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FROM CRADLE TO GRAVE –
VALUE CHAIN RESPONSIBILITY IN THE SHIP SCRAPPING INDUSTRY

written by

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ABSTRACT

The World fleet plays a crucial role in the world economy. With growth in world trade the world economy has expanded, facilitated largely by shipping. The profitable trading life of a ship, however, is limited to 25-30 years. Each year approximately 3.5 to 4 % of the world fleet or 4,000 vessels are sent to recycling yards around the world. The majority of commercial vessels are dismantled in Asian countries where health and safety and environmental protection standards remain unacceptably low by developed world standards. At present, however, there are few viable alternatives, with recycling facilities in the developed world incapable of dismantling the largest ships, and current IMO legislation remaining voluntary and difficult to enforce. In this thesis the value chain responsibility of shipping companies will be discussed in the context of the current industry conditions in terms of market circumstances and legislative landscape.

LIST OF ABBREVIATIONS

BIMCO	The Baltic and International Maritime Council
BW	Bergesen Worldwide
CBM	Cubic Meter
CFC	Cloroflorocarbons
CODEC	Community Development Centre
DB	Double Bottom
DG TREN	Directorate-General Energy and Transport
DS	Double Sides
DWT	Dead Weight Tonnage
EEA	European Economic Agreement
EEC	European Economic Community
EFTA	European Free Trade Association
EU	European Union
FOC	Flag of Convenience
GATT	General Agreement on Tariffs and Trade
ICS	International Chamber of Shipping
ILO	International Labour Organisation
IMF	International Metalworker's Federation
IMO	International Maritime Organisation
INTERTANKO	International Association of Independent Tanker Owners
ITOPF	International Tanker Owners Pollution Federation
LDT	Light Displacement Tonnage
LNG	Liquefied Natural Gas
LPG	Liquefied Petroleum Gases
MARPOL	Maritime Pollution Convention
MEPC	Marine Environment Protection Committee
MNC	Multi National Company
MoEF	Ministry of Environment and Forests
NGO	Non-Governmental Organisation
NHH	Norwegian School of Economics and Business Administration
NIS	Norwegian International Ship Register
OECD	Organisation for Economic Cooperation and Development
OSH	Occupational Safety and Health
PBC	Polychlorinated Biphenyls
SS	Single Skin
TBT	Tributyltin
ULCC	Ultra Large Crude Carrier
UN	United Nations
US OPA 90	United States Oil Pollution Act of 1990
VCR	Value Chain Responsibility
VLCC	Very Large Crude Carrier
WTO	World Trade Organisation

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CHAPTER 1 - INTRODUCTION

Motivation

In 2001 the International Maritime Organisation (IMO) achieved an important environmental victory. All single hull tankers were to be phased out by 2015. In the aftermath of the Prestige accident in November 2002, the end date for the phasing out was, however, accelerated to the year 2010. The phasing out of single hull oil tankers is likely to have a significant effect on the tonnage and number of vessels to be scrapped with a major peak in the year 2010.

The increase in scrapping tonnage - even though an important environmental victory in the operational part of the shipping industry – is likely to lead to increased human and environmental costs in the scrapping industry. A majority of all oil tankers are dismantled at scrapping locations that lack proper dismantling facilities, both in terms of equipment and in terms of local knowledge about dismantling.

When vessels are scrapped in regions of the world like the US or the EU, firm environment, health and security regulations imposed by the costal state ensure that hazardous liquids like oil or toxic chemicals that leak from the vessels during the scrapping process are taken care of in a responsible manner. More than 90 % of the scrapping is, however, done in Asian developing countries where the regulative framework has yet to be completed, and thus protects the surrounding environment and the workers involved in the dismantling process only to a limited extent.

The combination of low labour costs, limited amount of environment, health and safety regulation and high demand for steel in developing countries like India, Pakistan, China and Bangladesh, are all factors that contribute to a favourable market for ship breaking in this region of the world. Historically there have been no signs of scrapping sector capacity constraints. If new industry regulation is introduced some scrap yards may be pushed out of business, and capacity constraints may arise.

Research Question

In this thesis the focus will be on value chain responsibility in the ship scrapping industry in the context of historical development and the current situation, including economic situation, legislative framework and working conditions. The research question is:

In the context of the current industry conditions, in terms of the economies of ship scrapping and the legislative landscape, does the shipping industry admit value chain responsibility?

As the volume of vessels sold for demolition is expected to reach an exceptionally high level in the year 2010 NGOs argue that it is important to ensure that the shipping companies acknowledge responsibility for the vessel from cradle to grave to avoid environmental and human tragedies. Due to time restrictions I have chosen to focus on one concrete case, the shipping company Bergesen Worldwide, which is a major industry player, to illustrate the degree to which the industry admits value chain responsibility.

Objective

The master thesis seeks to discuss current issues within the ship scrapping industry. Issues in connection with the scrapping industry have gained increased interest as the deadline for the phasing out of single hull tankers approaches. The primary objective of the thesis is to analyse the value chain responsibility of a shipping company like Bergesen Worldwide in the context of the current industry conditions in terms of market circumstances and legislative landscape.

Report Design

- The report has *chapter 2,* the background chapter, as point of departure. In this chapter the decision to phase out single hull tankers by 2010 is described, and a reason for the attention drawn to the ship scrapping industry is given.

- *Chapter 3* outlines the methodology applied in the report to gather information and perform the analysis.

- Three theoretical areas, described in *chapter 4*, the economies of ship scrapping, legal regulations and business ethics, build on the background chapter and determine the structure of the report.

- Theoretical elaboration on the economies of ship scrapping is especially important for *chapter 5,* where the ship scrapping industry is described.

- *Chapter 6*, where working conditions and impact on the local environment of ship scrapping are described, contributes with an impression of how human and environmental issues are currently treated by the shipping industry.

- Theories explaining legal regulation establish a framework for understanding the current legislative framework of the ship scrapping industry, outlined in *chapter 7*.

- Theories originating from the field of business ethics construct the necessary background for understanding whether value chain responsibility, described in *chapter 8*, is typically acknowledged in the shipping industry.

- To illustrate how drivers from the three theoretical fields might affect an industry player I have chosen to focus on the shipping company Bergesen Worldwide. Six cases of Bergesen owned demolitions will be described and analysed in *chapter 9* of the report.

- In *chapter 10* concluding remarks on my research questions are provided.

- Finally, in *chapter 11*, recommendations for shipping companies and suggestions for future research are outlined.

Report Framework

Figure 1 is meant to give an overview of how the report is built up.

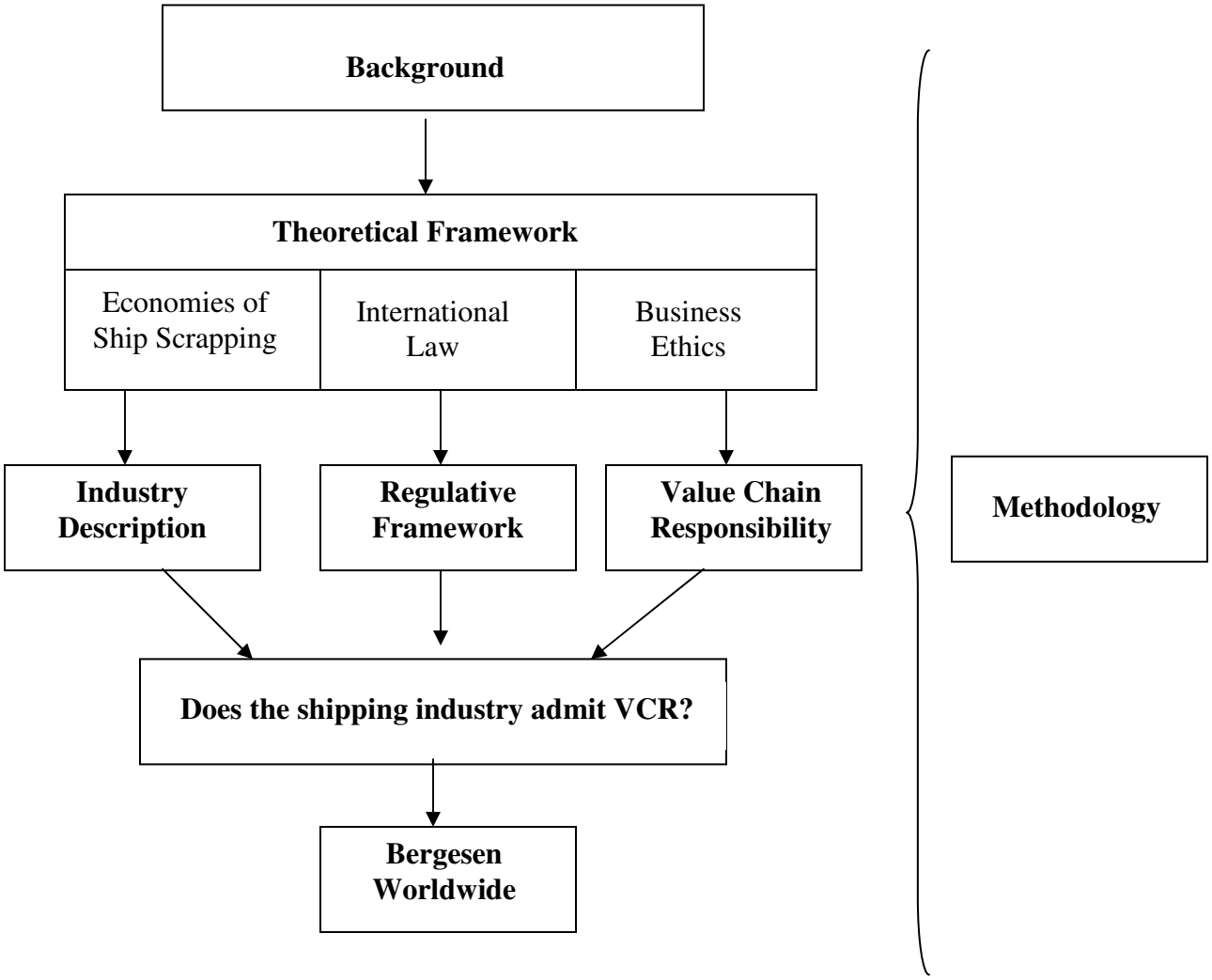


Figure 1: Report Framework

CHAPTER 2 - BACKGROUND

The Decision to Phase Out Single Hull Tankers

The ship scrapping industry has gained much attention lately because a large increase in the volume of vessels sold for scrap is expected to occur in the year 2010. An important issue is whether the demolition market will be able to absorb the extra scrapping volume and to which extent new international environment, health and security regulations will affect the market conditions.

In general two equally important factors have lead to increased scrapping volume. First of all international trade, which has been steadily increasing for centuries, contribute to increased demand for transport, and traditionally the majority of traded goods is transported by sea. In turn increased demand for sea transport implies that the shipping industry as a whole order more vessels when demand increases. When these vessels reach the end of their lives, they will be transferred to the last of the four shipping markets, the demolition market[1]. Hence, increased trade implies increased scrapping volume, with a time delay of approximately 20-25 years, which is the average life span of a vessel. Economic downturns, causing the level of international trade to drop, are also expected to result in increased scrapping volume because ship owners are unwilling to keep relatively old vessels during unfortunate economic periods. The economic rationale behind the scrapping decision during downturns is that it is optimal to scrap a given vessel if the expected value of continued trading is less than its scrap value.

Secondly regulative decisions, like the decision to phase out all single hulled tankers by the year 2010, are expected to lead to a scrapping industry volume boom. While increasing or decreasing trade is a longitudinal development, stretching over a relatively long period of time, the introduction of a new legislative framework requiring the final phase out of all single hulled tankers represents a sharper change in the market conditions. The phase out decision builds on several environmental disasters that occurred in the late 20th and early 21st century. The

[1] See Chapter 4, Theory, for an introduction to the four shipping markets.

development towards a stricter regulative framework for new building and operation of tankers is described in the section below.

The grounding of the single hulled oil tanker Exxon Valdez outside the coast of Alaska in 1989 and the resulting oil spill that released about 37,000 tonnes of crude oil (ITOPF Handbook) provoked the issuance of the United States Oil Pollution Act of 1990 (OPA 90). OPA 90 commanded the phase out in US waters of all single hull tankers by the year 2015 (Birkland 1998).

The International Maritime Organisation (IMO) reacted to the American phase out legislation in 1992 when international requirements of double hull tankers were introduced. The Amendments to Annex I of MARPOL 73/78 (International Convention for the Prevention of Pollution from Ships, adopted in 1973) launched two new regulations, 13F and 13G, relating to design and construction of oil tankers. 13F concerned construction standards for new vessels and states that tankers ordered after 6 July 1993 are required to have double hull or an equivalent. Regulation 13G deals with existing tankers, and requires that at 30 years of age all tankers have to comply with Regulation 13F and must thus be double hulled (Stopford, 2004).

Another single hulled oil tanker, the 24-year old Erika, split in two off the coast of France in 1999 and spilt 10,000 tonnes of crude oil into the sea. This second major disaster forced the French government and the EU to take action to prevent further causalities. Besides, it forced the IMO to react in order to defend its position as the only international forum for legislation. Consequently, in 2000 the EU Parliament approved a phase out scheme for single hulled tankers similar to the OPA 90 proposed by the EU Commission. The proposal aimed at accelerating the phasing in of double-hulled tankers. The outcome was the 2001 revised version of Regulation 13G, with a stricter phase out scheme than before, with a final end in the year 2015.

When the third single hulled oil tanker, the Prestige, suffered hull damage off the coast of Spain in 2002 and spilt 63,000 tonnes (www.itopf.org) of oil into the sea, the EU Commission suggested accelerating the phase out scheme of 2010 to align with the relevant time schedule of the OPA 90. With the adoption of Regulation 1726/2003, the EU has, since 2003, applied the

same rules for the phasing out of single hulled tankers as the US. Finally the 2003 amendments to Regulation 13G of Annex I to MARPOL stated that the final phasing out date for all single hulled tankers was accelerated to the year 2010. These amendments were given final approval in 2004.

Accidents with single hulled tankers other than those mentioned above have of course occurred since the 1980s. The accidents mentioned here are, however, of special interest since they have induced regulatory changes of great importance to the industry.

Consequences for the Demolition Market

The MARPOL and EU regulations accelerating the phase out of single hull tankers are likely to lead to a significant increase in scrapping volume, with a peak in 2010. Estimated future scrapping volumes of up to 11.0 million LDT[2] (66.3 million DWT or 784 vessels) (EC-DG TREN 2004) in 2010 by far outrange the highest scrapping volume recorded throughout history. The maximum volume scrapped was recorded in 1985, when the market was extremely pessimistic and 38.2 million DWT of bulk carriers[3] were scrapped (Fearnelys 1985). Of these 27.1 million DWT were oil tankers.

The total fleet of single hulled tankers of 5,000 DWT and above consisted of 2,256 vessels or 129.5 million DWT as of January 2004. The LDT equivalent to the total fleet size estimated by the industry is 24.1 million LDT (2,256 vessels/129.5 million DWT). According to a report developed by the European Commission in June 2004, the decision to accelerate the phasing out of single hulled tankers from 2015 to 2010 will result in a 25-30 % higher scrapping volume in the year 2010 (EC DG-TREN 2004).

Currently the supply of scrapping capacity to meet the increased volume of vessels for demolition is found in developing countries in Asia. There is no historical evidence of capacity constraints in the industry, and it is thus likely that countries with high market share in the

[2] LDT is the steel weight of the vessel.
[3] Including combined carriers, oil tankers and bulk carriers.

scrapping market today will continue to dominate the business as the scrapping volume increases. It is, however, important to note that the no-capacity-constraints scenario builds on the assumption that the present industry conditions will prevail (EC DG-TREN 2004, p. 98).

Conflict of Interests

The decision to phase out single hull tankers and the expected increase in scrapping volume explains why the ship scrapping industry has gained much attention lately. While new environmental and working condition related legislation is needed to avoid future human and environmental disaster, the shipping industry is dependent on maintenance of the current situation to avoid capacity constraints. This conflict between different stakeholder interests shapes the background for this report.

CHAPTER 3 - METHODOLOGY

Literature Review

This report is written with an extensive literature review as point of departure. I have aimed at approaching the ship scrapping industry from different angles by reading material provided by independent researchers, political organs, shipping companies, non-governmental organisations (NGOs) and the world press on the topic. Unfortunately the amount of material available from NGOs and the world press by far outrange the material originating from the shipping companies. I have tried to keep this lack of balance in mind when analysing the industry.

By studying literature originating from a number of different sources I hope to elucidate different aspects of the ship scrapping industry, including the economic, the legal, the environmental and the human aspect of the industry. Furthermore I hope to illustrate the controversies between two fundamentally different groups, the shipping companies and the NGOs.

First of all material provided by independent researchers forms the platform for the theoretical framework presented in chapter 4. Furthermore the description of the ship scrapping industry in terms of the economies, the working and environmental conditions, the legislative landscape and value chain responsibility, which is presented in chapter 5, 6, 7 and 8 respectively, builds on a combination of material provided by independent researchers, research forums like the Clarkson Research Studies, political organs like the IMO and the ILO and NGOs like Greenpeace. Finally the analysis of Bergesen Worldwide in chapter 9 is based on information provided by the shipping company itself, empirical data from Clarkson's database and reports from the world press.

The drawback of applying literature review as methodology for information collection is that all knowledge gained must be considered second hand information. A better approach would perhaps have been to perform interviews, with representatives from the shipping industry, from the NGOs and from the ship scrapping industry. To achieve a complete picture of the industry it would, however, have been desirable with a substantial number of interviews. Due to the time-

and financial restrictions of this study, an extensive literature review appeared as a better alternative than a limited number of interviews that would have been unable to cover the interests of all involved stakeholders.

Case Study

To achieve a context dependent understanding of the ship scrapping industry in terms of the economies of ship scrapping, the legislative landscape and the value chain responsibility of shipping companies, I believe that it is helpful to conduct concrete cases studies. I will thus describe six demolitions owned by the shipping company Bergesen Worldwide to discuss how the three areas of ship scrapping may affect an industry operator. A few remarks on my choice of case does, however, seem appropriate;

Bergesen Worldwide with its six latest demolitions was initially chosen because the company is a major shipping industry player. The company has a significant market share in several shipping divisions, including dry bulk, gas and tank. Market leaders like Bergesen often possess considerable amounts of industry power, and are likely to be in the position to influence the development of the industry in which it operates. How Bergesen handles issues related to vessel decommissioning may thus have an effect on how the industry as a whole is likely to treat ship-scrapping issues in the future.

The six Bergesen cases, the Hesperus case in specific, have features that are typical for the ship scrapping industry, and illustrate a wide range of aspects that I presume to be generally valid for the ship-dismantling scenario. The six cases were thus chosen because they may be able to give an illustration of how different industry drivers affect a shipping company.

