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An analysis of the creation of a global ship recycling fund in the framework of the Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships, 2009

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An analysis of the creation of a global ship recycling fund in the framework of the Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships, 2009

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DECLARATION

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

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

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ABSTRACT

Title of Dissertation: **An analysis of the creation of a global ship recycling fund in the framework of the Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships, 2009.**

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This dissertation undertakes an analysis of creating a global ship recycling fund to promote green ship recycling targeted under the International Maritime Organisation (IMO)'s Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships, 2009.

Green ship recycling is always expensive therefore the ship recycling yards opt for the conventional methods without following safety norms and environment friendly practices. On the other hand, ship owners also are not interested in monitoring of the procedure opted by the yards in recycling of their ships because they are interested in the best price from their scrap ships.

To achieve the goal of green ship recycling, enforcement of the IMO's Convention by the all the stakeholders of Ship Recycling industry in an effective manner is needed. Therefore, a provision of incentive is needed to motivate the stakeholders to opt the green ship recycling in place of conventional methods and the additional burden arisen due to this reason, needs to be compensated from the Ship Recycling Fund proposed to be created.

This dissertation discusses about the cost-barrier in green ship recycling and proposes a mechanism to be developed as a market-oriented incentive scheme suggesting arrangement of the Ship Recycling Fund, its monitoring and disbursement method.

KEY WORDS: Ship Recycling Convention, green ship recycling, safety of human and the environment, hazardous materials, toxic wastes, conventional and standard methods of ship recycling, Ship Recycling Fund.

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LIST OF ABBREVIATIONS

ARF	Advance Recycling Fee
ARN	Auto Recycling Netherlands
BIMCO	Baltic and International Maritime Council
DNA	Deoxyribo Nucleic Acid
DWT	Dead Weight Ton / Tonnage
ELV	End-of-life Vehicle
ESM	Environmentally Sound Management
GT	Gross Ton / Tonnage
ICS	International Chamber of Shipping
IGO	Inter-governmental organization
IHM	Inventory of Hazardous Materials
ILO	International Labour Organization
IMO	International Maritime Organization
ISRT	International Ship Recycling Trust
JARC	Japan Automobile Recycling Promotion Centre
LDT	Light Displacement Ton / Tonnage
MARPOL	Marine Pollution
MEPC	Marine Environment Protection Committee
NGO	Non-governmental organization
NOx	Nitrogen oxide
NVMSRP	National Vehicle Mercury Switch Recovery Programme
OECD	Organization for Economic Co-operation and Development
P & I Club	Protection and Indemnity Club

PCB	Polychlorinated Biphenyl
R & D	Research and Development
RO-RO	Roll on- Roll off
SENS	Shiftung Entsorgung Schweiz (an organisation in Switzerland)
SOx	Sulphur oxide
SWICO	Swiss Association for Information, Communication and Organisational Technology (an organisation in Switzerland)
TBT	Tributyltin
U. K.	United Kingdom
U.S. / U.S.A.	United States / United States of America
UNCLOS	United Nations Convention on the Law of the Sea
UNCTAD	United Nations Conference on Trade and Development
VLCC	Very Large Crude Carrier

CHAPTER- 1

Introduction

1.1 Background

Shipping is the most environment friendly and cheapest mode of transportation which is responsible for carriage of goods of more than 90 % of the world tonnage. Ships, the focal point in the shipping industry, have a life span of 20-25 years for commercial use and after that period they are replaced by new ones with the latest technology and more environmentally friendly design. Accordingly, old ships are taken out of operation and sent for recycling as there is little scope to convert them for other uses. Ship recycling offers the most environmentally sustainable way of disposing of ships, with virtually every part of hull, machinery, equipment and fittings being reused or recycled as scrap metal. It can, therefore, be said that decommissioning of ships is a commercial process to convert end-of-life ships into steel and other recyclable items which gives an opportunity to the industry to take the incentive of economic benefits and employment opportunities.

Up to the first half of the twentieth century, ship recycling was done all across the world but the market was dominated by the United States and the United Kingdom. Subsequently, enforcement of regulations on safety of life and environment by the western countries compelled the industry to shift from there due to cost-escalation. The ship recycling industry being labour intensive, requiring 500-1500 employees for dismantling of a ship, shifted to the Mediterranean and then gradually to the regions with low labour costs. Demand for scrap metals also affected the market. Yards, after purchasing the ships, separate the steel, usable machines, instrument, devices and other parts from it for suitable reuse. Scraps are mostly used to produce new steel; therefore, it can be said that the steel content of the ship determines its price. Tankers and bulk carriers have higher prices than other vessels due to their steel content. In 1993, the demand for steel was very high in China and it dominated the market with a major share of the world's scrapping business (Mikelis, 2007). However, it was then taken over by India and Bangladesh.

In the present era, Asian countries viz Bangladesh, India, Pakistan, Turkey and China, are leading the ship recycling industry in the world. Ship recycling activities which are unsafe and environmentally unfriendly, are done in Bangladesh, India and Pakistan on a manual basis without basic facilities and proper training of the workers about handling the hazardous material (China and Turkey have already taken initiatives towards green ship recycling). Cheaper labour cost, liberal rules and regulations to govern the ship recycling activities motivate the ship owners and ship brokers to approach these countries.

With the intention to ensure safe and environmentally friendly recycling of ships, the International Maritime Organisation (IMO) after making groundwork on the issue came up with a new Convention on it. In the Diplomatic Conference in Hong Kong on 11-15 May, 2009, the International Convention for Safe and Environmentally Sound Recycling of Ships, 2009 was adopted by the IMO. The Convention was open for signature by any state at the Headquarters of the Organisation from 1st September, 2009 to 31st August, 2010 and shall now be open for accession by any state. Till now, sixty states have signed the Convention including Turkey, one of the main ship recycling states (Beck, 2010, p. 1). The Convention shall enter into force 24 months after the date on which the conditions mentioned in the Convention (Article-17) are met. As mentioned above, out of the five main ship recycling states, Turkey has signed the Convention on 26th August, 2010 but the other four states may take some time to sign it (IMO press release, 2010).

IMO's Ship Recycling Convention, 2009 has the intention to standardize recycling of ships all over the world. But green ship recycling requiring safe and environmentally sound facilities, has cost higher in comparison to its conventional method which attracts the industry to opt for the latter benefiting all its stakeholders. As per the NGO, Greenpeace, to achieve the target of environmentally friendly ship recycling, it is necessary to create a fund to meet the additional financial burden due to environmentally sound scrapping practices by the yards. IMO also in its meetings agreed in principle to the need for establishing an International Ship Recycling Trust (ISRT)

Fund for technical co-operation activities and encouraging ship recycling countries towards safe and environmentally friendly recycling of ships (Mikelis, 2006). After endorsement in its ninety-fourth session (20-24 June, 2005) by IMO's Council, ISRT Fund was established with effect from 1st May, 2006.

Similarly, the European Commission is also planning to create the Ship Dismantling Fund for proper recycling of the ships with a strong link to the European Union. Here a strong link relates to the flag or ownership of a ship. As per the Commission, IMO's Convention on the subject will take time to come into force, may be up to 2015 and fully effective by 2020. To control environmental pollution and ensure human safety, they are planning to recycle their ships at their recycling yards with the financial support through their Ship Dismantling Fund proposed to be created. Introduction of the Hong Kong Convention, 2009 without creation of a parallel financial mechanism may lead to circumvention of the rules and increased use of substandard scrapping yards by ship owners to avoid extra costs ("The Ship Recycling", 2005).

As ship recycling is a service to the shipping community instead of a dumping industry, the shipping industry should pay for it instead of being paid for. The financial gap between the conventional and green dismantling methods need to be analysed and for viability of green ship recycling, there appears a need to create a global 'Ship Recycling Fund' to meet the additional financial burden on ship recycling yards opting for green recycling. This dissertation will undertake an analysis of creating a global ship recycling fund in the framework of the Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships, 2009.

1.2 Objectives

To achieve the goal of green ship recycling, enforcement of the IMO's Convention by the Ship Recycling States in an effective manner is needed. To have better understanding about the problems faced by these states in enforcement of the Convention, this research intends to first discuss about the reasons for shifting the ship recycling market from one corner of the world to another. The trend of the market will indicate the factors responsible for selection of a site suitable for the industry. To achieve the target of

green ship recycling, it is necessary to tackle the key factors properly so that the risk of a parallel market developing in any corner of the world can be avoided. Secondly, the research analyses the procedure existing in the ship recycling states compared with the standard practice. The role played by the stakeholders of the industry needs to be understood properly to have a good understanding of the problem faced in achieving the target of standard practices for green ship recycling. Then the research elaborates the guidelines issued by international organisations on ship recycling and analysis of the responsibility assigned to the stakeholders under the IMO's Convention on the subject. Lastly, it intends to analyse the practical problems of the stakeholders in compliance with the guidelines under the Convention (i.e. the cost-escalation) and explore a viable solution to the problem in green ship recycling suggesting for a provision of incentives to motivate the ship recycling yards to opt for the green ship recycling in place of conventional methods and the additional burden arisen to be compensated from the Ship Recycling Fund proposed to be created.

1.3 Methodology

There are some questions which need to be replied before drawing conclusions on the research topic. They are as follows:

- What is the reason for shifting the ship recycling market from one place to another?
- The standard procedure for ship recycling and the procedure existing in the yards.
- What are the provisions made in the Ship Recycling Convention, 2009 and other regulations / guidelines issued by international organisations for green ship recycling?
- What are the responsibilities bestowed upon the stakeholders of the ship recycling industry in the Ship Recycling Convention, 2009?
- What are the problems faced by the stakeholders in accepting those responsibilities and viable solution to those problems?

- Sources and disbursement mechanism of global ‘Ship Recycling Fund’ proposed to be created to compensate the additional financial burden arisen due to green ship recycling.

For the above said analysis, information from periodicals, conference proceedings and the reports of the NGO, ‘Greenpeace’, the international consulting firm, ‘COWI’ and many other reputed organisations, have been collected. Analysis of the cost for green ship recycling method alongwith the conventional method, has been done on the basis of the calculation made in the report submitted by ‘ECORYS’, a research and consultation company, to ‘Greenpeace’, a NGO. The Ship Recycling Convention being a recent development, no books published on green ship recycling as per the Convention could be found; therefore, deliberations of the conferences and reports available on ship recycling have been used for the research.

1.4 Scope and Limitation

Since ship recycling is a very broad topic, some areas like survey and certification of ships to be recycled, legal regime of the Conventions adopted by IMO, ILO and other international organisations on ship recycling have not been covered under this dissertation. As mentioned above, ship recycling is a service to the shipping community and therefore, they should come forward to take the responsibility of green ship recycling and if necessary, additional financial implication in achieving the target should also be borne by the stakeholders as a cost of waste management. This dissertation focuses on analysis of the problems faced in green ship recycling alongwith an analysis of the creation of a global ‘Ship Recycling Fund’ proposed to be created to meet the additional cost for adopting environmentally sound ship recycling facilities as a viable solution. To achieve the goal of green ship recycling, the yards will require appropriate infrastructural facilities for environmentally sound waste disposal, training of staff, their protective clothing and appropriate tools. Providing incentives for green ship recycling by the creation of a global ship recycling fund, formulating its sources and disbursement mechanism intended to be covered under this research to meet the additional financial

burden of green ship recycling, may be helpful in achieving the goal of IMO's Ship Recycling Convention, 2009.

CHAPTER-2

Ship Recycling Industry

2.1 Ship Recycling: An Overview

Waterways are the oldest mode of transportation in the world. As is known from the history, in the medieval period (9th Century-16th Century) trade flourished through sea routes only; when road and air routes were not developed, people enjoyed the goods of far away with the help of the shipping sector. Silk and spices were the most popular items for trade through the sea route from Asian countries. Even in the present era, shipping is the cheapest and most eco-friendly mode of transportation for bulk cargo. After enjoying a boom in passenger ferries in the 19th century, this sector has seen its recession in the 20th century but after globalisation of the world trade, the shipping industry again shot up in the last quarter of the century after shifting of the production units to the countries having cheaper man-power and resources (Stopford, 2009, p. 143).

Globalisation of trade has given the world market a good opportunity for import and export of goods. The emergence of Asian countries as key drivers of modern shipping, has also helped the current shipping boom (Knapp, Kumar and Remijn, 2008, p.1024). Accordingly, the cargo movement through sea-route increased significantly which resulted in a demand for a good number of ships offering ship owners a chance to increase their fleet by acquisition of new ships or replacement of their ships smaller in size by larger ones. Introduction of more efficient ships also compelled the ship owners to scrap their ships, physically sound but rendering uneconomical. In the very low post-1973 freight market, the medium size steam-turbine tankers unable to compete with lower fuel consuming diesel tankers, were scrapped in bulk due to this reason only (Buxton, 1991, p. 107). From time to time changes in regulations on environmental aspects also compelled ship owners to dispose of their ships; for example, the requirement of double hull tankers under the MARPOL Convention[1] (Amendments to Regulation 13G of Annex

[1] The International Convention for the Prevention of Marine Pollution from Ships, 1973, as modified by the Protocol of 1978 (MARPOL 73/78) entered into force on 2 October 1983 (Annexes I and II). In 1997, a Protocol was adopted to add a new Annex VI. Amendments to 13G of Annexure I MARPOL 73/78 adopted through Tacit procedure entered into force on 05/04/2005.

I MARPOL 73/78). All these developments resulted in the decommissioning of a good number of old ships and ship owners were inspired to approach the market offering the best price for recycling. Asian countries having cheaper labour costs offering a handsome price for these old ships came into the picture as the favourite destination for recycling of ships.

Ship recycling in its present form is a labour intensive activity demanding low skills and therefore, is expected to grow in the countries having low labour costs. In addition to low labour costs, recycling takes place either in the close proximity to a large scrap importing market or in a location where there is a local steel industry using a high proportion of scrap. Taking these characteristics into consideration, the Indian sub-continent, particularly Bangladesh, India and Pakistan, are the most promising locations for large scale recycling of ships (Drewry, 1977, p. 41).

2.2 Ship recycling states and their market share

Ship recycling prices have a good link with the demand from steelworks which do not fluctuate as much as second-hand price of ships in absolute or relative terms. The second-hand price of ships has a strong link with the freight markets, current new building prices along with the type, age and condition of a particular ship. On the contrary, ship recycling prices depend on the cost-structures of a particular country opted for demolition of ships. The prime factors for the ship recycling price are the value of realized materials, cost of demolition and the cost of delivery of ship to the recycling yard. The value remaining after deducting the cost of demolition and delivery cost from the value of realizable materials of a ship becomes the profit from the deal.

Material received from the ships to be recycled, can be separated into the following categories:

(i) Scrap steel for furnaces,
(ii) Re-rollable steel,
(iii) Non-ferrous metals,
(iv) Reusable items (machinery, wooden furniture), and

(v) Unusable and rubbish.

In the Asian market, re-rollable steel is used particularly for reinforcing bars for concrete construction. Reusable equipment like engines, generators, boilers, electrical and plumbing items, wooden planks, bars, furniture, refrigerators, air-conditions also has a good market in these countries. On the other hand, in developed countries such items are valued little more than scrap which makes the realization value of scrap materials 50% higher in the Asian market than in the European market. Resultantly, after taking into considering all the factors including cheaper labour force the ship recycling price offered by the Asian market becomes just double the price offered in Europe. Due to these reasons, the share of the Asian market in ship recycling increased gradually from 40% in the 1960s, 60% in mid the 1970s reaching around 90% in the 1980s and more than 95% (excluding Turkey's share) in 2000. Even in Asia, the market shifts in accordance with the wages and prosperity. Ship recycling started by Japan gradually shifted to Taiwan and Korea. Taiwan dominated the market with around 50% of the share from late 1960s until 1988 (Buxton, 1991, pp. 111-112). In the 1990s, India and Bangladesh took over the market (Figures 1-3).

