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Scope

Scope of this thesis is to better understand the demolition market. That's why we set several questions and tried to thoroughly answer them.

At first we wrote down the factors that drive the supply and demand side and finally set the equilibrium in the market. However apart from the economical description of the demolition market, the every day business is also to be explained. For example what are the options the ship owner has when he decides to have his vessel demolished? What are the common practices followed by those participating in the market?

Following the data collected by the Clarkson's Intelligence Network it was evident that demolition market is dominated by Asian countries (India, Pakistan, Bangladesh and China). Which are the main reasons that offer the advantage to asian ship breaking yards compared to these in western economies (UK, USA, Germany etc.)?

However, since there are several environmental and human casualties due to ship breaking industry, why dominant asian countries give many incentives in order to further develop this industry? Ship breaking countries gain many economical benefits from the demolition market and several domestic markets dependant to the ship breaking are appeared.

Furthermore from all the asian countries which are these that dominate the demolition market? When did China, India or Bangladesh enter the market? Which country is more favorable for tankers' or bulk carriers' demolition? Which countries are more competitive in terms of scrap prices?

Next we present the variables that affect the probability of scrapping and their effect on the major ship breaking countries (India, China, Bangladesh and Pakistan).

Finally we collected several data of the years 2000-2009 in order to examine the correlation between the world merchandise trade on one hand and the demolition and freight market on the other hand.

Summary

At the end of their operational life vessels must be withdrawn. There are several ways of disposing a ship, however this thesis touches upon the technique of ship breaking.

Ship breaking is conducted either in dry docks or on beach. Dry dock is preferable as far as the workers safety and environmental protection is concerned while beaching is much cheaper.

Like in all other markets, demand and supply side are those that set the equilibrium in the demolition market. Supply side refers to the ship owners and their decision on when to sell for scrap. Factors that drive this decision are the freight market conditions, cost of keeping the vessel in operation, age profile of existing ship, size of current fleet and regulation. On the other side demand refers to the ship breakers and their decision on whether to stay in the industry or not. Breakers are to compare their expected revenues versus their running costs in order to decide. Domestic demand for steel and other reusable items is the main source of their revenues.

Apart from the ship owners and the breakers there are also other players in the market such as brokers and the cash buyers who intervene between the seller and the end buyer.

Areas dominant in this market are Asian countries which recycled the 86% of total number of vessels demolished the last decade. One of the main reasons for this dominance is the lax environmental regime established in these countries. Even though these areas are parts to the Basel Convention they do not implement any environmental

precautions due to high internal corruption scores. The International Maritime Organization in an effort to control the environmental hazards developed the new Hong Kong International Convention for the Safe and environmentally sound recycling of ships, 2009. However since this Convention affects the whole operational life of a vessel, the cost of implementing it is estimated to 50-100 \$ per LDT for ship owners and 200.000.000 \$ for ship breaking yards. These extra costs raises concerns for the creation of two distinct recycling markets, one for Convention ships and one for non- Convention ships.

Another reason for Asian countries dominance is the tremendous lower labour cost compared to this in western countries like USA, UK, France, and Germany. Other factors contributing to this dominance are also the increased domestic demand for steel, domestic market for second hand equipment and machinery, beaching tides which favor the scrapping technique of beaching, exchange rates between the American dollar and the local Asian currencies and finally cyclical nature of the demolition market.

However despite the human and environmental hazards ship breaking countries encourage the development of the industry since it offers several benefits. At first demolition activity provides employment to thousands of workers directly and indirectly. Domestic needs for steel are covered by the scrap steel without exploiting the natural resources while at the same time states reduce steel imports saving a lot of money in foreign exchange. At last through the payment of taxes governments gain an important source of revenues.

China, India, Bangladesh and Pakistan are the major ship breaking countries. In 2003 China broke the USD 300/ldt price barrier for the first time in demolition history. Up to 2003 India was the leader of the market in terms of number of vessels scrapped while from 2004 and later Bangladesh gets the higher market share of tonnage demolished.

Variables like age, tonnage and scrap price affect positively the probability of scrapping, while earnings affect this probability negatively. Regarding ship's registry HKC ratification by EU member states will most likely affect Turkey while ratification by major flags will affect China.

Finally for the scope of this thesis we collected several data of the years 2000-2009 in order to examine the correlation between the world merchandise trade on one hand and the demolition and freight market on the other hand. As expected world trade is negatively correlated with the demolition market and positively with the freight market. This means that growth in the world trade leads to growth in the freight market and depression to the demolition market.

1. Ways of ships' disposal

All vessels have a life expectancy of approximately 25 -30 years. With hundreds of ships being built and delivered it's year to their owners, old ships are withdrawn. Money required for these old ships' maintenance, makes their operation uneconomical and the torch is passed to the new buildings and younger ships.

There are several ways of disposing a ship since this has reached the end of it's effective and operational life. These are the following:

- a) Hulking: Ship is stripped of it's motive equipment and the hull is converted in order to be used for another purposes.
- b) Artificial reefing: All toxic components and electrical devices are removed from the interior of the vessel and then this is sunk offshore resulting reefs formation. This option of ship disposal can be feasible only after relevant approval has been obtained by state authorities.
- c) Donation or sale: Vessel is donated or sold in order to be further used as a second hand.
- d) Deep water sinking of vessels provided that all toxic compounds and devices are previously removed.
- e) Floating or dry dock storage: However this option is expensive and as a result not usually seen.
- f) Ship breaking or ship demolition: Interior equipment of ship is removed and the hull is being broken up. Materials from the ships like electrical equipment and especially steel can be reused after the ship breaking.

This thesis touches upon only the ship breaking since this is the most commonly used method of ship disposal.

In order any misunderstandings to be avoided the following definitions are given:

Word	Definition
Decommission	Taking an end-of-life ship out of service
Dismantle	The physical process of taking the ship apart, not including beaching
Demolition	The process of taking a ship apart, including beaching
Ship breaking	The process of taking a ship apart, including beaching
Recycling	The process of taking a ship apart, when procedures with respect for the environment and workers health and safety are applied, "green recycling"
Scrapping	"Neutral" word for the process of taking a ship apart without considering the procedures used

Table No1: Ways of ships' disposal, Source: European Commission Directorate-General Energy and Transport Oil Tanker Phase Out and the Ship Scrapping Industry

A study on the implications of the accelerated phase out scheme of single hull tankers proposed by the EU for the world ship scrapping and recycling industry, June 2004

1.1 Techniques of ship breaking

The two methods of scrapping a ship are the afloat (beaching) method and the dry-dock method.

The afloat method is generally less expensive but more difficult and dangerous as far as the workers and the environment are concerned than the dry-dock method.

The ship is anchored in international waters off the territory where the ship breaking yard is located and the first administrative steps are set in motion. For formality reasons, the ship is inspected, checked and made gas free. Other teams from the plot where the ship is to be broken, including a non-ferrous metal dismantler, inspect the vessel to assess the best way to break it. Finally, once all the administrative formalities have been completed, the Port Authority issues a permit for the ship to enter territorial waters for beaching. The ship's captain puts the ship in position off the coast and waits for the ideal time to perform the beaching manoeuvre. Vessels are beached by own propulsion power at high tide, while during low tide vessels are lying stable on their flat bottom. Ship must be grounded as high as possible on the beach in order dismantling operations to be facilitated. Beaching has a crucial impact on the final cost, since time needed for dismantling can be doubled, if the beaching operation is not successful.

During the second phase, cutters and their helpers start cutting the vessel into parts. The breaking operation is undertaken based on the structural design of the vessel. The larger parts are dragged to the dry part of the shore with the help of motorized pulley. A large number of workers are also engaged in this operation. Though the motor does the main job, workers need to help the pulley driver in dragging the part to the dry area of the shore. Another group of cutters, helpers and workers start cutting the dragged parts of the ship into truck able parts as per order of the purchasers. Heavy equipment like boilers, motors, capstan stocking etc. are carried to stack yards by moving crane. The unskilled workers carry metal plates, metal bars or pipes on their heads or shoulders, start walking in synchronized steps with the rhythm of the singers call up to a definite destination and then pile up metal plates in stack yards or load them on trucks. There are also supervisors who over watch the group of workers. The ship is cut down into different pieces and winched to the shore at high tide and further large portion is cut into suitable pieces on the beach for easier loading and transportations.

The valuable components (e.g. small motors and pumps, generator, navigation equipments, life saving equipments, furniture, electrical cables, utensils etc.) are dismantled and sold to second hand market situated nearby ship breaking yards. It needs 5-6 months to dismantle a typical cargo ship.



Figure: Loading of metal plate on truck, Source: **Ship Breaking Activities and its Impact on the Coastal Zone of Chittagong, Bangladesh: Towards Sustainable Management**, Young Power in Social Action (YPSA), July 2006

Scrapping a ship in a dry-dock is more expensive, yet it is easier to scrap the vessel. Since the ship is not in the water, the workers can immediately begin separating the vessel into large sections, then move the large sections to other areas to be cut into smaller sections.

A diagram of all rooms, compartments, tanks, and storage areas is used (or prepared if not available) to identify areas that may contain hazardous and/or combustible materials since gas cutting is used and explosions and spills need to be prevented. The removal of fuels, oils, other liquids (e.g., bilge and ballast water), and combustible materials from the ship generally occurs throughout the ship scrapping process. Following removal activities, a marine chemist is contracted to certify that the ship is safe for workers or safe for hot work allowing the issuance of hot work permits. Hot work permits allow cutting torches and saws to be used to dismantle the ship.

2. Demolition Market (theoretical frame)¹

Demolition market is one part of the shipping industry. More detailed shipping industry embodies four markets:

- The **new building market** which trades new vessels
- The **freight market** which trades sea transport services
- The **sale and purchase market** which trades second-hand vessels
- The **demolition market** which trades old and obsolete vessels.

Above mentioned markets are closely related and usually follow a chain reaction. If for example only few new ships are built and the demand for sea transport services increases (for example due to an upswing in the global economy) the price for sea transport services will increase. This will affect both the second-hand market and the demolition market. The price for second-hand ships will increase reflecting the higher earning potential and fewer ships will be sold for scrapping, also affecting the price in the demolition market. This will lead to an increased activity in the new building market and, eventually, to a downward pressure on the price for sea transport services due to the increased supply of sea transport service.

In times of oversupply of vessels or over demand of transport services the demolition market is the one that brings back the equilibrium in the shipping industry as a whole regulating the new building and the freight market respectively. This is the major economical impact of the demolition market in the shipping industry.

Demolition market like all other markets has two sides, the supply and demand of vessels for scrapping.