The Bergesen vessels are not unique, neither in a Norwegian nor an international context. Thousands of obsolete vessels from OECD countries has ended and will end their lives at Asian ship scrapping yards. The way five of the six Bergesen vessels reached Asia, without much media attention, is also typical. In terms of media attention the Hesperus case is the only of the six demolitions that stands out as special. The vessel was subject to immense focus of attention

both in Norway, in India and internationally. This attention creates a platform for analysis of value chain responsibility because it might uncover how a specific company treats issues connected to the ship scrapping industry.

It is however important to keep in mind that the sole objective of the world press is to 'sell its story' (Arleth and Krogstrup 2006). The media only covers a story if it expects its audience to be interested in that particular story. Furthermore choice of words, pictures and interview objects will determine how the audience experience the situation. The Hesperus case received substantial media attention, in the Norwegian and Indian as well as the international press. Typically the stories covering the Hesperus case seem to be written to appeal to the reader's sense of justice, and the shipping companies are often portrayed as irresponsible and unethical.

Finally it is worth mentioning that the NGOs, like the media, are dependent on attention to survive and are likely to choose which cases to focus on based on this. To avoid repeating false statements I have aimed at verifying media accounts whenever possible by comparing the statements with official documents and press releases.

CHAPTER 4 - THEORETICAL FRAMEWORK

The theoretical framework of this thesis builds on a combination of theories from three fields, including the field of shipping economics, the field of international law and the field of business ethics. I have chosen to include theories derived from shipping economics because these theories are necessary to understand the underlying market mechanisms controlling the shipping industry in general and the ship scrapping industry in specific. Furthermore, theories from international law can contribute with a framework for understanding what a regulative regime like for instance the Basel Convention is, and why some national governments seem to be more reluctant in joining regulative regimes than others. Finally theories originating from the field of ethics are important because these theories can provide us with knowledge about how the maturity of moral reasoning may affect the development of the ship scrapping industry.

The relationship between these theories and the prevailing ship scrapping industry situation is illustrated in figure 2:

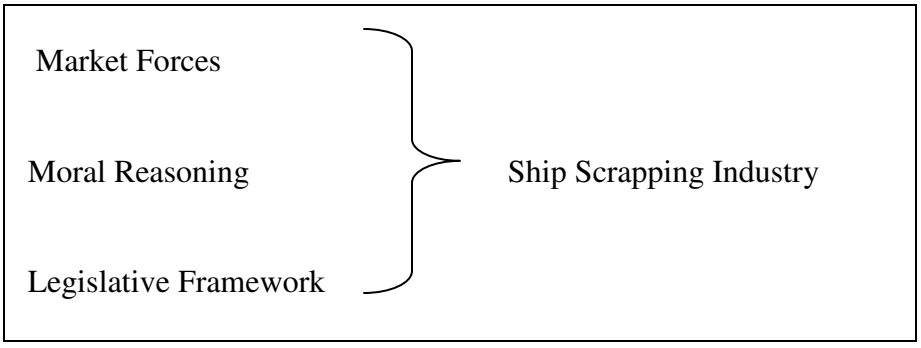


Figure 2: Theoretical Framework

The Economies of Ship Scrapping

This section offers an overview of the driving mechanisms of the ship scrapping industry. The section aims at providing the reader with an understanding of how factors connected to supply and demand determine when and where ships are scrapped. As an important source of information the June 2004 report of the European Commission, '*Oil tanker phase out and the ship scrapping industry'* will be applied. The information provided in this section may serve as a platform for understanding how the ship scrapping industry has developed historically and how the sector is likely to develop in the future.

The Long Term Development of Shipping

Like in most industries, the business cycle, describing the development of the sector, is an integrated part of the shipping industry. The business cycle ensures a 'survival of the fittest' business development, where the weakest industry participants are forced out of business during economic downturns, leaving only the most efficient companies in business (EC DG-TREN 2004, p. 41). The shipping industry consists of four basic markets:

- The *new building* market trades new vessels
- The *freight market* trades sea transport services
- The *sales and purchase* market trades second hand vessels
- The *demolition* market trades obsolete vessels

Because a wide range of factors influences the business cycles and because the four shipping markets are highly interconnected, the development of the shipping industry is very complex. The business cycle manages risk and return on business investments and plays as such an important role in the economics of the entire shipping industry.

The following example illustrates that the demand and supply of the four shipping markets is interconnected: *'At a moment in time only a restricted number of new vessels are built, and at the same time the demand for sea transport services increase due to a world economy upturn. Due to*

such a situation with excess demand the price of sea transport services increases, and the increase in freight price affects both the second hand market and the demolition market. The price of second hand vessels will increase due to the increased earning potential of the vessel, and fewer vessels will be sold for scrap, also increasing the demolition market price. This development will lead to an increased number of new building orders and, eventually, to excess supply of sea transport services and a downward pressure on the freight rate' (EC DG-TREN 2004, p. 42).

The demolition market has an important buffer role in the shipping industry, since it contributes with balance between supply and demand in the freight market. During a world economy recession international trade typically stagnates, creating an overcapacity in the freight market, sending more vessels to the scrap yards, and thus balancing out supply and demand. During an economic upturn the reverse development, as described above, is likely to occur. Even though it is a highly complex or even impossible task to predict the future development of the business cycles, much industry effort is each year laid down to sort out what is the most plausible development.

The Supply Side of the Ship Scrapping Industry

Historically the owner of a vessel has had positive cash inflow from two sources. The main source of income is cash generated in the freight market. In addition, selling a vessel in the second hand market or the demolition market will generate a positive cash inflow. Keeping other factors constant a ship owner's decision to sell a vessel to the demolition market will be a matter of weighing the advantages of keeping the vessel, in terms of future expected income, against the advantages of selling the vessel as scrap, the achievable scrap price. It is optimal to scrap a given vessel if the expected value of continued trading is less than its scrap value (Strandenes 2004, p.10).

The age of the vessel will affect the ship owner's scrapping decision given that older vessels have a lower future earning potential due to higher maintenance costs. An important cost element for aging vessels is the regular surveys the vessels has to undergo to obtain classification and

then insurance. The fifth survey, at the age of 25 years tends to be expensive and high freight rates are thus necessary to compensate for the increased costs if the vessel is to be held in operation.

Ignoring possible international regulations, company policies and the cost of transporting the vessel to the scrapping location, the ship owner is presumably indifferent about where to scrap the vessel (EC DG-TREN 2004, p.43). The ship owner will choose the scrapping location that offers the highest scrap price for the vessel. By aggregating the individual ship owners' scrapping decisions we get the total demolition supply curve. This curve illustrates the total number of vessels sold for scrap at any given price.

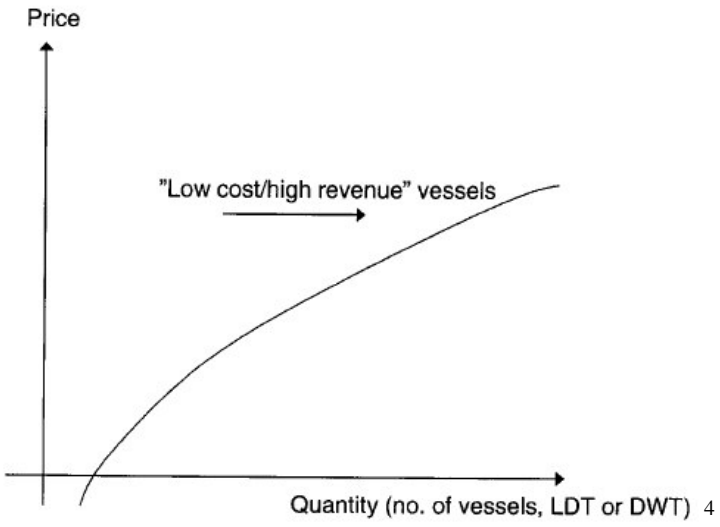


Figure 3: Demolition Supply Curve (Source: EC-DG TREN 2004)

Figure 3 illustrates that there is a positive relationship between the obtainable price of an obsolete vessel and the volume of vessels sold for scrap.

The European Commission (EC-DG TREN 2004, pp. 44-45) identifies five key drivers that may affect the position of the demolition supply curve. If the ship owner perceives improved market conditions in the freight market, the *future earning potential* has increased and the demolition

[4] It is important to note that the shape of the curve is only an illustration of the scrapping market it may be formed differently.

supply curve shifts upwards since high potential earnings encourage continued operation of the vessel. Secondly, if the *operation costs* of the vessel, that is for instance fuel costs or survey costs, increases the demolition supply curve shifts downwards, since the ship owner requires a lower price to scrap the vessel. Thirdly the supply curve shifts downwards with increasing *average age* of the existing fleet. With a high share of old vessels the ship owners will, on average, demand a lower price to scrap their vessel. Fourthly, a constant increase in the *size of the current fleet* will, keeping other conditions constant, lead to an increased supply of vessels for scrap. Finally, regulatory issues, like the decision to phase out single hulled vessels, vetting systems, port state control, etc., will affect the supply curve.

The Demand Side of the Ship Scrapping Industry

A ship scrapper's decision to buy an obsolete vessel for scrap is affected by the possibilities to sell steel and other reusable items from the vessel in addition to the scrapper's cost structure (EC DG-TREN 2004, p. 45). At a given steel price and a given level of running costs the scrapper will require buying the outranged vessel at a given price. Under changing conditions, like decreased steel price or increased running costs, the scrapper will require to get the vessel at a lower price. Both revenue possibilities and running costs, like labour costs, taxes, capital costs and environmental requirements are determined by local conditions. Ship scrappers in some regions of the world will thus be able to offer a higher scrap price than scrapper in other regions.

By aggregating the decisions of the individual scrappers we get the demolition demand curve, which illustrates the aggregate demand for obsolete vessel at any price. In some countries the ship scrapping yards will only be willing to enter the scrapping market if the price of an obsolete vessel becomes negative, due to high running costs. Economic models do, however, assume non-negative prices. If the future market conditions imply that shipping companies will have to pay to get rid of their vessels, the market situation will be illustrated through the shipping companies' demand curve against the scrap yards' supply curve.

The June 2004 report provided by the European Commission (EC DG-TREN 2004, p. 45 and 128) discusses a future scenario where ship owners have to pay to get rid of their obsolete vessels.

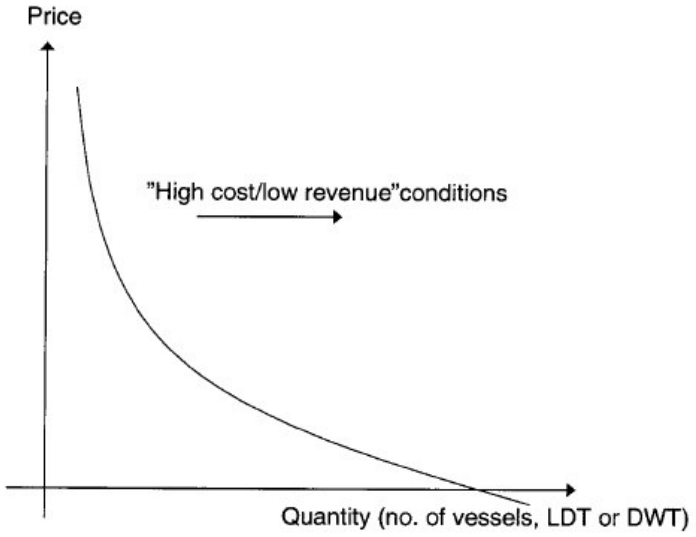


Figure 4: Demolition Demand Curve (Source: EC-DG TREN 2004)

According to the European Commission's report on the ship scrapping market (EC-DG TREN 2004, pp. 46-47), the position of the demolition demand curve will be affected by the *demand for steel and other reusable items*, the *running costs* of a particular scrap yard and the *exchange rate*. Among the running costs labour costs is of great importance since the ship scrapping industry is highly labour intensive. Furthermore local, national and international regulation is an important cost factor since health, safety and environment regulation increases running costs. Finally better infrastructure reduces running costs. Exchange rates affect the competitiveness of a certain country since the running costs of a scrapping yard is paid in local currency.

Low demand for second hand steel and high running costs explains why European ship scrapping yards are almost absent from the demolition market today. In an unregulated world market where ship owners are indifferent about where to scrap, European scrap yards are not competitive.

The Equilibrium Solution

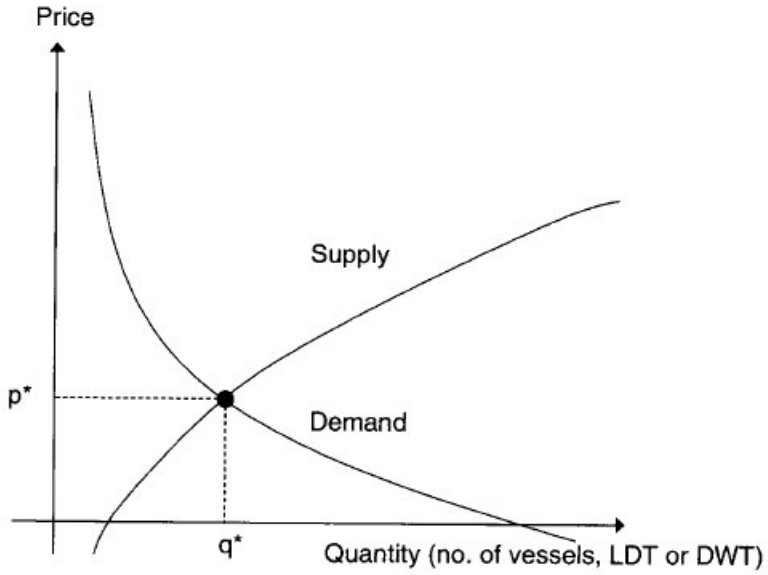


Figure 5: Supply and Demand of Ships for Demolition (Source: EC-DG TREN 2004)

The interaction of the supply and demand curves determines the amount of vessels scrapped (q*) and the market price (p*) in a competitive market. As the scrap price decreases scrappers will demand more vessels and vice versa.

Throughout history the scrap yards have had to pay for obsolete vessels. Given certain conditions ship owners will have to pay scrap yards to decommission their vessels, though (EC-DG TREN 2004, pp. 48-49). In the case of for instance the future phase out of all single hull vessels such a situation may arise. The supply of obsolete vessels increases to a level where high running cost yards find it profitable to enter the market. If ship owners are not willing to pay for the scrapping process the result might be a ghost fleet of outranged vessels without value. If the excess supply situation is temporary, it will again be possible to obtain positive cash inflow from the scrap market.

Market Drivers Influencing Supply and Demand

Change in important market drivers like freight rate, international regulation, steel prices and market interactions ensure that the ship scrapping market is not static but dynamic (EC DG-TREN 2004, p. 49). First of all peaks in the *freight rate* is transferred to the demolition market with a small delay. High freight rates reduce the incentive to scrap old vessels and the supply curve is shifted upwards.

Regulations like the phase out scheme, which force ship owners to scrap their vessels earlier than they would otherwise have done, increase the supply of vessels to the demolition market. If 'low cost' scrappers' capacity is filled up, demand from 'high cost', often European, scrappers might be satisfied. Furthermore, regulations concerning health, safety and environment my influence the demand for obsolete vessels by increasing running costs. Regulation on these areas is often implemented only locally, while the ship scrapping market is global, and it is plausible that new regulation only affects some of the ship scrappers, in some cases pushing these operators out of the market.

A higher level of scrapping due to higher *steel prices* could affect the market price for steel. However, second hand steel from obsolete vessels constitutes only a marginal part of the total supply of steel, and the price of steel must hence be considered as exogenous in the scrapping context.

Finally *market interactions* introduced by international organs like IMO, ILO or the Basel Convention guidelines might influence ship owners' decision about where to scrap their vessel. If for instance high cost, environmentally friendly scrap yards are subsidised the incentive to scrap at these locations is increased. Furthermore control regulation can ensure that scrap yards applying dangerous or environmentally threatening procedures are pushed out of the market. Control regulation will, however, require global support to be effective.

Capacity

In chapter 5 we will see that historically there is no evidence of capacity constraints in the ship scrapping industry. New regulations on health, safety and security may, however, result in capacity constraints as the volume of vessels sold for scrap peaks in the year 2010.

International Law

Even though market mechanisms caused by shifting supply and demand conditions affecting the four shipping markets are important to the development of the ship scrapping industry, other factors such as regulation and political resolutions can have an equally significant effect on the market situation. As the regulative situation is today the ship scrapping industry will be able to meet future increased demand for ship scrapping services that will arise due to the political decision to phase out all single hull tankers. However, if new environmental or working condition related regulations are introduced and signed by affected nations, the terms of the industry will be changed, some ship breakers may be forced to shut down their business, and it may not be enough capacity to meet the need for scrapping services. It is thus necessary to understand the mechanisms of the regulative situation. To achieve such an understanding it may be helpful to use a theoretical framework.

Environmental Regimes

Environmental issues were not addressed in theories about international relations before the late 1980s. Since then the notion of 'environmental regimes' has been an important element in theories concerning relations across borders. Typically new legislation is introduced through regimes and affects the national states that have signed the treaties of the regime (Arleth and Krogstrup 2006). Regimes have been defined in a number of ways, but the definition below, developed by Stephan Krasener, is frequently referred to ((e.g. (Baylis 2001), (Keohane 1982), (Keohane 1989), (Young 1993a), (Jakobsen 2000), (Hansen1997)).

"Regimes can be defined as sets of implicit or explicit principles, norms, rules, and decision-making procedures around which actors' expectations converge in a given area of international relations. Principles are beliefs of fact, causation, and rectitude. Norms are standards of behavior defined in terms of rights and obligations. Rules are specific prescriptions or proscriptions for action. Decision-making procedures are prevailing practices for making and implementing collective choice". (Krasner 1983)

This definition reveals that regimes are defined not only by a common understanding of which rules apply to a certain area of international regulations, but also the common understanding of which norms are relevant for the specific area. An example of a regime governing international environmental relations is the Basel Convention. The countries that have signed the Basel Convention will, theoretically, share a common understanding of how hazardous waste is to be treated. The international regimes are built up around legislation and rules, and when legislation changes, the regime changes.

Some industries, like the ship scrapping industry, has characteristics that ensure that it falls under, or in some cases between, several regimes with different degrees of institutionalisation (Arleth and Krogstrup 2006). The issues that arise when vessels are traded internationally with the purpose of scrapping may potentially fall under the regulation of environmental regimes such as the Basel Convention or under trade regimes such as the WTO. So far the international community has not been able to decide whether ship scrapping should primarily be subject to trade regulation or environmental regulation. Consequently both trade and environmental regimes and the development of legislation in these regimes affect the sector. Problems arise when the legislation of the regimes involved come to different conclusions.