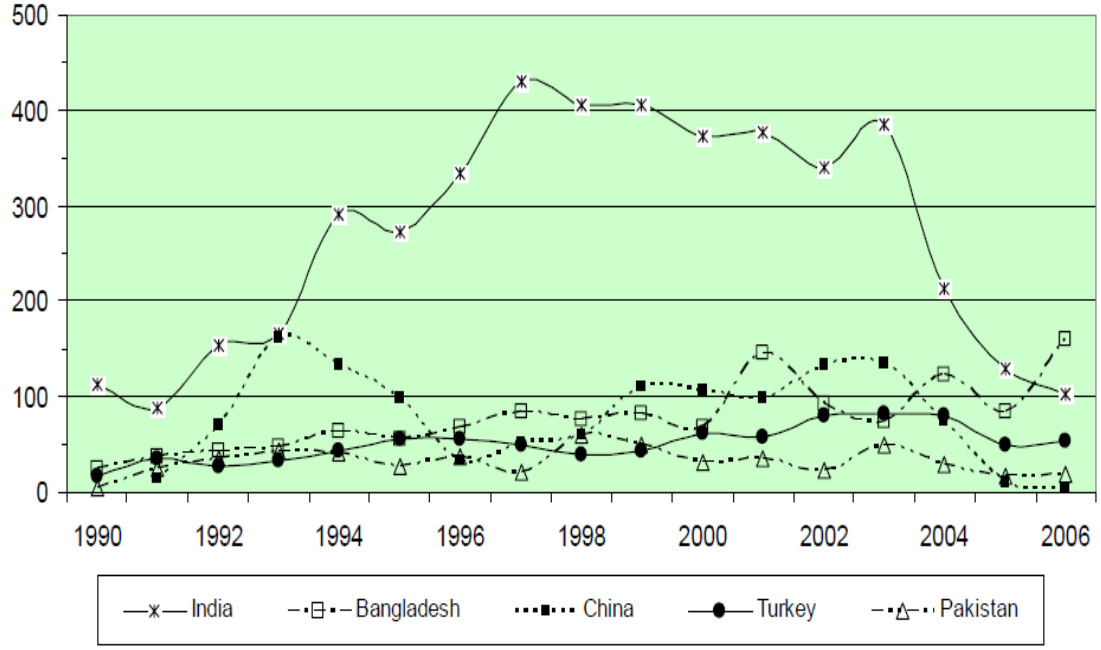

Figure 1- Leading recycling states in terms of ship numbers (ships >499 GT)

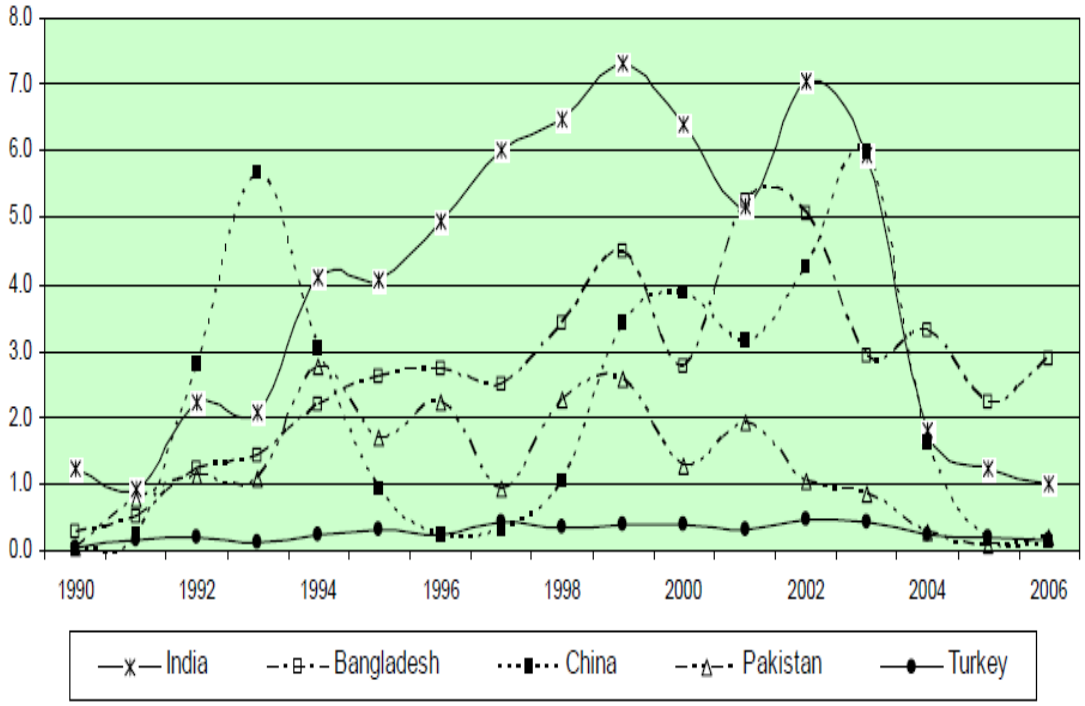

Figure 2- Leading recycling States in terms of tonnage (million GT) (ships >499 GT)

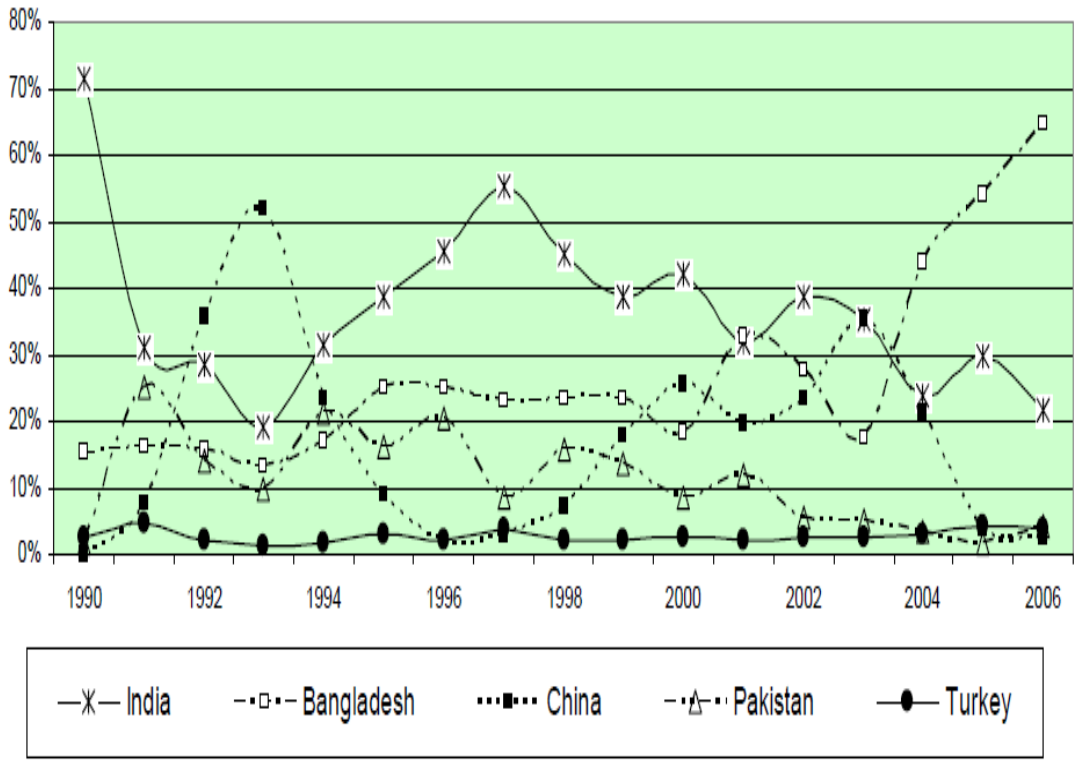

Figure 3- Market share of leading recycling States in terms of tonnage (ships >499 GT)

Source (Fig. 1, 2 & 3): Mikelis, N. E. (2007, September). *A statistical overview of ship recycling.* Paper presented at the International Symposium on Maritime Safety, Security & Environmental Protection, Athens, Greece. http://www.martrans.org :8093/symposium/papers/Track%20B/B42%20mikelis.pdf

2.3 Ship Recycling: A Process

Ship recycling is the processing of waste or rubbish back into raw materials to produce new items. It is beneficial to the individual, the community, the world offering the most environmentally sustainable way of disposing of old vessels, with every part of the hull and machine complex being reused or recycled. Disposal of ships after its economic life was referred earlier as "ship demolition" or "ship scrapping" (Sinha, 1998, pp. 397-403). Since most of the things obtained from the ships are either recycled or reused directly, now the word "ship recycling" is used by the shipping sector for this purpose. According to Rolf Westfal-Larsen, a ship owner and former chairman of International Chamber of Shipping (ICS), everything received from the ship has a further life and nothing goes to waste; therefore, ships are not scrapped but recycled (Varcoe,

1999, pp. 28-30). As stated above, most of the items removed from ships are reused; some after processing and some directly. Engines, generators, boilers, electrical and plumbing items, wooden planks, bars, furniture, refrigerators, air-conditions, these are the items taken from the ships which are sold directly to the market. In Bangladesh, garment manufacturing factories use these engines and generators. Boilers are used mainly in rice mills, garments washing plants, knitting plants and other industries (Parkinson, 2005[2]).

As is known, scraps are mostly used to produce new steel. Therefore, tankers and bulk carriers have prices higher than other vessels due to their steel content. Scraps received from these ships are recycled to get steel to be used in the construction industry resulting in saving two thirds of the energy, when compared with steel production from raw materials. In the absence of any domestic source of iron ore, Bangladesh gets 50 % of its steel requirements from recycled ships (see Table 1):

Table 1- Ship Recycling Industry contributions in Bangladesh, India and Pakistan, 2008/2009

	Bangladesh	**India**	**Pakistan**
National steel production	2.2–2.5 m tons	55 m tons	3 m tons
Scrap steel from ship breaking	Up to 1.5 m tons	Up to 3.5 m tons	Up to 0.8 m tons
Ship breaking steel's contribution to production	50%	5-6%	15%
No. of re-rolling mills	250 to 350	1,500 operational	330
Scrap yards (total no.)	40 active	130 active (183)	30 active (132)
Estimated no. of workers in yards	22,000	16,000 – 20,000	6,000–8,000

Source: World Bank Report (Unpublished) on ship breaking in South Asia, November 17, 2010. p. 2.

[2] Page number not available but placed as executive summary after the slides.

As is known, tankers are used to carry oil, toxic wastes, sometimes radioactive materials and extremely poisonous chemicals. Disposal of such wastes requires training and facilities to avoid damage to human health. Not only does it directly affect the health of the workers, it also has an impact on the environment. When workers strip the ships marooned on the sea-shore, there is severe contamination of the sea bed, eventually seeping into the marine food chain. Due to these reasons, ship breaking is considered a rough business in the world.

In the second half of the twentieth century, after implementation of the safety regulations by developed countries, the industry shifted to the Mediterranean and then gradually to the Asian countries having cheaper labour-force and liberal safety and environmental regulations. Shifting of the ship recycling industry from developed countries can be attributed to the following four main factors (Sinha, 1998, p. 397):

- The industrialised countries were no longer in need of scrap steel.
- In the U.S. and Europe, steel was available in abundance, which brought down the prices of scrap metals. Thus, ship scrapping was no longer profitable for them. In fact, many of the European countries later became net exporters of steel.
- Construction regulations no longer permitted the use of re-rolled products.
- With development, labour costs increased; safety and environmental regulations became strict, which made it difficult for scrap dealers to continue in the business.

This industry shifting from the Mediterranean reached Taiwan in Asia, where cheaper labour force was available. South Korea too remained in this industry for some time. In the mid 1980s, about three-fourth of the ship scrapping industry was located in Taiwan, China and South Korea, Taiwan being the leader. Thereafter, Taiwan developed economically and for the same reasons as given above, it closed the demolition yards in the early 1990s. By then, the scrapping industry had moved to India, Bangladesh and Pakistan because of their economic necessity and lax environmental laws. The reason for these countries' involvement in the highly labour intensive ship recycling, is that they are over-populated and have the need for employment for the masses. Thus, using primitive

methods, the ship scrapping industry provides employment opportunities to the people in these countries along with providing a market for recycled parts.

As per the information available, wage rates in Cambodia and Myanmar are lower than India and Pakistan whereas Bangladesh can compete with them on wages. From wage point of view, the risk of relocation in future of ship recycling industry to these countries having cheaper man-power can not be ignored. But there are many other factors also affecting the industry like domestic steel demand, market for other recyclable items, natural condition of high tide gauge and wide beaches. Keeping in view all the factors, there is low possibility for relocation of the industry from South Asia in near future (World Bank Report, 2010, p. 2).

As stated above, ship recycling is considered a rough business but its impact on human health and environment can be minimised by following the standard procedure. After following the standard procedure ship recycling becomes costlier as it involves sufficient infrastructure, requisite training of workers and proper facilities for disposal of hazardous waste removed from the ships. Presently ship recycling is done mainly on a manual basis with the facilities available on beaches. The margin being small in the ship recycling business and the nature of the market being volatile, ship recycling yards are not ready to invest in mechanisation which can improve their productivity (Stopford, 2009, p. 649). Volatility of the market and small margin (see Table 2) in the business are therefore, the hurdle for investment in the industry. In addition, sometimes changes in the policy of the states also create problems for these yards.

Table 2- Main cost and profit margins of ship breaking and recycling in Bangladesh, India and Pakistan, mid-2009 (recalculated to percent for comparison)

Costs (in %)	**Bangladesh**	**India**	**Pakistan**
Purchase of ship	69	73	70
Labour costs	2	4	4
Consumables	5	4	4
Financial costs	3	4	5
Taxes, tariffs and duties	5	5	13
Other costs (including investment costs rents, and other costs)	1	2	1
Total costs	85	92	97
Comparable profit	15	8	3

Source: World Bank Report (Unpublished) on ship breaking in South Asia, November 17, 2010. p. 4.

2.4 Market developments and ship recycling

The decision to sell a vessel depends on a number of variables. The relation between these variables can be shown in terms of the formula:

$$Po - (Pt) > \sum_{K=1}^{mt} (Yk - Ck)$$

A vessel is sold if the difference of present sale price (Po) of the vessel and the expected net present value (Pt) is greater than the summation of the net present values of the net voyage revenue i.e. income (Y) – cost (C) expected to be earned during the time (t). Here the income (Y) will be dependent upon both current and expected earnings anticipated from the market. The anticipated change in the cost (C) over the same period is also an important factor for the decision to sell a vessel.

The decision to sell a vessel becomes a decision to recycle it if the net present value of the discounted net earnings of the vessel plus the discounted value of its anticipated residual value at the end of its operational life, is less than the amount of money that could be realised immediately from the sale for recycling of the vessel. When a vessel gets older, its operating cost rises and service speed tends to fall as scheduled and

un-scheduled repair time becomes greater, fuel consumption rises, equipment deteriorates, repairs and maintenance costs rise. Along with the rise in operating costs, the insurance cost of the aging vessel also increases proportionally to counter the increased trading risks. The decision whether to continue trading or to sell the vessel, is reviewed during its special survey becoming due at four to five years of interval. Trading costs of a vessel include two components i.e. voyage costs and operating costs. Voyage costs cover fuel cost, port expenses and canal dues whereas operation costs cover the expenses on manning, insurance, repairs/maintenance, stores and spares, administration and other sundry expenses of the ship (Drewry, 1977, pp. 26-33). Some of the life cycle factors of a ship responsible for its recycling price evaluation are as follows:

(i) Type of ship: This gives an indication of configurations and the sort of plate sizes to be worked. It also indicates about the global or local trading, tramp or liner operation.

(ii) Ship age: It works as a guide to design considerations and make up of steel content. As the ship grows older, its condition deteriorates gradually and expenditure on its maintenance increases accordingly making the operating and voyage cost higher. The speed, efficiency and cargo handling capacity of old ships make them less competitive as many reputed charters do not accept old ships for shipment of their cargo. Regulations/Guidelines on environmental aspects from time-to-time coming into force also catalyse the ship owners to dispose their old ships. But there is no specific age of a ship recommended for its scrapping. It depends on the care and expenditure made by the ship owner on its maintenance. The statistics of the last decade indicate that average life of ships is increasing. Tankers have the least life (i.e. 28 years) whereas passenger ships the maximum i.e. 43 years. The average age of broken-up ships by type during the period 1999-2009 is given in Table 3:

Table 3- Average age (in years) of broken-up ships by type 1999-2009

Year	Tankers	Bulk carriers	Container ships	General cargo ships	Ro/Ro ships	Passenger ships	Total
1999	26.2	25.0	24.8	26.7	23.8	35.1	26.1
2000	26.9	25.9	25.7	27.3	23.8	30.1	27.0
2001	28.0	26.7	26.9	27.4	23.8	35.9	27.7
2002	28.3	26.6	26.0	28.2	23.7	37.7	28.0
2003	29.3	26.5	25.5	29.3	27.3	33.6	29.1
2004	29.5	27.3	30.5	32.9	28.1	37.6	31.7
2005	31.5	28.1	30.6	31.9	30.2	36.7	31.9
2006	30.0	28.9	28.1	32.3	28.6	36.6	31.4
2007	31.4	29.1	29.6	34.9	25.2	41.0	23.5
2008	31.1	30.6	29.1	33.6	28.2	23.8	32.5
2009	28.3	30.6	27.0	31.5	28.9	43.0	30.4

Source: Shipping Statistics and Market Review, Volume 54 No. 1/2, 2010, p. 35

(iii) Yard of build and conversion work: It is a further guide to steel and fixture/fittings.

(iv) Other items: In addition to the above components, the real condition of the ship's hull is a prime factor for pricing of a ship.

(Drewry, 1973, pp. 5-11)

Apart from the above factors, the price paid to the vessels to be recycled rises when the freight market is strong. Supply of ships is declined this time due to rising Net Pay Value of anticipated net earnings from future trading and ship recycling yards are forced to increase the price of the ships to be recycled. The inflationary trend of trading costs also influences recycling trends throughout the period under review.

The market cycle also plays a great role in ship scrapping decision. The market cycle is a process maintaining balance between supply and demand of tonnage for ships. At the boom stage of the shipping market, the freight rate becomes high and orders for ship building are given by ship owners earning substantial profit from enhanced freight

market. But at the slump stage, the freight rate goes down and the market having surplus fleet compels the ship owners to opt for pre-mature disposal of their ships for recycling due to heavy operational loss. Between the year 2004 and 2008, the shipping sector was enjoying the boom and freight rates went high due to high demand for maritime transportation. This demand kept even older ships in operation during the period which resulted in a record low number of vessels being offered for recycling. The figure came down to 300-400 ships (larger than 499 GT) during this period against the annual average of 700-800. Following the recent economic recession in 2009, the demand for maritime transport declined and the number of ships recycled during the year reached 1200. It is expected that the ship recycling market will get good number of ships for at least the coming 5-10 years due to massive booking done by the ship owners during the boom period ("Ship Breaking", 2010, p. 3).

In this way, it can be said that ship recycling decisions depend on many factors, each of them dependent on other factors. Figure 4 shows the factors responsible for the recycling decision of a ship.