¹ European Commission Directorate-General Energy and Transport Oil Tanker Phase Out and the Ship Scrapping Industry

A study on the implications of the accelerated phase out scheme of single hull tankers proposed by the EU for the world ship scrapping and recycling industry, June 2004

2.1 Supply of vessels for demolition

Ship owners sell their vessels and are paid by the ship scrappers. Supply curve is as shown below:

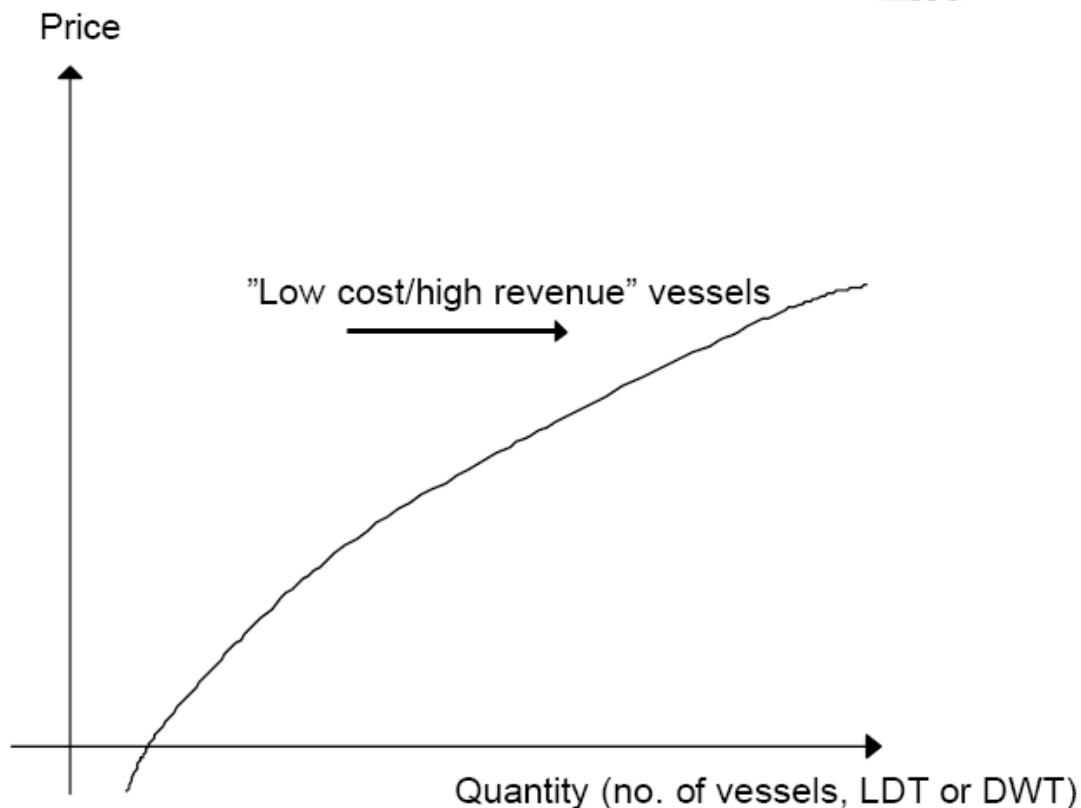


Figure No1: Supply curve of vessels for demolition , Source: European Commission Directorate-General Energy and Transport Oil Tanker Phase Out and the Ship Scrapping Industry

A study on the implications of the accelerated phase out scheme of single hull tankers proposed by the EU for the world ship scrapping and recycling industry, June 2004

The higher the price offered by the ship scrappers the more vessels are sold for scrap by ship owners and vice versa.

Ship owners on their decision when to offer their vessels for scrap should take into consideration two things. On one hand the freight market since their main revenue comes from freights and on the other hand the below mentioned factors. If the general **freight market conditions** are favourable and future earning potential is positive, ship owners are more hesitant to sell for scrap and require higher prices from the ship scrappers. The opposite is happening if freight market is weak.

When revenue from freight market can not outweigh below mentioned factors, ship owner may find it optimal to sell the vessel for scrap.

These factors are:

- **Cost of keeping the ship in operation:** This category embodies among else cost of bunkers, labour costs, supply costs, survey costs etc. As the vessel grows older, the cost of keeping it in operation increases while at the same time it's scrap value declines. It is worth mentioning that most vessels are sold for scrap before their fifth special survey at age of 25. Freight rates have to be strong in order to justify the additional investments needed by the ship owner following the fifth special survey. As a result if the cost of keeping the vessel in operation increases, ship owners require lower prices from the ship scrappers and vice versa.

- **Age profile of existing fleet:** As mentioned earlier the older the vessel is, earning potentials decline while running costs increase. If the average age profile of existing fleet is old, then ship owners will require lower prices to sell to the ship scrappers.
- **The size of current fleet:** Keeping all other things equal an increase in the world fleet will lead to an increased supply of vessels in the demolition market and a decrease in the scrap values offered by the ship scrappers.
- **Regulation:** Many international organizations like IMO, ILO etc pose regulatory requirements and try to construct an institutional frame in order to protect the marine environment, the safety and health of those working in the shipping industry etc. These regulations like the MARPOL phase out regulation, the Hong Kong IMO Convention etc have a strong economical impact on the shipping industry. MARPOL phase out regulation for example forced many ship owners to sell their single hull vessels for scrap increasing by this the supply of vessels in demolition market.

To sum up ship owners' decision on when to sell their vessel for scrap is mostly driven by whether the freight rates outweigh the vessel's operational costs or not. Scrap prices are shaped by the vessels' supply and do not actually affect ship owners' decision on **when** to sell for scrap but on **where** to sell.

2.2 Demand of vessels for demolition

Ship scrappers are entering the demolition market by buying vessels for scrap in order later to sell the steel and reusable items from the ship. The demand demolition market is as shown below:

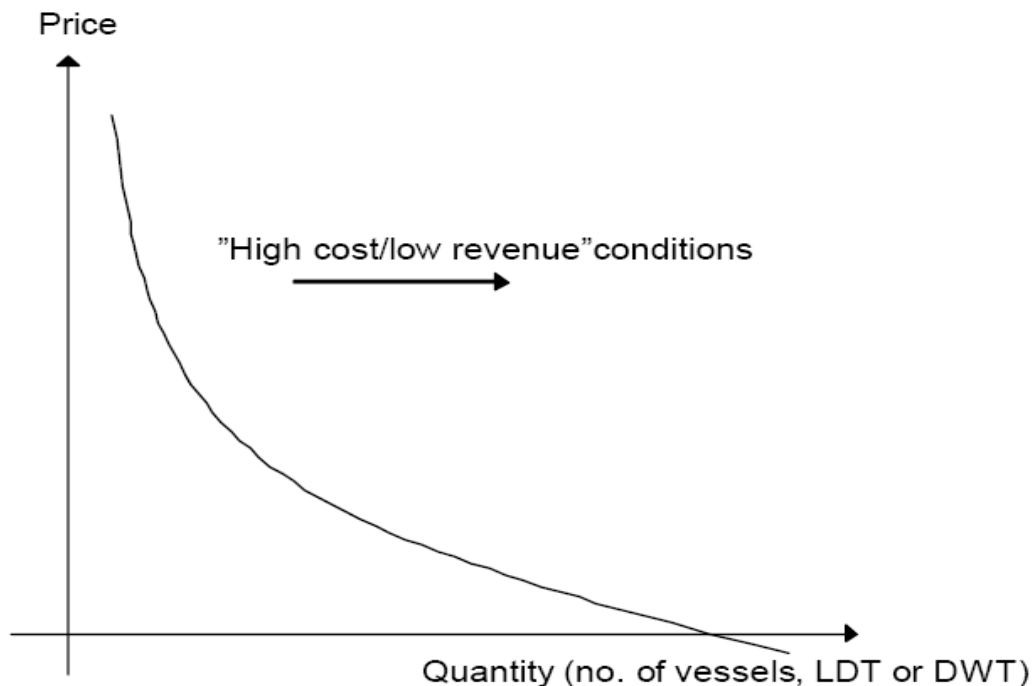


Figure No2: Demand curve of vessels for demolition , Source: European Commission Directorate-General Energy and Transport Oil Tanker Phase Out and the Ship Scrapping Industry
A study on the implications of the accelerated phase out scheme of single hull tankers proposed by the EU for the world ship scrapping and recycling industry, June 2004

As the quantity of vessels sold for scrap increases, the scrap prices offered by the ship scrappers decrease. Negative prices mean that there is such an oversupply of vessels for scrap that ship owners have to pay the ship scrappers in order to demolish their ships or that the operational costs of the yard are so increased that needs to be paid in order to afford to break the ship.

Ship scrappers have to compare their revenues and costs in order to decide whether to stay in the industry or not. This decision is mostly driven by the following factors:

- **Demand for steel and other reusable items:** When the demand for steel and other reusable items increases, the ship scrappers' earning potential increases. Hence, the ship scrappers are willing to pay more for a vessel for demolition. In some countries (Asia) demand for steel and reusable items is high. As a result keeping all other things equal ship scrappers in these countries can offer higher scrap prices since they have better revenue possibilities.

- **Running Costs:** Running costs are determined mostly by local conditions. An increase could lower ship scrappers' willingness to pay for a vessel sold for scrap and vice versa. Running costs embody:

- Labour costs* since ship demolition is a very labour intensive industry.
- Waste disposal costs*
- Costs implied by regulation (safety, health and environment)*
- Import duties, levies and taxes*
- Capital costs:* Better technologies improve productivity and it is maybe the only solution for the "high cost" industrialized countries to develop domestic demolition industry depended on efficient non labour intensive techniques.
- Infrastructure:* The better the infrastructure (road/ railway network) the lower the running costs.

- **Exchange rates:** Exchange rates naturally affect the competitiveness of the ship scrapping yards , as the costs of the ship scrapping yard are paid in local currency (except from the vessels for decommissioning which are paid mostly in USD dollars)

In conclusion ship scrapper should compare the expected revenues with his running costs in order to decide whether to stay in the business or not, and if yes which scrap price is going to offer in the market.

To sum up below graph shows factors that drive ship owner's decision (supply side) and factors which formulate scrap prices offered by ship scrappers (demand side).

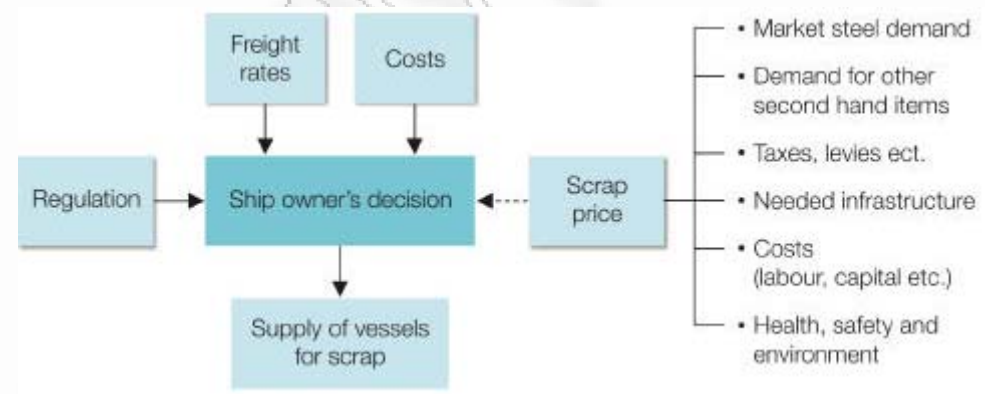


Figure No3 – Source: European Commission Directorate-General Energy and Transport Oil Tanker Phase Out and the Ship Scrapping Industry
 A study on the implications of the accelerated phase out scheme of single hull tankers proposed by the EU for the world ship scrapping and recycling industry, June 2004

2.3 Demolition Market Equilibrium

Below figure shows that at a certain quantity (q^*) of vessels sold for scrap, a certain scrap price is to be offered (p^*).

Historically scrap prices are positive and ship owners are paid by ship scrappers in order to have their vessels demolished. However it may be cases where there is such an oversupply of vessels that high cost scrapping yards are entering the market and negative prices appear. If no ship owners are willing to pay for getting their vessels scrapped, no negative price levels will be observed in the market. The only indicator that the equilibrium price is negative will be the setting up of semi-permanent anchoring.