Willingness to Sign Treaties

Another problem in the ship scrapping industry is that some national governments seem to be less willing to sign treaties and engage in international regimes protecting the environment and ensuring improved working conditions than others. Researchers have attempted to explain the varying willingness to sign treaties through domestic and international factors (Sprinz 1992).

Detlef Sprinz (1992) has developed the conceptual framework below for understanding why some national governments hesitate when it comes to support of international policy decisions:

A Conceptual Model of Support for International Environmental Regulation

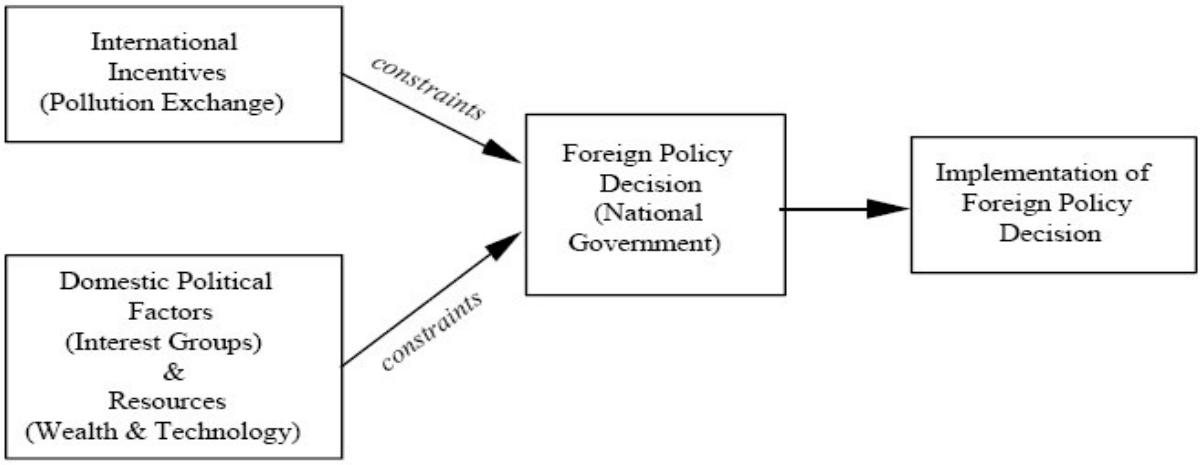


Figure 6: A conceptual model
Source: Sprinz 1992 p. 11

Previous research on domestic and international environmental regulation has emphasized the role of environmental damages and the perception thereof, societal actors in the form of interest groups, for instance environmental groups or green parties, and resources at the disposal of countries, such as wealth and technology (Sprinz 1992). Given these constraining factors national governments will seek to maximize utility, and, if other factors are held constant, national governments will seek to maximize the degree of domestic environmental quality. In practice, this means that national governments have to balance competing goals, namely environmental and non-environmental goals (Ibid.). National preference for long term ecological sustainability that trumps preferences for short term profit opportunities is likely to lead to a willingness to sign stringent international environmental agreements, which after implementation will result in reduced pollution.

The framework presented above may also apply to international regulation of worker's rights. Frequently national governments have to weigh the interests of national workers against profit opportunities. The existence of interest groups, technology and wealth is again likely to affect the government's willingness to sign international treaties.

International Incentives

According to Keohane and Nye (1989) the *vulnerability of states* to international pollution, which will be asymmetrical, ensures that the most vulnerable countries will pursue policies of highly stringent environmental regulation. Prittwitz (1990) assumes that the aggregate interest of a country is determined by its composition of *polluter interests*, that is advantages of continuing polluting activities, *victim interests*, that is the perceived adverse impacts of pollutant activities, and *third party interests*, that is the interests of producers of abatement and substitution technologies. Countries with dominant polluting interests are, according to Prittwitz (1990), not likely to agree to international environmental regulation, whereas the opposite is true for countries that have strong victim interests. The work of Keohane and Nye (1989) and Prittwitz (1990) illustrates that a government's willingness to sign international treaties depends on a combination of its ecological vulnerability and its interests. Furthermore Sprinz (1992) suggests that an important measurable factor in a country's interest is the amount of *abatement costs*[5] it will be exposed to by signing international regulations. The relationship is illustrated below:

		Ecological Vulnerability	
		Low	High
Abatement Costs	Low	Bystanders	Pushers
	High	Draggers	Intermediates

Figure 7: Environmental interests
Source: Sprinz (1992), p. 36

According to Sprinz (1992) 'pushers' are more willing to engage in international environmental regulation than 'intermediates' or 'bystanders'; in turn, members of the latter two groups are more likely to be in favor of international regulation than 'draggers' are.

[5] Abatement cost is the cost of reduction or removal of an undesired item or effect like for instance pollution or human exposure to hazardous waste.

Domestic Political Factors

In addition to the international factors mentioned above, several domestic characteristics may affect a country's willingness to engage in international regimes protecting the environment or workers' rights. First of all the attitudes of concerned parties seems to be important. The development of post materialism in Western Europe has lead to the establishment of *interest groups* like green parties and environment movements in this part of the world. It seems plausible to assume that countries with high shares of post materialists, on the level of mass publics and elites, will be willing to spend scarce resources on international environmental regulation. Furthermore factors like exposure to environmental hazards, socio-economic status and concern for the quality of the environment on the national and international level, have been suggested by researchers as possible domestic explanatory factors affecting willingness to sign international treaties (Rohrschneider 1988, and Sprinz 1990).

In addition to the influence of interest groups, *resources* (wealth and technology) have been pointed out as a factor influencing willingness to engage in international agreements. According to Prittwitz (1990) countries with sufficient resources will be able to undertake environmental policies. Furthermore, the presence of abatement technology (i.e., end-of-pipe and process control technologies) or integrated technologies (which avoid or reduce pollution by modifying production processes) may allow countries to adopt policies that lead to substantial improvements of their environmental quality. Overall wealth of resources should be associated with ambitious environmental policies (Sprinz 1992).

Summing up one could say that the development of the regimes governing an industry and the involved countries' willingness to sign international treaties will probably affect the development of the industry.

Business Ethics

The third theoretical field that may contribute in explaining the development of the ship scrapping industry is the field of ethics. Theories describing levels of ethical development may be able to provide us with some knowledge about the extent to which norms and values affect the operation of the industry. The objective of this thesis is, as earlier mentioned, to reveal whether the shipping industry admits value chain responsibility. To simplify the analysis a major industry player, Bergesen Worldwide, has been in focus. Such an understanding of responsibility is likely to be connected to level of ethical development.

Traditional theories describing ethical development through stages are typically applied at the level of the individual (Kohlberg 1971). However, the analytical ideas and methods have been developed and are frequently applied at a corporate level (Reidebach and Robin 1991, Falkenberg 2004). If the theories are applied at a corporate level, the way the corporation acts upon the surrounding world is in focus. Through an analysis of an important corporation's choice of behaviour in different cases it may be possible to get an impression of the industry's level of ethical development.

Lawrence Kohlberg's Framework

In this report I have chosen to apply the conceptual model developed by Lawrence Kohlberg (1971). Kohlberg suggested three stages of moral development each with two subcategories resulting in a total of six stages. The stages are *pre-conventional* moral reasoning, *conventional* and *post-conventional* moral reasoning.

The pre-conventional stages of moral reasoning is characterised by a rather egoistic view of ethics. The individual or the corporation acts to avoid pain and seek pleasure. Economic theories like transaction cost economics and principal agent theory both assumes that man is opportunistic and selfish and that control and incentive mechanisms are needed to achieve desired behaviour. Theories like these assume pre-conventional moral development as rule of thumb – the corporation has as its sole objective to maximise own profit without regard for the

environment or the well-being of people affected by its actions (Falkenberg 2004). Within the bounds of legality cost-benefit calculations will determine what the ultimate strategy is.

Supporters of utilitarianism like John Stuart Mill and Adam Smith (Mill 1863 and Smith 1776) have described the second pre-conventional stage of development. Mill and Smith believed that it is the responsibility of the corporation to produces as much good as possible, for all, at a macro level. Human rights are, however, not important to utilitarians, and utilitarianism, like ethical egoism, must be seen as a representative of consequential perspectives where cost-benefit calculation is the analytical tool. But unlike ethical egoism utilitarianism has a long-term perspective and does not focus on maximised profit for anyone individual or company.

The third and the fourth stage of moral reasoning are based on adhering to the conventions of ones immediate group (stage three) or of the society as a whole (stage four). The individual or the firm does what is expected by the local culture and what most people consider to be 'right'. The conventions of a particular society have been developed through local institutions over time. Institutions are humanly devised constraints that shape human interaction (North 1990). Institutions include the legal and regulatory framework as well as the norms, values, customs and patterns of behaviour present at particular place at a given time (Falkenberg 2004). The will of the people is represented in the institutions or the conventions that have been developed through a democratic process. Consequently different cultures and societies will have different sets of institutions.

In developed countries institutions have been changed by movements like labour movements, consumer movements, environmental movements, civil rights movements and the like over a long period of time, changing how people think of right and wrong and what economic organisations can and cannot do. Non-governmental organisations (NGOs) have been important contributors in this process, especially in Western cultures. However, to adhere to local institutions does not ensure ethical behaviour (Ibid.). In several developing economies the institutions are inadequate, unable to protect local environment and inhabitants. In these economies it is not sufficient simply to adhere to local conventions to act morally responsible.

Moral reasoning at the conventional stage will allow cost-benefit calculations to direct behaviour within the bounds of local institutions.

In economies with inadequate institutions conventional moral reasoning allows the company to take full advantage of the local conditions by for instance hiring and exploiting young children, expose employees to hazardous working conditions or release toxic waste to the water or to the air.

When institutions are inadequate, moral reasoning at a post-conventional level is necessary to protect people and the environment. In the fifth and the sixth stage of moral development a set of autonomous, universal ethical principles is developed to determine what is right and what is wrong. Ethical principles are followed not because 'good ethics pays' or because conventions expect that the principles are followed, but simply because it is right to act in adherence with the principles. The principles of justice or human rights should trump utilitarian considerations (Brandise 1932). In practice it is difficult to ensure that economic organisations are always able to judge what is right and what is wrong. It is tempting to apply cost-benefit calculations in a similar manner as in developed countries in developing countries, and a good set of institutions is thus important. In a situation where behaviour is regulated by laws, norms and values it is easier to compete with integrity.

Five principles of ethical behaviour may provide international organisations with guidelines for post-conventional moral reasoning (Falkenberg 2004). First of all the principle of *equality* implies that humans may not be treated differently based on who they are in terms of for instance gender, age, race, religion, etc. Everyone should have equal rights, equal opportunities and be considered equal before law.

Secondly the principle of *just institutions* encourages the company to see their acts from another person's point of view. Do I want my act to become a generally accepted principle? Do I want all others to pollute as much as I do for the same reasons as I do it? Do I want to work under the same conditions as my employees do? According to Falkenberg (1996) three basic principles have to be promoted to ensure just institutions; survival, equality of moral value and distribution

of index good according to the maxi-min principle. Survival includes a minimum of nutrition, health and education and consumption at a level that ensures survival of future generations. The equality principle was discussed above. The maxi-min principle states that in case of inequality those who have the least should get the most.

Thirdly the principle of *rights and duties* states that a firm shall not deprive anyone from their rights, in addition the firm shall protect the rights of the individual and aid those who have been deprived from their rights. The firm has obligations towards individuals who are directly or indirectly affected by its activities.

Fourth the principle of *integrity* states that in situations where the background institutions are inadequate, the firm has to develop a set of values that sets standards above the locally required minimum level (De George 1993). According to De George (1993) a MNC (Multi National Company) should do no intentional direct harm, it should produce more good than harm, it should contribute to the development of the local community, it should respect human rights and the local culture, it should pay its share of local taxes and it should cooperate with the local government.

Finally the principle of *responsibility* declares that the company is morally responsible of reducing harmful effects and causing desirable effects if it is capable of doing so.

If a firm is able to follow the five guidelines or principles of ethical behaviour described above it has reached the highest level of moral reasoning, the post-conventional level. However, in addition to its own actions, the firm may have some responsibility for acts conducted by upstream or downstream members of its value chain. A MNC may for instance be powerful enough to control the behaviour of its upstream suppliers or its downstream customers. According to the principle of responsibility the MNC may be responsible of changing the behaviour of the other value chain members if it is capable of doing so.

CHAPTER 5 - THE SHIP SCRAPPING INDUSTRY

The purpose of this part of the report is to establish a platform of general knowledge about the ship scrapping industry. The development of the industry will be outlined in terms of choice of scrapping location, level of scrapping volume and level of scrap prices during the last decade. Furthermore prognoses for future level and capacity of scrapping will be discussed. Theoretically the chapter builds on the economies of ship scrapping, described in chapter 4.

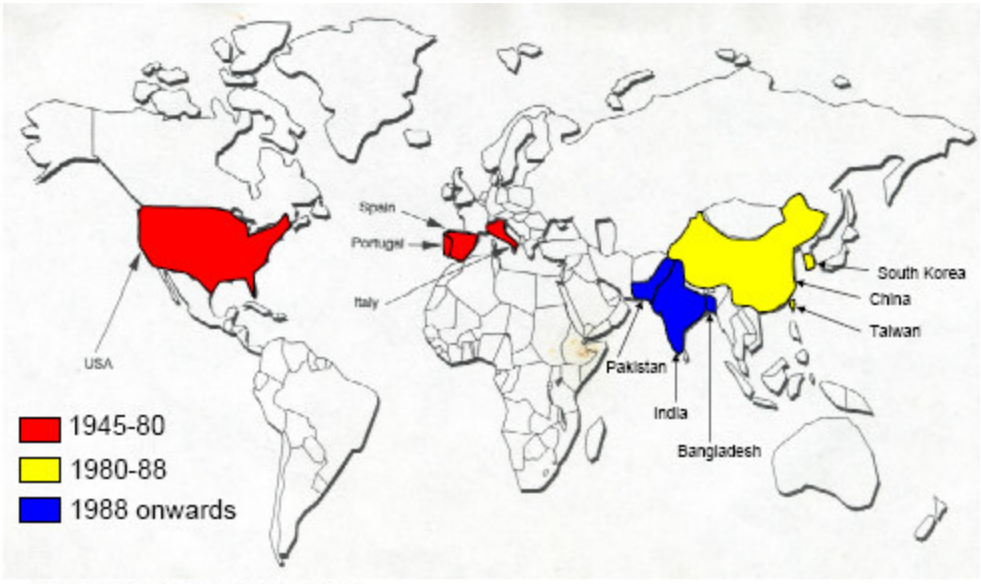
History of the Ship Scrapping Industry

Ship scrapping can be defined as the process of dismantling an obsolete vessel's structure for scrapping or disposal (www.osha.gov). A wide range of activities are included in the process, spanning from removing all gear and equipment to cutting down and recycling the vessel's structure. Due to the structural complexity of the vessel and the numerous health, security and environment issues involved, the dismantling process is a challenging operation. The main component of an obsolete vessel is steel, which can be reused in a number of industries and businesses. Unfortunately most vessels also contain several hazardous components.

Scrapping Location

Throughout the 1960s and 1970s vessels were mainly scrapped in mechanised, capital-intensive operations in Europe, notably in Spain and Italy, and in the US. During this period ship scrapping took place along piers in connection with ship building activities. As the level of environmental regulation in industrialised countries increased during the 1980s, costs of complying with the standards also increased. Consequently most of the ship scrapping industry was transferred to developing Asian countries, first to China, Taiwan and South Korea, then to Bangladesh, India and Pakistan (see map below). These countries attracted the scrapping industry due to low wages and a low degree of compliance with international standards of environment, health and security (ILO 2004).

Geographic Move of the Ship Scrapping Industry



Picture 1: Geographic Move

During the 1980s beaching as a method, which was initiated by an accidental beaching[6], became the most frequently applied method since it allows the demand for infrastructure (piers, sufficient depth of the harbour, cranes etc.) to be replaced by a mud flat and a huge labour force. To take full advantage of the low labour costs in the developing countries the industry, which had been highly capital intensive in high-labour-cost Europe, became labour intensive. As the economy grew in Korea and Taiwan, labour costs increased and ship scrapping became less attractive in these countries. India, Bangladesh, China and Pakistan, which are countries with relatively low labour costs, became the new market leaders in the scrapping industry from 1988 onwards.

The reason for the current geographical distribution of demolition services is thus that the economics of ship scrapping are not favourable for most developed countries. Higher labour costs, costs of protecting the environment and human health and lower demand for second hand steel and other reusable items than Asian developing countries ensures that the EU and other

[6] The method of beaching started automatically when a 20,000 DWT vessel was driven ashore by a devastating tidal bore in 1965. That was the first ship scrapped on the Chittagong beach in Bangladesh. (Rahman and Ullah 1999).

developed regions do not attract supply of obsolete vessels. Per tonne steel prices obtainable in Asia are higher than those obtainable in Europe (EC DG-TREN 2004).

Scrapping Volume

During the last 10 years ship breaking in Asia has accounted for more than 90 % (see table 1) of the total volume scrapped (LDT). The number of OECD countries that have operating ship-dismantling facilities is limited. Less than 2 % of the ship scrapping in the period from 1997 to 2006 was carried out in Europe. Of these 2 % Turkey accounts for more than 85 %. Demolition of obsolete fishing ships and navy vessels do occur, but no larger vessels are scrapped in OECD countries (www.mst.dk).

Location	Unit	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Total
Bangladesh	mLDT	0.7	1.1	1.2	0.8	1,7	1.4	0.7	1.6	1.5	0.2	10.9
	mDWT	3.2	5.8	7.2	4.2	9,5	8.7	5.5	6.0	3.8	1.6	55,5
	No.	63	66	65	61	123	69	52	90	69	38	696
India	mLDT	2.1	2.8	2.8	2.1	2.2	2.9	2.2	0,9	0.6	0.1	18.7
	mDWT	7.7	10.0	10.6	8.1	8.1	11.1	8.3	1.8	1.1	0.2	67.0
	No.	293	360	340	274	298	326	279	116	44	16	2,346
Pakistan	mLDT	0.2	0.6	0.7	0.2	0.6	0.3	0.2	0.1	0.0	0.0	2.9
	mDWT	0.9	3.4	4.3	1.2	3.7	1.7	1.3	0.3	0.1	0.0	16.9
	No.	14	40	34	16	26	13	25	11	4	1	184
China	mLDT	0.0	0.5	1.0	1.1	1.1	1.3	1.5	0.7	0.2	0.0	7.4
	mDWT	0.1	2.1	5.4	5.7	5.7	5.9	10.9	1.8	0.4	0.1	38.1
	No.	6	48	72	77	76	90	131	47	17	3	567
Other	mLDT	0.8	0.6	0.7	0.6	0.3	0.3	0.7	0.2	0.1	0.0	4.3
	mDWT	3.4	2.6	3.3	2.6	1.2	1.1	1.2	0.1	0.2	0.1	16.3
	No.	71	85	89	64	42	58	67	24	36	3	539
Total	mLDT	3.8	5.6	6.4	4.8	5.9	6.2	5.3	3.5	2.4	0.3	44.2
	mDWT	15.3	23.9	30.8	21.8	28.2	28.5	26.8	10.0	5.8	1.9	193.3
	No.	447	599	600	492	565	556	521	282	166	50	4,332

Table 1: Total historical scrapping volumes by region and year
Source: Clarkson 2006
Note: 2006 includes only January to April

The table above is based on data from Clarkson Research (2006). The data is compiled from Clarkson's fleet database in April 2006. This database covers a wide range of data on demolition, including type of vessel, size of vessel, location of scrapping, scrap price, etc.