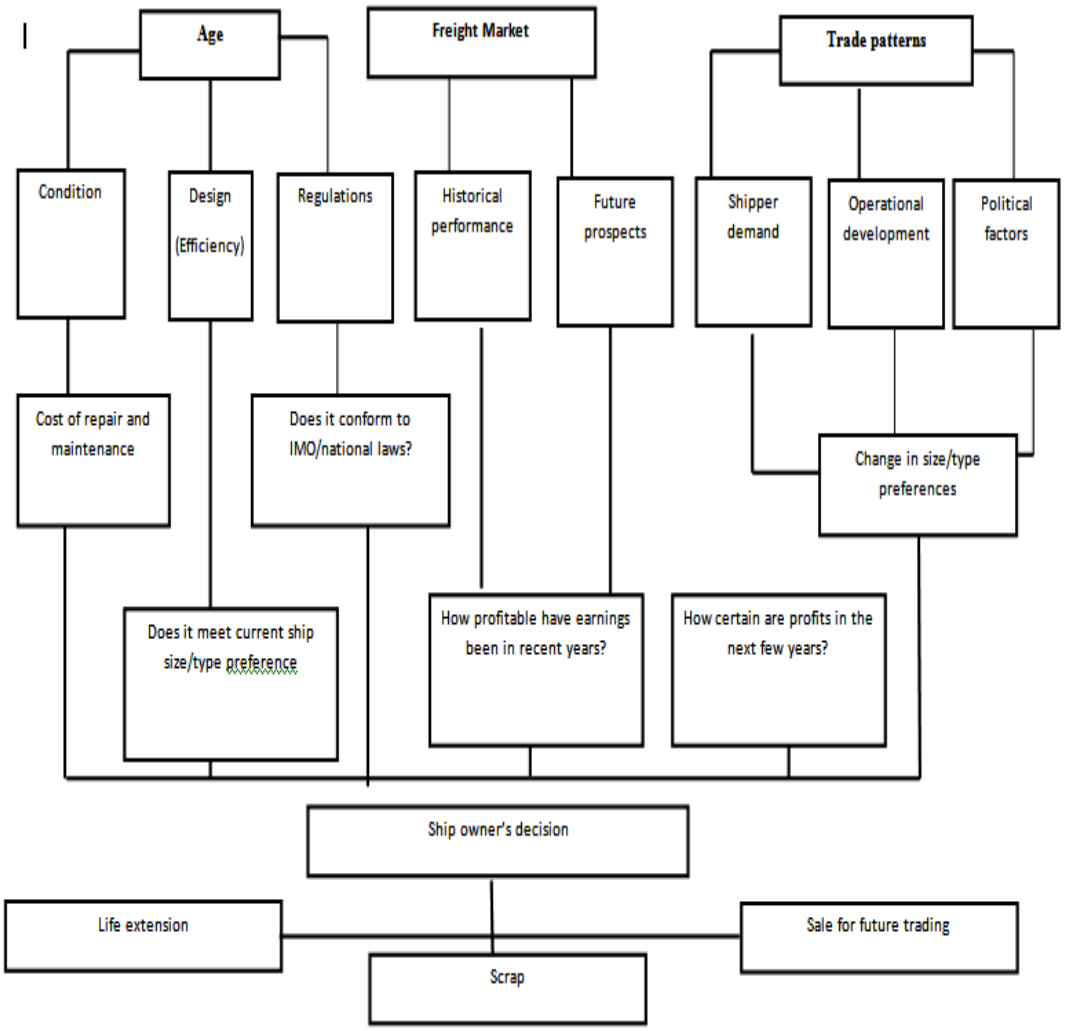

Figure 4- Factors responsible for ship recycling decisions

Source: Drewry Shipping Consultants (1996). *Ship Scrapping: Locations, Activity, Price Trends and Problems*, p. 21

2.5 Procedures and practices for ship recycling

After decision to end the economic life of a ship, it is removed from fleet site and is towed to the ship recycling site. The process of ship breaking is completed in three stages. At the first stage, the ship owner is undertaking various operations like pumping out bilge water, blocking off intakes and valves, removal of all non-metal objects along with potentially dangerous gases. Then the ship is either moored or beached/dry-docked

and large metal structures are removed from the ship. After removal, pumps, auxiliary engines and other pieces of equipment are sold in the market. The remainder of the ship is then cut into sections before making smaller pieces as per the requirements of rerolling industries. Thus, recycling of ships occurs in a series of steps:

- Vessel survey: Diagram of all rooms, compartments, tanks and storage areas is used to identify areas containing hazardous materials like asbestos, PCBs, hazardous waste, fuel and oil. Preliminary sampling of materials is conducted to decide the cutting plan identifying the compartments to be cut first.
- Removal of fuel, oil and other liquids: Removal of fuel, oil, other liquids (bilge, ballast water) and combustible materials from the ship, is then started which is continued throughout the recycling process. After issuance of a hot work certificate by the marine chemist, it is considered safe for hot work like the use of cutting torches and saws to dismantle the ship.
- Equipment removal: Engines, generators, boilers, electrical and plumbing items, refrigerators, air-conditions are the equipment removed from the ship to be recycled and sold in the market.
- Removal of asbestos and PCBs: The engine room usually contains the most asbestos which is removed from the ship. Then PCBs containing materials accessible are removed.
- Preparing surfaces for cutting: Following asbestos and PCBs removal, paint is removed from the surfaces to be cut. Presence of hard-to-remove and potentially toxic materials sometimes requires specific cut-line preparation for the safety of workers.
- Metal cutting: Upper deck and superstructure are cut first, followed by the main deck and lower decks. Large parts of the ship are cut first and lifted by cranes to the ground where they are cut to specific shapes and sizes required by the foundry or smelter. Ultimately, the remaining part of the hull is pulled ashore and cut.

- Recycling of materials: Scrap metals like steel, aluminium, copper and nickel alloy are stored by grade and composition and then sold to re-melting firms or scrap metal brokers.

(A guide for ship, 2000, pp. 1-1 – 9-23)

2.6 Stakeholders in ship recycling

Ship owners, flag states, ship recycling yards/states and many intermediaries are involved in the chain of the ship recycling industry. Figure 5 below outlines the participants involved in the ship recycling process.

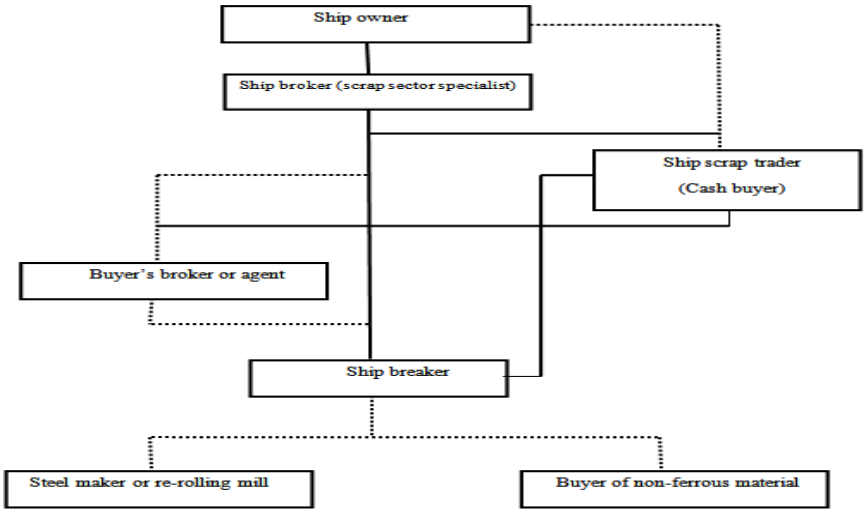

Figure 5- Participants in the ship recycling process

Source: Drewry Shipping Consultants (1996). *Ship Scrapping: Locations, Activity, Price Trends and Problems,* p. 58

2.6.1 Ship owner

The ship owner is the only authority to take decision to sell the ship to be recycled. He can make the deal directly with the ship recycling yard or take the help of ship brokers. As the ship sales and purchase market is worldwide, it is difficult for a ship owner to devote sufficient time on it in addition to his main job of ship operations. Therefore, normally all the sales and purchases of ships are done in the international

market through ship brokers. Ship owners provide the ship brokers full details of vessels alongwith the terms for their sale. The deal is finalised by the ship owner with the ship broker offering the highest price. Terms like “as is” or “as is where is” are mentioned in the agreement and in the latter term, the arrangement to bring the vessel to be recycled, is done by the buyer(s).

2.6.2 Ship broker

In the maritime market, there are ship brokers specialised in the deal for ship recycling. They have detailed knowledge about ship recycling yards existing all over the world. They provide the information to the ship owner about the demand / supply situation in the market and the ship recycling prices of different types of ships along with the information about the ships sold recently. Sometimes they forecast the market trend also to assist the ship owner in taking a decision. Negotiation becomes easier between the ship owner and ship recycling yard after taking the services of ship broker acting as an intermediary passing on the information to another party. The sale may be channelled through a specialist intermediary dealing with the cash purchase of ships for demolition assuming the responsibility for arranging the sale and the ship’s physical delivery. Thus, the transaction-chain between a ship owner and ship recycling yard may involve one or more middlemen operating in either’s interest.

2.6.3 Ship recycling yard

Ship recycling yards rely on the information provided by the ship brokers. On the basis of the specification provided by the ship owner, yards calculate the price of the ship to be recycled as per the quantity of ferrous and non-ferrous items expected to be received from it. Yards are normally allowed to inspect the ship before its purchase but in case of not being allowed, they are dependent on the calculation about ferrous and non-ferrous items on the basis of the ship’s age, type, flag, owner and country of built. Although the scrap steel provides most of the value of the ship, non-ferrous items smaller in quantity even make good earnings from the sale directly to the market.

CHAPTER- 3

Ship Recycling: Existing and Standard Procedures

3.1 Ship recycling destinations

After enjoying freight escalation for 3-4 years, the shipping industry experienced a drastic decline in demand in the second half of the year 2008 due to world-wide recession. Decline in demand forced the industry to adjust its supply. In the shipping industry, surplus supply has five ways for adjustment with the declined demand. Firstly, it will stop ordering new tonnage; secondly, it may demolish vessels; thirdly, it may cancel orders at the shipyards; fourthly, vessels may slow steam to reduce the effective capacity supplied by the existing fleet; and finally, it may temporarily withdraw the existing tonnage from service. As the industry felt a drastic decline in demand in the second half of 2008, ship owners had no way after some period but to sell their older vessels even at very low price. During the last quarter of 2008, ship recycling yards in India got 80 vessels for scrapping followed by Bangladesh getting 70 vessels, China getting 20 and Pakistan 11 vessels. The ship recycling industry experienced in 2009 its largest growth period in history. During the first four months of 2009, 339 vessels were reported to be sold for recycling against 487 vessels during the whole year of 2008. Total scrapping tonnage during the first four months of 2009 (i.e. 2.9 million light displacement tons) was higher than the scrapping tonnage within the period of three years between 2005 and 2007 (UNCTAD, 2009, pp. 64-70). The ship recycling industry is expected to get good tonnage up to next 5-10 years due to the deliveries of ships ordered during the boom period of the shipping market and Amendments in MARPOL Convention for double hull tankers.

In India, ship breaking activities started in 1983, are carried out in Alang, a coastal town in the state of Gujarat located on the Gulf of Khambat, 50 kilometres southeast of Bhavnagar. Ship recycling yards have the advantage of the location as it has the highest tidal level (10 meters) in the country and the best continental shelf available for ship breaking in Asia. It is the biggest ship breaking yard in the world carrying on the

activity throughout the year on its 182 plots. The high tide facility available to the area makes it possible to accommodate VLCC, bigger Ro-Ro and container ships which are beached during high tide and dismantled as the tide recedes. The author visited the ship recycling site of Alang to have first hand information about the ship recycling activities done there. Information gathered there could be utilised in the present research paper. The report of the visit is placed in Appendix-G. As per the report, after the judgement of the Supreme Court of India vide order 06/09/2007 in a hazardous waste (Blue Lady Ship breaking) case, safety and waste management is improving gradually in these ship recycling yards. World Bank in its report (unpublished) also has accepted that following a string of national Supreme Court cases in India, regulatory authorities are making efforts to improve the labour and environmental conditions there (World Bank Report, 2010, Unpublished, p. 2).

In Bangladesh, ship breaking is done at Fauzdarhat sea shore of Sitakunda Upazilla, extending over 14 kms along Fauzdarhat to Kumira coast. Tankers, cargo ships and container ships are the three types of vessels preferred by Bangladesh ship recycling yards for three reasons: availability of lucrative items, relatively safe and easy breaking operations and secured journey of the vessels to the beaching site. As towing of a dead ship for scrapping is costly and time consuming, Bangladeshi ship breakers and their agents generally prefer to buy ships on voyage or ships anchored in Singapore or at a port near to Chittagong, i. e. located at any port of India, Sri Lanka, Myanmar and Thailand. The total man-power of the country involved in this industry is around 100,000.

In Pakistan, Gadani situated in the west of the port city of Karachi, is the hub of ship breaking activities. The workers facing the problem of unemployment, are ready to work for $2-$3 a day, without safety gear and health plans (Hossain and Islam, 2006, p. 3).

In Turkey, Aliaga is the main ship breaking site on the Aegean coast, 50 km north of Izmir. Ship breaking in Aliaga started in 1984 as a consequence of liberalization measures adopted by the Turkish Government. The environmental and working

conditions of Aliaga are like other ship breaking countries of Asia except the ban on import of toxic ships for recycling (Vardar and Harjono, 2002).

In China, ship breaking is done in the docks with the help of cranes and machinery. Ship breaking is concentrated mainly in the following four yards:

(i) Chang Jiang Shipbreaking Yard, operated by the China National Shipbreaking Corporation in Jiang Yin, on the Yangtze river, China,

(ii) Zhangjiagang Yuanwang Iron & Steel Co. Ltd, Deji, on the Yangtze river, China,

(iii) Gujing Shipbreaking Company, Xinhui City. Guangdong Province (Joint venture by Xinhui City and China State Shipbreaking Company), on the Pearl river delta, China,

(iv) Shuangshui Shipbreaking Company, Xinhui City. Guangdong Province, on the Pearl River Delta, China.

(Hossain and Islam, 2006, p. 3)

3.2 Econometric analysis of the ship recycling market

The econometric analysis of market dynamics and industry trends, done by Econometric Institute, Erasmus University, Rotterdam, says that the average age of ships scrapped in Bangladesh is the highest followed by India and Turkey. The ship recycling market escalated with the rising freight market due to high demand of steel and Bangladesh came on the top, offering the highest price for scrapping. Table 4 shows the fluctuation happened in scrap prices in the ship recycling market during the period of 1978-2007.

Table 4- Mean age, tonnage and scrap price per scrapping location (1978-2007)

Scrapping Location	Age (in years)	GRT	Scrap Price in US$ /LTD
Africa and Middle East	14.1	7312	240
Bangladesh	26.7	31094	299
China	25.0	29372	196
Europe	20.7	5160	223
India	25.9	16524	221
North America and Pacific	25.5	8615	214
Rest of Asia	15.9	7927	166
Pakistan	24.9	26501	214
South & Central America	21.9	11042	222
Turkey	25.9	7034	195
Unknown	15.3	11320	213
Average	**22.0**	**14718**	**218**

Source: Knapp, Kumar and Remjin, (2007). The Ship Recycling Conundrum: An Econometric Analysis of Market Dynamics and Industry Trends, p. 8. World Wide Web: repub.eur.nl/res/pub/10878/EI%202007-52.pdf

Further, as per the econometric analysis, smaller ships are scrapped in Turkey. Bangladesh and Turkey are the preferred ship recycling destination for the ship owners from OECD countries. The owners from developing countries prefer Pakistani ship recycling yards whereas owners from former Eastern block countries go to Turkey. Regarding flags, the study claims that most of the flag states show positive or negative effect towards one country. For example, Malta has positive effect to all the ship recycling states except China and likewise Romania to all except Bangladesh. The top five flags, showing positive effects to India for recycling of their ships, are Morocco, Qatar, Cayman Islands, Kuwait and India. For Bangladesh, these five flags are Argentina, Malaysia, Indonesia, Singapore and India. For China, they are Poland, the U.K., the Philippines, Romania and Cambodia whereas for Turkey, these are Romania, Italy, Spain, Canada and Malta. For Pakistan, they are Georgia, Romania, Cambodia, St. Vincent and

Greece. In case of main open registries, Malta and Cyprus have positive effects towards all the ship recycling states whereas Panama, Bahamas and Bermuda have positive effects towards China only. Turkey is the favourite recycling location for European flags. A few states like Cyprus, St. Vincent and the Grenadines are the exception showing positive effects towards all the ship recycling states (excluding Turkey) (Knapp, Kumar and Remjin, 2008, pp. 1027-1035).

3.3 Existing procedures for ship recycling

Even the principle of ship recycling being a sound one, the existing method adopted by the ship recycling yards provides no room for safety of human life and the environment. As per the study reports of NGOs and maritime journals, scrapping of ships is done on the coast of the sea without any infrastructural facilities polluting the area through hazardous substances present in the ships. Some countries have not yet made mandatory the certificate, "gas free for hot works" and the gas tanks not emptied properly, cause accidents during the work. Workers have no way to escape but to take such risk for the sake of their livelihood ("Is there a decent", 2001).

Workers have no proper knowledge about handling of these hazardous substances which pose danger to their health and the environment. They are doing their job in these yards bare handed using cutters to dismantle huge parts of the ship into small pieces without any protection from toxic wastes[3] and steel falling from the cutters. The total number of workers in the industry is approximately 400,000 having the age-range of 15-35 years (Lucero-Prisno III, 2005, p. 2). They are poor and migrated, uneducated people who are compelled to work under the scorching sun on the open beaches without safety equipment.

It is a fact that ships have hazardous materials[4] and toxic wastes like asbestos, heavy metals, hydrocarbons and ozone-depleting substances. The structural parts of the vessel contain insulation and asbestos panelling. There may also be cargo and operational

[3] Toxic waste is a discarded material that is dangerous to humans, animals and plant life. Toxic waste can pollute the air, land and water and exposure to it can cause cancer, other illness.

[4] A hazardous material is any item or agent (biological, chemical, physical) which has the potential to cause harm to humans, animals, or the environment, either by itself or through interaction with other factors.

residues or items like sludge, lubricants, paints and electrical equipment that potentially contain harmful substances (Lucero-Prisno III, 2005, pp. 3-12). The typical waste materials left on board vessels to be scrapped, are shown in Table 5:

Table 5- Average waste materials left on board vessels to be recycled

Waste material	Waste (Ton/ship/year)	Of which: recycled or re-used	Of which: disposed
Asbestos	10.0	95%	5%
Glass wool	7.1	8%	92%
Rubber	0.1	3%	97%
Thermo coal	1.9	41%	59%
Fiberglas	0.1	0%	100%
Rexene	0.1	0%	100%
PVC	0.02	0%	100%
Pipeline	0.03	0%	100%
Cable	0.01	0%	100%
Oily sludge	2.9	n.a.	n.a.
Cementing material tiles	28.6	n.a.	n.a.
Iron scaling	2.6	0%	100%
Card board & packaging	0.1	0%	100%
Glass	0.5	0%	100%
Other toxic chemicals	0.01	0%	100%

Source: The Ship Recycling Fund: Financing environmentally sound scrapping and recycling of Sea-going ships. (2005, January), p. 16. http://www.greenpeaceweb.org/shipbreak/fund.pdf

The hazardous materials present in the ship are not to be reused but are required to be disposed of in a proper manner. The ship recycling yards have neither sufficient knowledge how to deal with these hazardous materials; simultaneously, nor do they have

waste reception facilities. Yards are normally operated on beaches without infrastructural facilities; therefore, it is very difficult to control the pollution from hazardous materials. Beaches where ship breaking happens, become graveyards littered with machinery parts contaminating the land and surrounding water by hazardous materials.