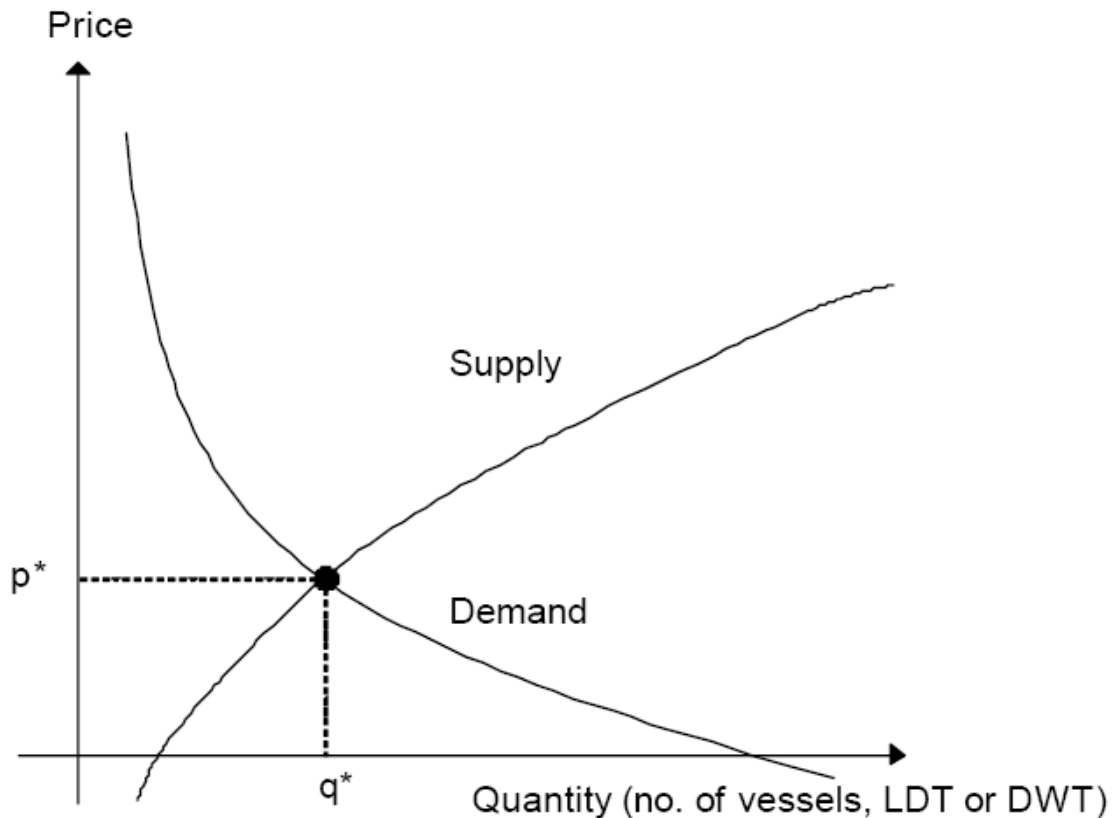


Figure No 4: Demolition market equilibrium, Source: European Commission Directorate-General Energy and Transport Oil Tanker Phase Out and the Ship Scrapping Industry

A study on the implications of the accelerated phase out scheme of single hull tankers proposed by the EU for the world ship scrapping and recycling industry, June 2004.

Key factors that affect the balance between the demand and supply in the ship scrapping industry are the following:

- **Freight Rates:** When freight rates are high, ship owners are more hesitant to sell their vessels for scrap and prefer to keep them in operation. This will lead to fewer vessels sold for demolition and higher scrap prices offered by the ship scrappers.

Technically supply curve is shifted upwards intersecting demand curve at a new point (New Equilibrium).

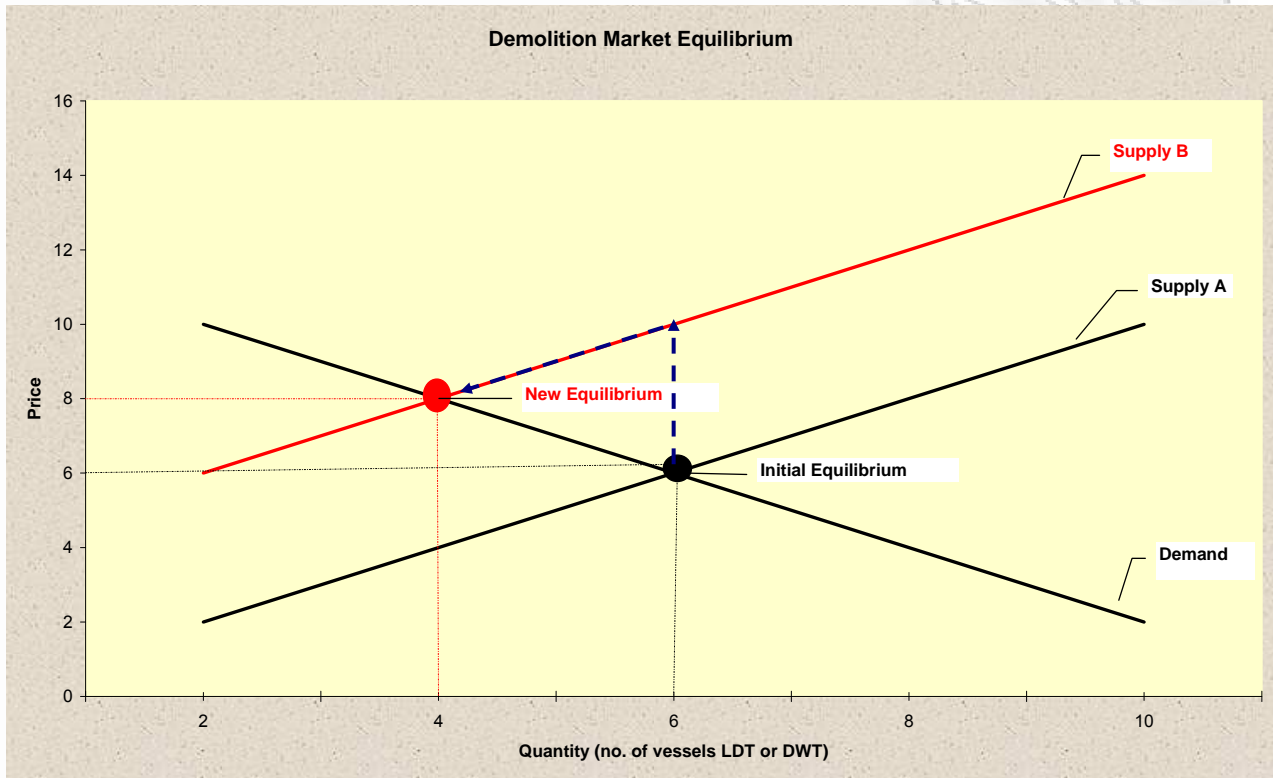


Figure No 5 : Shift of supply curve due to freight rates increase

- Phase out schemes:** When a regulation dictates the phase out of certain ships before the ship owners would otherwise find it optimal to scrap them, this will increase the ships sent for demolition. As a result scrap prices will decrease and more ship scrappers will appear in the market. Technically, as shown in the below graph, supply curve is moving downwards intersecting demand curve at a new point (New Equilibrium). Recent example of such regulation is the amended MARPOL 73/78 which dictates the gradual single hull tankers phase out.

In cases when the oversupply of vessels is such that can not be satisfied by the existing “low cost” ship scrappers, then “high cost” ship scrappers will also join the business and scrap prices may become negative (ship owners have to pay in order to have their vessels scrapped). When more ships are scrapped, keeping all other stable, supply of the sea transport services declines. This leads to increased freight rates which on their turn lead to increased demand for new vessels.

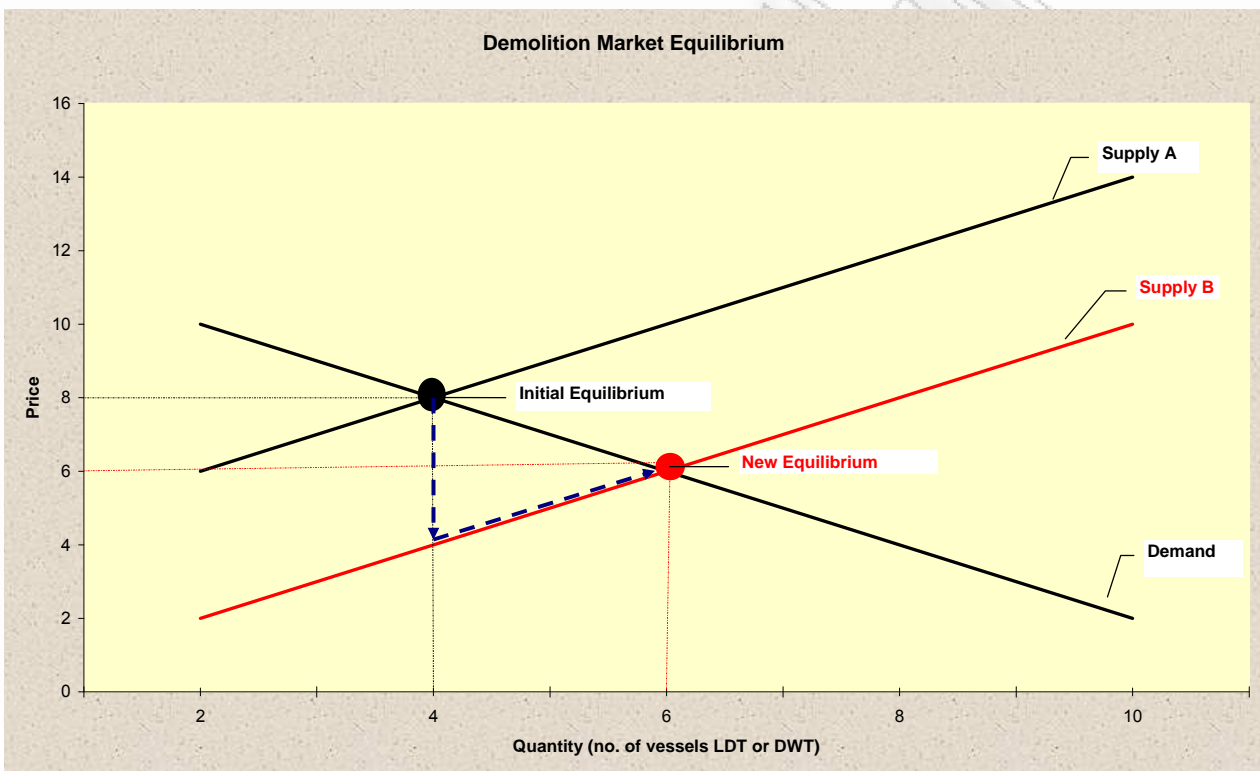


Figure No 6. : Shift of supply curve due to phase-out regulation

- **Fluctuations in steel prices:** Most revenue of ship scrappers comes from the recycled steel that they later resale after ship's demolition. As indicated to the below table, steel is the dominating material on both types of vessels, bulkers and tankers, and including machinery accounts for around 80-90% of the LDT of a ship.