During the period from 1997 to 2006 approximately 4,300 vessels have been dismantled globally. The level of activity has varied significantly throughout the period. The ship scrapping activity peaked in 1999 when 600 ships representing about 6.4 million LDT were scrapped and dipped in 2005 when only 170 ships representing 2.0 million LDT were scrapped. This pattern of historical scrapping is found across a number of different sources, for instance (Clarkson 2006), and (EC-DG TREN 2004).

Since 2004 the number of vessels sold to scrap yards has been low. Booming freight rates across all shipping sectors have been the cause of this scrapping drought as the tight demand/supply balance means owners choose to keep older ships, which in a weaker demand environment would have been scrapped, operating. A strong freight market and few candidates for demolition are the two most important reasons for the demolition drought (see chapter 4). However, campaigns of environmental lobbies such as Greenpeace have drawn attention to the poor and dangerous conditions that many workers in the dismantling industry have to endure and these campaigns have, according to Clarkson Research Studies (2005), also contributed to the low scrapping volumes.

Scrapping Prices

The balance of demand and supply in the scrapping market determines the price obtainable for an obsolete vessel. The development of prices during the last decade is illustrated in the figure below. The price obtainable in the demolition market and the volume of decommissioning is negatively correlated, indicating that when volumes increase, the price of an obsolete vessel decreases. This relationship indicates that factors other than the scrap price, for instance the freight market rate, determine when a ship owner decides to sell the ship for scrap.

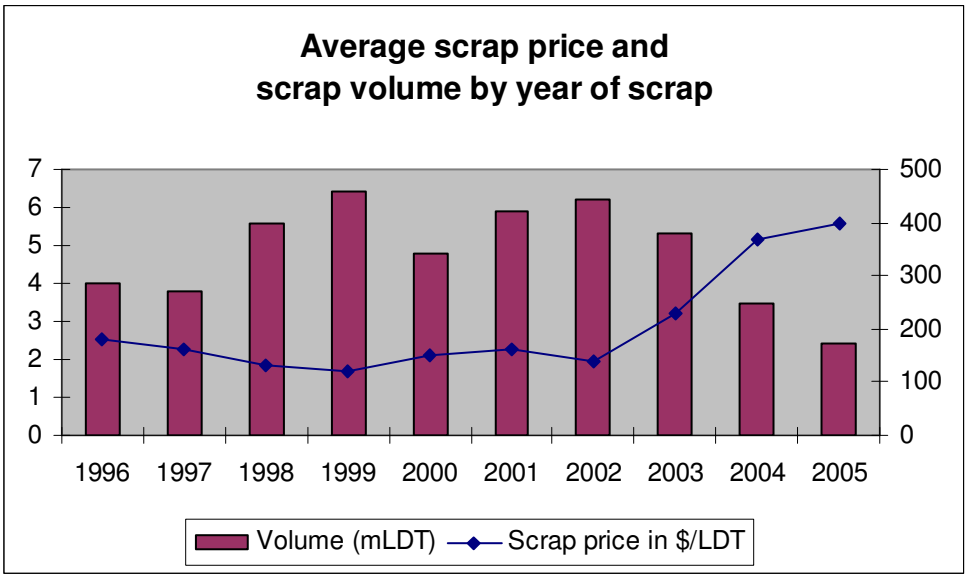


Figure 8: Average scrap price and scrap volume by year of scrap
Source: Clarkson 2006

According to the Platou report on the demolition market (www.platou.com) from 2006 the current level of scrapping is the lowest since the early 1990s. This historically low supply of vessels for scrap has, as illustrated above, lead to a significant increase in scrap prices during the period from 2004 to 2006, confirming the negative correlation between scrap price and scrap volume. The high level of scrap prices may primarily be explained by two factors. First of all the massive demand for second hand steel for the construction industry in China has increased the demand for obsolete vessels for scrap. Secondly the strong freight market has, as mentioned above, limited the supply of vessels for scrap. Even though scrap rates have been high, few vessels have been scrapped, indicating the importance of the high freight rates to ship owners.

Figure 9 illustrates the strong negative correlation between freight rates and demolition on a monthly basis for 2004. During the first half of 2004 tanker earnings moved into decline. VLCC earnings fell from $110,000/day in January to $40,000/day in May, and scrapping responded by increasing significantly (Clarkson Research Studies 2005). Scrapping stayed high until June and then fell in August when earnings skyrocketed. During 2005 and the first quarter of 2006 freight rates have remained high and scrapping has been correspondingly low. If signs of freight market weakening appear an increase in supply of old vessel is likely, though.

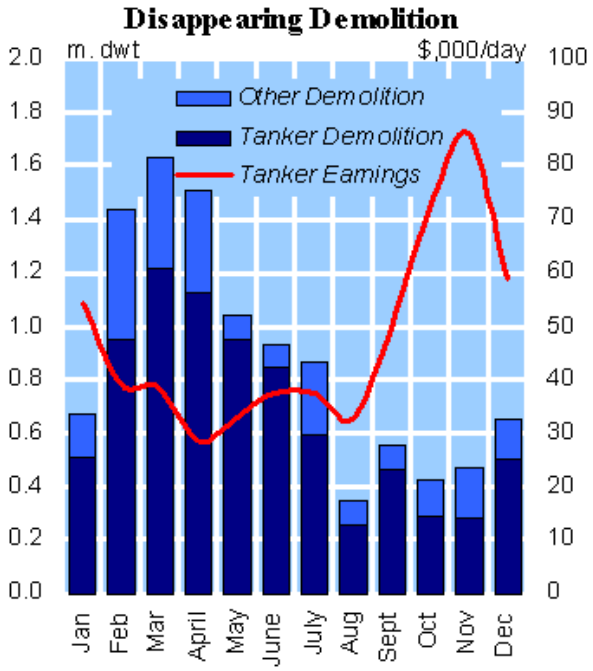


Figure 9: Monthly demolition and freight rates 2004
Source: Clarkson Research Studies (2005)

Future Prognoses

The future volume of vessels sold for decommissioning is likely to be significantly affected by the implementation of IMO MARPOL 13G regulation and the amendments to this regulation, both of which were introduced in the background chapter of this report. The implementation of regulation 13G and its amendments will affect the volume of single hulled oil tankers sold for scrap. I will first turn to an approach for estimating future level of single hull oil tanker decommissioning. Secondly an approach for estimating future level of ship scrapping volume in other shipping segments is introduced. The approaches for future scrapping volumes estimation is based on an analysis performed by the European Commission (EC-DG TREN 2004).

Single Hull Oil Tankers

Single hull oil tankers, which consist of both single skin (SS) oil tankers and oil tankers with double sides (DS) or double bottom (DB), are divided into three categories in the regulation (www.imo.org (4)):

- Category 1: This category covers single hull tankers over 20,000 DWT carrying crude oil, fuel oil, heavy diesel oil or lubricating oil as cargo, and of single hull tankers over 30,000 DWT carrying oil other than the above, which do not comply with the requirements for protectively located segregated ballast tanks.
- Category 2: This category covers single hull tankers over 20,000 DWT carrying crude oil, fuel oil, heavy diesel oil or lubricating oil as cargo, and of single hull tankers over 30,000 DWT carrying oil other than the above, which do comply with the requirements for protectively located segregated ballast tanks.
- Category 3: This category covers single hull oil tankers over 5,000 DWT, but less than specified under the two first categories.

The phase out date of a vessel will mainly depend on which category it is subject to. See appendix I for an illustration of the age profile of the current fleet of single hull oil tankers.

Other Shipping Segments

The estimates for shipping segments other than single hulled oil tankers may be accomplished through four steps:

1. The *age profile* of the existing fleet for each shipping segment is estimated.
2. The *decommissioning frequency function*, which shows the share of vessels scrapped at a certain age, is estimated for each segment.
3. The *conditional decommissioning frequency function* is estimated on the basis of the *decommissioning frequency function.* The conditional decommissioning function

expresses the probability that a vessel is scrapped in the following year conditional on being in operation at the beginning of the year.

4. Combining the estimated age profile and the fitted conditional decommissioning frequency function for each segment, estimates of the future decommissioning volumes are obtained. By adding these for all segments, the aggregate estimates of future volumes of scrapping of all other vessels than single hull oil tankers are reached.

The table in appendix II illustrates the age distribution of the current (April 2006) fleet of vessels other than single hull oil tankers. It is worth noting that some segments have seen massive new building during the last years. In for instance the segment for double hull oil tankers almost 80 % of the vessels are less than 10 years old. This distribution mirrors the ordering boom that came in the wake of the phase out plan for single hull tankers. The container segment has a similar age profile, reflecting the growth in the industry. The growth in new building will be reflected in the demolition market with a delay of 20-30 years.

The decommissioning frequency function shows the share of vessels scrapped at a certain age. Around 14% of the vessels scrapped were for example scrapped at the age of 25 years. The conditional frequency function shows, for example, that given a vessel has reached the age of 28 the probability that the vessel is scrapped in the following year is around 30%.

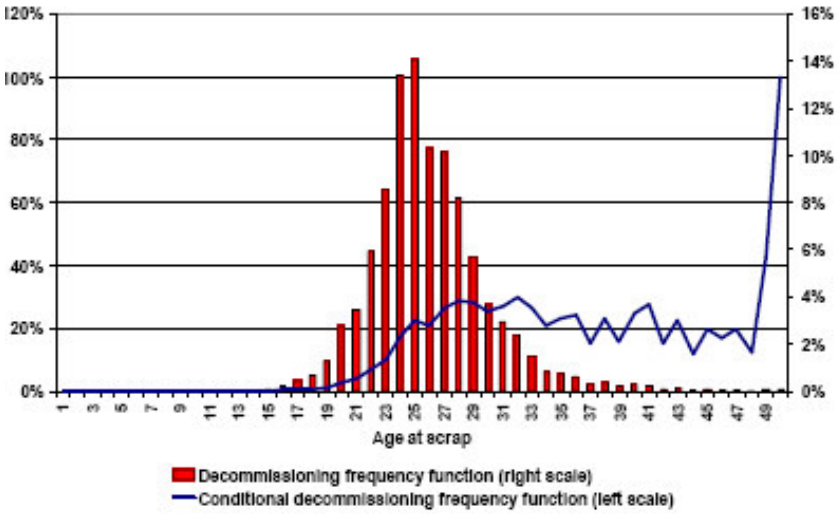


Figure 10: Frequency functions
Source: EC-DG TREN (2004)

Future Scrapping Volume

In this section it is assumed that single hull oil tankers are phased out on at the dates specified in Regulation 13G Annex I. The total fleet of single hull oil tankers represents 24.1 million LDT (2,256 vessels/129.5 million DWT), of which 7.1 million LDT (523 vessels/35.0 million DWT) are category 1 tankers. Based on the dates in the regulation (www.imo.org (4)) the phase out of single hull oil tankers is estimated by the European Commission to peak in 2010, with an estimated volume of 11.0 million LDT (66.3 million DWT or 784 vessels). INTERTANKO operates with a similar estimate for 2010 of 67 million DWT (2005).

For other shipping segments the volume of future scrapping is estimated by the European Commission to fluctuate around 5 to 8 million LDT per year in the period from 2005 to 2018. The current very strong freight market may have an influence on this estimate, though. The estimate is based on the age profile of the current fleet, which reveals a relatively high number of old vessels. The estimated increase in scrapped vessels from 2014 onwards reflects the large volume of vessels ordered and delivered during the last decade. The graph below illustrates total expected scrapping volume as estimated by the European Commission in 2004.

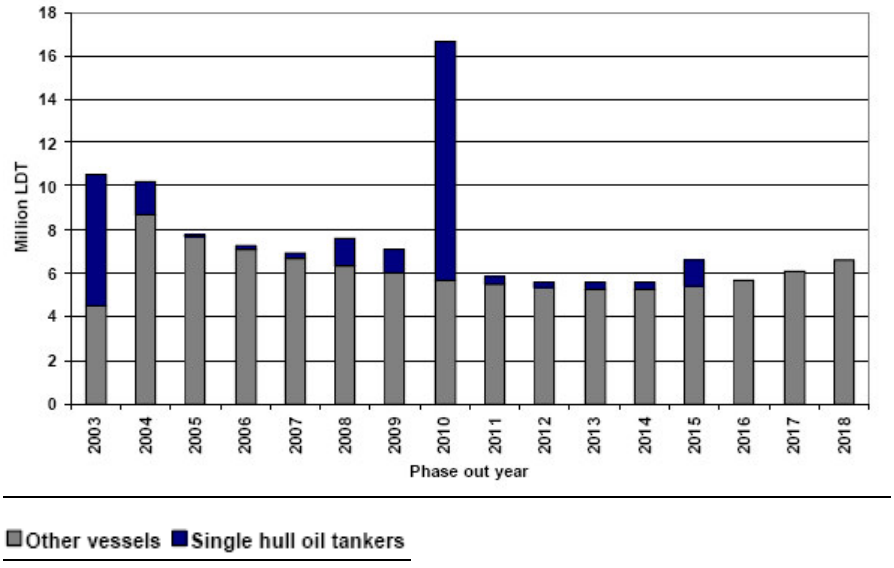


Figure 11: Total expected scrapping volume
Source: EC-DG TREN (2004)

Figure 11 illustrates the overall trend in ship scrapping volume, but does not take into account ups and downs in the market caused by for instance fluctuating freight rates. The graph is based on the age profile of the 2004 fleet and the dates of phase out determined in Regulation 13G (www.imo.org (4)).

Capacity

The real challenge of the ship scrapping industry appears, according to the estimate described above, in 2010. Without new environmental or working condition related regulations imposed by international organs it is unlikely that this increase in supply of obsolete vessels will lead to capacity constraints. The excess supply is, on the other hand, likely to put a downward pressure on the scrap prices, to the benefit of scrap yards. In theory, a situation where ship owners would have to pay for the dismantling of their vessels may arise. Under circumstances like these some ship owners may decide to wait until the price obtainable for their vessel is positive again, and a fleet of non-operating vessels will exist for a period.

By estimating a sum of maximum annual scrapping activity per country during the period from 1996 to 2005 a lower bound for maximum scrapping capacity may be estimated (method developed by BIMCO, 2001). By applying this method the lower capacity bound is estimated to 8.3 million LDT, which should be compared with the estimated future peak year 2010, when the scrap volume is expected to be approximately 16.7 million LDT.

Scrapping Location	**Maximum LDT per year (1996-2005)**
Bangladesh	1.7
India	2.9
Pakistan	0.7
Indian Sub Continent	0.3
China	1.9
Vietnam	0.1
Other Asia	0.0
EU	0.0
Turkey	0.1
North America	0.0
South America	0.0
Mexico	0.1
Other/Unknown	0.0
Total	**8.3**

Source: Clarkson Research Studies (2006)

Table 2: Maximum scrapping activity 1996-2005 by country (all vessels) (million LDT)

One may assume that the countries have not utilised their potential scrapping capacity during this period, though. The upper bound of the ship scrapping capacity might be significantly higher than the lower bound. According to the European Commission it is, however, impossible to estimate the upper bound of scrapping capacity (EC-DG TREN 2004). Asian countries offer beaches, cheap labour and a hinterland that demands second hand steel. So far the market drivers behind supply and demand have determined the level of scrapping and the equilibrium scrap price. The EU (EU 2000) states that the only plausible constraint to future scrapping capacity is environmental and working condition related regulation.

CHAPTER 6 - WORKING CONDITIONS AND IMPACT ON THE LOCAL ENVIRONMENT

In this chapter various implications for human health and the environment of the ship dismantling industry are briefly presented. Environment, health and security issues are discussed to give an idea about the differing opinions on the subjects. Towards the end of the chapter a European scrapping initiative will be described to illustrate how ship dismantling can be performed without causing harm to the environment or human health. In the next chapter I will turn to a description and discussion about the regulative framework currently surrounding the ship scrapping industry.

According to the International Metalworker's Federation (IMF) ship dismantling is among the most labour intensive and dangerous occupations existing (www.imfmetal.org). Employees in the ship scrapping industry are exposed to hazards like asbestos and other toxic materials, which they remove from the vessels by hand, risks of explosions, lack of basic safety equipment and a number of other safety restricting conditions (Arleth and Krogstrup 2006). Toxic materials that are forbidden to use in new building of vessels today are possible to discover in outranged 20-30 years old vessels. The most common toxic materials and components are listed below:

Toxic components and materials found in outranged vessels:

- Asbestos
- PBC (polychlorinated biphenyls)
- Hydraulic fluids
- Lead from paint, lead ballast, batteries, generators and motor components
- Tributyltin (TBT) antifouling coatings and contaminated holding tanks.
- Heavy metals from ship transducers, ballast and paint coatings
- Mercury from fluorescent light tubes, thermometers, electrical switches, light fittings, fire detectors and tank level indicators
- Cloroflorocarbons (CFCs) in self-contained refrigeration devices such as water coolers and small freezer units

- Flammable liquids such as lubricants and residual fuel

(Greenpeace 1999) (www.osha.gov)

Working Conditions

To describe the conditions under which employees in the ship scrapping industry work, a report developed by NorWatch after a visit in Chittagong, Bangladesh in 1999 (www.norwatch.no) will be applied. This report describes working conditions at Bangladesh's largest yards in terms of wages and contract relations, working environment and safety, local environmental impact, living conditions and consequences for local settlements. According to Greenpeace (www.greenpeaceweb.org (1)) the working conditions on scrap yards in India, China and Bangladesh are quite similar, and the description of the Bangladeshi conditions are thus assumed to be representative for the industry in general. Photographs and analyses of samples collected at the docks document the findings in the report. It may be problematic to apply a report developed by an NGO, since NGOs are seldom neutral in their description of the situation. It has, however, been difficult to find any information about local scrap yard circumstances originating from other sources.