3.4 Occupational hazards and standard procedures for ship recycling

It is true that ship recycling creates job opportunities for people and contributes to the economic growth of a state, but it exposes the labour force to the risk of death, serious injury and chronic health problems. Scrapped ships have 95% of steel, coated with between 10 and 100 tons of paint containing lead, cadmium, organotins (especially TBT), arsenic, zinc and chromium, depending on the ship's size and function. Ships also contain a wide range of other hazardous wastes, various types of asbestos, PCBs and several thousand litres of oil (engine oil, bilge oil, hydraulic and lubricant oils, fuel oil and grease). Hydrocarbons present in this residual oil affect the workers' DNA level and marine life.

Asbestos used in such ships as adhesive, sealing putty or for insulation on pipes and hull, sound damping or brake linings, have very bad effect on the health of workers getting exposure during scrapping of the ship. The fine fibres of asbestos inhaled by workers accumulate in their lungs and cause lung cancer or cancers of the oesophagus, stomach, colon and rectum. As per the standard practice, all asbestos containing materials are required to be removed from a ship being scrapped before any activity is carried out. As per U.S. Environmental Protection Agency (A Guide for Ship, 2000, pp. 2-1 - 2-25), all asbestos containing materials to be removed must be:

- Adequately wet when removed and must remain wet until collected and contained for disposal.
- Carefully lowered to the ground without dropping, throwing, sliding or otherwise damaging or disturbing the material.
- Moved to the ground via leak-tight chutes or containers if removed more than 50 feet above the ground.

According to the Occupational Safety and Health Administration of U.S., there must be a regulated area for asbestos removal work and only authorised workers should

have access to that area. All workers entering and working in this area must wear approved respirators. Workers should not be allowed to eat, smoke, drink or chew tobacco or gum in the regulated area. A qualified person should be deputed to supervise the work conducted in the area. Workers should enter or exit the regulated area through a three-stage decontamination area.

Polychlorinated biphenyls (PCBs) are used in the ship's electrical, heat transfer and hydraulic equipment due to their non-flammability, chemical stability, high boiling point and electrical insulating properties. The parts of the ship containing PCBs are: hoses/rubber and felt gaskets, plastic foam insulation, cable/thermal insulation, silver/oil-based paint, primarily paint on hull steel, foundation mounts and light ballasts. PCBs are organic chemicals known as chlorinated hydrocarbons. They are toxic and persistent and are ingested, inhaled absorbed through the skin when workers get exposure to it. PCBs are stored in the fatty tissues of the body affecting the immune, reproductive and endocrine systems of the workers. They cause a variety of adverse health effects, such as cancer in animals, liver damage, reproductive impairment and immune system damage. The composition of a PCB mixture changes following its release into the environment. The PCBs bio-accumulating in fish and animals tend to be the most carcinogenic components of PCB mixture. People ingesting PCB-contaminated fish or animal products or touching PCB-contaminated sediment, may be exposed to PCB mixture that is more toxic than the PCB mixture contacted by the workers and released into the environment.

As per the Occupational Safety and Health Administration of U.S., workers removing or disposing of liquid or solid PCB articles from the ships to be scrapped, are required to use appropriate personal protective clothing or equipment. That equipment/clothing must be disposed of as PCB remediation waste. If required, workers must be provided with approved respirators appropriate for the work being conducted. There should be facilities for medical surveillance for the workers performing PCB removal work for a combined total of 30 or more days in a year. There should also be a training programme for the workers performing PCB removal work under which training must be provided prior to or at the beginning of the work and at least once a year

afterwards in a manner which the workers are able to understand (A Guide for Ship, 2000, pp. 3-1 – 3-19).

As stated above, a huge quantity of paint is applied in the interior and exterior parts of ships for preservation of the metal from corrosion and prevention of fouling[5]. To prevent fouling, the anti-fouling paint containing TBT (Tributyltin) is used. TBT, an organic compound, is a hazardous substance causing damage to the marine ecosystem due to leaching slowly into the sea-water and entering human food chain also. IMO through the Anti-Fouling-Systems Convention, adopted in 2001, has tried to ban its use on ships' hull but in old ships there is possibility of its use and during the paint removal exercise, the workers have the risk of exposure to this dangerous compound (Gipperth, 2009, pp. S86-S87).

Paints can be flammable also (in older ships) or may contain toxic heavy metals like Lead (Pb), Mercury (Hg) and Cadmium (Cd), Chromium (Cr), Zinc (Zn), pesticides and toxic compounds like PCBs. Lead components, such as Red Lead Tetra-oxide (PB_3O_4) and Lead Chromate are used in marine paint. In addition, they are also used in batteries, generators and motor components. Workers exposed to lead exceeding its permissible limit (i.e. 50 grams/m^3 of air averaged over an eight hours working day) suffer from health problem like abdominal pain, anaemia, renal disease, headache, memory loss, learning difficulties and mental retardation (A Guide for Ship, 2000, pp. 6-1 – 6-17). Mercury affecting the nervous system, causes memory loss, insomnia, excitability, delirium and skin disorders to the workers getting exposure to it. Further, mercury consumed by fish contaminates the food chain. Similarly, Cadmium inhaled by workers causes abdominal pain, diarrhea, chest pain and respiratory failure (Hossain & Islam, 2006, p. 12). Sometimes a paint or preservative coating is inflammable and may catch fire in the areas to be heated during cutting. Therefore, these coating are to be removed before heating the surface to prevent ignition and should be burned away under controlled conditions.

[5] The marine organisms when attach to the hull of a ship during sailing, the process is called fouling. It can reduce the speed of the ship and increase the fuel consumption. Fouling can also cause introduction of invasive species in the ecosystem and to prevent it, anti-fouling paint containing TBT is used on the hull of the ship.

Some ships sold for scrapping contain diesel fuel, fuel oil, natural and synthetic oils used as lubricants and hydraulic oil. There is a chance of fire due to presence of oil and fuel on these ships. Besides, some crude oil and high-end products are highly toxic and exposure to this toxic oil/fuel through dermal contact or through contaminated water or inhalation of fumes/particles, can cause damage to the liver, lungs, kidney, heart or the nervous system ("A Guide for Ship", 2000, pp. 5-1 – 5-37).

Removal/Disposal of wastewater, specially bilge water[6] and ballast water[7] is also an important activity to be done during ship scrapping. If not conducted properly, it has an impact on the environment and on the health of the workers exposed to it. Bilge water consists of stagnant, dirty water and other liquids allowed draining to the lowest inner part of a ship's hull. It may contain pollutants, such as oil and grease, inorganic salts and metals like arsenic, copper, chromium, lead and mercury. Similarly, ballast water, specially compensated fuel ballast[8] and dirty ballast[9] may contain residual fuel, fuel additives (like biocides to control bacterial growth in the fuel oil), oil and grease, petroleum hydrocarbons and metals like copper, nickel, silver and zinc. Metals contained in bilge and ballast water can not be removed through treatment or environmental degradation and if ingested, can cause various health problems like lead-poisoning and cancer. Bilge water sometimes contains toxic organs e.g. solvents or PCBs which may cause cancer or lead to other serious ailments like kidney/liver damage, anaemia and heart failure. Bilge water containing oil and fuel can interfere with plant life and the animals' respiration or can poison the fish and other marine organisms as well. Besides, ballast water containing micro-organisms and pathogens transported and discharged into port/coastal waters sometimes causes significant changes to the ecosystem, upsets the

[6] Bilge water is a mixture of fresh water, sea water, oil, sludge, chemicals and various other fluids accumulated in bilge wells.

[7] Ships use water as ballast to adjust their position in the water to improve their manoeuvrability and stability.

[8] Sea water that is taken in by the ship as a replacement to the fuel for maintaining its stability, is called compensated fuel ballast.

[9] When the sea water is pumped into empty fuel tanks for the purpose of increasing ship stability, it mixes with residual fuel and produces dirty ballast.

ecological balance and finally causes economic loss to the area. Before scrapping the ship, onboard water must be tested to determine pollutant concentration prior to transfer onshore/discharge. Prior to discharge, waste water treatment should be done to remove certain pollutants ("A Guide for Ship", 2000, pp. 4-1 – 4-48).

Apart from the hazardous and toxic materials present in the ship, metal cutting also causes health problems to the workers performing it. As stated above, ships have 95% of steel which is removed during its scrapping by cutting it into pieces using a variety of torches and mechanical cutters. The existing process adopted by ship recycling yards for metal cutting and scrap metal management poses a threat to the environment as well as workers' health and safety. During the ship scrapping, upper decks and systems of the ship are cut first, followed by the main deck and lower decks. After cutting, the larger parts of the ship are lifted by cranes to the ground where they are further cut into smaller shapes and sizes as per the requirement of the buyers. For cutting these ferrous and non-ferrous (bronze, brass and various other copper alloys) scrap, different types of torches and mechanical cutters are used. Oxygen-fuel torches operating with a flame temperature of 3,500 degree – 4,000 degree Fahrenheit and flame velocity of 290 – 425 feet / second, are used for cutting steel. It burns a wide variety of fuel such as acetylene, propane, butane, fuel gas or natural gas and uses oxygen (liquid or compressed) or liquid air as oxidizer/cutting gas that serves to burn (oxidize) iron along the cut-line. Electric arc or plasma arc torches which are able to generate temperature high enough to liquefy almost any metal by the discharge of electric arc, are used for the metals not suitable for cutting with oxygen-fuel torches. For making large metal parts to small dimension suitable for a melting furnace, shears are used. Saws with circular/reciprocal blades are used for cutting nonferrous metals.

Torch cutting generates large amounts of fumes of the materials like manganese, nickel, chromium, iron, aluminium, asbestos and lead as particulates. As mentioned above, cutting torches themselves generate oxides of nitrogen (NOx) and sulphur (SOx) and the process of combustion produces carbon dioxide and carbon monoxide. These contaminants inhaled by the workers from air, metal fumes, particulates and smoke, can cause poisoning and long-term damage to their central nervous system. Further, there is a

possibility of soil/water contamination, primarily from lead, if scrap metal or other waste generated from metal cutting, are not properly stored or disposed. In case of exposure of metal scrap/waste with storm water, the water contamination is possible from the metal waste and contaminants from the scrap. Therefore, yards must fix the exposure limit for various contaminants considered toxic. The maximum exposure limits fixed by U.S. Environmental Protection Agency for contaminants are shown in Table 6:

Table 6- Maximum exposure limits for contaminants

Contaminants	**8-hours time-weighted average**
Chromium metal	1 mg/m^3
Nickel	1 mg/m^3
Particulates not otherwise regulated	15 mg/m^3
Lead	50 g/m^3
Cadmium	5 g/m^3

Source: A Guide for Ship Scrappers: Tips for Regulatory Compliance, 2000, p. 7-6

Hot work in ships also causes accidents mostly due to lack of care on the occasion of scrapping. Therefore, before performing hot work in certain confined or enclosed space or any dangerous atmosphere or pipeline, it should be tested and certified by a marine chemist as "safe for hot work". Hot work should not be performed in or on the spaces or other dangerous atmosphere (e.g. dry cargo hold, bilges, engine room and certain boiler spaces, vessel sections and landside confined and enclosed spaces) unless they have been tested by the competent person and determined to contain concentration of flammable vapours or gases within the permissible limit. Workers performing any type of metal cutting, should wear suitable eye protective equipment as well as appropriate hand and body protective clothing or equipment.

If the noise level produced by metal cutting machine is above 100 decibels, efforts should be made to make it feasible to reduce it below the maximum limit. If not feasible, then workers should be provided personal protective equipment. Metal cutting should be

performed in a confined space having sufficient ventilation and required means of access to the space for the workers. Workers cutting the metals containing toxic materials must wear filter type respirators. ("A Guide for Ship, 2000", pp. 7-1 – 7-14).

3.5 Gap between existing and standard practices of ship recycling

Ship recycling is really an action of hazardous waste disposal and needs to be done properly i.e. under standard procedures. If done as per the standard procedures explained above in detail, the cost of scrapping becomes expensive and the business becomes unprofitable due to low margin and high competition in the ship recycling industry. The ship owners/ship brokers/cash buyers finalise the deal with the ship recycling yard offering the highest price in the international/global market. Ship recycling yards running with marginal profit in the volatile and competitive market, are not ready to make investment for the long term but they are trying to take advantage of the existing ship recycling market. The market always has the probability to shift to a new destination in case of regulations enforced strictly by the ship recycling states or due to any other influencing reason. If the existing ship recycling states ratify the IMO's Ship Recycling Convention, 2009, even then no one can guarantee to achieve the ultimate goal of green ship recycling due to probability of shifting the industry elsewhere. If the industry shifts to states like Somalia then the situation can be worse.

As explained above, ships contain hazardous materials and toxic waste. According to the first law of thermodynamics, a pollution-free product is not possible and economic activities are possible only at the cost of the environment. The industry has to make a balance between the two: ecology and economics (Ma, 2002, p. 400). As more than 90% of world tonnage is carried through the sea, it is impossible to think about the global trade without shipping having the cheapest transportation cost for bulk cargo and the least pollution among all the modes of transport. But shipping sector has not done efforts sufficiently to control the pollution in comparison to air traffic and road transport. The pollution from ships needs to be controlled to have a good balance up to a possible extent and International Maritime Organisation (IMO) is making efforts in this regard for

last four decades. Hong Kong International Convention on Ship Recycling, 2009 is in line with it.

Ship recycling can be said to be an externality as it poses danger to human life and the environment. As this externality is negative and not possible to be compensated for, the external cost needs to be paid for in the form of compensation. In the present situation, ship owners are ultimately responsible for scrapping of their ships and they should bear the external cost for this negative externality in the form of compensation. But in actuality, in place of paying the external cost for internalising the negative externalities, ship owners are getting money for their ships to be recycled. As they are ultimately responsible for disposal of hazardous materials and toxic wastes present in the ships, they should be asked to bear the difference between the costs under existing procedures of scrapping and standard procedures explained above in detail. In developed countries, such system already exists for disposal of many wastes like computers/cars. For dismantling such wastes through standard practices, the owner has to pay the cost. In Germany, the process is initiated on the occasion of registration of a new car to arrange the fund for its green dismantling at the end of its economic life. For achieving the goal of green ship recycling such steps can be taken.

Further, it can be said that even the external cost compensated by the ship owners will be a compromise with the loss to the human beings and the environment. But for the sake of economic activity, internalization of such negative externalities can be accepted. However, the "Lawrence Summers[10]" criterion should not be applied for the toxic waste trade like ship recycling. As per this criterion, the pollution should be sent to the places where there are no people or where the people are poor since it will have the lowest cost in the countries having lowest wages (Demaria, 2010, p.251). This principle of lowering the internalization cost of externalities does not match with the principles of economics of safety and environment. As per the principles of economics of safety and environment, efficient allocation of resources can not be left to the market (Ma, 2002, pp. 404-405). Out of the three main approaches suggested to deal with externality problem, the proven

[10] Lawrence Summers, the then chief economist at the World Bank in 1991.

method of intervention through appropriate rules and regulations, appears the best choice for managing the negative externalities of ship recycling. The maritime sector being international, inter-governmental organisations should come forward with a permanent solution to achieve the ultimate goal of green ship recycling. The issue will be discussed further in the fifth chapter after analysis in the third chapter, of the guidelines issued by international organisations on the subject.

CHAPTER-4

Regulations/Guidelines on ship recycling

4.1 The environmental issue: Ship recycling

The shipping sector has a great role in globalization of the world trade. Provision of logistics facilities and clustering of industrial units in the vicinity of ports are the best example showing its importance. The share of transportation cost in the total cost of a product has now increased due to transportation of unfinished goods from one place to another before finishing; on the other hand, the share of production cost has declined by availing the comparative advantage for a product. To manage the growth in maritime transportation due to decentralization of industries, the world merchant fleet increased rapidly. But this increase in the world fleet affected various issues like safety of life and the environment. During the last two decades, environmental issues have taken on a new level of recognition on the international platform. The issues like ship recycling, air pollution due to emission of sulphur and carbon dioxide from ships and ballast water causing ecosystem imbalance, drew attention of the world. The Basel Convention, 1989, the Vienna Convention, 1985, ILO's Conventions on Occupational Safety and Health, Asbestos, Chemicals and MARPOL, 1973/1978 are some examples of awareness about the safety of human beings and the environment. The controversial cases of ship recycling like the Otapan, the Sea Beirut, the Sandrine, the Margaret Hill, the Tor Anglia and the Onyx, drew the attention of international organizations and NGOs towards trans-boundary movements of hazardous materials affecting the human and environmental safety. IMO which is primarily concerned with human safety and the environment, has already taken initiatives for environmental safety, health and welfare matters relating to the ship recycling industry. Guidelines in this regard have been issued from time to time by the Organization. The IMO Marine Environmental Protection Committee at its forty-second session (MEPC 42) in 1998 agreed that IMO has an important role to play in ship recycling, including preparatory work before commencement of ship recycling and a coordinating role towards the ILO and the Basel Convention in recycling matters (Mikelis, 2006, p. 2).

4.2 Adoption of the Hong Kong Convention, 2009

For proper implementation of the regulations by the contracting states for safe, sound and environmentally friendly recycling of ships, the IMO has adopted the International Convention on Safe and Environmentally Sound Recycling of Ships, 2009 in its Diplomatic Conference held in Hong Kong on 11 May, 2009. The European Union and many other countries widely welcomed the Convention as it reflected the responsibility of ship owners just from the time of construction of the ship to its demolition along with various actions required to be approved by the flag states and authorities in ship recycling nations for monitoring of recycling activities. Particularly the handling of hazardous materials from the construction to demolition stage has been appreciated. It has been found a good attempt of IMO towards human and environmental safety as it has taken the issue on the international platform for its proper recognition by the countries not serious about the issue ("The Hong Kong ship", 2010, p. 23).

The Convention explains about the Environmentally Sound Management (ESM) of hazardous materials on board ships. Regulations 20.3 and 20.4 of the Convention cover the issues like ensuring safety and ESM of all hazardous materials and wastes, identifying waste management and transfer of wastes to the authorised management facilities (Wingfield, 2011, p. 11). The relationship of the Ship Recycling Convention with other international conventions/agreements has been covered under Article-15. As per the provision of Article 15.1, the Convention shall not prejudice the rights and obligations of any state under the United Nations Convention on the Law of the Sea (UNCLOS) and under the customary international law of the sea. Similarly, as per Article 15.2, the Convention shall not prejudice the rights and obligations of parties under other relevant and applicable international agreements.