	Fraction, % of total weight	
	Tanker	Bulker
Steel	74	63
Copper	0.01	0.04
Zinc	0.03	0.04
Special bronze	0.03	0.04
Machinery	14	19
Electrical equipment	2.5	5
Joinery	5	6
Minerals	0.5	2.5
Plastics	0.5	1.2
Liquids	2	1
Chemicals and gases	0.03	0.03
Other misc.	1	2
Total	100	100

Table No 3: Fractioning of a typical tanker and bulker, % of total weight, Source: European Commission Directorate-General Energy and Transport Oil Tanker Phase Out and the Ship Scrapping Industry
 A study on the implications of the accelerated phase out scheme of single hull tankers proposed by the EU for the world ship scrapping and recycling industry, June 2004

If steel prices increase, then ship scrappers will be willing to pay more for the vessels, prices will increase and more vessels are to be sold for demolition. As a result demand curve will shift upwards (Demand B) and will intersect supply curve at a new point (New Equilibrium).

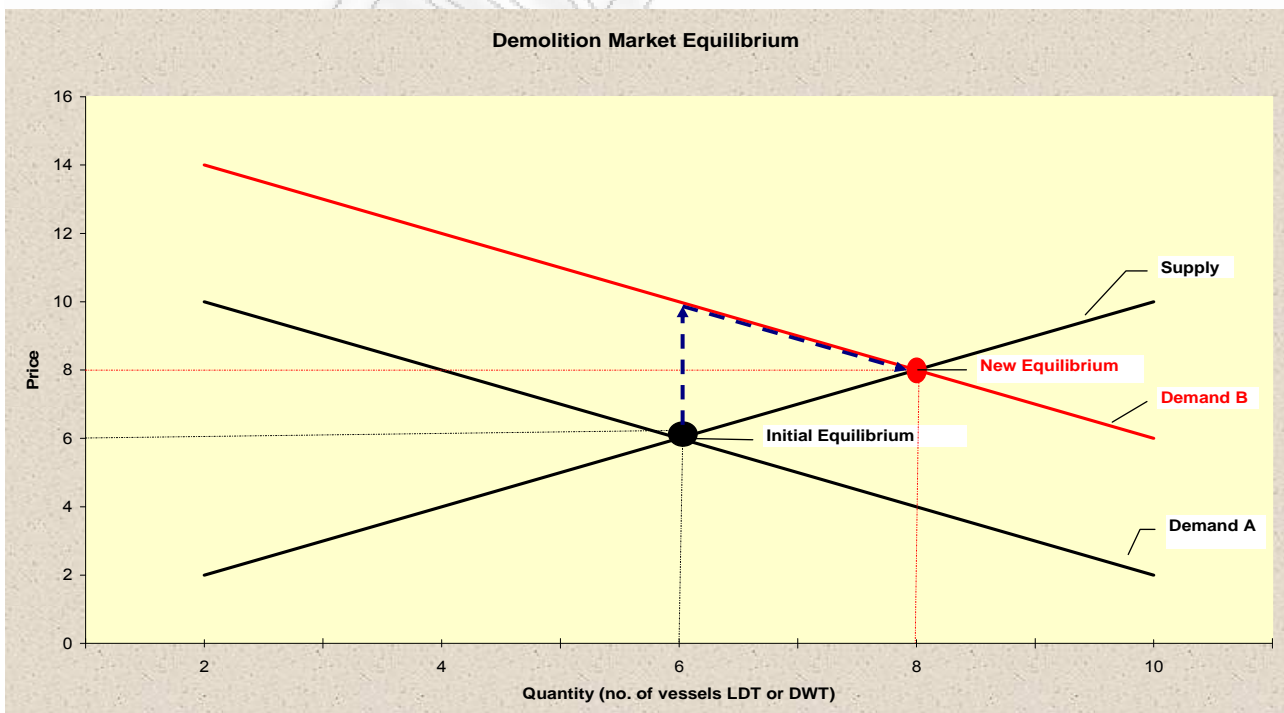


Figure No 7 : Shift of supply curve due to fluctuations of steel price

A higher level of decommissioning will result in more recycled steel on the market, which could, eventually, affect the price of recycled steel. However, BIMCO (2002, page 12) concluded that: "recycled steel from ships forms an insignificant share of total steel production, as well as of the global supply of recycled steel". Hence, the price for steel can be considered as exogenous in this context, i.e. the steel price is not significantly affected by the developments in the ship demolition market.

- **Health, safety and environmental regulation:** Regulations set for the protection of workers' health, safety or protection of environment usually increases the costs of scrapping a ship. However most of these regulations are implemented locally and affect certain ship scrappers. In cases where a regulation affects a major number of ship scrappers, this increase in the cost of scrapping will lead to a decrease of the demand of ships for scrap. As a result demand curve will shift downwards (Demand B) and scrap prices offered will be lower.

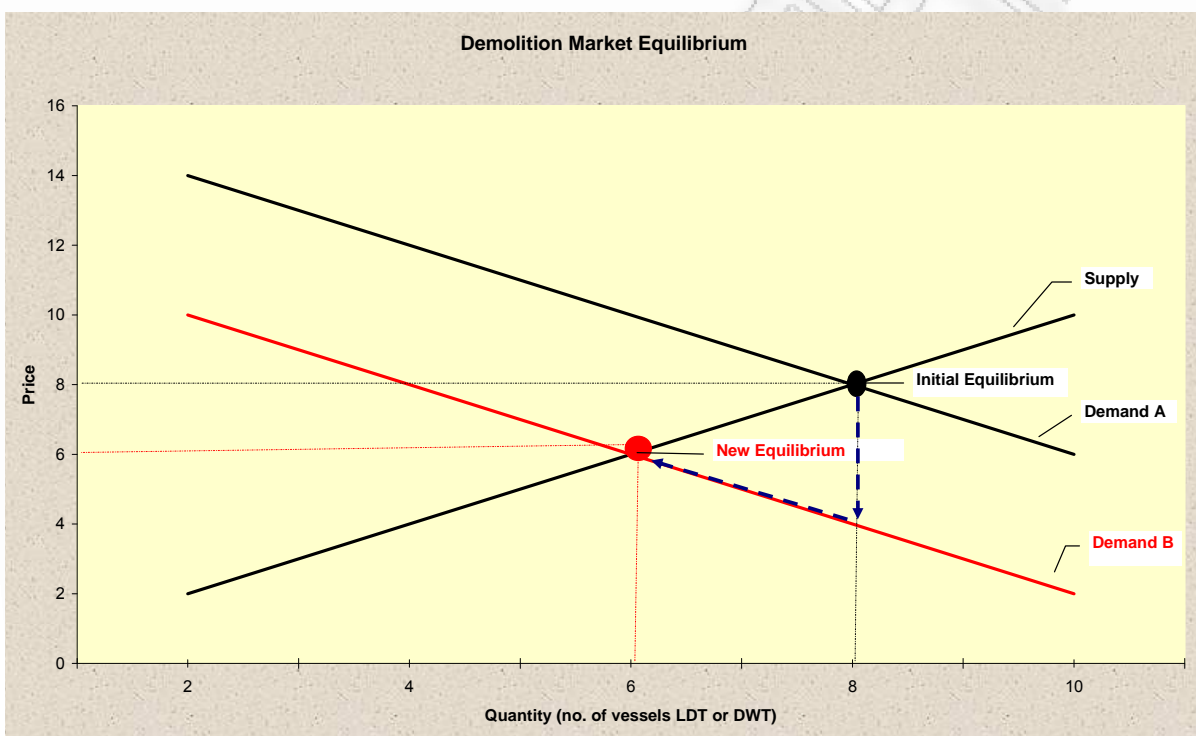


Figure No 8 : Shift of supply curve due to implementation of health, safety and/or environmental regulation

- **Market Interactions:** The implementation of a worldwide control and command regulation or the subsidy of the "high cost" recyclers will lead to the formation of a new demand curve. This curve would probably embody the "high cost" recyclers who due to subsidy will be able to offer prices for demolition competitive to prices offered by "low cost" scrappers.

3. Ship Recycling Process

When a ship owner decides to recycle his vessel, he sells it to a ship recycling facility for a price. This scrap price is estimated usually in USD\$/LDT and varies from one ship recycling facility to another. As earlier mentioned features that determine level of scrap prices are the freight rates, phase out schemes, fluctuation in steel prices and domestic demand for steel, implementation of new regulations.

Ship owner has three options to have his vessel recycled.

1. **Direct sale:** The shipping company direct sales the vessel to the ship breaking facility. This means that the company has dedicated staff with detailed knowledge of the recycling market regarding prices, ship breaking countries, availability of ship recycling facilities compliant with the international environmental regulations etc. This is viable only for large shipping companies and if the recycling process is successfully completed it offers relatively better returns from the sale.
2. **Brokering:** Ship owners in order to avoid the above mentioned need for experienced staff dealing with the recycling issues, many times prefer to hire brokers who search the best options in the market in the name of ship owner. When the process is completed they get their commission as a percentage of the final sale price of the vessel.
3. **Cash Buyers:** Cash buyers have become perhaps the most critical component in the ship recycling process. A "CASH BUYER" as the name suggests, is an entity that purchases a vessel for "Cash" and delivers it to a recycling yard for the purpose of recycling. Cash buyers have the same legal responsibility for the ship as a ship owner. They have developed life-long relationships with ship recycling facilities which result into well synchronized conclusion of the transaction. They deal with all demolition markets and thus are able to offer the best scrap price – vessel's value combination. Finally their familiarity with the ship breakers increases the likelihood of finding a suitable yard, compliant with the existing environmental regulations.

In approximately 90% of contracts vessel is delivered at yard, while in only 10% of contracts vessel is sold on a "as is/where is" basis. This means that the ship owner sells his vessel "as is" at the time of the selling and the cash buyer has the obligation to deliver the vessel at the yard. Many cash buyers deal with both dead vessels (under tow) and laid-up vessels which are reactivated by special teams and delivered to the recycling yards either with cargo or in ballast.

There are many business functions need to be performed in order a recycling process to be successfully completed. Ship owners, brokers or cash buyers have to be able to identify the most competitive recycling country (e.g., China, India, Bangladesh, Pakistan, etc.) and then can market the vessel to the most competitive facility.

Cash Buyer shall be able to finance the purchase of the vessel for end buyers by extending credit terms while simultaneously buy the vessel on straight cash basis from the owners. For example the world's largest cash buyer of ships for demolition, Global Marketing Systems (GMS) has extremely efficient banking relationships. When needed, bankers personally get involved and talk directly to sellers, their brokers, their bankers and lawyers to ensure smooth closing and payment process. Most banking is done via USA and UK jurisdictions—a more secure and better legal environment.

In today's highly competitive and volatile demolition markets, scrap prices often change by the time the vessel arrives at the port of delivery. Historically, cash buyers have simply 'passed-on' this loss (due to market corrections) to owners, under the guise of vessel mis-description. Cash buyers shall effectively forecast future prices as well as future exchange rates and work as a "buffer" between the end buyers and owners. This minimizes the risk of renegotiating upon delivery of the vessel and cash buyer is able to keep his reputation.

At last ship owners should take many things into consideration in order to choose a cash buyer. These are his management style, his performance record, his market share, whether purchasing vessels for demolition is his primary business etc.

4. Demolition Areas

As indicated in the below figures (Figure No. 9&10) the demolition market is dominated by Asian countries like India, Bangladesh, China and Pakistan.