Picture 2: Bangladesh: Ship breaking without protection.
(www.norwatch.no)

Wages and Contract Relations

According to the report few employees are employed directly by the scrapping company. In Bangladesh's largest ship scrapping yard about 1000 people are at work during NorWatch's visit. Among these 50 are employed be the scrapping company, the rest are employed by a variety of sub vendors with different responsibilities during the scrapping process. According to Community Development Centre (CODEC) Bangladesh has a minimum legal wage level of 100 Taka (about 15 NOK) a day. Despite this the start wage for the youngest workers is 40 Taka a day. Even though the wage level is below the legal minimum, there is, according to NorWatch, little opposition detectable among the workers. Most of the workers are employed at short-term contracts, and short-term employees are entitled fewer rights.

Bangladesh has ratified ILO convention number 59, where the minimum age for industry work is 15 years. Even though the ship scrapping industry is included in the convention workers below 15 years are employed and perform vital ship breaking operations in Bangladesh.

The average wage level at the Bangladeshi yards is 2000 Taka (about 350 NOK) a month. Even though the cost of living in Bangladesh is relatively low, this level of payment is not able to secure more than an absolute minimum (www.norwatch.no).

Working Environment and Safety

One of the reasons why Asian beaches are chosen as locations for ship dismantling is the huge difference between high and low tide. The difference ensures that it is possible to pull the large vessels up during high tide. From the entrance of the scrap yard in Chittagong to the waterline it is about 300 meters at high tide. At low tide the waterline subtracts another 700-800 meters. Even though the beach, which consists of mud, is packed with sharp pieces from the vessels most workers perform their work barefooted. Acoording to the NorWatch representatives the workers do not have helmets, glows or any other type of basic protection. Furthermore the workers do not have any kind of protection against dangerous fumes steaming from fires where useless ship liquids are destroyed.

According to the NorWatch report all vessels bought by Chittagong scrap yard are checked for explosives before dismantling is started. However, explosions frequently occur, causing injuries and sometimes death.

The Local Environment

Since the dismantling process in Bangladesh and most other developing countries takes place at the beach, toxic wastes are dumped directly into the sea or burned at the beach. According to a CODEC representative interviewed by NorWatch, the Bangladeshi government has decided to put all their efforts into the establishment of a successful ship scrapping industry. Everything else, including the environment, is subordinate to this goal. All materials impossible to sell are thus either burned, causing fumes harmful to the local environment, or dumped at sea, causing destructive effects on the local marine environment and the possibilities for fruitful fisheries.

Living Conditions

The workers in the Bangladeshi ship scrapping yards in Chittagong live in 'dormitories' with 20-30 people in each room of 25 square meters. The rent for the primitive residence is subtracted from the worker's wage each month. Most workers accept the living conditions because they have no other job opportunities (www.norwatch.no).

Implications for the Local Settlements

The ship scrapping industry in Chittagong has occupied kilometres of coastline, and has forced a number of local villages to move (www.norwatch.no). Without access to the sea the villages, which are totally dependent on fishing, will loose their basis for existence. Furthermore the fish has disappeared near the coast and the catching has decreased since the ship scrapping industry was established in the 1980s.

A European Scrapping Initiative

The EEC recently concluded in a feasibility study that due to high labour costs and the lack of demand for second hand steel, ship scrapping is unlikely to take place in Europe (ILO 2004a). However, funding for a 'zero pollution' ship-scrapping yard in the Netherlands has been obtained in 2005. The intention behind the establishment of this yard is to offer environment friendly, secure and healthy, in terms of working conditions, dismantling possibilities for dry-cargo vessels, tankers and oilrigs. If the project is successful it will be replicated, and the company behind the idea hopes to establish as many as 30-40 similar yards. The time frame of the project is not yet known (www.ecodock.info).

Picture 3: The Netherlands:
Scrapping a ship in dry dock prevents pollution of ground and surface water with oil.
(www.greenpeace.org)

Picture 4: The Netherlands: Asbestos removal from a ship using protective gear.
(www.greenpeace.org)

The prices obtained in third world countries are better on per tonnes of steel basis than in OECD countries, increasing the financial attractiveness of the Asian market to owners of end-of-life vessels. Based on the significantly higher price offered in Asia one may argue that it will be difficult for the planned Dutch yard to attract customers.

Chapter Discussion

Most OECD countries and several Asian countries have ratified the Basel Convention, and the countries have thus agreed to work for an environment friendly management of hazardous waste. To comply with the regulations of the Basel Convention, it has become urgent for Asian countries with a high vessel scrapping market share to decide on their position regarding treatment and trade of hazardous materials. There are, however, many different stakeholders in the ship scrapping industry and the different actors tend to draw the development of an internationally applicable system of regulation in different directions (Arleth and Krogstrup 2006).

The current ship scrapping industry can be seen from two different angles: seen from the perspective of a number of Asian countries the scrapping industry constitutes with an important part of the steel to their growing construction industries. To gain access to steel through dismantling of outranged vessels is associated with significantly lower costs than steel originating from import and processing of iron (ILO 2004). In the eyes of the Asian countries the ship scrapping industry is favourable both in terms of profitability and the ability to create thousands of jobs. It is moreover possible to argue that the reuse of huge amounts of steel is by far a more environment friendly way to dispose old vessels than for instance dumping at sea. From the perspective of a number of NGOs the industry is viewed in a less positive light, though. The NGOs argue that the scrapping industry is a typical example of the downside of globalisation due to its effects on environment and human health. In the eyes of the NGOs the current ship scrapping industry clearly demonstrates an expressed need for international regulation.

Some claim that the Asian ship breaking industry represents a sustainable developmental path, with the creation of jobs and the reuse of steel and other vessel components. Critics argue that ship scrapping represents the downside of globalisation, where industrialised countries use developing countries for dumping of dangerous waste, exposing inhabitants and the environment for short- and long-term risk (ILO 2000).

Research has thus far not been able to confirm short-term or long-term effects on the environment or human health of some types of toxic materials involved in ship scrapping operations. However, some of the short-term consequences on workers' health and safety situation are rather simple to identify. Injuries caused by the lack of basic safety equipment and diseases caused by uncontrolled handling of for instance asbestos are fairly well documented.

Even though long-term implications are to a lesser extent scientifically documented, they are frequently applied as an argument for a stricter regulative framework around the ship scrapping industry. In for instance the Basel Convention and the EU regulation the principles of precautionary and proximity are applied to ensure workers' protection even though long-term implications have yet to be documented. Opposite to this precautionary position others have argued that the development of international, regional and national regulation should be based on confirmed research and knowledge about short- and long-term effects. The rationale behind this argumentation is that unnecessary regulation of specific activities and materials should be avoided to ensure free market competition.

The literature about the ship scrapping industry in Asia seems to confirm an overall agreement among researchers about the negative effects of poor working conditions in general and the lack of basic safety equipment in specific. It is, however, disagreement with regards to how the problem is to be optimally solved.

First of all there seems to be a disagreement about whether the ship scrapping process should be removed from Asian beaches and carried out in OECD countries instead. The main argument applied in favour of removing the industry from Asia is that the vast majority of the vessels ready for scrapping have their origin in OECD countries. The three first stages of their life cycles –planning, construction/production and operation/maintenance/support – have been performed in OECD countries, and the last stage of their life cycle, the scrapping, should therefore also be carried out within the boarders of an OECD country.

The opposing view argues that the existence of the scrapping industry in Asian countries contributes to the creation of thousands of jobs in areas with high levels of unemployment. According to the supporters of this view the scrapping industry should remain in Asia, but under tighter regulation. Furthermore most vessels operate on a worldwide level, transporting goods between OECD countries, but also between OECD countries and non-OECD countries and between non-OECD countries. It would thus be wrong to claim that the only stage of a vessel's life that is carried out in a non-OECD country is the final, scrapping stage.

The information presented in this chapter confirms that the ship scrapping industry poses a complex situation because it involves a number of different stakeholders, it imposes problematic impacts on the local environment and on human health and it contributes to an important job-creating effect.

CHAPTER 7 - THE CURRENT LEGISLATIVE FRAMEWORK

During the three first phases of a vessel's life cycle, that is planning, construction/production and operation/maintenance/support, a relatively well established regulative regime governing international shipping addresses issues related to health, safety and environment and identifies minimum standards. This maritime legislative framework does not, however, apply to the final phase of a vessel's life cycle, that is its retirement; the scrapping of the ship. International standards for the scrapping process are currently limited and complex. The information provided in this chapter builds on the report *'Ship scrapping- a floating scenario'* developed at the Roskilde University in 2006 (Arleth and Krogstrup 2006). This report investigates the need for new regulation in the ship scrapping industry, but does not consider economic or ethical aspects of the industry. Theoretically this chapter is supported by theories from the field of international law, described in chapter 4.

Introduction to the Legislative Framework

It is important to note that the future development of the regulative framework for ship scrapping will have immense importance to the future scrapping industry situation. Today more than 90 per cent of all vessels are scrapped using the beaching method, and as long as political resolutions or new regulations do not put restrictions on beaching as method for scrapping, the expected future increase in scrapping volume is not likely be met with capacity constraints. If, however, political resolutions concerning the environment or the health and safety situation of workers in the scrapping industry are introduced, a number of scrapping sites applying the beaching method may be forced to shut down, limiting available scrapping capacity.

In this part of the report the international, regional and national regulation of the ship scrapping industry will be presented and discussed. The presentation of the legislative framework will be divided into three subcategories; environmental regimes, legislation regulating working conditions and regimes controlling international trade. This presentation will perhaps uncover the lack of, and need for, an international organ that is able to regulate the sector as a whole,

ensuring minimum environmental standards and basic workers' rights throughout the world. In the end of the chapter important issues related to the current situation will be discussed.

Environmental Regimes

At the international level the ship scrapping industry is regulated by the Basel Convention on Transboundary Movements of Hazardous Waste and by regulations adopted by the International Maritime Organisation (IMO). Regionally regulations such as the EEC regulation on shipment of waste from the EU are of relevance. At the lowest level of regulation, the national level, the environmental regulation of the costal state is important. The difference in national environmental regulation between developed and developing countries must be seen as an important determinant for the distribution of market shares in the ship-scrapping sector. Typically countries with a low degree of national environmental regulation such as India, Bangladesh and Pakistan, have high market shares in ship scrapping.

The International Level

The Basel Convention from 1989 and the Ban Amendment from 1995

The Basel Convention on Transboundary Movements of Hazardous Waste from 1989 came as a response to a series of incidents involving dumping of hazardous waste originating in developed countries in developing countries in Africa and Asia. The Convention was initially aimed at setting up a framework for control of the transboundary movements of hazardous waste. Furthermore it developed the criteria for environmentally sound management and a control system based on prior written notification (www.basel.int (1)). The Convention has during the present decade expanded its aim to the minimisation of hazardous waste generation. Through active promotion and use of cleaner production technologies, further reduction of the movement of hazardous wastes, the prevention and monitoring of illegal traffic, improvement of institutional and technical capabilities in developing countries and further development of regional centres for training and transfer, the Convention aims at reducing the quantity and hazardousness of the wastes (Ibid).

The Basel Convention is at present signed by 166 countries, among these Norway and India. The Convention is based on several basic principles; first the Convention rests on the Precautionary Principle due to the imperfect knowledge and uncertainty about long-term effects of import and export of hazardous waste. Secondly the Polluter Pays Principle is included to ensure that the generator of pollution has to pay for the environmentally sound disposal of it. Lastly the Convention rests on the Proximity Principle to ensure that the disposal of hazardous waste takes place as close as possible to its point of generation (OECD 1998).

The process of dismantling vessels is included in the Basel Convention, and in specific an amendment to the Convention, the Basel Ban, which came in 1995, is of interest to the topic of this report. In March 1994 "*Parties agreed to an immediate ban on the export from OECD to non-OECD countries of hazardous wastes intended for final disposal. They also agreed to ban, by 31 December 1997, the export of wastes intended for recovery and recycling (Decision 11/12)* (www.basel.int (1)).

Decision 11/12 was, however, not incorporated in the Convention itself, and the question as to whether it should be legally binding or not arose. Consequently the Ban was included in the Basel Convention in 1995 as an amendment (Decision III/1). In this decision the distinction between OECD and non-OECD countries is not applied.

The main purposes of the Ban are to ensure that hazardous waste is taken care of by the responsible party and to protect developing countries that have traditionally been receivers of hazardous waste. Vessels intended for scrapping can be classified as hazardous waste and are as such illegal to transport from an OECD to a non-OECD country for scrapping in terms of the Basel Ban. The Ban Amendment has, however, yet to enter into force. It has to be ratified by three-fourths (62) of the parties to the Basel Convention to become internationally legally binding. Currently it is ratified by 61 parties (www.basel.int (3)).

The ship scrapping industry represents a challenge for the Basel Convention and the Basel Ban. Several of the substances included on the Basel list of hazardous waste are typically found in 20-30 year old vessels ready for dismantling. However, to which extent the Basel Convention is

applicable to the ship scrapping industry is rather unclear. Some stakeholders, like for instance the ILO, find that the Basel Convention is difficult to implement in the scrapping industry because it was not developed for this sector in specific (Andersen 2001). According to an NGO like Greenpeace the Basel Convention is the right forum for regulation of the ship scrapping industry, however, the Convention has to be adapted to the specific characteristics of the industry in order to be effective.

Representatives from the shipping industry argue, on the other hand, that end-of-life vessels cannot be seen as waste. According to these stakeholders the vessels are products that may be utilized by the receiver and do therefore not fall under the specifications of the Basel Convention.

There seems to be a general disagreement among different stakeholders when it comes to where the development of ship scrapping regulation should take place. Some, like Greenpeace argue that the Basel Convention is a suitable framework while others tend to rely on the expertise of the IMO. If the IMO should be accepted by the NGOs as the most appropriate organ for ship scrapping regulation development, Greenpeace argue that it is important that the Basel Convention is respected and that the standards that are developed do not secure lower level of environmental protection than those of the Basel Convention.

The International Maritime Organisation

As indicated above the IMO seems to stand out as the most likely framework for the future development of regulation of the ship scrapping industry. However, to ensure that the interests of all stakeholders are taken care of, the IMO participates in a joint working group with ILO and the Basel Convention Secretariat. This working group is primarily aimed at developing an intra organisational common language to facilitate future cooperation, to avoid duplication of work and overlapping roles. According to the IMO (www.imo.org (1)) the three organisations believe that through minimisation of environmental, safety and occupational health risk related to the ship dismantling process, ship recycling can contribute to sustainable development.

At its 53rd session in July 2005 an organ under the IMO, the Marine Environment Protection Committee (MEPC), decided that the IMO should develop, as a high priority, a new instrument on recycling of vessels to provided future legally binding and globally applicable ship recycling regulations for international shipping and recycling facilities. Further the MEPC agreed that the new IMO regulation should include regulations for the design, construction, operation and preparation of ships so as to facilitate safe and environmentally sound recycling, without compromising the safety and operational efficiency of ships; the operation of ship recycling facilities in a safe and environmentally sound manner; and the establishment of an appropriate enforcement mechanism for ship recycling (certification/reporting requirements). The new instrument should be completely implemented by 2008-2009 (www.imo.org (2)).

On March 24 2006 the 1996 Protocol to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, 1972, entered into force. This Convention was developed in the 1970s to protect the marine environment from dumping of wastes at sea. The adoption of the 1996 Protocol may have an indirect effect on the ship scrapping industry because it ensures that dumping of wastes will be prohibited, except for materials on an approved list (www.imo.org (3)). Even though this Convention does not mention ship scrapping in specific, it does imply that hazardous wastes have to be handled onshore since dumping at sea is no longer an option.

The Regional Level

To illustrate what is meant by regulation at the regional level, I have chosen to focus on the European Union as regional area and the regulations adopted by the European Commission.

The 1993 Council Regulation (EU) No. 259/93

This regulation concerns the supervision and control of shipments of waste within, into and out of the European Community (europa.eu.int (1)). Regulation 259/93 states that obsolete vessels destined for scrapping must be considered hazardous waste. Vessels that are incompletely emptied for cargo or contain toxic materials may thus be classified as hazardous waste. The first

legal recognition of a vessel as hazardous waste came in the Netherlands in 2002 when the highest Council of State ruled that the chemical tanker Sandrien, which was to be sent to India for scrapping, should be classified as toxic waste. The vessel contained asbestos, heavy metals and other dangerous substances. According to the NGOs (for instance Greenpeace) all vessels should be cleaned before they are sent for scrapping in developing countries.

To circumvent the strict EU environmental legislation many vessels are registered under so-called flags of convenience (FOC) (Arleth and Krogstrup 2006). FOCs typically have relatively low taxes, weak domestic regulation and little enforcement of international legislation. The legislative framework that applies to a specific vessel is determined by the regulation of the flag state, in other words the state where the ship is registered. The registration of flag state determines the legal framework the vessel must abide at sea. To cope with the tendency to choose FOCs to circumvent regional legislation the EU regulative opens up for the possibility of interpreting the port state as the port from which the vessel departs. Such an interpretation would ensure that an increased number of vessels leaving a port within the EU are subject to Regulation 259/93. However, the regulation may still be avoided if the vessel visits a port outside the EU before it reaches its final destination.

The National Level

To illustrate the national level of regulation, I have chosen to describe the legislative framework of one major end-of-life-vessel exporting country, Norway, and one major end-of-life-vessel importing country, India.

Norway

The OECD country Norway has ratified both the Basel Convention and the Basel Ban, and due to its membership in the European Free Trade Association (EFTA), which is linked to the EU through the European Economic Agreement (EEA) Norway has since 01.05.95 applied the EC-Waste shipment Regulation (259/93). Consequently Norway is obliged to abide to these regulations. According to the Norwegian Pollution Control Act of 1981, which has as its

objective '*to protect the outdoor environment against pollution and to reduce existing pollution, to reduce the quantity of waste and to promote better waste management'* (odin.dep.no), owners of for instance vessels have the responsibility to clear up wastes or to pay for it to be cleared up (§ 37). Norway is thus subject to several international, regional and national environmental regulations. Nevertheless, situations where the regulations have been circumvented frequently occur and are sources of NGO protest campaigns.

India

India has, like Norway, ratified the Basel Convention and is thus obliged to follow its regulations. However, unlike Norway, India has yet to ratify the Basel Ban. According to the Basel Action Network (www.ban.org) the import of vessels containing hazardous substances is a clear violation under Indian law. In May 1997 the Indian Supreme Court ruled that the import of hazardous wastes as defined by the Basel Convention into India was prohibited. In addition the Central Pollution Control Board has, in its "Environmental Guidelines for Ship Breaking Industries" declared: *"old vessels containing or contaminated with any of the above substances [lead, cadmium, PCB, asbestos] are accordingly [as per the Basel Convention] classified as hazardous materials. The customs authority and/or the concerned State Maritime Board should ensure this and issue a certificate to the effect that the vessel is free from the prohibited materials."*

Furthermore in its "Directions of the Supreme Court on Ship Breaking No. 657/95" the Supreme Court defined a number of relevant positions that has to be followed in India, including:

1) Before a ship arrives at port, it should have proper consent from the concerned authority or the State Maritime Board, stating that it does not contain any hazardous waste or radioactive substances.
2) The ship should be properly decontaminated by the ship owner prior to the breaking.
3) A complete inventory of hazardous waste on board of ship should be made mandatory for the ship owner, and no breaking permission should be granted without such an inventory.