4.3 Hong Kong Convention and its enforcement

The Convention was open for signature by any state at the Headquarters of the Organization from 1st September, 2009 to 31st August, 2010 and shall now be open for accession by any state. Till now sixty states have signed the Convention including Turkey, one of the five main ship recycling states (Beck, 2010, p. 1). The Convention shall enter into force 24 months after the date on which the following conditions (Article-17) are met:

(i) not less than 15 States have either signed it without reservation as to ratification, acceptance or approval, or have deposited the requisite instrument of ratification, acceptance, approval or accession in accordance with Article 16;

(ii) the combined merchant fleets of the States mentioned in point (i) above constitute not less than 40 per cent of the gross tonnage of the world's merchant shipping (i.e. at least 383,192,922 GT considering the gross tonnage of 2010 which is 957,982,304 GT); and

(iii) the combined maximum annual ship recycling volume of the States mentioned in point (i) above, during the preceding 10 years constitutes not less than 3 per cent of the gross tonnage of the combined merchant shipping of the same States (i.e. at least 11,495,788 GT for the period 2001 to 2010).

[The Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships (2009)]

The first two conditions of the Convention are easy to be fulfilled as European Union members and the OECD members have consensus to sign and enforce the Convention. The combined maritime merchant fleet of these states (European Union having 23% of total world tonnage) constitutes at least 40% of the world's total merchant fleet (Chang, Wang & Durak, 2010, p. 1395). To fulfil the third condition, the main ship recycling states, recycling 97-98% of the world's total recycling tonnage, have to come forward to ratify the Convention. As mentioned above, out of the five main ship recycling states, Turkey has signed the Convention. But the larger recycling capacity exists with

China (7.7 million GT), India (7.6 million GT) and Bangladesh (6.8 million GT), Pakistan having medium (2.4 million GT) and Turkey having the smallest capacity (0.7 million GT) (Mikelis, 2010, pp. 28-29). After 24 months from the accession by the two large recycling capacity states out of the three, the Convention can enter into force. China has initiated action for standardization of its recycling activities and new yards with appropriate infrastructural facilities are either under construction or have already been completed. It is expected that China may ratify the Convention early. But India and Bangladesh may take some time to ratify the Convention, which will cause delay in the enforcement of the Convention anticipated by 2015 at the earliest ("Study in relation", 2009, p. 6).

As the conditions for entry into force of the Convention will take some time, IMO member states have been requested (by Resolution 5 of the Hong Kong Diplomatic Conference, see Appendix A) to consider applying the technical requirements of the Convention during the interim period (Mikelis, 2011, pp. 4-11). For implementation of the technical requirements voluntarily by the ship recycling states, IMO is continuously making efforts to have discussion between the ship recycling facilities and the states concerned. The Pattaya Workshop organized in May, 2010 is an effort in this direction, which was represented by the Ship Recycling Associations and Administration from the main five ship recycling states, International Ship Owners' Associations along with the experts from UN bodies, IGOs and NGOs (Mikelis, 2010, p. 33). The voluntary implementation of technical requirements proposed under the Convention has been welcomed by the International Ship Owners' Associations like ICS, BIMCO, INTERTANKO and their ships joining the fleet, have started to maintain the Inventory of Hazardous Materials in line with the provision under the Convention.

4.4 Structure of the Convention

The Convention can be divided into three parts: the first part containing 21 Articles establishing the main legal mechanism, the second part having 25 regulations explaining technical requirements and the third part containing appendices. Regulations can be divided into four parts as follows:

(i) **General provisions** (Regulations 1-3): Under the general provisions, the definitions of the terms used, general applicability of the provisions and relationship with other standards, recommendations/guidelines issued on the subject, have been covered.

(ii) **Requirements for ships in service** (Regulations 4-14): The states, party to the Convention have been assigned the responsibility to ensure that the hazardous materials listed in Appendix-1 of the Convention (see Appendix B) are not utilized by their shipyards. Along with ensuring the above, the party states have also to ensure that these hazardous materials are not installed on their ships. All their ships will have to carry throughout their operational life, an Inventory of Hazardous Materials (IHM) quantifying the materials listed in Appendices 1 & 2 of the Convention (Appendix 2 of the Convention, see Appendix C). In case of installations of the materials listed in Appendix-2 of the Convention, the Inventory of Hazardous Materials is to be updated. After each 5 years, the ships of the party states will undergo a survey to verify their IHM quantity and then issue an International Certificate on Inventory of Hazardous Materials. Further, it is binding on the flag states, party to the Convention that their ships will be recycled in the recycling facilities of the party states only.

(iii) **Requirements for ship recycling facilities** (Regulations 15-23): The ship recycling facility selected by the ship owner should be a facility authorised by a party state, capable of handling the hazardous materials shown in the IHM of the ship. After receiving the ship recycling plan from the ship recycling facility[11], the ship owner has to arrange the final survey of

[11] A defined area that is a site, yard or facility used for the recycling of ships.

the ship for verification of the Inventory of Hazardous Materials and the Ship Recycling Plan for disposal of hazardous materials shown in the inventory, before obtaining the International Ready for Recycling Certificate from the flag state.

A Ship Recycling Facility Plan is to be developed and implemented by the Ship Recycling Facility. This plan will cover workers' safety and training, protection of human health and the environment, role and responsibilities of personnel, emergency preparedness and response, systems for monitoring, reporting and record-keeping. The Ship Recycling Facility will be authorized by the state, party to the Convention, and validity of the authorization will be maximum 5 years. Ship Recycling Facility will have to accept those ships only that are authorized to be recycled and also meet the requirements complying with the Convention.

After finalization of a deal with a ship owner, the Ship Recycling Facility has to develop a Ship-specific Recycling Plan on the basis of the information provided by the ship owner. Then, a notification containing the name of the Competent Authority for intent of the Ship Recycling Facility and details of the ship, its owner, Inventory of Hazardous Materials and the draft Ship Recycling Plan, is be issued by the Ship Recycling Facility. The Ship Recycling Plan prepared by the Ship Recycling Facility will then be approved by the Competent Authority concerned before handing it over to the ship for its final survey. After final survey, the ship will acquire the International Ready for Recycling Certificate, which will be submitted to the Ship Recycling Facility. Then, the Ship Recycling Facility will report to its Competent Authority about the planned start of recycling.

(iv) **Reporting requirements** (Regulations 24-25): The ship recycling state, a party to the Convention, has to make regulations conforming to the provisions made in the Convention. The state has to designate one or more competent authorities who will develop a mechanism for authorizing ship recycling plans and ensuring compliance of the Convention.

In the last part of the Convention, there are 7 appendices containing lists of hazardous materials, formats for certification and document of Authentication to undertake ship recycling (Mikelis, 2010, pp. 14-23).

4.5 Analysis of the Convention

As explained above, the Hong Kong Convention has been appreciated as a right approach to control the use of hazardous materials in ships but as per the critics, two aspects could not be covered properly under the Convention i.e. beaching and pre-cleaning. In support of beaching, IMO has argued that 75% of world ship recycling is done on beaches; therefore, in place of taking up the beaching issue, ship recycling activities have been focused upon. The Convention has the intention to standardise ship recycling throughout the world by concentration upon human safety and environmental aspects through proper training of workers, implementation of safety measures and their monitoring along with the record management to be done by the authority appointed by the party state.

Regarding pre-cleaning work, critics say that it should be the responsibility of the flag state to first do the pre-cleaning work and after removing all the possible hazardous wastes, the ship is to be handed over to the ship recycling yards. The NGOs are taking the example of the chemical tanker (Otapan principles) which spent nine years in the Netherlands and was pre-cleaned before the final voyage to Turkey. NGOs are calling on the flag states to follow this precedence and make ship owners liable for breaking of ships. Further, it has been stated that Regulation 20 (read with Regulations 10 &11) of the Convention mentions safe and environmentally sound management of hazardous materials but it does not clearly mention the place where pre-cleaning work will be done- either in the exporting country or importing country. As importing countries for recycling of ships are lacking in handling hazardous materials in terms of technical and mechanical facilities, pre-cleaning work has been suggested by the critics to be done in the exporting countries.

On the contrary, it has been argued by the IMO that after pre-cleaning of the hazardous materials, the ship becomes unseaworthy and then it will perhaps not be feasible to tow away the ship a good distance for recycling in Asian countries. As stated in the Convention, pre-cleaning work can be done at the facility capable and authorized for the Inventory of Hazardous Materials of a ship (Mikelis, 2010, pp. 35-37). This provision may encourage the ship recycling facilities to make them capable of pre-cleaning activities to avoid the risk of customer loss. But pre-cleaning work at the ship recycling facilities attracts the controversial issue of trans-boundary movement of hazardous materials used in ships.

The issue of hazardous materials and its movement is a hot topic for debate on international platforms for a long time. The Basel Convention, adopted under the United Nations Environmental Programme in March, 1989 deals with trans-boundary movement of hazardous wastes but not directly related to ship recycling. The Convention covers Environmentally Sound Management (ESM) of hazardous wastes (Article-4) such as minimising generation of hazardous wastes, availability of adequate waste disposal facilities, prevention of pollution and minimising the consequences on human health and the environment, authorising the disposal of hazardous wastes (Wingfield, 2011, p. 12). The exporting state has been considered responsible under Article 2(10) of the Convention for the planned trans-boundary movement of hazardous wastes. The aim and objectives of the Convention are as follows:

(i) To reduce trans-boundary movements of hazardous wastes and other wastes ;

(ii) To dispose of the hazardous wastes and other wastes generated, as close as possible to their source of generation;

(iii) To minimise generation of hazardous wastes in terms of quantity and hazardousness;

(iv) To ensure strict control over movements of hazardous wastes across borders;

(v) To prohibit shipments of hazardous wastes to countries lacking the capacity to manage and dispose of in an environmentally sound manner;

(vi) To assist developing countries in the environmentally sound management of hazardous and other wastes generated by them.

The hazardous wastes which are explosive, flammable, poisonous, infectious, corrosive and toxic/eco-toxic are covered under the Convention. The polluter/generator[12]/owner of the hazardous wastes is considered responsible for its safe disposal under the Basel Convention. The Convention prohibits its parties to send hazardous wastes to be recycled to the non-OECD states. If a ship to be recycled is considered as hazardous waste, prior notification and consent is required for its trans-boundary movement, as per the Convention [Basel Convention on the Control of Trans-boundary Movements of Hazardous Wastes and Their Disposal, (1989)]. There are 177 countries party to the Convention, including Iraq and Palau, the recent members. Till now, 70 parties have ratified the Ban Amendment to the Basel Convention, Zambia being the most recent and 10 parties have ratified the Basel Protocol on Liability and Compensation (Basel Convention Bulletin, 2011, p. 6). All the members of the European Union, party to the Convention have decided through Council Decision 97/640/EC not to export the hazardous wastes to non-OECD states ("UK Ship Recycling", 2007, p. 27). The European Union appears to prohibit its ships to recycle in Asian countries unless it has pre-cleaned hazardous materials. In line with the Basel Convention, United Nations Human Rights Commission, set up in 1995, adopted a resolution on adverse effects of hazardous wastes. Further investigation was done by the Commission on the subject and in its report ship recycling was considered as waste trafficking and it was suggested to consider ships as hazardous waste (Hossain and Islam, 2006, p. 42).

On the contrary, the Hong Kong Convention does not consider the ship ready for recycling as hazardous waste. As stated above, the issue of considering ships ready for

[12] "Generator" means any person whose activity produces hazardous wastes or other wastes or, if that person is not known, the person who is in possession and/or control of those wastes- Basel Convention-Article-2.

the last voyage, as a hazardous waste, created controversy and parties on different footing interpreted it differently. Without going into this controversy, it is a fact that the responsibility for disposal of hazardous materials present in ships lies with the ship owners and it is the responsibility of the ship owners to ensure that their ships are recycled in a manner complying with the standard practices prescribed under international rules and regulations/conventions. The International Chamber of Shipping (ICS) has taken initiatives in this regard and in August, 2001, established an Industry Code of Practice on ship recycling. The aim of the Code is to encourage ship owners/shipping companies to initiate a programme to identify and record the hazardous materials on their existing ships and to minimize the amount of potentially hazardous materials on board the ship (Parkinson, 2005[13]). The International Labour Organisation, the first specialised agency of the United Nations focusing on labour rights, has also put emphasis on minimum utilisation of hazardous materials on board the ships (Hossain and Islam, 2006, pp. 41-42).

The steps taken by ICS and ILO towards minimum utilisation of hazardous materials are really helpful in achieving the target of green ship recycling but it will have an impact in the long run i.e. after 20-25 years. To tackle the present situation prevailing in the ship recycling industry, immediate concrete steps need to be taken. The European Union is very keen on finding a solution to this problem and from time to time resolutions are passed by them to make the efforts successful. As stated above, ships registered in European Union member states (party to the Basel Convention) would be prohibited for recycling in the Asian ship recycling facilities unless they are considered non-hazardous after pre-cleaning or they change their flags. As selling of ships is a purely commercial decision, there is always a possibility that the ship owners change the flags of their ships for a better deal. By choosing the flag of a state not party to the Convention, the ship owner will then be free to sell his ships to any ship recycling facility to get the best price.

Even after the entry into force of the Ship Recycling Convention, there is a possibility of two distinct ship recycling markets running parallel, one i.e. conventional

[13] Page number not available but placed as executive summary after the slides.

market for the ships which comply with the Ship Recycling Convention and another i.e. non-conventional market for ships not complying with the Ship Recycling Convention (Knapp, Kumar and Remjin, 2008, pp. 1023-1024). As green ship recycling is always expensive requiring standard methods along with proper infrastructure and trained workers with appropriate equipment, the ship owners may shift to the non-conventional market defeating the purpose of the Hong Kong Convention.

There may also be the scene that many states do not ratify the Hong Kong Convention to favour their ship owners. Then the non-conventional market will definitely be bigger than the conventional market which will not only be detrimental to the human being but also to the environment. If the major ship recycling states like Bangladesh, India and Pakistan do not ratify the Hong Kong Convention, then also the possibility of the non-conventional market being bigger than the conventional market can not be ignored.

As explained earlier, even after formulation of the guidelines from time to time on ship recycling, the target of green ship recycling could not be achieved but the market could shift from one place to another. The 'Industry Code of Practice on Ship Recycling' introduced in August, 2001 by Ship Owners' Associations and led by ICS, could not get the expected result either. In this open world market, ship owners are not ready to bother about the recycling activities after selling their ships, but they are only interested in the best price of their ships. Sometimes they even do not know where their ships have gone for recycling as buyers of these ships for recycling are normally the cash buyers who finalise the deal with the ship recycling yards.

On the other hand, ship recycling yards are always keen on earning the maximum profit from the business. They are ready to ignore even the safety rules and regulations issued on the subject by the state concerned. Ship recycling states either do not have sufficient guidelines/regulations on the subject or do not have strict implementation of the existing regulations. The Ship recycling industry is flourishing in such states having cheaper man-power. After strict compliance with the regulations, the activity becomes costlier in comparison to the parallel markets, so the industry starts shifting to the destination that is favourable for profit earning.

All the developments in the past indicate that there is a permanent solution required to tackle the status quo situation of the ship recycling industry for the past three decades. Ship owners are the prime stakeholders responsible for disposal of hazardous materials existing in their ships, as per Article-2 of the Basel Convention. But as already discussed, they are not willing to accept such burden. Monitoring of the activities of ship owners by any international organisation is also a difficult task.

Further, green ship recycling is always costly and there is no incentive for opting such standard practices requiring investment on infrastructure, training and equipment. In the USA and Europe, income from the ship's scrap is not even sufficient to meet the expenditure on ship recycling (Finn, 2005[14]). The European Council is planning to generate a fund to meet the expenditure on green ship recycling ("Study in relation", 2009, pp. 6-7). For disposal of vehicles, Germany has created a fund, starting contribution from the stage of registration of the vehicle. In case of ships' recycling also, such arrangements can be done. In real sense, the ship at the end of its life is nothing else than waste and like other wastes, the honour/generator of this waste should take care of its disposal in a standard manner. If they are not in a position to do so directly, they can develop a system to run it properly. For example, to protect themselves from the enormous liability due to collision of the ships, ship owners established the 'Protection and Indemnity Insurance Club' (P & I Club). The P & I Club is a non-profit making mutual insurance association providing coverage for its ship owners and charter members against third party liabilities relating to the use and operation of commercial vessels. This development could be initiated after the judgement of the collision case, 'D Vaux v Salvador' given by an English court in 1836 that the ordinary policy against perils of the sea can not cover the damage done to another vessel by collision ("The story of P& I", 2011). It can be derived from the example that after getting a bigger liability, ship owners formulated a system i.e. P & I Club to tackle such liabilities. If ship owners are also made responsible for green recycling of their ships, there is a possibility of evolving a new system improving the situation. A club/society constituted by the ship owners can do the job in an efficient and effective manner with the help of a 'Ship Recycling Fund'

[14] Page number not available but placed as executive summary after the slides.

proposed to be created to meet the additional financial burden due to green ship recycling practices. A detailed discussion will be done on this proposed line of action in the next chapter.

CHAPTER- 5

Ship Recycling Fund: An Incentive Scheme

5.1 Background

Maritime transport is a derived demand from world trade. Transportation of goods from one place to another is needed to facilitate the trade. As stated in the first law of thermo-dynamics, a product can not be pollution-free totally and maritime transport also is not an exception. But for taking the benefit of transportation, the world has to accept the pollution generated by it. One thing that can be done, is the selection of the best option to minimise the pollution. Among all the modes of transportation, shipping is the cheapest and most eco-friendly mode for bulk cargo and acquisition of ships is required for transportation of goods/cargo through this mode. Ships are required to be disposed of at the end of their economic life. As ships contain different types of hazardous materials, on the occasion of scrapping these materials need due care and proper handling. The hazardous effects of these materials on human being and the environment can be minimised by following the standard procedures of recycling.