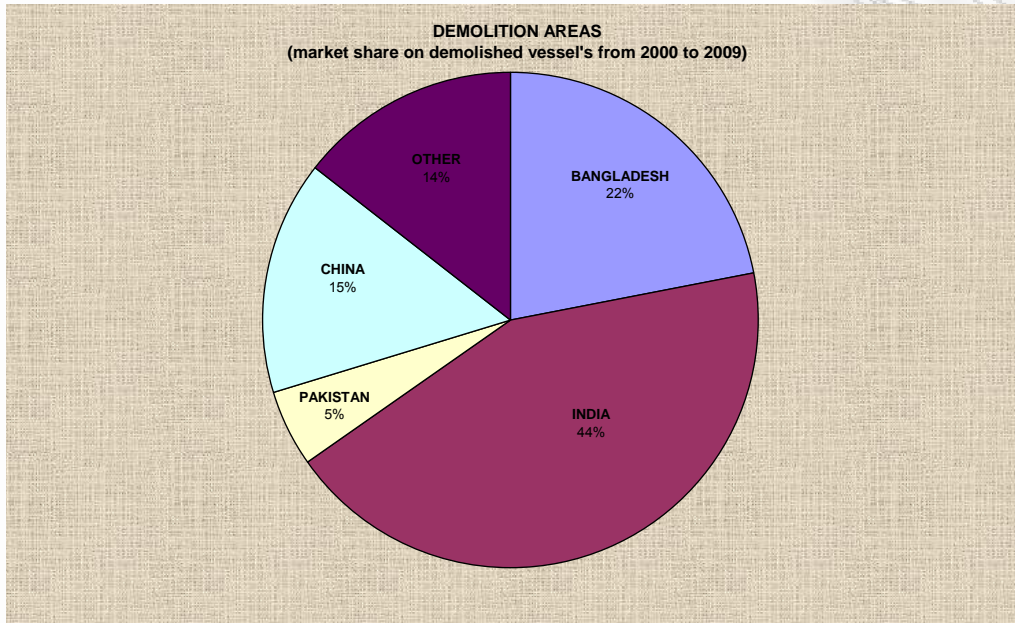


Figure No 9- Demolition Areas, Source: Clarkson's Shipping Intelligence Network

Country/ Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	TOTAL
BANGLADESH	63	123	68	49	86	66	126	81	152	193	1007
PAKISTAN	19	26	12	25	12	5	8	19	16	85	227
CHINA	86	81	96	131	48	16	10	8	30	200	706
INDIA	278	288	310	273	108	45	47	79	156	396	1980
OTHER	87	71	76	81	42	33	32	39	29	166	656

Table No 4: Number of vessels demolished from 2000-2009, Source: Clarkson's Shipping Intelligence Network

Total historical ship scrapping volumes, all types by region (share of LDT)

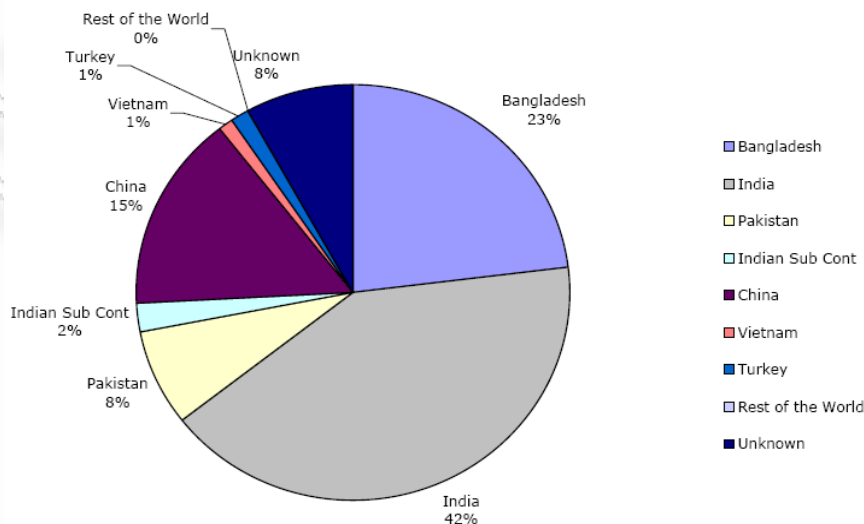


Figure No 10 – Source: COMMISSION STAFF WORKING DOCUMENT-Accompanying document to the GREEN PAPER on better ship dismantling -{COM(2007) 269 final}

The graphs show that in the past 10 years decommissioning of ships have been heavily concentrated in countries in the Indian Sub Continent and Asia. Thus, ship breaking in India, Bangladesh, Pakistan, and China has accounted for more than 90% of the total volume of ships scrapped (LDT). Only a small amount of ship scrapping has been carried out in Western Europe and other OECD countries. Less than 2% of the ship scrapping seen from 1994-2003 has taken place in Europe of which Turkey alone accounts for more than 85%.

Shipyards in Indian Sub Continent and Asia offer higher scrapped prices than European- American yards to ship owners and this is why they are more competitive. Main reasons which offer to Asian shipyards the advantage to offer higher scrapped prices are the following:

1. lax environmental regime
2. low labour cost
3. increased domestic demand for steel
4. domestic market for second hand equipment and machinery
5. beaching tides which favour the scrapping technique of beaching
6. exchange rate between American dollar and local currencies
7. Cyclical nature of demolition market. *(Since there is no standard inflow of scrapped vessels, no fix income is generated in order organized yards to be able to estimate and cover their fix costs and develop their business plan)*

It is obvious to see that these reasons match with the factors earlier presented that drive the demand of ships for demolition.

4.1 Environmental Regulations

Beaching is the technique that dominating ship scrappers (India, Bangladesh, Pakistan) use in order to have the vessels demolished. However this process of ship breaking raises many environmental and health concerns.

Pollutants discharged from shipbreaking and its impact²

Ninety-five per cent (95%) of scrapped vessels weight is steel, coated with tons of paint containing lead, cadmium, organotins, arsenic, zinc and chromium. Ships also contain a wide range of other hazardous wastes, sealants containing Polychlorinated biphenyls(PCB), tones of various types of asbestos and several thousands liters of oil (engine oil, bilge oil, hydraulic and lubricants oils and grease). Tankers additionally hold up to 1,000 cubic meters of residual oil. Most common hazardous wastes are the following:

Persistent Organic Pollutants (POP's):

POPs are chemicals that are highly toxic, remain intact in the environment for long periods, become widely distributed geographically, bioaccumulate through the food web, accumulate in the fatty tissue of living organisms and pose a risk of causing adverse effects to the human population, wildlife and the environment. There has been a realization that these pollutants, upon exposure of human population, can cause serious health effects ranging from increased incidence of cancers to disruption of hormonal system. Shipbreaking activities are a source of lethal POPs.

Asbestos:

Asbestos was used in old ships as a heat insulator. As there are no asbestos disposal procedures, during scrapping, workers and the surrounding environment are

² <http://www.shipbreakingbd.info/Environment.html>

exposed to the asbestos fibers. Exposure to asbestos fibers (even in very low concentrations) especially through inhalation may cause cancer and asbestosis. On the shipbreaking beaches, asbestos fibers and flocks fly around in the open air. Workers take out asbestos insulation materials with their bare hands.

It has also proven to be one of the most lethal, as inhaling asbestos fibers can lead to a wide range of pulmonary problems such as asthma and asbestosis - and can also be the direct cause of mesothelioma.



Figure: Workers take out asbestos and glass wool from engine room of scrapped ship without having any protective tools, Source: Ship Breaking Activities and its Impact on the Coastal Zone of Chittagong, Bangladesh: Towards Sustainable Management , Young Power in Social Action (YPSA), July 2006



Figure: Woman filters asbestos into powder in workshop outside the shipbreaking yards, Bangladesh, Source: Ship Breaking Activities and its Impact on the Coastal Zone of Chittagong, Bangladesh: Towards Sustainable Management, Young Power in Social Action (YPSA), July 2006

Heavy Metals:

Heavy metals are found in many parts of ships such as in paints, coatings, anodes and electrical equipment. These are taken apart with no protective measures in place and reused. Exposure can result in lung cancer, cancer of the skin, intestine, kidney, liver or bladder.



Figure: Heavy metals found in paints, coatings, anodes and electrical equipments etc, Source: Ship Breaking Activities and its Impact on the Coastal Zone of Chittagong, Bangladesh: Towards Sustainable Management, Young Power in Social Action (YPSA), July 2006

Oil Pollution:

As a result of breaking the ships, oil residues and the other refuses are being spilled, mixed with the sea water and left floating along the entire seashore. Oil may cause serious damage in different ways, such as a reduction of light intensity beneath the water surface which inhibits photosynthesis. Oil films on water reduce the exchange of oxygen and carbon dioxide across the air-sea interface which is harmful to aquatic life. It also causes damage to the bird population by coating their feathers with oil which causes buoyancy and insulation losses. Sometimes spilling may cause wide spread mortality amongst the population of fish, mammals, worms, crabs, mollusks and other water organisms.



Figure: Black oil residues collected from scraped ships often get mixed with the beach soil, Source: Ship Breaking Activities and its Impact on the Coastal Zone of Chittagong, Bangladesh: Towards Sustainable Management, Young Power in Social Action (YPSA), July 2006

Impact of shipbreaking on inter-tidal sediments and soils:

In shipbreaking areas various refuse and disposable materials are discharged and spilled from scrapped ships and often get mixed with the sand. The scraps from the ships are staked haphazardly on the sea shore, leaving behind an accumulation of metal fragments and rust (particularly iron) in the soil. These together with extensive human and mechanical activities often go on as matter of routine work resulting in the beach soil losing its binding properties and this accelerates the amount of shore erosion and increase the turbidity of sea water and sediments in the area.

Impact of shipbreaking on biodiversity:

Shipbreaking activities contaminate the coastal soil and sea water environment mainly through the discharge of ammonia, burned oil spillage, floatable grease balls, metal rust (iron) and various other disposable refuse materials together with high turbidity of sea water. The high PH of the seawater and soil observed may be due to the addition of ammonia, oils and lubricants. High turbidity of water can cause a decrease in the concentration of DO and substantially increase the BOD. Furthermore, oil spilling may cause serious damage by reduction of light intensity, inhibiting the exchange of oxygen and carbon dioxide across the air-sea water interface, and by acute toxicity. As a result the growth and abundance of marine organisms especially plankton and fishes may seriously be affected. Indiscriminate expansion of ship breaking activities poses a real threat to the coastal inter-tidal zone and its habitat.

All these impacts mentioned above led the international community to generate various environmental guidelines and regulations in order to promote the environmentally sound ship breaking. Most important of these regulations are presented below:

4.1.1 Basel Convention on the control of the transboundary movements of hazardous wastes and their disposal.³

During the decade of 1980 environmental regulations adopted by industrialised countries led to a dramatic rise in the cost of hazardous waste disposal. As a result hazardous wastes began to be shipped from the industrialized world to developing countries for economical reasons. In order these transboundary movements of hazardous wastes to be controlled, Basel Convention began to be constructed by the United Nations Environmental Programme. Finally Basel Convention was adopted in 1989 and entered into force in 1992.