4) At the international level, India should participate in international meetings on ship breaking at the level of the International Maritime Organization and the Basel Convention's Technical Working Group with a clear mandate for the decontamination of ships of their hazardous substances such as asbestos, waste oil, gas and PCBs prior to exports to India for breaking. Participants from both Central and State level should be included (www.toxicslink.org).

It is difficult to achieve a comprehensive overview of the enforcement of the Indian regulative system for ship scrapping. Locally the Gujarat Maritime Board together with the Gujarat Pollution Control Board (gpcb.org.in) is supposed to control the ship breaking activities in Alang, the world's busiest ship breaking site. At the national level offices under the Ministry of Environment and Forests (MoEF) are responsible for the enforcement. However, according to The Indian Express (May 20 2005) enforcement of the regulations is poor.

Regulation of Workers' Rights

In the following workers' rights in terms of health and safety are presented on the international and the national level. I have chosen to focus on the situation in India because India has the largest market share in the ship breaking industry (see table 3).

Breaking major	By number of vessels (%)	By tonnage (%)	Average vessel size (dwt)
India	42	46	30 000
Bangladesh	7	24	95 000
Pakistan	6	17	80 000
China	4	7	50 000
Others	41	6	3 500

Table 3: Market shares as of 1999 (www.ilo.org)

The International Labour Organisation (ILO)

The International Labour Organization is a UN specialized agency which seeks the promotion of social justice and internationally recognized human and labour rights. The ILO has as its

objective to formulate international labour standards in the form of Conventions and Recommendations setting minimum standards of basic labour rights: freedom of association, the right to organize, collective bargaining, abolition of forced labour, equality of opportunity and treatment, and other standards regulating conditions across the entire spectrum of work related issues(www.ilo.org).

The ILO is engaged in the ship scrapping industry through several arenas. The organisation has for instance developed health and safety guidelines and a best practice compendium especially intended for Asia. Furthermore the ILO publishes updated papers on specific industry issues and it conducts assessments on industry matters. Finally the ILO is engaged in awareness activities and has produced a documentary video on occupational and health issues in ship scrapping (ILO 2001).

In the paper *'Safety and health in ship breaking: Guidelines for Asian countries and Turkey'* (ILO 2003) the ILO outlines basic workers' rights in the ship breaking industry. In this paper the legal framework is outlined, general preventive and protective measures are described and possible measures against physical and biological hazards are suggested. Furthermore safety requirements for machines and tools, competence and training, ideal management of hazardous substances and several other health and safety related issues are described (ILO 2003).

In debates about ship breaking the guidelines of the ILO are continuously referred to, and the ILO may have an influence on the future development of the international regulation on workers' rights through its membership in the joint working group with the Basel group and the IMO.

The Indian Legislation

In India occupational safety and health (OSH) regulation, national health policy, and recent draft policy leaves a lot to be desired. The decline in the density of Trade Unions and rise of hazardous industries underlines the fact that the progress of OSH has been stalled ever since economic reform. The well-being of workers may deteriorate further if poor enforcement and widespread ignorance of OSH persist (mumbai.indymedia.org).

In 1998 the Gujarat High Court issued directives to improve working conditions, provide clean water, sanitation and health facilities to the workers. In 1999 India's central Pollution Control Board issued guidelines for ship scrapping operations that included safety and environmental measures (The Indian Express 24 June 2003).

In 2003 the Indian Supreme Court provided detailed guidelines for regulating the entry of ships for breaking and for ensuring that the rights of workers, costal ecology and provisions of the Basel Convention are not violated by the activity. To monitor the implementation of these directions, among several others, the Court set up a Monitoring Committee. This Committee was subject of complaints in January 2005 due to the possible movement of the French end-of-life vessel "Le Clemenceau" to Alang for demolition. The complaints indicated that the ship may contain unexpected levels of the health threatening substance asbestos. The Monitoring Committee decided that the vessel was not allowed to enter Indian waters if it contained asbestos.

There seems to be differences among the Asian countries engaged in the ship breaking industry when it comes to requirements on wastes. Different from for instance Pakistan and Bangladesh India demands a 'gas-free' certificate (Stuer-Lauridsen 2003). According to the ILO all ship scrapping countries have introduced gas-free certificates, but the degree to which the use of these certificates is enforced varies between countries.

In general the Indian regulation of workers' rights in the ship breaking industry seems, relative to OECD countries, to be underdeveloped. Legislation is developed on an ex ante case-to-case basis rather than due to precautionary concerns. The high rate of injuries is harmful to productivity, and increased guard on safety and health would most likely be beneficial to the industry. According to the Indian independent media centre labour standards must be re-evaluated and responsible legislation has to be developed (mumbai.indymedia.org).

Picture 5: Ship dismantling in Alang, India.
Source: Environmental Health Perspectives

Trade Regimes

Regulation of international trade has a significant effect on trade with obsolete vessels and the ship scrapping industry in general (Arleth and Krogstrup 2006). Most vessels are subject to national, regional and international regulation on trade since trade with end-of life vessels typically occur internationally. The legislation of the World Trade Organisation (WTO) and the trade organisation of the maritime industry, the International Chamber of Shipping (ICS), is thus of relevance and will be briefly presented below.

The World Trade Organisation (WTO)

The World Trade Organisation (WTO) is the only global international organisation treating rules of trade between nations. The WTO is centred on the WTO agreements, which are signed and ratified by most of the world's trading nations. The WTO is aimed at helping producers of goods and services, importers and exporters to conduct business. (www.wto.org (1)). The agreements are the result of negotiations between member countries. The current set of agreements is the outcome of the 1986-94 Uruguay Round negotiations that included a major revision of the General Agreement on Tariffs and Trade (GATT) (www.wto.org (2)).

In addition to agreements on tariffs and trade, the WTO control international trade through technical trade barriers, patents, import limitations etc (Friis Bach and Nordbo 1999). These agreements have a significant impact on national regulation on for instance environment and health. Environmental regulation is of WTO interest because it may contribute to restriction on the free movement of trade. In relation to other agreements concerning the environment, health, safety and trade, such as the Basel Convention, article XX developed by the WTO is of relevance. This article poses exceptions to the GATT agreement and states that:

'Subject to the requirement that such measures are not applied in a manner which would constitute a means of arbitrary or unjustifiable discrimination between countries where the same conditions prevail, or a disguised restriction on international trade, nothing in this Agreement shall be construed to prevent the adoption or enforcement by any contracting party of measures: necessary to protect human, animal or plant life or health or relating to the conservation of exhaustible natural resources if such measures are made effective in conjunction with restrictions on domestic production or consumption' (www.wto.org (3)).

Due to this exception paragraph countries are, under certain conditions, allowed to introduce trade-restricting measures, such as import bans. In the ship scrapping industry this exception to the GATT is important. Under article XX countries may for instance reject to import end-of-life vessels that contain toxic substances that may be harmful to the environment and/or human and animal health. Whether trade with obsolete vessels is covered by the exception paragraph has, however, long been a matter of discussion.

The International Chamber of Shipping (ICS)

The International Chamber of Shipping (ICS) is the international trade association for merchant ship operators. The ICS represents the collective views of the international industry from different nations, sectors and trades (www.marisec.org (1)). Representing the interests of the shipping industry, including shipping companies, the ICS has been accused by NGOs for using its influence in the IMO to ensure a development towards an international regulation of the ship

scrapping industry that is less rigid than the Basel Convention. The ICS claims that the Basel Convention does not cover the movement of ships to recycling yards. Furthermore the ICS states that *'placing responsibility for the conditions in the yards themselves directly upon ship owners is neither reasonable nor practical'* (www.marisec.org (2)).

Chapter Discussion

As the final deadline for the phase out of single hulled tankers approaches, scrapping volume increases, and the need for a worldwide legislative framework for performing business within the ship scrapping industry becomes more evident than ever before. The description of environmental-, workers' rights- and trade regulation illustrates that the current international legislative framework surrounding the ship scrapping industry in terms of working conditions and environmental conditions on scrapping locations is complex and incomplete.

Several factors contribute to the complexity of the industrial situation. First of all the global dimension of the industry, which ensures that international, regional and national legislation has to be taken into account, is a factor that increases the level of complexity (Arleth and Krogstrup 2006). The fact that regulation on several levels as well as on several areas may be applicable to the ship scrapping industry has frequently lead to uncertainty about which regulation should be applied in any specific case and about which regulative framework has precedence over the other.

Environmentalists tend to argue that in the long term environmental regulation must have precedence over trade regulation to ensure sustainable development. However, stakeholders in developed countries fear that if environmental legislation is allowed to outrange trade legislation the result will be protectionism and restrictions on free trade because countries will apply national environmental legislation to keep domestically produced products and services away from international competition (Friis Bach and Nordbo 1999).

Furthermore the high number of industry stakeholders and their differing individual understanding of the applicability of existing environmental, health and safety and trade regimes

to the ship scrapping industry is another factor increasing complexity. Some stakeholders, in specific NGOs fighting for the environment and human rights, attempt to pressure the international society to specify the international regulation to the ship scrapping industry. Other stakeholders, like the shipping industry and some developed countries, are fighting against a development towards stricter regulation because regulation as such will worsen industry trade conditions.

As an example the Basel Convention, which is an environment protecting convention with trade restricting elements that may be applicable to the ship-scrapping sector, is often circumvented because different stakeholders disagree about the definition of obsolete vessels. By the stakeholders in favour of applying the Basel Convention to ship scrapping, end-of-life vessels are defined as waste, and thus covered by the Convention. Stakeholders like the ICS disagree to this definition, define end-of-life vessels as products and argue that the trade with these vessels is not covered by the Basel Convention.

Even though a number of the components in an obsolete vessel is on the Basel Ban list of hazardous substances, different stakeholders disagree about whether the vessel as a whole can be defined as waste and is subject to the Basel Convention, or if only the parts of the vessel containing the hazardous components fall under the definition of waste. Due to this high degree of definition uncertainty the shipping industry has thus far been able to circumvent the Basel Convention by defining the vessels as products and referring to the WTO agreements about free trade in products.

The joint Basel/IMO/ILO working group has recently been established to develop an internationally applicable regulative framework for the ship scrapping industry. Initially the group has been aimed at undertaking a comprehensive examination of the guidelines developed by each of the three organisations to uncover gaps, overlapping agendas or ambiguity (www.imo.org (1)). This joint group has, however, solely an advisory purpose and no legislative competence. The establishment of the group must be seen as an attempt to develop a common language and respect between the regimes.

The global dimension of the ship scrapping industry, the high number of stakeholders and the uncertainty about regulation interpretation are all factors contributing to the complexity of the industrial situation. As the deadline for phase out of single hulled tankers is approaching and the volume of obsolete vessels is expected to increase, the need for negotiation between different stakeholders and to establish a responsible organ able to define a clear industry framework is becoming more evident than ever before. If an independent organ is to be able to develop such a framework it is important that all stakeholders are willing to cooperate and realise their value chain responsibility. The degree to which the shipping industry seems to be willing to realise value chain responsibility will be discussed later in this report.

It is important to remember that if new environmental or working condition related regulation is introduced, some of the currently operating scrap yards may not be able to comply with the requirements and will thus be pushed out of business. The result may then be scrapping capacity constraints, and loss of a number of workplaces with its many spreading consequences. The designers of the new regulation have to take this implication into account and perhaps suggest possible solutions that will enable scrap yards to meet the new requirements.

CHAPTER 8- VALUE CHAIN RESPONSIBILITY IN THE SHIPPING INDUSTRY

Does a shipping company have responsibility for the conditions under which its vessels are dismantled even though this work is carried out by another, independent company? In this part of the report the downstream value chain responsibility (VCR) of a shipping company will be discussed. Legal regulation and level of moral maturity together with distribution of power among players in the industry are factors that are likely to affect the shipping company's degree and understanding of responsibility. Theoretically this chapter builds on theories derived from the field of business ethics.

The term 'value chain responsibility' is relatively new, and has its origin in the development of the so-called network organisation (Phillips and Caldwell 2005). Through the evolution of the network organisation during the last 30-40 years, where several independent companies cooperates in the value creating process, the boundaries of the firm have become more difficult to define. Which stakeholders are internal and which are external to the organization is becoming an increasingly complicated question to answer. The networked organisation has characteristics that may provide it with huge amounts of power. Lagging in the wake of the increase in international power, has been the development of new concepts of responsibility within networks or value chains. With blurry organisational boundaries responsibility has become more difficult to attribute.

The Value Chain of a Vessel

The shipping industry is a service industry where value is created through the generation of services demanded by customers. The downstream customers are companies producing goods at one location and selling goods at another location, thus demanding transport between the locations. The shipping industry does, however, have an additional value chain, the value chain of its mean of transport, the vessel. The vessel is typically ordered from a shipyard, then operated by one shipping company, sold and resold to other companies, and then, finally, sold to a scrap yard. This life cycle is typically of about 20-30 years, and when the vessel is sold to the scrap

yard, its remaining value lies in the value of its steel components and other reusable items. The latter of these two value chains is in focus in this report.

The value chain of a vessel is special in a number of ways. Most discussions about the value chain responsibilities of multinational giants concern the companies that are *sourcing* in developing countries, in other words, discussions about upstream responsibility. Shipping companies *sell* their outranged vessels to developing countries, and the value chain responsibility has thus a downstream, customer focused, dimension.

The literature suggests that '*the value chain is a series of interconnected firms engaged in bringing value to a good or service as the good or service makes its way to end users'* (Phillips and Caldwell 2005, p.1). Unlike the typical good or service, vessels have not been produced with the demands of the end customer, the scrap yard, in mind. The needs of an intermediary customer, the shipping company, have been in focus during the production of the vessel. Today NGOs argue that the interests of the end customer have to be taken into consideration during the production of the vessel. The NGOs argue that materials that can be a threat to workers' health or the local environment during dismantling should not be applied during construction.

Furthermore environmentalists have demanded that the shipping company should empty all vessels sold for scrapping for hazardous components before the dismantling process takes place, again taking the interests of the local community into account. If the requirements of environmentalists are to be followed by shipping companies, a vessel might end up with a negative cash flow at the end of its value chain. If such a situation arises the ship owner may not be willing to pay for the dismantling of the company's vessel. As mentioned earlier (see chapter 5) the result will be a ghost fleet of old, non-operating vessels.

Distribution of Power

Until the 1970s North American and European obsolete vessels were mainly dismantled in North American and European dry docks (see chapter 5). The shipping companies as well as the scrap yards were independent market players responsible for their actions and subject to European or North American legal regulation. The two parties were considered to be equally powerful and able to affect environmental and working conditions. As the advantages of selling outranged vessels to Asian developing countries applying the so called beaching method of ship dismantling started to be utilised in the 1980s, the terms of the industry started to change. The distribution of power between the shipping companies and the scrap yards became uneven, in favour of the shipping companies.

The literature on value chain responsibility suggests that when the distribution of power becomes uneven between value chain members, the most powerful member of the chain is often held responsible for the actions of less powerful upstream or downstream members of the chain (Phillips 2003). According to the traditional understanding, the various nodes of a value chain are independent of one another. Producers of raw materials, distributors, retailers, and final consumers are independent entities with no relationship between one another beyond the economic transaction by which the goods or services exchange hands.

The understanding of value chains and value chain responsibility seems to be changing, though. Several of the shipping industry stakeholders, like the buyers of shipping services, NGOs, including environmental and societal organisations, and the general public have developed new conventions (see chapter 4) and no longer accept the premise that the shipping company is an island or that it is incapable of influencing its value chain. As the business activity of shipping companies has become more extended and networked, stakeholders' expectations of responsibility have accelerated and it is likely that the shipping companies will have to shoulder even more responsibility for externalities caused by value chain activity in the future (Slater 2004).

Challenges to Embracing Value Chain Responsibility

The most common way to state good intentions about value chain responsibility is through social responsibility reports, outsourcing reports, codes of conduct, and the like. In statements like these the company describes its efforts to establish acceptable practices in its value chain. The incentive to develop the reports is often prior problems or requests from NGOs or activists to do more to protect health, security and environment.

The reports are often criticised for lack of accuracy, for instance that the companies that issue the report present themselves in an undeservedly favourable light or fail to present VCR issues correctly. Companies that have reached the highest level of moral reasoning, the post-conventional level, described by Kohlberg (see chapter 4) may be genuinely interested in accepting greater responsibility for value chain activity, transparency and accuracy about their activities and the activities performed by their value chain partners may carry dangers. If transparency is not industry standard, one company's openness about value chain difficulties may lead to a competitive disadvantage on the short term, since the company that performs monitoring and displays problems may appear to have greater problems than competitors that do not monitor at all. It may thus be competitively harmful to be among the first to embrace greater VCR and transparency when others continue to reap the economic benefits of refusing to accept responsibility (Phillips and Caldwell 2005).

The response to such short-term challenges is typically the establishment of some sort of governing or enforcement body that can apply legal measures to achieve the desired effect on a local, national or international level of legislation. Legal sanctions may for instance be effective in case of false social responsibility advertisement or accusations of human rights violations in foreign countries.

Chapter Conclusion

The shipping company is often the dominant player in the value chain of a vessel. Based on the current view on value chain responsibility, and due to the shipping company's position of power it is likely to be held responsible, not only for the conditions under which its own employees work or the pollution the shipping company causes, but also for the conditions under which the employees of its subcontractors works and the pollution their operations cause. It is thus plausible that the shipping companies to an increasing extent will be held responsible for poor working conditions and environmentally hazardous operations at the locations where their vessels are scrapped by less powerful value chain members.

CHAPTER 9 - BERGESEN WORLDWIDE ASA – AN EXAMPLE

Thus far in the report I have focused on three areas affecting the ship scrapping industry in general; the economies of ship scrapping (see chapter 5), the current legislative landscape (see chapter 7) and the business ethics of shipping companies (see chapter 8). The theoretical foundation for understanding the mechanisms of these three areas was built in chapter 4. In this section of the report I will try to illustrate how the three areas might affect the operations and decisions of one industry participant – Bergesen Worldwide Ltd. (referred to as Bergesen)- by diving into six demolitions owned by the company.