Due to the pollution caused to the environment and threats to the human being, ship recycling is considered as a negative externality. As per the market principles, to internalise this negative externality, a provision of compensation is needed. In place of paying the compensation to the ship recycling facilities for internalizing such a negative externality, ship owners are getting money for their ships. Ship recycling yards are paying the money with the intention to scrap the ships in a sub-standard manner. The owners of the ships also know about this; in other words, they are not serious about green recycling of their ships. They know that in case of recycling of their ships in a standard/proper manner they can not get a penny from the sale of their ships but they might have to pay even money to the yards. It would not be wrong to say that ship owners intentionally show unwillingness in the green method of recycling to get money from the sale of their ships to be recycled. As stated above, ship owners, not the ship recycling facilities, are the owners/generators of the hazardous materials and toxic wastes received under the process of ship recycling and to internalise this externality, they should pay the

compensation to the ship recycling facilities/states concerned. Payment of money by ship recycling yards in place of the compensation for internalising this negative externality, is really against the 'polluter pays' principle. As per the Basel Convention, ship owners being the owner/generator of hazardous materials and toxic wastes used in ships, are supposed to monitor its disposal by the ship recycling facilities in a proper way. It can therefore, be said that ship owners are the key stakeholder for green ship recycling and initiatives taken by them will have great impact on the industry. If they are assigned the responsibility of green recycling of their ships and provision is made for submission of such certificate by them compulsorily after completion of pre-cleaning and recycling exercise, then the scenario will definitely change.

The guidelines/conventions issues from time to time on ship recycling ask about the procedure to be followed by the stakeholders but neither the owners of the ships, nor the ship recycling yards are following the procedures laid down in these guidelines/conventions. Before adoption of the Hong Kong Convention by the IMO, there were guidelines issued by the international organisations from time to time for the stakeholders i.e. ship owners, flag states, ship recycling facilities and concerned states, but the stakeholders are not willing to comply with these guidelines. Even after enforcement of the Hong Kong Convention, it is not confirmed that the stakeholders of the industry will follow the procedures indicated under the Convention. Therefore, along with formulation of conventions/guidelines on the subject, it is required also to analyse the response from its stakeholders on such conventions/guidelines. It is a fact that even after the guidelines on the subject, the situation has been status quo for a long time, which suggests the need to thoroughly investigate to find its root cause together with the solution.

5.2 Cost a barrier in green ship recycling

As appears prima facie, the cost difference between the conventional and standard methods of ship recycling is the main barrier in achieving the goal of green ship recycling. The standard procedure of recycling causes additional expenditure in scrapping exercise; as a result, the profit margin of ship recycling facilities is reduced which also

affects the ship owners, getting a lower price and sometimes no money for their ships to be recycled. As there is no incentive available to cover the gap between the cost of conventional and standard methods of recycling, ship recycling industry is not willing to opt for the standard method. As discussed earlier, ship owners also are interested in the money to be received from the sale of their ships to be recycled. To make the standard method of recycling acceptable by the ship recycling industry, a fund needs to be arranged for the provision of incentive to meet the additional cost to be arisen due to standard methods of green ship recycling. The additional cost due to the standard method of recycling has the following elements:

(i) The cost involved in removal of structural components requiring special treatment:

The cost for each of the elements of scrapping is different for different types of ships. Further, the actual cost separately for such elements, is difficult to know as most of these activities are done simultaneously on the occasion of scrapping. Ship recycling yards are not ready to calculate separately the expenses under each head and disclose the same. As per the report prepared in April, 1998 by US Ship Scrapping Inter-agency Panel, an amount of US$145 million was required for scrapping of 111 US Navy vessels. Out of US$145 million, the expenditure on removal and disposal of the structural components had been estimated at US$110 million (average US$1 million per ship).

ECORYS, a consultation company conducting a study on ship breaking for the NGO, Greenpeace, also has taken the figures from a ship owner opting for pre-cleaning before scrapping of the ship in a Chinese yard. According to this source, the total pre-cleaning cost was in the order of US$20-40/Light Displacement Ton (LDT) including the expenses on removal of structural elements of the ship. Taking the ratio the same as shown for US Navy vessels, the expenses on removal of structural elements from ships comes to US$15-30/LDT. A U.S. ship yard, involved in scrapping of ships in a standard manner, has also confirmed this cost estimated for different types of ships as follows:

War ships	US$ 900-1300 per LDT*
Military support vessels	US$ 300- 700 per LDT*
Commercial vessels	US$ 100- 500 per LDT*

*Including both remediation (removal and disposal of hazardous wastes) and dismantling costs. Remediation cost estimated at one-third to half of the total cost includes labour, materials and disposal costs.

(ii) The cost of removing operational waste generated within ship's operational period:

Under this heading, the expenditure on making the ships for hot work by tank-cleaning or making it gas-free, costs for removal of engine room wastes, hydraulics, are to be considered. This expenditure has been estimated to one-third of the total pre-cleaning work. In container ships, the cost has been estimated at US$ 5-10/LDT. Tankers and liquid bulk carriers have considerably higher costs.

(iii) The cost involved in improving the capacity of the ship recycling yards to recycle the ships in a standard manner:

Ship recycling activities are normally done on beaches. Yards are running without having permanent structures and proper training for handling of hazardous materials/toxic wastes. For green ship recycling, there is a requirement for physical infra-structures, waste reception facilities, dry docking facilities, appropriate training to workers for handling of hazardous materials and proper equipment as per suitability of the work. All these facilities need investment and after such investment the recycling cost will be higher.

(iv) The cost involved in making the yards able to deal with the on-board generated wastes:

Ship recycling yards are normally not serious about disposal of the hazardous wastes received from recycling of ships but the same are handed over to any one ready to pay or are disposed of in the sea/on the land. There is no facility in the vicinity of the ship recycling yards to deal with these hazardous materials and toxic wastes. For such facility, the yards have to take initiatives with the support of the states concerned to invite companies and co-operate with them in disposal of such wastes in a proper manner.

In this way, one can say that the costs for standard method of ship recycling is higher due to additional facilities required for disposal of wastes in a proper manner and safety norms to be followed by workers. It has been calculated to US$ 10-40/LDT, as per the estimation for scrapping a container ship in a Chinese yard. The cost for some types of ships, like tanker and reefer ships may be higher. To cover certain investment items for yards not considered, the overall cost for estimation of the Ship Recycling Fund has been taken up at US$ 25-50/LDT ("The Ship Recycling Fund", 2005, pp. 19-23).

For estimation of the total requirement for the Ship Recycling Fund, the second factor required to be known, is the supply of ships for recycling in the world market. The global ship recycling volume and recycling projected by the World Bank for 2010-2030 is given in Figure-6.

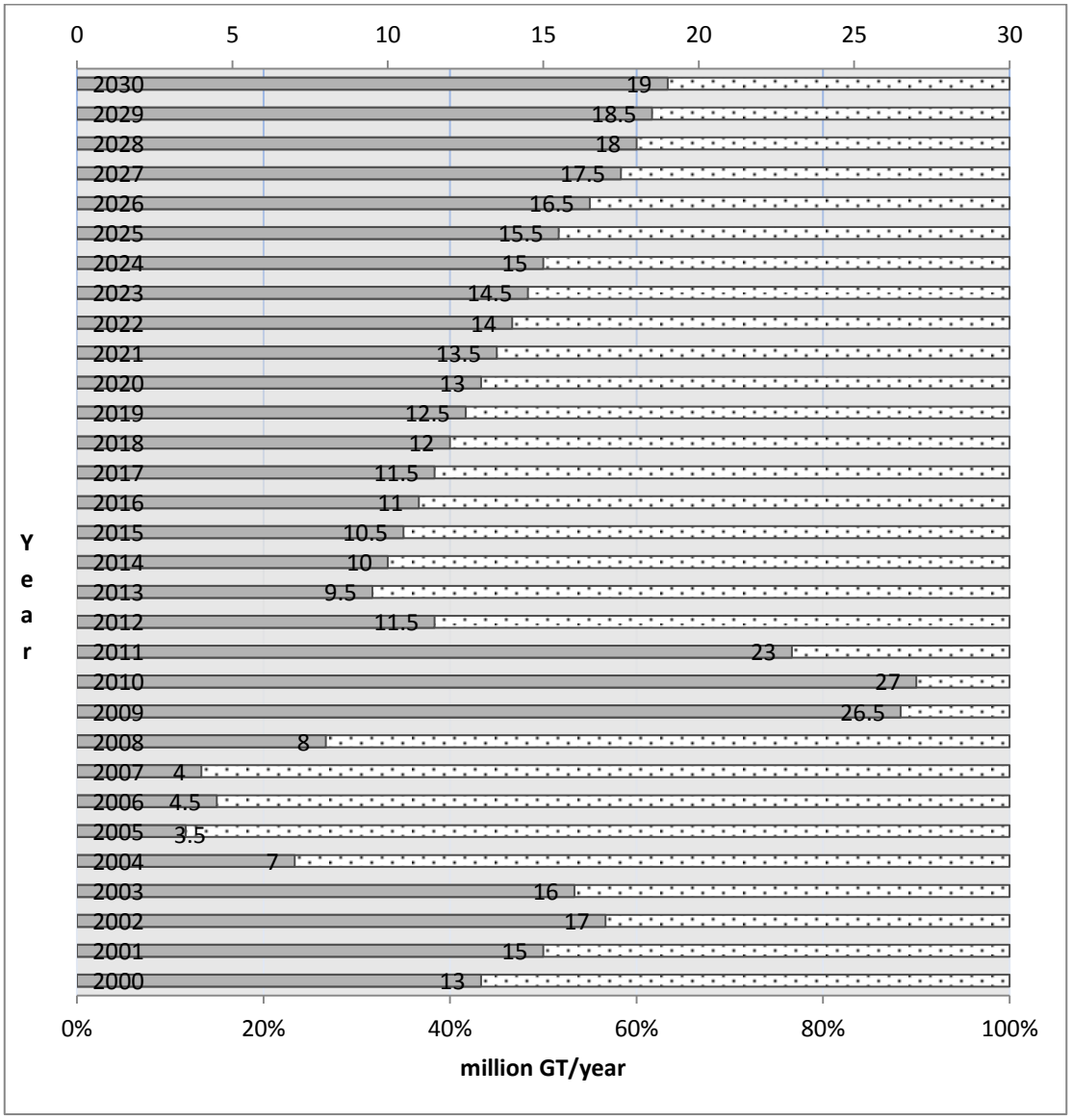

Figure 6- Global recycling volumes 2000-2009 and projected recycling 2010-2030 in million GT (2010 marked)

Source: World Bank Report (Unpublished) on ship breaking in South Asia, November 17, 2010. p. 34

As per the World Bank Report, 2010 (unpublished), the maritime sector enjoyed high freight rate during 2005-2008 and the scrapping market slashed down during the period due to operation of even older ships. However, operation of the older ships to cover the high demand during the period increased the ship recycling volume in the years 2009-2011 after the recession in the world trade. Further, the phasing out of single hull

tankers also, made an addition to the volume for the years 2009-2012. The balance of backlog and single hull phase out has been divided among the main ship recycling states (see Table 7) as per their share and the scrap tonnage distribution based on 2008 data (World Bank Report, 2010, Unpublished, p. 34) among Bangladesh, India and Pakistan for the period 2010-2030.

Table 7- Tonnage scrapped globally and in Bangladesh, India and Pakistan, 2010-2030

	Accumulated tonnage scrapped 2010-2030 (million GT)	
Location	Distribution based on 2008 data	Distribution based on 2000-2008 data
Global	320.0	388.0
Bangladesh	162.0	130.0
India	95.2	132.0
Pakistan	10.2	22.9

Source: World Bank Report (Unpublished) on ship breaking in South Asia, November 17, 2010. p. 34

5.3 Estimation of Ship Recycling Fund

Before taking any step to constitute the Ship Recycling Fund, one has to first calculate the annual demand for such fund. The average annual fund requirement for ship recycling can be calculated on the basis of the ship supply forecasted for the coming years (shown in Figure 6). As mentioned above, the additional cost due to the green ship recycling method has been taken at US$ 25-50/LDT. As the forecasted figure of ship supply for recycling is in Gross Ton, it is to be converted into LDT for calculation of fund requirements. First, Gross Ton is to be converted into Dead Weight Ton (DWT) and then DWT into LDT as per conversion Table 8, as follows:

Table 8- Conversion factors

Tonnage Factor	Tanker	Bulk Career	General Cargo, Ro-Ro, Reefer	Container, Others
*DWT (per GT)	1.75	1.70	1.44	1.00
**LDT/DWT factor	0.30	0.33	0.44	0.34

*Source: Stopford, 1982

** Source: The Ship Recycling Fund, 2005, p. 26

As LDT/DWT depends on the type of the ship and its size, its factors should also be considered (factors shown in Table 8). In the next 3-4 years, the share of tankers/ liquid bulk carriers will be bigger in the total supply for recycling due to the phasing out drive of single hull liquid bulk carriers. As per the forecasting made above, the requirements of additional funds for green ship recycling will be as shown in Table 9.

Table 9- Requirement of additional fund for green ship recycling

Year	Million GT/year	Funding requirement in million US$	
		Low(US$25/LDT)	High(US$50/LDT)
2011	23.0	297.850	595.700
2012	11.5	148.925	297.850
2013	9.5	123.025	246.050
2014	10.0	129.500	259.000
2015	10.5	135.975	271.950
2016	11.0	142.450	284.900
2017	11.5	148.925	297.850
2018	12.0	155.400	310.800
2019	12.5	161.875	323.750
2020	13.0	168.350	336.700
2021	13.5	174.825	349.650
2022	14.0	181.300	362.600
2023	14.5	187.775	375.550
2024	15.0	194.250	388.500
2025	15.5	200.725	401.450
2026	16.5	213.675	427.350
2027	17.5	226.625	453.250
2028	18.0	233.100	466.200
2029	18.5	239.575	479.150
2030	19.0	246.050	492.100
Annual Average	14.3	185.509	371.018

Source: Author

The requirements of funds shown in Table 9 have been calculated for the investment required for green ship recycling in the ship recycling facilities. There will also be expenditure on arrangement and monitoring of funds, which needs to be considered for calculation of the total requirement figure. On the basis of the above assumptions, the average annual additional requirement has been calculated at US$200-400 million to meet the gap between the conventional and standard practices of ship recycling.

After arrangement and monitoring of the fund, the next important task is to ensure its utilisation in a proper manner, otherwise the whole exercise would be infructuous. A mechanism is required to be developed for its proper utilisation and accordingly, the amount released to the stakeholder concerned (ship owner, shipyard or the state) is required to be monitored to ensure its bona fide use.

5.4 Financial structure of the Fund

The fund structure for arrangement of 'Ship Recycling Fund' can have any of the following three options:

(i) Endowments: Capital investment can be done by the members of the Association made for the Ship Recycling Fund and the income from the investment is to be utilised to cover the gap between conventional and standard practices of ship recycling.

(ii) Sinking funds: Under this system, the entire principal and the income from investments can be accumulated regularly in a separate account and disbursed over a fixed period.

(iii) Revolving funds: Under this system, resources are received on regular basis, such as proceeds of special taxes, levies and charges augmenting the original capital of the fund, providing a continuous source of funds for the purpose.

Among these three options, the first two types of funding require a big capital investment; on the other hand, sources for revolving funds do not require big investments but are managed from the current charges. The 'polluter pays principle' suits this system

of funding managed from taxes and charges to be levied ("Study in relation", 2009, p. 9). Initial investment in ship recycling yards will be needed to facilitate them in initial preparedness for green recycling. This support funding can be managed through donor assistance bilaterally or multilaterally or pre-financing by states in the form of loans.

5.5 Financial mechanism of the Fund

Funds can be raised in the form of contribution from the stakeholders either at the construction stage or during the operational life of ships.

(i) Contribution at the construction stage of ships

The proposed 'Ship Recycling Fund' can be raised by making contribution at the construction stage of the vessel. For contribution at the construction stage, the system adopted in the Netherlands can be followed. In the Netherlands, on the occasion of the purchase of a car the owner has to pay a fee (i.e. 0.5% of the cost of the car) as disposal contribution to be utilised by the foundation established to ensure standard dismantling of the car at the end of its economic life. The foundation has been entrusted to manage the fund, monitor the car recycling industry and subsidise the car recycling industry for removal of non-recyclable materials along with the research and development work on recycling methods. The car recycling industry is taking the cars without making any payment to the car owners which has been accepted by the consumers. Further, for disposal of batteries and electrical appliances, a similar system has been introduced there. The European Union had also introduced a special scrapping fund to control the inland navigation sector facing overcapacity. For raising this fund, pre-financing was done by the member states through advance payment in the form of loans ("The Ship Recycling Fund", 2005, pp. 26-28). Such system of contribution at the construction stage can be adopted for ships also and a fee structure can be made as per the type and size of the ship. The ship owners can establish an association or club, which will be assigned the task of collection and disbursement of the fund for green ship recycling along with the research and development work on the subject.

However, there are certain demerits in this method: (i) The owners of the new ships will have a competitive disadvantage in comparison to owners of existing ships

exempted from the contribution as the former only has to contribute for the Fund; (ii) As the contribution is to be made by the new ships only, it will be too high due to the number of new ships being much lower than the total number of ships in operation (details of the present world merchant fleet and ship acquisition forecasted can be seen in Tables 10 & 11). Further, this system will be against the 'polluter pays' principle as the owners of the existing ships are creating more pollution than the new ships. Furthermore, the accumulation of the requisite amount under the proposed fund may take a long time due to lower number of contributing ships i.e. only new ships having a long economic life.

Table 10- World merchant fleet by country of domicile as of January 1st, 2006-2010 (Ships of 1,000 GT and above; in million DWT)

Country Type	2006	2007	2008	2009	2010
Country unknown	50.6	45.7	59.3	67.3	86.6
Country of domicile	885.8	955.4	1011.8	1077.1	1139.1
World total	936.4	1001.1	1071.1	1144.4	1225.7

Source: Shipping Statistics and Market Review, Volume 54 No. 7, 2010, p. 5

Table 11- Addition to the world merchant fleet by nation and foreign flag distribution during 2005 and 2009 (in million DWT)

Ship type	New Building addition to					
	National flag		Foreign flag		Total controlled	
	2005	2009	2005	2009	2005	2009
Tanker	9.7	15.4	22.4	34.7	32.0	50.1
Bulk Carrier	4.6	7.6	17.8	31.7	22.3	39.3
Container	1.5	1.2	9.5	10.0	11.0	11.2
General Cargo	0.7	1.1	1.6	3.3	2.3	4.4
Passenger	0.1	0.0	0.1	0.1	0.1	0.1

Source: Shipping Statistics and Market Review, Volume 54 No. 7, 2010, p. 6

(ii) Contribution in the form of fee levied during operational life of ships

The second option for financing can be in the form of fee levied during the operational life of the ships. Earning of funds will be made from both the new and old ships, which will be an impartial treatment to both age groups of ships. Collection of funds under this system will definitely be bigger as the number of ships will be greater. Under this mechanism, collection of fund has been proposed by one of the following methods:

(a) **Collection of fee along with P &I insurance premium of the ship**: The contribution for 'Ship Recycling Fund' can be collected by the insurance companies along with the insurance premium. As Protection and Indemnity (P & I) insurance is highly international and obligatory, the contribution attached with it will have favourable results. There will not be the requirement for a new set up which will save the administrative expenditure.