According to the Basel Convention a Party shall not permit hazardous wastes or other wastes to be exported to a non-Party or to be imported from a non-Party. Transboundary movements of hazardous wastes are to be allowed only between Parties. Parties to this Convention are obliged to ensure that hazardous and other wastes are managed and disposed of in an environmentally sound manner (ESM). In the context of the Basel Convention ESM means *"taking all practicable steps to ensure that hazardous wastes or other wastes are managed in a manner which will protect human health and the environment against the adverse effects which may result from such wastes"*. To this end, Parties are expected to minimize the quantities that are moved across borders, to treat and dispose of wastes as close as possible to their place of generation and to prevent or minimize the generation of wastes at source. Parties in order to facilitate Basel Convention's implementation should establish one or more competent authorities and one focal point. The transboundary movement between Parties should be conducted as follows:

a) The State of export shall notify, or shall require the generator or exporter to notify, in writing, through the channel of the competent authority of the State of export, the competent authority of the States concerned of any proposed transboundary movement of hazardous wastes or other wastes. Such notification shall contain the declarations and information specified in Annex V A, written in a language acceptable to the State of import.

ANNEX V A **INFORMATION TO BE PROVIDED ON NOTIFICATION**

1. Reason for waste export
2. Exporter of the waste 1/
3. Generator(s) of the waste and site of generation 1/
4. Disposer of the waste and actual site of disposal 1/
5. Intended carrier(s) of the waste or their agents, if known 1/
6. Country of export of the waste
Competent authority 2/
7. Expected countries of transit
Competent authority 2/
8. Country of import of the waste
Competent authority 2/
9. General or single notification
10. Projected date(s) of shipment(s) and period of time over which waste is to be exported and proposed itinerary (including point of entry and exit)3/
11. Means of transport envisaged (road, rail, sea, air, inland waters)
12. Information relating to insurance 4/
13. Designation and physical description of the waste including Y number and UN number and its composition 5/ and information on any special handling requirements including emergency provisions in case of accidents
14. Type of packaging envisaged (e.g. bulk, drummed, tanker)
15. Estimated quantity in weight/volume 6/
16. Process by which the waste is generated 7/
17. For wastes listed in Annex I, classifications from Annex III: hazardous characteristic, H number, and UN class 46
18. Method of disposal as per Annex IV
19. Declaration by the generator and exporter that the information is correct

³ <http://www.basel.int/index.html>

20. Information transmitted (including technical description of the plant) to the exporter or generator from the disposer of the waste upon which the latter has based his assessment that there was no reason to believe that the wastes will not be managed in an environmentally sound manner in accordance with the laws and regulations of the country of import

21. Information concerning the contract between the exporter and disposer.

Notes

1/ Full name and address, telephone, telex or telefax number and the name, address, telephone, telex or telefax number of the person to be contacted.

2/ Full name and address, telephone, telex or telefax number.

3/ In the case of a general notification covering several shipments, either the expected dates of each shipment or, if this is not known, the expected frequency of the shipments will be required.

4/ Information to be provided on relevant insurance requirements and how they are met by exporter, carrier and disposer.

5/ The nature and the concentration of the most hazardous components, in terms of toxicity and other dangers presented by the waste both in handling and in relation to the proposed disposal method.

6/ In the case of a general notification covering several shipments, both the estimated total quantity and the estimated quantities for each individual shipment will be required.

7/ Insofar as this is necessary to assess the hazard and determine the appropriateness of the proposed disposal operation.

b) The State of import shall respond to the notifier in writing, consenting to the movement with or without conditions, denying permission for the movement, or requesting additional information.

c) The State of export shall not allow the generator or exporter to commence the transboundary movement until it has received written confirmation that:

(i) The notifier has received the written consent of the State of import; and

(ii) The notifier has received from the State of import confirmation of the existence of a contract between the exporter and the disposer specifying environmentally sound management of the wastes in question.

d) The Parties shall require that each person who takes charge of a transboundary movement of hazardous wastes or other wastes sign the movement document either upon delivery or receipt of the wastes in question. They shall also require that the disposer inform both the exporter and the competent authority of the State of export of receipt by the disposer of the wastes in question and, in due course, of the completion of disposal as specified in the notification. If no such information is received within the State of export, the competent authority of the State of export or the exporter shall so notify the State of import.

e) Any transboundary movement of hazardous wastes or other wastes shall be covered by insurance, bond or other guarantee as may be required by the State of import or any State of transit which is a Party.

f) Require that hazardous wastes and other wastes that are to be the subject of a transboundary movement be packaged, labelled, and transported in conformity with generally accepted and recognized international rules and standards in the field of packaging, labelling, and transport.

g) Require that hazardous wastes and other wastes be accompanied by a movement document from the point at which a transboundary movement commences to the point of disposal.

When a transboundary movement of hazardous wastes or other wastes to which the consent of the States concerned has been given, subject to the provisions of this Convention, cannot be completed in accordance with the terms of the contract, the State of export shall ensure that the wastes in question are taken back into the State of export,

by the exporter, if alternative arrangements cannot be made for their disposal in an environmentally sound manner.

Any transboundary movement of hazardous wastes to non Parties or to Parties without prior notification and necessary consent of all States concerned shall be deemed to be illegal traffic. Each Party shall introduce appropriate national/domestic legislation to prevent and punish illegal traffic.

Administration and Financial Matters of the Basel Convention

The Conference of the Parties (known as the COP), of which all the States that are party to the Convention are members, is the primary organ of the Convention. The Conference of the Parties develops the policies that will guide the implementation of the Convention, and it can adopt amendments to the Convention, as well as new instruments, such as Protocols, if it considers that these would assist in the achievement of the goals of the Convention.

The Secretariat services the Convention by providing logistical and substantive support to the Parties to facilitate the implementation of the Convention. The Secretariat is administered by the United Nations Environment Programme (UNEP) and reports to the COP.

The Basel Convention also has 14 Basel Convention Regional and Coordinating Centers which develop and undertake regional projects, and deliver training and technology transfer for the implementation of the Convention.

A Trust Fund for the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal is established to provide financial support for the ordinary expenditure of the Secretariat of the Basel Convention. A Technical Cooperation Trust Fund is established to assist developing countries and other countries in need of technical assistance in the implementation of the Basel Convention.

The Trust is financed from contributions made by the Parties to the Convention.

The contributions are to be based on the United Nations scale of assessments for the apportionment of the expenses of the United Nations (adjusted to provide that no one contribution shall exceed 25 per cent of the total).

Basel Convention and Ship dismantling

According to the decision VII/26 adopted by the Conference of the Basel Convention at its seventh meeting many ships and other floating structures are known to contain hazardous materials (polychlorinated biphenyls (PCBs) and/or polybrominated biphenyls (PBBs), Asbestos) and that such hazardous materials may become hazardous wastes as listed in the annexes to the Basel Convention. Furthermore ships and other floating structures may pose a threat to the environment and human health if they are not, when pre-decontaminated or dismantled, managed in an environmentally sound manner.

However the problem arisen is that a ship may become waste as defined in article 2 of the Basel Convention while at the same time it may be defined as a ship under other international rules.

As a result Conference reminds

- the Parties to fulfil their obligations under the Basel Convention, where applicable, in particular their obligations with respect to prior informed consent, minimization of transboundary movements of hazardous wastes and the principles of environmentally sound management

- invites Parties, other States, ship owners and other stakeholders to assist in the improvement of the environmentally sound management of ship dismantling worldwide
- invites Parties, especially developed States, to encourage the establishment of domestic ship recycling facilities.

As shown in the table below most popular demolition areas along with most popular national flags have ratified the Basel Convention and are bound by all the obligations under this Convention.

Country	Signature	Date
Bangladesh		01.04.93
China	22.03.90	17.12.91
India	15.03.90	24.06.92
Pakistan		26.07.94
Panama	22.03.89	22.02.91
Liberia		22.09.04
Marshall Islands		27.01.03
Bahamas		12.08.92
Singapore		02.01.96
Greece	22.03.89	04.08.94
Malta		19.06.00
Cyprus	22.03.89	17.09.92
United Kingdom of Great Britain and Northern Ireland	06.10.89	07.02.94
Italy	22.03.89	07.02.94
Germany	23.10.89	21.04.95
Japan		17.09.93

Table No 5: Basel Convention Ratifications

Ban Amendment to the Basel Convention on the control of the transboundary movements of hazardous wastes and their disposal

On 22 September 1995 the Third meeting of the Conference of the Contracting Parties to the above Convention adopted an amendment which bans the export of hazardous wastes intended for final disposal from Annex VII countries (members of EU, OECD and Liechtenstein) to non Annex VII countries (all other Parties to the Basel Convention). Scope of the ban was to further control and to reduce the transportation of hazardous wastes to developing countries with doubtful facilities regarding the environmental sound management of these wastes.

The Ban Amendment has not yet entered into force and it is worth mentioning that from the above mentioned demolition areas only China has ratified the Amendment.

Country	Date
China	01.05.01
Panama	07.10.98
Liberia	16.09.05
European Union	30.09.97
Cyprus	07.07.00
United Kingdom of Great Britain and Northern Ireland	13.10.97

Table No 6: Ban Amendment Ratifications

Since the Basel Convention exists and provides all the necessary institutional tools on the transboundary movements of hazardous wastes why do we still face phenomena where hazardous wastes are transported to developing countries and been disposed there in order to be managed by the most primitive ways? The answer might be corruption.

According to the Transparency International, demolition areas like Bangladesh, Pakistan etc. had in 2009 some of the lowest CPI scores (Corruption Perceptions Index). As shown to the below table China is ranked to 79 out of 180, India 84 while Bangladesh and Pakistan have the worst ranking 139. Demolition countries enjoy many economical benefits from the ships' dismantling and it is expected to overcome bureaucracy procedures by disregarding the unsuitability of many inland shipyards and allowing their operation. As mentioned earlier non implementation of the environmental regulations gives to the shipyards a comparative advantage over their competitors from West, since they can keep their operational cost lower and thus offer better scrap prices.

Rank	Country/Territory	CPI 2009 Score	Surveys Used	Confidence Range
79	China	3.6	9	3.0 - 4.2
84	India	3.4	10	3.2 - 3.6
139	Bangladesh	2.4	7	2.0 - 2.8
139	Pakistan	2.4	7	2.1 - 2.7

Table No 7: CPI 2009, Source: http://www.transparency.org/policy_research/surveys_indices/cpi/2009/cpi_2009_table

4.1.2 EU Waste Shipment Regulation

A European Regulation (EC) No 1013/2006 on shipments of waste was published in 12 July 2006.

The Waste Shipment Regulation implements the Basel Convention and the Basel ban within the EU. Waste Shipment Regulation, sets the requirements at EU level for management and shipments of end-of-life vessels. A ship is considered as waste when it is "discarded" by its owner.

It follows from the Waste Shipment Regulation that:

- Exports of ships destined for disposal outside the Community are banned if destined for non-OECD countries
- Exports of ships destined for recovery and listed in Annex V as hazardous waste are also banned if destined to countries to which the OECD decision does not apply
- Exports of ships destined for recovery in countries to which the OECD decision applies is only allowed if destined for environmentally sound management
- All exports of ships destined for recovery is subject to control requirements.

Community law, however, is applicable only to EU-flagged ships or to ships leaving or entering EU waters in accordance with the United Nations Convention on the Law of the Sea (UNCLOS). Waste shipment rules in particular, due to their focusing on transports between countries of dispatch, of transit and of destination, are designed to apply within the land territory and territorial waters of states. In any case, an EU-flagged ship can change its flag before its dismantling and a non-EU flagged ship can leave to its last destination for scrapping from a place outside EU jurisdiction. Therefore, an international legal instrument (Ship Recycling Convention) with Flag States and Port States obligations is intended to deliver a practicable and enforceable solution. In addition, the dismantling of the ship must be environmentally sound. In other terms, whatever the economic conditions, the export to a developing country of a ship that has not been "properly emptied" of hazardous materials is an infringement of EU legislation⁴.