I have chosen to focus on Bergesen because the company is a major shipping industry player, because it has gained significant media attention due to one of its choices of scrapping location and, finally, because it has been subject to Norwegian, European Union and international legislation. All Bergesen vessels referred to here were registered in the Norwegian International Ship Register (NIS) when they were scrapped.

Bergesen Worldwide – The Company

The BW Group is one of the world's leading maritime groups. It comprises BW Gas, BW Tankers, BW Dry Bulk and BW Offshore. BW Gas was listed in Oslo in October 2005 as a pure gas shipping company with the BW group retaining a majority share. The non-gas assets remain in private ownership (www.bergesenworldwide.com).

The BW group's leading position in the maritime industry has been underpinned by the historic achievements of two long-standing shipping businesses: Bergesen d.y. ASA and World-Wide Shipping. Bergesen Worldwide (BW) Gas ASA is the world's largest gas shipping company, transporting liquefied petroleum gases (propane and butane) and liquefied natural gas (LNG) all over the world. (www.bergesen.no).

BW Shipping Managers, part of the BW Group, is the commercial and technical manager of the BW group's tanker fleet. With a fleet of 23 VLCCs (Very Large Crude Carriers) it is one of the world's leading operators of super tankers. BW Shipping Managers is also the technical manager

of 6 dry bulk vessels, part of the 12 dry bulk vessels commercially managed by BW (www.bwshipping.com).

Bergesen Worldwide Owned Demolitions

Since May 2003 Bergesen has scrapped the six vessels listed in the table below:

Type	Name	Size (DWT)	Built	Date	Ldt	US$/Ldt	Location
L.P.G.	Havprins	40,605	1974	26.03.2004	16,48	365.00	China
L.P.G.	Havmann	40,625	1973	12.01.2004	16,427	325.00	China
L.P.G.	Hesperus	40,615	1973	08.08.2003	16,5	245.50	India
L.P.G.	Havsol	9,521	1976	16.05.2003	5,783	200.00	China
Tanker	Berge Borg	315,699	1976	09.05.2003	41,7	197.50	China
Tanker	Berge Boss	315,699	1976	09.05.2003	41,7	197.50	China

Table 4: Bergesen owned demolitions
Source: Clarkson Research Studies (2006)

The table reveals that Bergesen has not sold any vessels for scrap since March 2004. Consequently the cases discussed in this report will be somewhat old, and may not fully reflect Bergesen's current understanding of for instance value chain responsibility. In the section below each of the six cases will be briefly described.

Berge Boss and Berge Borg

Berge Boss and Berge Borg, two ULCCs, were put through their fifth special surveys in 2001. Both vessels had been trading profitably in the half year before they were sold to Chinese scrap yards, not least carrying cargoes out of Iraq. When the Iraq war broke out, the vessels were taken out of service. The decision to scrap the vessels was, however, taken in 2002 due to a lack of approval from the oil majors of the vessels (Platts Commodity News May 2003).

Havsol

The sale of the gas carrier Havsol for scrap was planned in July 2002 and carried out in May 2003. Bergesen reported that the sale contributed with an insignificant sales profit. Havsol was number eight in a group of small 1970s-built gas carriers cleared out during 2002-2003. During the following year more gas carriers with similar characteristics were to be sold for scrap. According to Loyd's List (May 2003) brokers did not find the sale surprising, as Bergesen was known to be heading towards selling or demolishing old tonnage to partially finance the construction of new and larger gas carriers.

Hesperus

In the beginning of August 2003 brokers suggested that Hesperus, a1973 built lpg carrier, were to be sold to Chinese breakers. According to Trade Winds (August 2003) Hesperus was likely to fetch some $240 per ldt if it was sold to Indian breakers or some $220 per ldt if it was sold to China. Bergesen ended up selling Hesperus to India for $245.50 per ldt, even though the company considered Chinese scrap yards to be more environmentally friendly (Trade Winds August 2003).

Before it was allowed beaching in Alang, India, Indian custom authorities arrested Hesperus. According to the environmental organisation Greenpeace the vessel was arrested due to suspicions about substances like PCB and asbestos aboard Hesperus (Dagsavisen October 2003). According to the Basel Convention (see chapter 7) transport of hazardous waste to developing countries is illegal. Bergesen director Jens Ismar rejected the accusations and claimed that Hesperus had a gas-free certificate, that the vessel did not contain any hazardous substances and that it was cleaned in accordance with international standards prior to the sale (Reuters September 2003). Ismar explained the arrest by a price dispute between Bergesen and the Indian buyer.

Indian custom authorities released Hesperus in late September and Greenpeace followed up by demanding a list of all substances aboard Hesperus, which is a requirement under Indian national law. This time the Indian Environment Ministry categorically instructed the port authorities at

Alang not to allow the ship to beach, based on the Basel Convention. India then became the second country after Turkey to seize a vessel on the grounds of violating the Basel Convention.

The list of components aboard Hesperus revealed that the ship contained some two kilograms of quick silver, but no traces of either PCB or asbestos (Dagsavisen October 2003). Bergesen promised that it would take care of the quick silver in a responsible manner, and Hesperus was, in the beginning of October 2003, allowed beaching in India. In the aftermath of Hesperus, Bergesen lawyer Arne Falkanger Thorsen said that Chinese breakers would be a preferred choice for future Bergesen owned demolitions (Dagens Næringsliv October 2003).

The Hesperus case induced India's Supreme Court to formulate fresh guidelines for ship breaking. The Court decreed that, as per the recommendations of the committee, an inter-ministerial panel comprising the ministries of surface transport, labour and environment should be constituted. The inter-ministerial panel were to act in conjunction with the involvement of labour and environmental organisations, as well as representatives of the ship breaking industry and it were to monitor all ship breaking activities in the country (Loyd's List October 2003).

Havmann

In June 2001 Bergesen decided that the 1973 built gas carrier Havmann was going into dry dock in Greece to be kept in service another five years (LPG World June 2001). Havmann was, however, sold to Chinese breakers in January 2004 at what was then a record high price for gas carriers of $325 per ldt. The ship had been fixed for a voyage to the Far East, which meant it would be open in South Korea. This made scrapping in China an even more attractive alternative. Bergesen's director Jens Ismar claimed that the company was not speeding up its phase-out of old LPG carriers, despite high scrap prices (Trade Winds January 2004).

Havprins

In March 2004 Bergesen went into negotiations to sell the 53,000-cbm Havprins (built 1974) for demolition. According to Jens Ismar it is company policy to sell vessels for scrap when they reach the age of 30 years. Ismar said to Trade Winds that Bergesen has no other tonnage similar

to Havprins that has reached the company's scrapping age (Trade Winds March 2004). Havprins was sold to Chinese breakers in March 2004 and since then no other Bergesen vessels have been dismantled.

Analysis of the Cases

The above description of the six cases indicates that, except for Hesperus, none of the Bergesen owned demolitions have evoked much media attention. It is, however, based on the information referred to above, possible to learn something about how the economies of ship breaking, international law and business ethics have affected Bergesen's decisions by analysing the six cases. The objective of the final section of this chapter is to perform such an analysis.

How have the Economies of Ship Scrapping Affected Bergesen?

By looking at the general development of Bergesen owned demolitions during the last five years it becomes apparent that the company is no exception from business cycle influence, as the business cycle of the shipping industry clearly affects Bergesen's decisions and operations. While freight rates were modest and scrap prices were correspondingly low, Bergesen followed the industry trend, and sold 20 vessels for scrap to Asian breakers in the period from 2002 to 2004. As freight rates increased and the industry as a whole scrapped less vessels (see chapter 5), Bergesen followed up and sold fewer vessels for scrap. With record high freight rates from April 2004 to April 2006 no Bergesen vessels have been scrapped, again illustrating a textbook example of the negative correlation between freight rate and volume of scrapping (see chapter 4).

Supply Side Drivers

The company policy of Bergesen is, as mentioned above, to sell its vessels for scrap when they reach the age of 30 years (Trade Winds March 2004). Nevertheless, Berge Boss, Berge Borg and Havsol, all built in 1976, were sold to breakers in 2003, at the age of 27 years. When these three fairly old vessels were sold in May 2003 the freight rate had yet to sky rocket, and Bergesen, like many other ship owners, concluded that the obtainable scrap price available in the market at that

point in time outweighed the difference between expected future incomes and expected future running costs for the vessels.

In the case of Berge Borg and Berge Boss, both single hull tankers, Bergesen may also have had the phase out regulation of the IMO (Regulation 13G with amendments) in mind when deciding to scrap the old tankers. In addition to the high age of the four gas carriers, the desire to clear out old, smaller vessels and invest in new and larger vessels might have affected the supply of Bergesen vessels to the scrapping industry.

Demand Side Drivers

Five of the six Bergesen vessels described above were scrapped in China, exemplifying China's strong demand for second hand steel. Even though Chinese breakers have paid record high scrap prices in some cases, like for instance in the case of Havmann, the average price obtainable in China is somewhat lower than in India and Bangladesh (Clarkson Research Studies 2006). When Hesperus was sold for scrap Bangladeshi breakers had formed a cartel fixing the scrap price (Lloyd's List October 2003). This cartel might have been the reason why a Bangladeshi scrap yard was not chosen. Hesperus was sold to Indian breakers because the Indian company was able to offer a higher scrap price than its Chinese counterpart (Trade Winds August 2003). The higher price offered in India is probably connected to a lower level of labour costs and capital costs and less environmental requirements in India than in China.

Future Prognoses

How are the economies of ship scrapping likely to affect Bergesen in the future? The future effect of business cycles and regulation on Bergesen is likely to depend on the age distribution of Bergesen's current fleet.

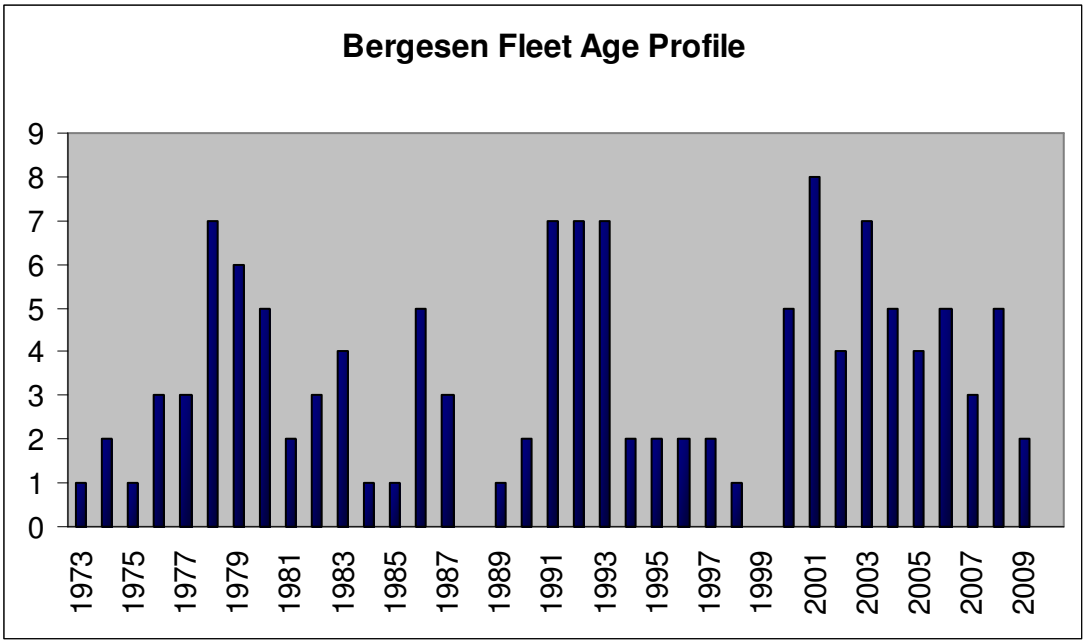


Figure 12: Bergesen fleet age profile
Source: www.bergesenworldwide.com (2) (2006)

The graph above illustrates the age profile of Bergesen Worldwide's fleet of vessels as of April 2006. The fleet consists of dry bulk and gas carriers in addition to tankers owned by the Bergesen Worldwide Group. For the years 2007 to 2009 the graph illustrates number of vessels on order. In total the fleet consists of 128 vessels, including 85 gas carriers, 12 bulk carriers and 31 tankers, eight with single skin. 23.4 % of the total fleet is above 25 years of age. The average age of the fleet is 13.6 years.

According to Bergesen's director, Jens Ismar, the company policy is to sell old vessels for scrap when they reach the age of 30 years (Trade Winds March 2004). This should imply that the three vessels built in 1973 and 1974 were due for demolition in 2003 and 2004 respectively. Bergesen may have chosen to keep the vessels in operation due to high demand for the services offered by

the vessels. Furthermore the graph illustrates that Bergesen possesses one vessel built in 1975 and three vessels built in 1976, two vessels built in 1977 and seven vessels built in 1978. If Bergesen sticks to its company policy four vessels should be sold for demolition in 2006 and two and seven vessels are expected to be scrapped in 2007 and 2008 respectively. By April 2006 no Bergesen vessels have been sold for demolition (Clarkson Database 2006).

Even though it may be possible to draw some conclusions based of the age profile of Bergesen's fleet, it is very difficult to give any concrete answers to how the future development of the shipping industry will affect Bergesen and other shipping companies. As pointed out in chapter 4 the volume of scrapping is significantly affected by freight market rates. Currently these rates are exceptionally high, indicating a low total volume sold for scrap. Since Bergesen has not sold any vessels for scrap since March 2004 it seems reasonable to believe that Bergesen, like most shipping industry companies, is affected by industry business cycles. It is worth noting that Bergesen's fleet has a relatively low average age (13.6 years), which may indicate that, in case of a drop in freight rates, Bergesen might sell their vessels for scrap later than shipping companies with a higher percentage of relatively old vessels.

How has the Legislative Framework Affected Bergesen?

The Basel Convention and the Basel Ban

Bergesen has in specific experienced the influence of the Basel Convention on Transboundary Movements of Hazardous Waste (see chapter 7). This convention or environmental regime was for instance evoked in the case of Hesperus. Since Hesperus was registered in NIS, and both Norway and India have signed the Basel Convention, the vessel was subject to the regulations of the Convention. As mentioned above the gas carrier was arrested by Indian port authorities based on the Basel Convention due to suspicions about hazardous waste aboard the vessel. Bergesen was in addition accused for not having notified Indian authorities about the arrival of Hesperus in advance, which is a requirement both under the Basel Convention and under Indian national law.

When a complete list of inventory was published and Bergesen admitted responsibility for the quick silver aboard, Hesperus was allowed beaching since it was no longer expected to contain hazardous waste. Bergesen's responsibility for the quick silver is formalised in the Basel Ban, which has been ratified by Norwegian authorities, but has yet to enter into force globally. Indian authorities have not ratified the Basel Ban. The Basel Convention and the Basel Ban has been signed and ratified, respectively, by China. This may indicate that Bergesen's director's assumption that China is a more environmentally friendly alternative is correct.

As outlined in the theory chapter of this report (chapter 4), national governments have to balance competing goals, namely environmental and non-environmental goals (Sprinz 1992). India may have chosen not to sign the Basel Ban because the country fears to loose supply of obsolete vessels to competitors with less stringent environmental regulations. If India chose to sign the Basel Ban, and the Ban enters into force, the prices Indian scrap yards will be able to pay for outranged vessels may decline. China, which has ratified the Ban, offers lower average scrap prices than its main competitors, India and Bangladesh, which have yet to ratify and implement the Ban. India will thus have what Prittwitz (1990) described as polluter interests. In the framework developed by Sprinz (1992) it seems natural to place India in the group 'intermediates' (see figure 6), that is countries that scores high on ecological vulnerability and high on abatement costs.

Furthermore domestic factors may have an affect on India's willingness to engage in the Basel Ban and in regimes protecting workers' rights. First of all India cannot be said to have reached the level of post materialism (see chapter 4) known from Western countries, and interests groups protecting the environment, health and security are relatively rare. India is, however, advancing in the field of technology, implying that the country is developing resources that may contribute in improving environmental conditions, also in the ship scrapping industry. India has, however, yet to reach a level of wealth where it is possible to focus on environment, health and security rather than profit.

IMO Regulation 13G

The IMO decision to phase out single hull vessel is another regulation at the international level that may affect Bergesen. The two single hull tankers Berge Borg and Berge Boss were both scrapped in 2003, perhaps due to a combination of high age, relatively low freight rates and the certainty about future phase out dates. Currently Bergesen possesses 19 tankers, the oldest is built in 1990, and eight of the tankers have single skin and will thus be subject to the IMO regulations in the future. The table below illustrates Bergesen's 2001 expectations about the effect of the IMO regulations (Bergesen d.y. ASA 2001).

Year	**Built**	**Number**	**Resulting Age**
2003	1973 or earlier	0	-
2004	1974 and 1975	1	29 years
2005	1976 and 1977	5	28/29 years
2006	1978, 1979 and 1980	2	26/27 years
2007	1981 and later	3	21/24/26 years

Table 5: Future Bergesen demolitions
Source: Bergesen d.y. ASA (2001)

Even though the company did not expect to scrap any vessels in 2003 both Berge Boss and Berge Borg were scrapped this year, and not in 2005 which was their expected scrap year. The decision to scrap the two ULCCs was probably, as mentioned earlier, based on high age, poor freight rate and the IMO regulations. Since 2001 Bergesen has been through a substantial renewal (www.huginonline.com) of the tanker fleet and several of the relatively old vessels have been sold. The remaining vessels are expected to reach almost the same age as they would without the IMO regulations (Ibid.).

Does Bergesen Admit Value Chain Responsibility?

To reveal whether Bergesen, as a representative from the shipping industry, admits value chain responsibility I will try to place the company at one of the stages of moral development described by Lawrence Kohlberg (1971) (see chapter 4). I will assume that level of moral maturity is likely to affect the degree to which a company admits value chain responsibility. The analysis is based on Bergesen's choice of scrapping location in the six cases described in the beginning of this chapter, and how Bergesen handled the Hesperus case, which was subject to substantial media attention. At the beginning of the section I will briefly discuss why Bergesen should pay attention to its value chain responsibility.

When reading this section it is important to keep in mind that all information about the Bergesen owned demolitions is second hand information, mainly derived from Norwegian and international newspapers. As mentioned in chapter 3 newspapers are seldom neutral in their descriptions and the interests of all involved stakeholders are not likely to be fully covered.

Bergesen's Stakeholders

First of all it is important to note that Bergesen, like most ship owners, is a powerful link in the value chain of a vessel. In chapter 8 it was underlined that the most powerful member of a chain is often held responsible for the actions of less powerful upstream or downstream members of the chain (Phillips 2003). Consequently Bergesen may be held responsible for the actions of the Indian or Chinese scrap yards where their vessels are dismantled, even though Bergesen no longer owns the vessel at the time of demolition.