(b) **Levying through the flag states**: The flag state providing the authority to fly its flag can ask its ships to deposit the contribution for the fund. After collecting the contribution, the flag state can transfer it to the fund organisers. IMO can play a great role as a co-ordinator in such arrangement.

(c) **Introduction of a recycling life insurance**: After estimating the recycling cost of a ship, the same can be collected within its operational life in the form of annual life insurance premium. For collection of the recycling premium, the services of insurance companies can be taken. The pre-cleaning and ship recycling expenses are to be paid initially by the ship owners. The fund accumulated is to be kept reserved and after submission of the proof/certificate about green recycling of the ship, expenses on pre-cleaning and recycling of the ship are to be reimbursed to the ship owner. In case of the amount collected for scrapping of a ship found higher than the amount claimed for reimbursement, the balance is to be refunded to the owner. Similarly, in case of shortage, the limit of reimbursement would be up to the fund accumulated in the form of recycling life insurance premium during the operational life of the ship.

There are two demerits in the system- (a) there is a possibility of false certificate to be submitted by the ship owners claiming green ship recycling. But it can be controlled by making the condition to have recycling only from the ship recycling facilities certified by the management of the Fund; (b) there is a possibility of different treatment by the insurance companies with the old and new ships; insurance companies may deny sometimes to insure old ships or if accepted, at very high premium ("The Ship Recycling Fund", 2005, pp. 30-33).

5.6 Disbursement mechanism of Ship Recycling Fund

Before selection of the most feasible option from the systems suggested above for creation and operation of the 'Ship Recycling Fund', the strategy proposed is discussed below:

(i) **Collection of fees**: There are three options suggested above for collection of fees- (a) by the insurance companies as fees along with the instalment of Hull and Machinery; (b) the contribution to be collected by the flag states as levy; (c) collection by the insurance companies in the form of premium for recycling insurance.

As discussed earlier, collection of fees, its monitoring and certification of ship recycling facilities, handing over all these responsibilities to the ship owners either by making an association or club like P & I Club, appears to be the best option under which the fees will be collected either through existing P & I Clubs or a new set up as per their suitability.

The fees to be collected from ships can be decided on the basis of an economic instrument as per the quantity of hazardous materials recorded in the 'Inventory of Hazardous Materials'. The difference in the fee (the higher the quantity of hazardous materials, the higher the fee) will give the message 'pollution not free' and will support the individual pollution control principle also (Ma, 2010, pp. 487-497).

(ii) Certification and control: Ship recycling facilities claiming green recycling practices will have to be certified by the management maintaining the Ship Recycling Fund. The ships recycled by any of these certified recycling

facilities only, will be entertained by the management of the Fund for reimbursement of the expenditure claimed by the ship owner on pre-cleaning and recycling of the ships. These ship recycling facilities should be able to recycle the ships as per the procedure prescribed under the Hong Kong Convention and the guidelines issued from time to time by other international organizations. There should also be a system for audit of these certified ship recycling facilities at regular intervals by the independent audit parties selected from the member states of the IMO. For co-operation from the states concerned, IMO may provide necessary assistance to the management of the Fund.

(iii) Disbursement of fund: It would be ideal to give the liberty to the ship owners to choose any of the certified ship recycling facilities. Ship owners will choose one of the certified ship recycling facilities. After completion of the pre-cleaning and recycling work in standard manner by making payment on their own, the ship owners will submit the green ship recycling certificate to the management for reimbursement of the expenditure done by them. After scrutiny of the claim, the amount can be released from the Fund to the ship owner. The amount reimbursed to the ship owner should be sufficient to meet the additional fund spent for green recycling of the ship. In case of an amount being lower than the requirement, there is possibility of continuation of the parallel recycling market running in the states, not ratifying the Hong Kong Convention. Therefore, the disbursement mechanism is to be finalised taking into consideration all the aspects so that there is no risk of any parallel recycling market providing sub-standard facilities.

(iv) Research & Development (R & D) on green ship recycling practices: For improvement in the green ship recycling, research needs to be done continuously. The management should arrange the fund for such research work and monitor its progress along with implementation of the recommendations made by the research team after examining their feasibility and other practical aspects. Continuous research to sort out the problem in

existing procedure of ship recycling and further improvement in the existing system will be helpful in achieving the goal of safe and environment-friendly recycling of ships. The management of the 'Ship Recycling Fund' should make efforts to have research uninterrupted for efficient and effective ship recycling facilities to achieve the goal of safe and environment-friendly practices.

5.7 Similar system existing for waste management

To have an idea about the feasibility of the system proposed above, an analysis of similar systems existing in many countries for green recycling of cars and other wastes has been done below:

Sweden: In Sweden the overall responsibility for waste management rests with the Ministry of Environment. In 1967, the Ministry established the Swedish Environment Agency to function as the central enforcement and supervisory agency. The 'deposit refund' system was introduced by the agency in the 1970s under which the producer or importer of a car pays a 'recycling fee' decided by the Government. This fee is deposited in the 'Vehicle Disposal Fund' which is utilised as an incentive in the form of scrapping premium. This scrapping premium is released to the final car owner after deregistration of the car for green recycling. The final car owner also gets the chance to negotiate with the dismantler about the negative or positive value of the car in addition to receipt of the scrapping premium. In case of purchase of the car by the dismantler before its deregistration, the scrapping premium is paid to him ("End-of-life Vehicles", 2005; "National Waste Management", 2005).

The Netherlands: As already explained in para 5.5 (i) above, a 'waste disposal fee' is collected from the customer on the occasion of the registration of the car. The financing for collection of the scrap cars and recycling activities, is done from this fund accumulated as 'waste disposal fee'. Auto Recycling Netherland (ARN), established by the Dutch Automobile industry, is responsible for collection of the scrap cars from the

last owner. The scrap car is taken from the owner without making any payment and its green recycling/dismantling is done by the ARN under the contract signed with car dismantling companies ("Recycling and Reuse", 2008; "End-of-life Vehicles", 2005).

Japan: In Japan the consumers pay a fee for dismantling on the occasion of purchase of a new car. The fee collected is managed by a third party, the 'Japan Automobile Recycling Promotion Centre (JARC). To properly ensure the recycling of end-of-life vehicles (ELVs), an electronic manifest system is used (Recycling and Reuse, 2008).

Similarly, the customers have to pay an extra charge for green dismantling of other household items e.g. US$35 for a washing machine, US$40 for a television, US$50 for an air conditioner and US$60 for a refrigerator as recycling fee including the transportation cost to the site of recycling ("Recycling and Environmental", 2011).

Switzerland: Switzerland ranking among the top countries in the world regarding environmental protection, stresses on the 'polluter pays principle' about waste management. It is the first country in the world establishing a formal system to manage e-waste. Electronic goods have been divided into two groups, namely brown goods and white goods allocating the task of collection and recycling to the two organisations-SWICO and SENS. The financing for these activities has been arranged through the Advance Recycling Fee (ARF) charged on all new appliances. This fund is utilised for the expenditure on collection, transportation and recycling of the disposed appliances collected free of cost from the owners through the collection centres of SWICO and SENS around the country. To ensure quality maintenance and environmental standards, there are multiple levels of independent controls supported by the national laws (Khetriwal, Kraeuchi & Schwaninger, 2005).

The USA: In the USA a coalition of federal, State, industry and environmental non-profit partners, created in 2006 a 'National Vehicle Mercury Switch Recovery Program (NVMSRP)' as a voluntary effort to promote safe removal of mercury switches from end-of-life vehicles before their recycling. A voluntary US$4 million fund has been

established by the steel and auto manufacturers to provide incentives for switches returned through the NVMSRP ("Recycling and Reuse", 2008).

5.8 Summary

As appears from the above examples of waste management systems adopted by many countries, the market-based incentive scheme is functioning as a motivation factor for its success. The "Seven R's principle[15]" of Wal-Mart also supports the market-based strategy. As per this principle, "When Wal-Mart tells a supplier that it wants a change in packaging, that supplier changes all its packaging". The principle demonstrates vividly that a customer can exert considerable pressure on its supplier to accept the demand placed by the customer (Lai, Lun, Wong & Cheng, 2010). In the ship recycling market, the customer is the ship owner; if the ship owners will demand green ship recycling, the yards will have no option but to opt for the same.

Establishing a Ship Recycling Fund to be utilised as an incentive scheme, can function as a market oriented mechanism, motivating the ship owners to demand green method for recycling of their ships which can not be denied by the yards to get the business. To have such arrangement for green ship recycling, a proper mechanism needs to be developed under which all the provisions for management of the 'Ship Recycling Fund' are to be finalised. But all these developments need support of the Regulations/Convention in this regard. IMO being the nodal agency, should take initiatives in this regard as it will assist in achieving the target fixed under the Hong Kong Convention, 2009. Through the tacit acceptance procedure[16], IMO can make such provisions in the Hong Kong Convention.

[15] The "Seven R's principle" of Wal-Mart refers to remove, reduce, reuse, renew, recycle, revenue and read.

[16] The 'tacit' or 'passive' acceptance procedure means that the body which adopts the amendment at the same time fixes a time period within which contracting parties will have the opportunity to notify either their acceptance or their rejection of the amendment, or to remain silent on the subject. In case of silence, the amendment is considered to have been accepted by the party...".

CHAPTER- 6

Discussion and Conclusions

6.1 Maritime industry and ship recycling

After globalisation of the world trade, the shipping sector played the key role in transportation of goods from one corner of the world to another. The increase in the world tonnage offered ship owners a chance to increase their fleets. As the demand in the world trade is not always increasing but constantly fluctuating, it affects the world merchant fleet. In case of increase in the demand, the fleet size increases; similarly, in case of decline in the demand, the fleet size has to decrease accordingly. Apart from cancellation of the ship acquisition orders, ship owners have two immediate options available to downsize their fleets: either lay up their old ships or sell them for recycling. As laying-up of ships is a temporary and expensive arrangement preferable for a shorter period, ship owners opt to sell their old ships for recycling. Otherwise also, after technological changes or on completion of the economic life, the ships are required to go for recycling. As ship recycling is the most sustainable and eco-friendly way of disposing of old vessels, it is beneficial to all offering the use or recycling of every part of a ship's hull and machinery.

In the first decade of the 21st century, the shipping industry enjoyed the boom for 4-5 years, but in the second-half of 2008 it felt a drastic decline in demand compelling ship owners to downsize their fleets. This decline in the world trade offered the ship recycling industry a good number of vessels for scrapping. Simultaneously, the amendments in IMO's Convention, MARPOL 73/78 also enriched the ship recycling industry, especially by single hull tankers. The period of 2009-2011 came as the golden period for this industry after sufferings during the period of 2004-2008, considered as the golden period for the freight market. In the years 2012 and 2013, the supply of ships for recycling is expected to decline but it will grow steadily thereafter, as per the forecasting of the World Bank (World Bank Report, 2010, p. 34).

The ship recycling industry which has a tendency to shift from one place to another, is presently running in South Asian countries (Bangladesh, India and Pakistan), China and Turkey. Due to cheaper manpower and liberal regulations on safety, health and the environment, ship recycling is cheaper in these states. The principle of ship recycling being a sound one, the method adopted by these states provides no room for safety of human-life and the environment. Ship recycling yards are lacking the infrastructural facilities and knowhow about handling and disposal of hazardous materials/toxic wastes. But they are not ready to invest in the business which is volatile in nature having a tendency to shift due to any of the reasons like strict compliance of the regulations, cheaper manpower, scrap steel demand or any other political reasons. If ship recycling is done by the standard procedures, it becomes expensive and the ship recycling yards facing tough competition in the market, have the risk of losing the business in case of following the standard procedures of recycling.

6.2 Ship recycling: a commercial activity

Ship recycling is a commercial activity; therefore, any solution to the problem faced by the industry is required to suit the market. If the market demands investment in infrastructure and training facilities for the workers, the industry will take the necessary steps automatically for such facilities just to avoid the risk of losing customers. For survival in the market, ship recycling yards will have to develop the facilities demanded by the market otherwise they will lose the customer. It can therefore, be said that the solution to the problem of substandard practices in the ship recycling industry demands a commercially viable mechanism, able to compel the stakeholders to opt for the standard practices for recycling of ships.

To achieve the goal of safe, sound and environment friendly recycling of ships, the Hong Kong Convention was adopted by the IMO on 11th May, 2009. The Convention reflecting the responsibility of the ship owners just from the construction stage of ships to its demolition, has been appreciated by the world. However, enforcement of the Convention may take some time as one of its three conditions (Article-17) is related to its ratification by main ship recycling states. Pattaya Workshop organised by the IMO in

May, 2010 is an effort towards early ratification of the Convention by these ship recycling states. However, critics have raised doubt about the success of the Convention.

As per critics, even after the entry into force of the Convention, there is a possibility of two distinct ship recycling markets running parallel. Presently there is no incentive for green ship recycling. Ship owners are selling their ships to the yards offering the best price. As explained in Chapter 5, cost is the main barrier in green ship recycling and to achieve the goal of green ship recycling, co-operation from ship owners is the crucial factor so that the yards doing sub-standard practices can be discouraged. In such a situation, the market will compel those yards to develop the facilities demanded; otherwise the yards will have no option but to close down. The arrangement of a Ship Recycling Fund proposed by the author to meet the additional expenditure for green recycling, is expected to function as a commercially viable solution motivating ship owners to opt for green recycling of their ships. Consequently, the ship recycling facilities will get motivation from the demand of the market (demand-supply principle of economics) for green ship recycling. All these market-based consequences will lead to the ultimate goal of green ship recycling targeted under the Hong Kong Convention, 2009. The only thing that is to be taken care of, is the arrangement of the 'Ship Recycling Fund', its monitoring and disbursement mechanism, which should be transparent and acceptable to all the stakeholders.

As discussed in Chapter 5, assigning the responsibility to the ship owners for arrangement and control of the 'Ship Recycling Fund' along with its disbursement mechanism appears to be the best feasible mechanism to achieve the goal of green ship recycling. Ship owners can make an association like P & I Club or assign the responsibility to the existing P & I Clubs. According to the author, for a permanent solution to the ship recycling industry shifting from one place to another, the IMO can take initiatives to have a market based solution to the problem and if required, necessary provision(s) in the Hong Kong Convention, 2009 may be made in line with the system proposed above.

6.3 Conclusions

The findings of the research derived from the discussion made in the chapters of the dissertation on the issues involved in ship recycling are as follows:

- The ship recycling industry has the tendency to shift to the place having cheaper man-power, liberal regulations on safety of human-life and the environment along with a good market for scrap steel/reusable items received from ships.
- As the standard procedures of recycling are expensive, existing ship recycling yards facing tough competition, are following sub-standard procedures i.e. insufficient infrastructural and improper waste disposal facilities, workers without proper training and lacking knowledge about handling of hazardous materials. Under the standard procedures, ship recycling is done with adequate infrastructural facilities, by the trained workers with appropriate equipment along with the proper waste management facilities.
- Cost is the main barrier in achieving the goal of green ship recycling. With the intention to get the best price, ship owners sell their ships without any consideration about the recycling method to be adopted by the ship recycling yards. The yards running the business with small margin and without any long term strategy, opt for the sub-standard practices of recycling to maximise their earnings from the business.
- The Hong Kong Convention, 2009 explains the responsibility of the ship owners from the construction stage of ships to its demolition. Handling of hazardous materials from construction to the demolition stage of ships along with the condition to carry the inventory, has also been explained in detail. The responsibilities of all the stakeholders have been mentioned as well as the procedure to be followed by them for safe and green ship recycling. However, not only the support of the regulations but also a market oriented strategy needs to be developed to motivate the stakeholders for green ship recycling.
- As cost difference in the conventional and standard procedures of ship recycling is the main barrier, a market-based incentive scheme acceptable to all the

stakeholders, is required to be introduced together with the supporting Convention/regulations.

- The Ship Recycling Fund proposed to be arranged to meet the additional cost for green ship recycling, is expected to function as a commercially viable solution motivating the ship owners and recycling facilities to go for green recycling.
- All the states having maritime activities should come forward and co-operate with the IMO in achieving the safe and environment friendly sound recycling of ships targeted under the Hong Kong Convention, 2009.

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References

A Guide for Ship Scrappers: Tips for Regulatory Compliance. (2000). U.S. Environmental Protection Agency, Washington D.C.

Basel Convention Bulletin (2011, September). P. 6. Retrieved September 1, 2011 from http://www.basel.int/TheConvention/Publications/Bulletin/tabid/2366/Default.aspx

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

Beck, M. (2010, January/February). Ship recycling: Green versus greenback. P. 1. Retrieved September 13, 2010 from http://www.greendock.eu/files/1001-Shipbreaking.pdf

Buxton, I. L. (1991). The market for ship demolition, *Maritime Policy & Management* Volume 18, Issue 2, 105-112, (pp. 107 & 111-112).

Chang, Y. C., Wang, N. and Durak, O. S. (2010). Ship recycling and marine pollution. *Marine Pollution Bulletin 60 (2010),* 1395.

Demaria, F. (2010). Shipbreaking at Alang-Sosiya (India): An ecological distribution conflict. *Ecological Economics 70 (2010),* 251.

Drewry Shipping Consultants (1973, September). *The Scrapping of Ships* (Number 18). London: Author.

Drewry Shipping Consultants (1977, March). *Ship Obsolescence and Scrapping* (Number 51). London: Author.

Drewry Shipping Consultants (1996, October). *Ship Scrapping: Locations, Activity, Price Trends and Problems*. London: Author.

End-of-life Vehicles: Free Take-Back and Other Instruments (2005, March). Retrieved September 28, 2011 from www.cesifogroup.de/DocDL/dicereport305-db5.pdf

Finn, A. (2005). The Role of the Shipbroker. Paper presented in the Ship Recycling Conference, Amsterdam, 2005, April organised on *Ship Scrapping to Ship Recycling....A Willingness to Change.* Lloyd's List events.