⁴ COMMISSION STAFF WORKING DOCUMENT- Accompanying document to the GREEN PAPER on better ship dismantling-{COM(2007) 269 final}

4.1.3 International Institutional Frame

Many international organizations in their effort to transform the ship dismantling into a more labor and environmental friendly procedure generated many relevant guidelines and/or regulations.

As a quick reference we would like to state the following:

- **Basel Convention** Technical Guidelines for the Environmentally Sound Management of the Full and Partial Dismantling of Ships, adopted in 2002⁵
- **ILO** Safety and health in ship breaking: Guidelines for Asian countries and Turkey, adopted in 2004⁶
- **IMO** Guidelines on ship recycling, adopted in 2003⁷
- **Joint IMO/ILO/BC Working Group (JWG)** on ship scrapping: Comparison of the three sets of guidelines (Basel Convention, ILO, IMO)⁸
- **IMO** Guidelines for the Development of the Ship Recycling Plan, 52nd MEPC session October 2004⁹
- **IMO** recommendations & guidance on “Gas-free-for-hot-work-certification” during ship recycling operations, 53rd MEPC session July 2005¹⁰
- **ICS** Industry Code of Practice on Ship Recycling, 2001¹¹
- **ICS** Inventory of Potentially Hazardous Materials on Board, 2001¹²
- **BIMCO** Standard Contract for the Sale of Vessels for Demolition and Recycling (DEMOLISHCON 2003)¹³
- Draft Pocket Manual on Implementation of Green Ship Recycling, prepared by **Danish Environment Protection Agency** (December 2005)
- **U.S. EPA** “A Guide for Ship Scrappers – Tips for Regulatory Compliance”, 2000¹⁴
- Draft **UK** Ship Recycling Strategy¹⁵
- An **EU** strategy for better ship dismantling¹⁶
- Commission presents **EU** strategy for safer ship dismantling¹⁷
- **EU, Green Paper**¹⁸
- The **Rotterdam Convention** on the Prior Informed Consent (PIC) Procedure for Certain Hazardous Chemicals and Pesticides in International Trade¹⁹
- The **London Convention**²⁰
- The **United Nations Convention** on the Law of the Seas (UNCLOS)²¹
- **Stockholm Convention** on Persistent Organic Pollutants (POPs)²²
- The **Universal Declaration of Human Rights**²³

⁵ <http://www.basel.int/ships/techguid.html>

⁶ <http://www.basel.int/ships/docs/02e.pdf>

⁷ http://www.imo.org/includes/blastDataOnly.asp/data_id%3D11404/ResShiprecycling962.pdf &

http://www.imo.org/includes/blastDataOnly.asp/data_id%3D16305/980.pdf

⁸ <http://www.basel.int/meetings/oewg/oewg5/docs/02a1e.pdf#annex2>

⁹ http://www.imo.org/newsroom/mainframe.asp?topic_id=848&doc_id=4405#9

¹⁰ <http://www.basel.int/ships/docs/07e.pdf>

¹¹ <http://www.basel.int/ships/docs/08e.pdf>

¹² <http://www.basel.int/ships/docs/09e.pdf>

¹³ <http://www.basel.int/ships/docs/10e.pdf> & <http://www.basel.int/ships/docs/11e.pdf>

¹⁴ <http://www.basel.int/ships/docs/14e.pdf>

¹⁵ <http://www.defra.gov.uk/environment/waste/strategy/ship.htm>

¹⁶ http://ec.europa.eu/environment/waste/ships/pdf/com_2008_767.pdf

¹⁷ <http://europa.eu/rapid/pressReleasesAction.do?reference=IP/08/1733&format=HTML&aged=0&language=EN&guiLanguage=en>

¹⁸ http://ec.europa.eu/environment/waste/ships/pdf/com_2007_269_en.pdf

¹⁹ <http://www.pic.int/en/ConventionText/ONU-GB.pdf>

²⁰ <http://www.imo.org/OurWork/Environment/SpecialProgrammesAndInitiatives/Pages/London-Convention-and-Protocol.aspx>

²¹ http://www.un.org/Depts/los/convention_agreements/convention_overview_convention.htm

²² <http://chm.pops.int/Convention/tabid/54/language/en-US/Default.aspx#convtext>

4.1.4 HONG KONG INTERNATIONAL CONVENTION FOR THE SAFE AND ENVIRONMENTALLY SOUND RECYCLING OF SHIPS, 2009

After many years of efforts from all above mentioned organizations to manage the environmental impacts of ship dismantling as this is being conducted mostly in Asian ship yards, IMO took the initiative to construct an institutional framework, mandatory for all Parties. This is the Hong Kong international convention for the safe and environmentally sound recycling of ships, 2009.

The 2009 International Conference on the Safe and Environmentally Sound Recycling of Ships took place at the Hong Kong Convention and Exhibition Cent, from 11 to 15 May 2009.

The Conference adopted the Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships, 2009, also known as the “Hong Kong Convention” (HKC).

Furthermore the Conference adopted 6 resolutions as following:

- Resolution 1:* Expression of appreciation to the host Government;
Contribution of the Parties to the Basel Convention and the International Labour Organization in the development of the
- Resolution 2:* Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships, 2009;
- Resolution 3:* Promotion of technical co-operation and assistance
Future work by the Organization pertaining to the Hong Kong
- Resolution 4:* International Convention for the Safe and Environmentally Sound Recycling of Ships, 2009;
Early implementation of the technical standards of the Hong
- Resolution 5:* Kong International Convention for the Safe and Environmentally Sound Recycling of Ships, 2009; and
Exploration and monitoring of the best practices for fulfilling the
- Resolution 6:* requirements of the Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships, 2009.

The HKC was therefore developed to provide a practical, workable and acceptable regulatory structure in the international maritime field. While the Basel Convention Guidelines deal with the requirements regarding dismantling of ships at the recycling facilities in the destination state and, to a certain extend, requirements prior to shipping in the dispatch state, HKC deals with the requirements before the ship enters the recycling facility (preparation for recycling).

The Convention includes 21 Articles, establishing the main legal mechanisms, 25 regulations, containing technical requirements and 7 appendices, containing forms for certificates etc

Separately, 6 voluntary guidelines are currently being developed under the coordination of Japan providing clarifications, interpretations, and uniform procedures for technical issues arising from the provisions of the Convention. It is worth mentioning the guidelines for the development of the Inventory of Hazardous Materials (adopted at MEPC 59) and Guidelines for the development of the Ship Recycling Plan (adopted at MEPC 60).

²³ <http://www.un.org/en/documents/udhr/index.shtml>

For the scope of this thesis we collected the most interesting parts of this Convention as these are shown below:

ARTICLE 3 - Application

This Convention shall apply to:

- 1) ships entitled to fly the flag of a Party or operating under its authority;
- 2) Ship Recycling Facilities operating under the jurisdiction of a Party.

This Convention shall not apply to any warships or ships operating on government non commercial service. Also this Convention shall not apply to ships of less than 500 GT or to ships operating throughout their life only in waters subject to the sovereignty or jurisdiction of the State whose flag the ship is entitled to fly.

With respect to ships entitled to fly the flag of non-Parties to this Convention, Parties shall apply the requirements of this Convention as may be necessary to ensure that no more favourable treatment is given to such ships.

ARTICLE 4 - Controls related to Ship Recycling

Each Party shall require that ships entitled to fly its flag or operating under its authority and Ship Recycling Facilities under its jurisdiction comply with the requirements set forth in this Convention and shall take effective measures to ensure such compliance.

ARTICLE 8 - Inspection of ships

A ship to which this Convention applies may, in any port or offshore terminal of another Party, be subject to inspection by officers duly authorized by that Party for the purpose of determining whether the ship is in compliance with this Convention.

ARTICLE 9 - Detection of violations

If the ship is detected to be in violation of this Convention, the Party carrying out the inspection may take steps to warn, detain, dismiss, or exclude the ship from its ports.

Regulation 4 – Controls of ships' Hazardous Materials

In accordance with the requirements specified in Appendix 1 to this Convention each Party:

- shall prohibit and/or restrict the installation or use of Hazardous Materials listed in Appendix 1 on ships entitled to fly its flag or operating under its authority; and
- shall prohibit and/or restrict the installation or use of such materials on ships, whilst in its ports, shipyards, ship repair yards, or offshore terminals,
- and shall take effective measures to ensure that such ships comply with those requirements.

APPENDIX 1

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.

Regulation 5 – Inventory of Hazardous Materials

Each ship shall have on board an Inventory of Hazardous Materials. The Inventory shall be verified either by the Administration or recognized organizations which act on behalf of the Administration.

The Inventory of Hazardous Materials shall be specific to each ship and shall at least:

- identify as Part I, Hazardous Materials listed in Appendices 1 and 2 to this Convention and contained in ship's structure or equipment, their location and approximate quantities; and
- clarify that the ship complies with regulation 4.

For new buildings use of Hazardous Materials as those listed in Appendix 1 is prohibited and Part I of Inventory of Hazardous Materials includes materials listed in Appendix 2.

For existing ships a plan shall be prepared describing the visual/sampling check by which the Inventory of Hazardous Materials is developed. Part I of the Inventory shall at least include materials listed in Appendix 1 which are contained in ship's structure.

For both new buildings and existing ships initial surveys are to be conducted in order to verify the existence of Part I of the Inventory. These surveys should end with the issuance of the International Certificate on Inventory of Hazardous Materials.

APPENDIX 2
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)

Part I of the Inventory of Hazardous Materials shall be properly maintained and updated throughout the operational life of the ship, reflecting new installations containing Hazardous Materials listed in Appendix 2 and relevant changes in ship structure and equipment.

Prior to recycling the Inventory shall, in addition to the properly maintained and updated Part I, incorporate Part II for operationally generated wastes and Part III for stores.



Inventory of Hazardous Materials (Reg.5)

- Development of Part I of Inventory
- Verification by the Administration or RO.
- Maintenance and update of Part I
- Incorporation Part II and Part III prior to recycling

Part I	Materials contained in structure and equipment of the ship	At Initial Survey
Part II	Operationally generated wastes	At Final Survey
Part III	Stores	At Final Survey

Figure No 11 – Source: Ship Recycling Convention - *What does it require shipbuilders to do?* - Tasuku Hirabara, *Japan Ship Technology Research Association*

NEW SHIPS

- The Inventory shall identify as Part I, hazardous materials listed in [Appendix 1](#) (is same as [Table A](#) materials in GL) and [Appendix 2](#) (is same as [Table B](#) materials in GL).