A shipping company like Bergesen has several stakeholders to pay attention to when choosing path of action. All of these stakeholders are in the position to hold Bergesen responsible for the actions of its downstream value chain member, the scrap yard. A key word is *reputation.* Since Bergesen is an international operator, with ***customers*** all over the world, people evaluate their actions with different backgrounds in terms of for instance culture. The degree to which Bergesen admits value chain responsibility may be experienced differently in different cultures

based on the general level of development in each culture. Customers in developed countries may for instance afford to pay more attention to Bergesen's environmental profile, while customers in less developed countries have to focus solely on the prices offered by Bergesen.

When choosing shipping company international customers may be affected by the opinions of non-governmental organisations (***NGOs***). Bergesen has thus to consider the requirements of NGOs like for instance Greenpeace because these kinds of organisations have the power to influence how customers experience Bergesen. In the case of for example Hesperus Greenpeace managed to draw substantial negative attention towards Bergesen, based on Bergesen's choice of scrapping location. Negative attention like this, revealing a possible lack of value chain responsibility, is potentially harmful to Bergesen's reputation, and may in turn lead to decreasing profits.

There is a close link between the actions of the NGOs and the ***world press***. If an NGO manages to reveal that a company like Bergesen is not acting in accordance with the general understanding of what is morally accepted behaviour, the world press is eager to cover the story. When Greenpeace started focusing on the Hesperus case, the world press followed up by printing stories with a taste of sensation. The demolition of the five other Bergesen vessels described in this report did on the other hand not gain any attention by NGOs, and no media attention arose. Less NGO attention at Chinese scrap yards may be due to better conditions in China. However, Greenpeace states that the conditions in China are similar to those in India (www.greenpeaceweb.org (2)), indicating that NGOs and their choice of attention influence the evaluation of the degree to which a company admits value chain responsibility.

Another group of stakeholders, the ***shareholders***, and their evaluation of Bergesen and its value chain partners, may be equally important to the company. Shareholders contribute with liquid assets and enable Bergesen to invest in for example vessels and other equipment. Negative media attention due to choice of for instance choice of scrapping location might ruin Bergesen's reputation among shareholders, and in turn result in less willingness to invest in the company.

Finally negative media attention may result in a less favourable relationship between Bergesen and its ***vendors***. If Bergesen's reputation is significantly damaged, some shipyards may be unwilling to sell their vessels to Bergesen, due to fear of loosing credibility. It is, however, more likely that unfavourable media attention affects the relationship between Bergesen and its customers, like for instance oil companies, than the relationship between Bergesen and its vendors. The rationale behind this may be that it is plausible that oil companies to a larger extent than the shipyards are affected by a shipping company's poor reputation.

Level of Moral Maturity

In the theory about the economics of ship scrapping presented in chapter 4 it is argued that shipping companies are highly price sensitive when choosing scrap yard. The scrap yard that is able to offer the highest price for any shipping company's obsolete vessel wins the battle regardless of how the yard treats its workers or what it does to protect the environment. This reflects a rather egoistic view on ethics. The corporation has as its sole objective to maximise own profit without regard for the environment or the well-being of people affected by its actions (Falkenberg 2004). According to Kohlberg (1971) such cost-benefit calculations within the bounds of legality is typical for the *pre-conventional* level of moral reasoning.

Prior to the demolition of Hesperus brokers suggested that the vessel would be sold for scrap to Chinese scrap yards despite lower Chinese scrap prices (Trade Winds August 2003). The brokers based their anticipations on statements from Bergesen about the importance of better environmental conditions in China than in for instance India. At the time Bergesen director Jens Ismar stated that *'We try to operate responsibly with regard to the environment and China is a good alternative. We will not scrap in Bangladesh for the time being* (Ibid).'

Hesperus was, however, sold to an Indian scrap yard and, due to a focus on the vessel from Greenpeace; Bergesen received much negative media attention. In the aftermath of Hesperus Bergesen lawyer Arne Falkanger Thorsen underlined that China would be a preferred choice for future Bergesen scrapings (Dagens Næringsliv Morgen October 2003). The vessels sold for scrap since Hesperus, Havmann and Havprins were sold to China.

The negative media attention that arose in the wake of Hesperus illustrates what follows if a company does not act in accordance with what is generally accepted; the conventions of a particular society. Bergesen, which is a company with Norwegian roots, got particularly much negative attention in Norwegian newspapers (see for instance Dagsavisen September 2003, Adresseavisen September 2003 or Dagsavisen October 2003), indicating that the conventions of the Norwegian society had been broken. During the Hesperus case the institutions of the Norwegian society, in terms of the regulatory framework (the Basel Convention) and the norms and values of the people were challenged. If Bergesen stated that the company would avoid India and Bangladesh as scrapping locations in the future to act in accordance with Norwegian institutions, the company has reached what Kohlberg refers to as the *conventional* level of moral development.

As mentioned in chapter 4, to adhere to local institutions does not ensure ethical behaviour. Information about the conditions under which a Bergesen vessel is scrapped does not always reach Norwegian newspapers, and the conventions of the Norwegian society may thus not be challenged. The actions of Bergesen will then be evaluated under for instance Indian institutions, which may be less developed than Norwegian institutions, both in terms of legal framework and in terms of norms and values. In chapter 6 it became apparent that developing country institutions are inadequate, unable to protect the local environment and inhabitants. If Bergesen adheres to Indian conventions this may not be enough to ensure ethical behaviour.

In the case of Hesperus Bergesen stated that it had followed industry code of practice, which is the institution or system of conventions connected to the shipping industry (Lloyd's List October 2003). Even though Bergesen adhered to the code of practice, hazardous substances like quick silver was transferred to a developing country, and Hesperus was finally dismantled under poor environmental and working conditions at an Indian beach. This may indicate that the industry code of practice for ship scrapping is inadequate, unable to protect workers and the environment. If the industry code of practice is improved and laws regulate behaviour, norms and values it might be easier for Bergesen to compete with integrity.

If Bergesen has decided to scrap its vessels in China based on a belief that Chinese scrap yards are able to offer better environmental conditions, the company may have reached what Kohlberg refers to as the *post-conventional* level of moral reasoning. Bergesen does, however, not mention the importance of working conditions at the scrap yard. The company has not issued a social responsibility report, and it is thus difficult to give any concrete answers to whether Bergesen admits responsibility for the conditions under which scrap yard workers dismantle its vessels. Bergesen's website (www.bergesen worldwide.com) does not mention ship recycling. Environmental responsibility is mentioned on the website of Bergesen Worldwide Gas, but not in terms of ship scrapping.

Conclusion on Value Chain Responsibility

Based on the information available through newspapers and press releases Bergesen seems to fit in at the conventional level of moral development. According to statements given by the company in newspapers Bergesen tries to avoid that the industry code of practice (the conventions) is broken (Lloyd's List October 2003). Bergesen representatives have stated that Chinese scrap yards will be preferred in the future due to better environmental conditions (Trade Winds August 2003). Statements like these may indicate that Bergesen, as a representative from the shipping industry, is striving towards the highest level of moral development, the post-conventional level described by Kohlberg (1971). To reach this ultimate level, where full value chain responsibility is admitted, the shipping company might get some advises from Kohlberg's (1971) five principles of ethical behaviour (see chapter 4):

- First of all Bergesen could aim at acting in accordance with the principle of equity. It is impossible for a multi national shipping company like Bergesen to ensure that the workers at the scrap yards are treated the same way as the employees at Bergesen operated vessels. Bergesen does, however, have the ability to influence the working conditions at the scrap yards to some extent, by for instance ensuring that the content of hazardous waste aboard the vessel is minimized.

- Secondly Bergesen could try to enforce the principle of just institutions, by choosing, if possible, scrap yards where the workers receive a minimum of nutrition, health and education and consumption at a level that ensures survival of future generations.

- Thirdly Bergesen could try to ensure the rights of the individuals who are directly or indirectly affected by its activities by engaging itself in activities that aim at improving the local circumstances.

- Fourth Bergesen could, since the background institutions are inadequate, try to develop a set of values that sets standards above the locally required minimum level. The principle of integrity will then be satisfied.

- As the most powerful value chain member, Bergesen may be held responsible for the environmental and working conditions at the scrap yards, and to reach the post conventional level Bergesen could try to improve these conditions.

It is, however, important to note that to fulfil the five principles above Bergesen has to contribute with substantial amounts of financial means. As long as the industry code of practice is not changed it is unlikely that Bergesen or any other shipping company change practice and admits full value chain responsibility. If Bergesen chooses to issue a social responsibility report it would be easier to get an overview of its attempts to improve scrap yard conditions.

Conclusion on Bergesen

The three areas of ship scrapping described in this report, the economies of ship scrapping, the current legislative landscape and the business ethics of shipping companies have clearly affected the operations and decisions of Bergesen.

- The company is, like most shipping companies, affected by business cycles, selling fewer vessels for scrap as freight rates increase.

- The case of Hesperus clearly illustrates that Bergesen has experienced the effect of the regulative framework of the ship scrapping industry, especially in terms of the Basel Convention and the Basel Ban.

- Finally business ethics and level of moral development have ensured that Bergesen is willing to sell its vessels to Chinese scrap yards with better environmental conditions, despite lower scrap prices. Based on information in newspapers and press releases one may say that Bergesen has, like many of its industry counterparts, yet to reach the highest level of moral maturity, the post-conventional level, where full value chain responsibility is admitted. It does, however, seem like Bergesen is striving towards this level.

CHAPTER 10 - CONCLUDING REMARKS

In the context of the current industry conditions, in terms of the economies of ship scrapping and the legislative landscape, does the shipping industry admit value chain responsibility?

In this report the value chain responsibility of shipping companies have been discussed in the context of the historical and current industrial framework. Through a focus on three theoretical areas affecting the ship scrapping industry, the economies of ship scrapping, the legislative landscape and the value chain responsibility of shipping companies, I have aimed at illustrating different aspects of the industry.

In chapter 9 I concluded that Bergesen Worldwide, which is a major shipping industry participant, is not completely able to admit full value chain responsibility because the company has yet to reach what Kohlberg (1971) describes as 'the post conventional level' of moral maturity. According to the analysis Bergesen has thus far reached the conventional level of moral maturity. A company that has reached the conventional level believes that it acts morally responsible as long as it does not break the conventions of the society as a whole. Since 90 % of all vessels are scrapped at Asian scrap yards under similar conditions as the Bergesen vessels have been scrapped, I will anticipate that the shipping industry in general also fits the characteristics of the conventional level. In terms of the ship scrapping industry conventional moral reasoning implies that the company or industry believes that it is morally obliged to adhere to the legislative framework in general and the industry code of practice in specific.

Poor health and safety and environmental protection standards at Asian scrap yards do, however, illustrate that the current legislative framework and industry code of practice fail to adequately protect the environment and human health. Until now the IMO guidelines on ship recycling has been merely voluntary. If the industry code of practice is improved and laws regulate behaviour it might be easier for shipping companies like Bergesen to compete with integrity and admit full value chain responsibility.

A step towards a globally applicable, legally binding regime regulating the scrapping industry was taken at the Marine Environment Protection Committee's (MEPC), 53rd session in July 2005. At this meeting it was decided that IMO should develop, as a high priority, a new instrument on recycling of vessels. The new IMO regime will contain regulations concerning design, construction and operation as well as preparations for scrapping. At its 54th session in March 2006 the MEPC made progress in developing the draft text of a mandatory instrument. The new instrument should be completely implemented by 2008-2009 (www.imo.org (2)).

Consequently the new regime will be implemented before the expected ship-scrapping boom of 2010, caused by the decision to phase out single hulled tankers, arises. According to the EU (EU 2000) the only plausible constraint to future scrapping capacity is environmental and working condition related regulation. The new regime may imply that some scrap yards are not able to comply with the requirements and are pushed out of business. If capacity at the Asian scrap yards that remain in business is driven to its limit, ship owners may have to pay scrap yards to get their vessels dismantled, and yards with recycling facilities in developed countries might find it favourable to enter the market. If ship owners choose not to scrap their vessels if they have to pay a fleet of non-operating vessels will arise.

If the ship scrapping industry is to remain in Asia, where the market conditions are ultimately favourable, funding seems to be needed. If it, through funding, is possible to ensure that most Asian scrap yards are able to meet the requirements of the new binding IMO regime, and can provide socially responsible scrapping of end-of-life vessels, shipping companies like Bergesen Worldwide can utilise market conditions like low labour costs and high demand for second hand steel in developing countries like India, Bangladesh and China without violating ethical commitments.

CHAPTER 11 - RECOMMENDATIONS AND FUTURE RESEARCH

In this final chapter of my master thesis I will aim at suggesting recommendations to the shipping companies about how they can match corporate responsibility with shipping practice. Furthermore I will try to recommend areas within the ship scrapping industry that may be of interest for future researchers.

Recommendations

If shipping companies like Bergesen Worldwide are to reach the ultimate level of moral responsibility and admit full value chain responsibility, they may have to fundamentally change their perception of the ship scrapping industry. If the ship scrapping yard is understood as a service provider to the shipping industry rather than a separate dumping industry, and is paid for its services by the shipping companies, environmentally sound and socially responsible recycling of vessels may be achievable.

Environmentally and socially responsible ship recycling may for instance be financed through a ship-recycling fund established by the world's shipping companies. The shipping companies may be obliged to pay contributions to this fund either at the new built phase or during the entire life cycle of the vessel. In case of the latter alternative recycling charges may for instance be paid as part of the insurance premium of a vessel, ensuring a 'life insurance' of the vessel, where future dismantling costs are considered.

To ensure the establishment of a recycling fund, a mandatory framework of appropriate regulation is necessary, as fund and regulation are interdependent. Globally applicable, binding regulation is likely to facilitate change of dumping practices. The introduction of new regulation without a parallel financing mechanism may, however, lead to circumvention of the rules, and increased illegal use of substandard scrap yards to avoid extra cost. A report developed in 2005 by ECORYS Transport, *'The Ship Recycling Fund'* describes how a fund may be developed.

Future Research

I would suggest that future research on the ship scrapping industry is carried out to understand whether the methods developed for vessel recycling in for instance the Netherlands (see chapter 6) are possible to transfer to Asian countries, and how such a change in the industry conditions might affect obtainable prices of obsolete vessels. Furthermore I would suggest that studies on the implications of the decision to phase out single hulled tankers are carried out as the tankers of the three respective categories are phased out. Finally the relationship between legislation and funding may be of interest for future researchers.

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APPENDIX I

Fleet of single hulled oil tankers by category, hull type and year of delivery (Million LDT)

	Category 1			Category 2			Category 3			Total
	DB/DS	SS	Total	DB/DS	SS	Total	DB/DS	SS	Total	
Pre 1970	0	0,2	0,2	0	0	0	0	0,1	0,1	0,3
1970	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0,1	0,1	0,1
1972	0	0,1	0,1	0	0	0	0	0	0	0,1
1973	0,1	0,1	0,2	0	0	0	0	0,1	0,1	0,3
1974	0	0,4	0,4	0	0	0	0	0,1	0,1	0,5
1975	0,1	0,5	0,6	0	0	0	0	0,1	0,1	0,7
1976	0,1	1	1,1	0	0	0	0	0,1	0,1	1,2
1977	0,1	0,6	0,7	0	0	0	0	0,1	0,1	0,8
1978	0,2	0,3	0,5	0	0	0	0	0,1	0,1	0,6
1979	0,1	0,7	0,8	0	0	0	0	0,1	0,1	0,9
1980	0,2	0,8	1	0	0	0	0,1	0,1	0,2	1,2
1981	0,4	1	1,4	0	0	0	0,1	0,1	0,2	1,6
1982	0	0	0	0,3	0,8	1,2	0	0,1	0,1	1,3
1983	0	0	0	0,3	0,6	0,9	0,1	0,1	0,2	1,1
1984	0	0	0	0,2	0,5	0,7	0,1	0,1	0,2	0,9
1985	0	0	0	0,3	0,4	0,7	0,1	0,1	0,2	0,9
1986	0	0	0	0,3	0,7	1	0,1	0	0,1	1,1
1987	0	0	0	0,3	0,5	0,8	0	0,1	0,1	0,9
1988	0	0	0	0,3	0,7	1	0	0,1	0,1	1,1
1989	0	0	0	0,3	0,9	1,2	0	0,1	0,1	1,3
1990	0	0	0	0,2	1,1	1,3	0	0,1	0,1	1,4
1991	0	0	0	0,3	1,1	1,4	0	0,1	0,1	1,5
1992	0	0	0	0,3	1,3	1,6	0	0,1	0,1	1,7
1993	0	0	0	0,2	1,1	1,3	0	0,1	0,1	1,4
1994	0	0	0	0	0,7	0,7	0	0	0	0,7
1995	0	0	0	0	0,5	0,5	0	0	0	0,5
1996	0	0	0	0	0,1	0,1	0	0	0	0,1
1997	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0	0	0
2001	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0
2003	0	0	0	0	0	0	0	0	0	0
2004	0	0	0	0	0	0	0	0	0	0
2005	0	0	0	0	0	0	0	0	0	0
Total	1,3	5,7	7	3,3	11	14,4	0,6	2,2	2,8	24,2

Source: Clarkson Research Studies (2006)

APPENDIX II

Age profile of current fleet in number of vessels other than single hull oil tankers and share of fleet

Segment		0-4 years	5-9 years	10-14 years	15-19 years	20+ years	Total	Average Age	Average hist. life
Double Hull Tanker	No.	1,551	995	445	120	152	3,263	6.0	26.1
	%	47.5 %	30.5 %	13.6 %	3.7 %	4.7 %	100 %		
Bulk Carrier	No.	1,218	1,178	654	631	2,357	6,038	15.0	25.7
	%	20.2 %	19.5 %	10.8 %	10.4 %	39.1 %	100 %		
Combined Carrier	No.	2	7	22	23	52	106	17.8	25.2
	%	1.9 %	6.6 %	20.7 %	21.7 %	49.1 %	100 %		
Container	No.	558	996	725	303	793	3,375	11.3	25.4
	%	16.5 %	29.5 %	21.5 %	9.0 %	23.5 %	100%		
Gas (LNG+LPG)	No.	188	219	181	117	471	1,176	14.8	29.3
	%	16 %	18.6 %	15.4 %	10 %	40.0 %	100 %		
Passenger and Ro-Ro	No.	104	94	44	107	175	524	14.5	27.1
	%	19.8 %	18.0 %	8.4 %	20.4 %	33.4 %	100 %		
Other cargo	No.	251	753	538	481	974	2997	17.4	25.9
	%	8.4 %	25.1 %	17.9 %	16.0 %	32.5 %	100 %		
Total	No.	3,872	4,242	2,609	1,782	4,974	17,479		
	%	22.2 %	24.3 %	14.9 %	10.2 %	28.4 %	100 %		

Source: Clarkson Research Studies 2006