Gipperth, L. (2009). The legal design of the international and European Union ban on tributyltin anti-fouling paint: Direct and indirect effects. *Journal of Environmental Management 90 (2009),* S86-S87.

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

Hossain, M. M. and Islam, M. M. (2006, July). *Ship Breaking Activities and its Impact on the Coastal Zone of Chittagong, Bangladesh: Towards Sustainable Management* (pp. 3, 12 & 38-43). Chittagong: Young Power in Social Action.

International Maritime Organisation (IMO) Press Release (2010, August 27). Major ship recycling country signs the Ship Recycling Convention. Retrieved August, 30, 2011 from http://www.imo.org

Is there a decent way to break up ships. (2001, February). Retrieved August 6, 2011 from www.ilo.org/public/english/dialogue/sector/.../shpbreak/index.htm

Khetriwal, D. S., Kraeuchi, P. and Schwaninger, M. (2005). A comparision of electronic waste recycling in Switzerland and in India. *Environmental Impact Assessment Review 25(2005),* 493-494.

Knapp, S., Kumar, S. N. and Remjin, A. B. (2007). The Ship Recycling Conundrum: An Econometric Analysis of Market Dynamics and Industry Trends, Retrieved August 11, 2011 from World Wide Web: repub.eur.nl/res/pub/10878/EI%202007-52.pdf

Knapp, S., Kumar, S. N. and Remjin, A. B. (2008). Econometric analysis of the ship demolition market. *Marine Policy 32 (2008),* 1024-1025 & 1027-1035.

Lai, K. H., Lun, V. Y. H., Wong, C. W. Y. and Cheng, T. C. E. (2010). Green shipping practices in the shipping industry: Conceptualization, adoption and implications. *Resources, Conservation and Recycling 55 (2011),* 636.

Lucero-Presno III (2005). Shipbreakers at Risk: Are Ships Heath Breakers? Paper presented in the Ship Recycling Conference, Amsterdam, 2005, April organised on *Ship Scrapping to Ship Recycling....A Willingness to Change.* Lloyd's List events.

Ma, S. (2002). Economics of maritime safety and environment regulations. In Grammenos, C. T. , *The Handbook of Maritime Economics and Business*. London: Lloyds of London Press.

Ma, S. (2010). Using economic measures for global control of air pollution from ships. In Grammenos, C. T. , *The Handbook of Maritime Economics and Business*. London: Lloyds of London Press.

Mikelis, N. (2006, December). *Developments and Issues on Recycling of Ships.* p. 2. Paper presented at the East Asian Seas Congress, Haikou City, Hainan Province, PR China.

Mikelis, N. (2007, September). *A statistical overview of ship recycling.* Paper presented at the International Symposium on Maritime Safety, Security & Environmental Protection, Athens, Greece.

Mikelis, N. (2010, December 9). *Multi-year Expert Meeting on Transport and Trade Facilitation.* pp. 14-23, 33, 35-37. Paper presented in the United Nations Conference on Trade and Development, Geneva.

Mikelis, N. (2011, June 27-28). *The Hong Kong Convention on Ship Recycling.* pp. 4-11. Paper presented in the Ship Recycling Workshop organised by European Union Safety Agency, Lisbon.

National Waste Management Strategy Implementation South Africa (2005, April) Retrieved September, 28, 2011 from www.sawic.org.za/documents/235.pdf

Parkinson, B. (2005). Industry Activity and Industry Code of Practice. Paper presented in the Ship Recycling Conference, Amsterdam, 2005, April organised on *Ship Scrapping to Ship Recycling....A Willingness to Change.* Lloyd's List events.

Recycling and Environmental Groups in Japan (2011, July). Retrieved September, 27, 2011 from World Wide Web: factsanddetails.com › Japan › 03Environment...

Recycling and Reuse: End-of-Life Vehicles and Producer Responsibility (2008, November). Retrieved September, 27, 2011 from www.epa.gov/oswer/international/.../200811_elv_directive.htm

Ship breaking and recycling industry in Bangladesh and Pakistan, (2010, December), World Bank Report No. 58275 SAS, p. 3.

Shipping Statistics and Market Review, Volume 54 No. 1/2, 2010, p. 35

Shipping Statistics and Market Review, Volume 54 No. 7, 2010, pp. 5-6

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

Stopford, M. (2009). Supply, Demand and Freight Rates, *Maritime Economics*. MPG Books Ltd., Bodmin, Cornwall, Great Britain

Stopford, M. (2009). The Economics of Shipbuilding and Scrapping, *Maritime Economics*. MPG Books Ltd., Bodmin, Cornwall, Great Britain

Study in relation to options for new initiatives regarding dismantling of ships. (2009, August). Brussels: Milieu Ltd. &COWI. Retrieved September 17, 2010 from http://www.ec.europa.eu/environment/waste/ships/pdf/executive_summary.pdf

The Hong Kong Ship Recycling Convention (2010) . International Chamber of Shipping International Shipping Federation, Annual Review 2010. p. 23. Retrieved August 13, 2011 from www.marisec.org/annualreview2010.pdf

The Ship Recycling Fund: Financing environmentally sound scrapping and recycling of sea-going ships. (2005, January). Rotterdam: Report by ECORYS. Retrieved August 13, 2011 from http://www.greenpeaceweb.org/shipbreak/fund.pdf

The Story of P & I Club. (2011). Retrieved September 11, 2011 from http://www.cosco.com/en/knowledgebase/detail.jsp?docId=5631

UK Ship Recycling Strategy (2007, February). p. 27. London: Department for Environment, Food and Rural Affairs. Retrieved September 2, 2011 from http://www.defra.gov.uk/environment/waste/strategy/pdf/shiprecycle-strategy.pdf

United Nations Conference on Trade and Development. (2009). *Review of Maritime Transport* (pp. 64-70). Geneva: United Nations

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

Vardar, E. and Harjono, M. (2002, January). Greenpeace Report on Environmental, Health and Safety Conditions in Aliaga Shipbreaking Yards, Izmir, Turkey. p. 3. Retrieved August 11, 2011 from www.greenpeace.org/raw/content/.../gemi-soekuemue-raporu-ingilizce.pdf

Wingfield, S. (2011). *The State of Play regarding the Basel Convention.* pp. 11-12. Paper presented in the EMSA Ship Recycling Workshop held on June 27-28, 2011.

World Bank Report Unpublished (2010, November 17). Ship Breaking and Recycling Industry in South Asia, (KP- P111045).

APPENDICES

Appendix A

Resolution 5 on the Early Implementation of the Technical Standards of the Hong Kong Convention, 2009

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RECOGNIZING the benefits to be derived from the early application of the technical standards contained in the Annex to the Convention and in the associated guidelines in respect of the environment and the occupational health and safety aspects associated with ship recycling,

1.INVITES Member States of the Organization to consider applying the technical standards contained in the Annex to the Convention on a voluntary basis to ships entitled to fly their flag, as soon as operationally feasible;

2.INVITES ALSO Member States of the Organization to consider applying the technical standards contained in the Annex to the Convention on a voluntary basis to ship recycling facilities under their jurisdiction, as soon as operationally feasible;

4. INVITES the industry to co-operate with Member States of the Organization in applying the technical standards contained in the Annex to the Convention to ships and ship recycling facilities, as appropriate.

Appendix B

CONTROLS OF HAZARDOUS MATERIALS

Hazardous Material	Definitions	Control measures
Asbestos	Materials containing asbestos	For all ships, new installation of materials which contain asbestos shall be prohibited.
Ozone-depleting substances	Ozone-depleting substances means controlled substances defined in paragraph 4 of article 1 of the Montreal Protocol on Substances that Deplete the Ozone Layer, 1987, listed in Annexes A,B,C or E to the said Protocol in force at the time of application or interpretation of this Annex. Ozone-depleting substances that may be found on board ship include, but are not limited to: Halon 1211 Bromochlorodifluoromethane Halon 1301 Bromotrifluoromethane Halon 2402 1,2-Dibromo-1,1,2,2-tetrafluoroethane (also known as Halon 114B2) CFC-11 Trichlorofluoromethane CFC-12 Dichlorodifluoromethane CFC-113 1,1,2-Trichloro-1,2,2-trifluoroethane CFC-114 1,2-Dichloro-1,1,2,2-tetrafluoroethane CFC-115 Chloropentafluoroethane	New installations which contain ozone-depleting substances shall be prohibited on all ships, except that new installations containing hydrochlorofluorocarbons (HCFCs) are permitted until 1 January 2020.
Polychlorinated biphenyls (PCB)	"Polychlorinated biphenyls" means aromatic compounds formed in such a manner that the hydrogen atoms on the biphenyl molecule (two benzene rings bonded together by a single carbon-carbon bond) may be replaced by up to ten chlorine atoms	For all ships, new installation of materials which contain Polychlorinated biphenyls shall be prohibited.
Anti-fouling compounds and systems	Anti-fouling compounds and systems regulated under Annex I to the International Convention on the Control of Harmful Anti-fouling Systems on Ships, 2001 (AFS Convention) in force at the time of application or interpretation of this Annex.	1. No ship may apply anti-fouling systems containing organotin compounds as a biocide or any other anti-fouling system whose application or use is prohibited by the AFS Convention. 2. No new ships or new installations on ships shall apply or employ anti-fouling compounds or systems in a manner inconsistent with the AFS Convention.

Appendix C

MINIMUM LIST OF ITEMS FOR THE INVENTORY OF HAZARDOUS MATERIALS

Any Hazardous Materials listed in Appendix 1
Cadmium and Cadmium Compounds
Hexavalent Chromium and Hexavalent Chromium Compounds
Lead and Lead Compounds
Mercury and Mercury Compounds
Polybrominated Biphenyl (PBBs)
Polybrominated Diphenyl Ethers (PBDEs)
Polychlorinated Naphthalenes (more than 3 chlorine atoms)
Radioactive Substances
Certain Shortchain Chlorinated Paraffins (Alkanes, C10-C13, chloro)

Appendix D

GUJARAT MARITIME BOARD, SHIP RECYCLING YARD, ALANG

STATEMENT OF SHIPS AND DESCRIBED YEARS

YEAR	NOS. OF SHIPS	LDT IN MT
1982-83	5	24716
1983-84	51	259387
1984-85	42	228237
1985-86	84	516602
1986-87	61	395139
1986-88	38	244776
1988-89	48	253991
1989-90	82	451243
1990-91	86	577124
1991-92	104	563568
1992-93	137	942601
1993-94	175	1256077
1994-95	301	2173249
1995-96	183	1252809
1996-97	348	2635830
1997-98	347	2452019
1998-99	361	3037882
1999-00	296	2752414
2000-01	295	1934825
2001-02	333	2727735
2002-03	300	2420724
2003-04	294	1986123
2004-05	196	938976
2005-06	101	480361
2006-07	136	760800
2007-08	136	643437
2008-09	264	1945540
2009-10	348	2957225
2010-11	357	3513784
2011-12(Up to Aug-11)	153	1318666.51

Port Officer
Alang

Appendix E

GUJARAT MARITIME BOARD,TRAINING AND WELFARE COMPLEX,ALANG
Nos. of workers trained during month

Month/ Year	2003	2004	2005	2006	2007	2008	2009	2010	2011
January	0	151	110	247	842	766	1109	2292	1078
February	0	449	142	203	585	766	1406	2419	1100
March	0	60	97	361	643	727	1909	2217	734
April	0	60	25	124	375	341	1130	1785	646
May	0	76	63	211	304	552	1536	919	687
June	87	56	117	387	872	752	1900	1001	855
July	118	158	85	339	947	635	2244	1541	1245
August	106	189	114	174	949	567	3461	2235	1235
September	29	123	150	107	624	1346	2115	1294	
October	36	194	47	89	300				
November	28	119	86	1287	276	377	3776	1324	
December	260	89	174	701	435	933	2357	1295	
Year wise TOTAL	664	1724	1210	4230	7152	8187	24898	18930	7580
Gross Total	**664**	**2388**	**3598**	**7828**	**14980**	**23167**	**48065**	**66995**	**74575**

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Appendix F

Year-wise Number of Fatal Accidents in Alang, Gujarat (India)

Year	Nos. of Ships	Nos. of Fetal Accidents
1996-97	348	35
1997-98	347	22
1998-99	361	24
1999-2000	296	27
2000-01	295	16
2001-02	333	09
2002-03	300	16
2003-04	294	01
2004-05	196	03
2005-06	101	07
2006-07	136	06
2007-08	136	05
2008-09	264	00
2009-10	348	14
2010-11	357	22
2011-12(up to June-11)	94	03

Appendix G

Ship Recycling Site, Alang Visit Report

The author is a student of World Maritime University (WMU) doing the post-graduation course in Maritime Affairs (specialisation in Port Management). World Maritime University is an organisation running by and for the international maritime community, operating under the auspices of the International Maritime Organisation, a specialised agency of the United Nations. Being a part of WMU family, to assist the maritime sector in achieving the goal of green ship recycling, the author chose to write a dissertation, analysing the creation of a global ship recycling fund in the frame-work of the Hong Kong International Convention for safe and environmentally sound recycling of ships, 2009.

The author visited Alang, India (19-21 September, 2011) to have first-hand knowledge of the ship recycling activities running there. Alang is a coastal town of Gujarat state located in the Gulf of Khambat, 50 kilometres southeast of Bhavnagar. Ship recycling yards in Alang-Sosiya have the advantage of the location with the highest tidal level (10 meters) in the country and the best continental self available for ship breaking in Asia. The high tide facility makes it possible to accommodate VLCC, bigger Ro-Ros and container ships to be beached during the high tide and scrapped as the tide recedes.

Visit of GMB office

The visit to Alang could be organised with the co-operation of Capt. S. C. Mathur, Chief Nautical Officer, Gujarat Maritime Board (GMB), State Govt. of Gujarat on the request of the Ministry of Shipping, Govt. of India. The visit started on 19th September, 2011 from the O/o the Gujarat Maritime Board, Alang with a small briefing by officials of GMB about the ship recycling activities and the monitoring role of GMB. Capt. S. Chadha, Port Officer, GMB who is in charge of the PMB office at Alang provided the information about the number of ships (year-wise) recycled during the period 1982-83 to 2011-2012 (up to August, 2011) which may be seen in Appendix D.

Visit to ship recycling yards

After the visit to the GMB office, the author visited Plot No.-V-1, Priya Blue Industries Pvt. Ltd. owned by the ship breaker, Mr. Sanjay Mehta. This yard has the record of dismantling the largest super-tanker of the world, 'Knock Nevis', owned by a Norwegian Company, 'Fred Olsen Production'. In the yard the author saw the state of art technique of removal of asbestos containing materials from ships and the removal of bigger parts of the ships beached to the area of the yard having permanent shaded dedicated platform for cutting them into smaller pieces. To cut the ship, the yards have a ship cutting engineer (called 'Mukdam' in local language) who decides the cutting plan of the ship as per its structure, size and type. Here the workers were wearing long boots and hand gloves but some were not wearing gloves all the time perhaps due to lack of knowledge about its impact on their health and safety. The author suggested to the manager of the yard that a small fine to the workers found working without gloves be imposed so that it becomes their habit to always wear gloves.

The author visited Plot No.-2, Leela Ship Recycling Pvt. Ltd. also. This yard was equipped properly having an asbestos handling unit, incinerator, medical and training facilities for the workers inside. The yard was functioning with safe and environment friendly facilities for green ship recycling.

Visit to the Safety Training Institute

Further, the author visited the training institute at Alang, which is responsible for organising the training programme for workers on safety and waste management of ship recycling. The training programmes are normally for 2-3 days duration covering different aspects of ship recycling. Apart from the training programme, socio-economic activities are also arranged by the institute involving the workers' families to make them able to earn something from arts and craft. Therefore, the institute has the name, 'Training and Welfare Complex, Alang'. The institute management discussed the problem in achieving the goal of 100% workers trained due to migrated labour force. As per them, in ship recycling activities the labour-force involved is the labour migrated from other parts of

the country and from time to time they escape to their native places. Discontinuation of the labour in ship recycling work makes the training programme run by the government infructuous. The author advised the management to arrange workshops sometimes for yard owners and their management staff to have discussion towards exploring the solution of such problems. The institute provided the details about the workers trained since its inception i.e. 2003 to August, 2011, which can be seen in Appendix E. Furthermore, the institute provided the information about year-wise numbers of fatal accidents during the period 1996-97 to 2011-2012 (up to June, 2011), which can be seen in Appendix F.

Visit to the Waste Management Site

Finally, the author visited the site of waste management where he saw the land fill sites for disposal of asbestos and other hazardous materials. The dedicated land fill facility for disposal of the wastes generated by ship recycling can be called a good initiative of GMB.

The next day i.e. 20th September, 2011 the author visited the Ship Recycling Industries Association (India), Bhavnagar and met with the President of the Association (Mr. Vishnu Kumar Gupta) and Mr. Nitin Kanakya, having a long discussion on different issues of ship recycling. After that the author visited the O/o the Regional Officer, Gujarat Pollution Control Board, Bhavnagar, Mr. Shah and discussed with him about the waste management of ship recycling done by GMB. He explained about the arrangements already made by GMB and its future plan to make Alang ship recycling area like Bharuch (Gujarat), where the green belt has been developed by the State Govt. on the waste disposal site.

On the last day of the tour the author visited the Head Quarters of GMB at Gandhi Nagar (the capital of Gujarat state). There he met with the Senior Environmental Engineer, GMB (Mr. Atul Sharma) and discussed about the waste management work done by GMB for all types of industrial wastes including ship recycling. He explained the changes that had happened after the Supreme Court of India order dt. 06/09/2007 in a

hazardous waste (Blue Lady Ship breaking) case, asking the government to do what was needed to ensure safety and waste management.

Before the visit to Alang, the author visited the Ministry of Steel, Government of India, Delhi on 16/09/2011. As ship recycling provides good enough scrap steel for recycling, it is the subject matter coming under this Ministry; the author discussed ship recycling with officer of the Ministry (Mr. C. A. Jhoseph, Under Secretary) concerned. A copy of the unpublished report of World Bank on ship recycling in South Asia, submitted to the Government of India for its consent before publishing, has also been provided by the officer. This report contained quite useful and the latest information on ship recycling in South Asia (Bangladesh, India and Pakistan). The author utilised the report in the dissertation to show the ship recycling forecasted for the period 2010-2030.

The present visit to Alang, India for first hand information on ship recycling was very useful and valuable especially for the research work on the subject.

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