EXISTING SHIPS

- The Inventory shall identify as Part I, at least, hazardous materials listed in [Appendix 1](#) (is same as [Table A](#) materials in GL)

Figure No 12 – Source: Ship Recycling Convention - *What does it require shipbuilders to do?* - Tasuku Hirabara, *Japan Ship Technology Research Association*

Regulation 8 – General requirements

Ships destined to be recycled shall:

- only be recycled at Ship Recycling Facilities that are:
 - a) authorized in accordance with this Convention; and
 - b) fully authorized to undertake all the ship recycling which the Ship Recycling Plan specifies to be conducted by the identified Ship Recycling Facility(ies);
- conduct operations in the period prior to entering the Ship Recycling Facility in order to minimize the amount of cargo residues, remaining fuel oil, and wastes remaining on board;
- in the case of a tanker, arrive at the Ship Recycling Facility with cargo tanks and pump room(s) in a condition that is ready for certification as Safe-for-entry, or Safe-for-hot work, or both, according to national laws, regulations and policies of the Party under whose jurisdiction the Ship Recycling Facility operates;
- complete the Inventory (Part I, II & III) required by regulation 5 and be certified with the International Certificate on Inventory of Hazardous Materials.
- provide to the Ship Recycling Facility all available information relating to the ship for the development of the Ship Recycling Plan required by regulation 9
- arrange a final survey to verify the Inventory of Hazardous Materials and that the Ship Recycling Plan reflects correctly the Inventory.
- prior to any recycling activity taking place notify the Administration and be certified as ready for recycling by it or the organization recognized by it. (International Ready for Recycling Certificate)

Regulation 9 – Ship Recycling Plan

A ship-specific Ship Recycling Plan shall be developed by the Ship Recycling Facility (ies) prior to any recycling of a ship. The Ship Recycling Plan shall:

- be developed taking into account information provided by the shipowner
- include information concerning inter alia, the establishment, maintenance, and monitoring of Safe-for-entry and Safe-for-hot work conditions and how the type and amount of materials including those identified in the Inventory of Hazardous Materials will be managed;
- be approved by the Competent Authority authorizing the Ship Recycling Facility

Regulation 10 – Surveys

Ships to which this Convention applies shall be subject to the surveys specified below:

- **an initial survey** before the ship is put in service, or before the International Certificate on Inventory of Hazardous Materials is issued. This survey shall verify that Part I of the Inventory required by regulation 5 is in accordance with the requirements of this Convention
- **a renewal survey** at intervals specified by the Administration, but not exceeding five years. This survey shall verify that Part I of the Inventory of Hazardous Materials required by regulation 5 complies with the requirements of this Convention
- **an additional survey**, may be made at the request of the shipowner after a change, replacement, or significant repair of the structure, equipment, systems, fittings, arrangements and material. The survey shall be such as to ensure that any such change, replacement, or significant repair has been made in the way that the ship continues to comply with the requirements of this Convention, and that Part I of the Inventory is amended as necessary
- **a final survey** prior to the ship being taken out of service and before the recycling of the ship has started. This survey shall verify:
 - a) that the Inventory of Hazardous Materials is in accordance with the requirements of this Convention
 - b) that the Ship Recycling Plan properly reflects the information contained in the Inventory of Hazardous Materials and contains information concerning the establishment, maintenance and monitoring of Safe-for-entry and Safe-for-hot work conditions
 - c) that the Ship Recycling Facility(ies) where the ship is to be recycled holds a valid authorization in accordance with this Convention.

Surveys of ships for the purpose of enforcement of the provisions of this Convention shall be carried out by officers of the Administration or surveyors and/or organizations recognized by the Administration to act on behalf of it.

Regulation 11 – Issuance and endorsement of certificates

An International Certificate on Inventory of Hazardous Materials shall be issued either by the Administration or by any person or organization authorized by it after successful completion of an initial or renewal survey.

The International Certificate on Inventory of Hazardous Materials shall be endorsed after successful completion of an additional survey.

An International Certificate on Inventory of Hazardous Materials shall be issued for a period specified by the Administration, which shall not exceed five years. No certificate shall be extended for a period longer than three months.

An International Ready for Recycling Certificate shall be issued after successful completion of a final survey prior to the ship being taken out of service and before the recycling of the ship has started.

An International Ready for Recycling Certificate shall be issued for a period specified by the Administration that shall not exceed three months.

No certificate shall be issued to a ship entitled to fly the flag of a State which is not a Party.

Regulation 14 – Duration and validity of the certificates

An International Certificate on Inventory of Hazardous Materials shall cease to be valid:

- if the condition of the ship does not correspond substantially with the particulars of the certificate
- upon transfer of the ship to the flag of another State. If the new flag State is Party of this Convention a new certificate shall be issued.
- if the renewal survey is not completed on time
- if the certificate is not endorsed after the successful completion of an additional survey.

APPENDIX 3 FORM OF THE INTERNATIONAL CERTIFICATE ON INVENTORY OF HAZARDOUS MATERIALS	
INTERNATIONAL CERTIFICATE ON INVENTORY OF HAZARDOUS MATERIALS	
(Note: This certificate shall be supplemented by Part I of the Inventory of Hazardous Materials)	
<i>(Official seal)</i>	<i>(State)</i>
Issued under the provisions of the Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships, 2009 (hereinafter referred to as “the Convention”) under the authority of the Government of	
..... <i>(Full designation of the country)</i>	
by	
<i>(Full designation of the person or organization authorized under the provisions of the Convention)</i>	
<i>Particulars of the Ship</i>	
Name of Ship	
Distinctive number or letters	
Port of Registry	
Gross tonnage	
IMO number	
Name and address of shipowner	
IMO registered owner	
identification number	
IMO company identification	
number	
Date of Construction	
<i>Particulars of Part I of the Inventory of Hazardous Materials</i>	
Part I of the Inventory of Hazardous Materials identification/verification number:	
Note: Part I of the Inventory of Hazardous Materials, as required by regulation 5 of the Annex to the Convention, is an essential part of the International Certificate on Inventory of Hazardous Materials and must always accompany the International Certificate on Inventory of Hazardous Materials. Part I of the Inventory of Hazardous Materials should be compiled on the basis of the standard format shown in the guidelines developed by the Organization.	
THIS IS TO CERTIFY:	
1. that the ship has been surveyed in accordance with regulation 10 of the Annex to the Convention; and	
2. that the survey shows that Part I of the Inventory of Hazardous Materials fully complies with the applicable requirements of the Convention.	
Completion date of survey on which this certificate is based: (dd/mm/yyyy)	

This certificate is valid until (dd/mm/yyyy)

Issued at

(Place of issue of certificate)

(dd/mm/yyyy)

(Date of issue) (Signature of duly authorized official issuing the certificate)

(Seal or stamp of the authority, as appropriate)

ENDORSEMENT TO EXTEND THE CERTIFICATE IF VALID FOR LESS THAN FIVE YEARS WHERE REGULATION 11.6 APPLIES*

The ship complies with the relevant provisions of the Convention, and this certificate shall, in accordance with regulation 11.6 of the Annex to the Convention, be accepted as valid until (dd/mm/yyyy):

Signed:

(Signature of duly authorized official)

Place:

Date: (dd/mm/yyyy)

(Seal or stamp of the authority, as appropriate)

ENDORSEMENT WHERE THE RENEWAL SURVEY HAS BEEN COMPLETED AND REGULATION 11.7 APPLIES*

The ship complies with the relevant provisions of the Convention, and this certificate shall, in accordance with regulation 11.7 of the Annex to the Convention, be accepted as valid until (dd/mm/yyyy):

Signed:

(Signature of duly authorized official)

Place:

Date: (dd/mm/yyyy)

(Seal or stamp of the authority, as appropriate)

* This page of the endorsement at survey shall be reproduced and added to the certificate as considered necessary by the Administration.

ENDORSEMENT TO EXTEND THE VALIDITY OF THE CERTIFICATE UNTIL REACHING THE PORT OF SURVEY OR FOR A PERIOD OF GRACE WHERE REGULATION 11.8 OR 11.9 APPLIES*

This certificate shall, in accordance with regulation 11.8 or 11.9** of the Annex to the Convention, be accepted as valid until

(dd/mm/yyyy):

Signed:

(Signature of duly authorized official)

Place:

Date: (dd/mm/yyyy)

(Seal or stamp of the authority, as appropriate)

ENDORSEMENT FOR ADDITIONAL SURVEY*

At an additional survey in accordance with regulation 10 of the Annex to the Convention, the ship was found to comply with the relevant provisions of the Convention.

Signed:

(Signature of duly authorized official)

Place:

Date: (dd/mm/yyyy)

(Seal or stamp of the authority, as appropriate)

* This page of the endorsement at survey shall be reproduced and added to the certificate as considered necessary by the Administration.

** Delete as appropriate.

**APPENDIX 4
FORM OF THE INTERNATIONAL READY FOR RECYCLING CERTIFICATE**

INTERNATIONAL READY FOR RECYCLING CERTIFICATE

(Note: This certificate shall be supplemented by the Inventory of Hazardous Materials and the Ship Recycling Plan)

(Official seal)

(State)

Issued under the provisions of the Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships, 2009 (hereinafter referred to as "the Convention") under the authority of the Government of

.....
(Full designation of the country)

by
(Full designation of the person or organization authorized under the provisions of the Convention)

Particulars of the Ship

Name of Ship
Distinctive number or letters
Port of Registry
Gross tonnage
IMO number
Name and address of shipowner
IMO registered owner identification number
IMO company identification number
Date of Construction

Particulars of the Ship Recycling Facility(ies)

Name of Ship Recycling Facility
Distinctive Recycling Company identity number*
Full address
Date of expiry of DASR

* This number is based on the Document of Authorization to conduct Ship Recycling (DASR).

Particulars of the Inventory of Hazardous Materials

Inventory of Hazardous Materials identification/verification number:

Note: The Inventory of Hazardous Materials, as required by regulation 5 of the Annex to the Convention, is an essential part of the International Ready for Recycling Certificate and must always accompany the International Ready for Recycling Certificate. The Inventory of Hazardous Materials should be compiled on the basis of the standard format shown in the guidelines developed by the Organization.

Particulars of the Ship Recycling Plan

Ship Recycling Plan identification/verification number:

Note: The Ship Recycling Plan, as required by regulation 9 of the Annex to the Convention, is an essential part of the International Ready for Recycling Certificate and must always accompany the International Ready for Recycling Certificate.

THIS IS TO CERTIFY:

- 1 that the ship has been surveyed in accordance with regulation 10 of the Annex to the Convention;
- 2 that the ship has a valid Inventory of Hazardous Materials in accordance with regulation 5 of the Annex to the Convention;
- 3 that the Ship Recycling Plan, as required by regulation 9, properly reflects the information contained in the Inventory of Hazardous Materials as required by regulation 5.4 and contains information concerning the establishment, maintenance

and monitoring of Safe-for-entry and Safe-for-hot work conditions; and
4 that the Ship Recycling Facility(ies) where this ship is to be recycled holds a valid
authorization in accordance with the Convention.

This certificate is valid until (dd/mm/yyyy)
(Date)

Issued at
(Place of issue of certificate)

(dd/mm/yyyy)
(Date of issue) (Signature of duly authorized official issuing the certificate)

(Seal or stamp of the authority, as appropriate)

**ENDORSEMENT TO EXTEND THE VALIDITY OF THE CERTIFICATE UNTIL
REACHING THE PORT OF THE SHIP RECYCLING FACILITY FOR A PERIOD OF GRACE WHERE REGULATION
14.5 APPLIES***

This certificate shall, in accordance with regulation 14.5 of the Annex to the Convention, be
accepted as valid for a single point to point voyage
from the port of:
to the port of:

Signed:
(Signature of duly authorized official)

Place:

Date: (dd/mm/yyyy)

(Seal or stamp of the authority, as appropriate)

* This page of the endorsement shall be reproduced and added to the certificate as considered necessary by the
Administration.

Regulation 15 – Controls on Ship Recycling Facilities

Each Party shall establish legislation, regulations, and standards that are necessary
to ensure that Ship Recycling Facilities are designed, constructed, and operated in a safe
and environmentally sound manner in accordance with the regulations of this Convention.

Each Party shall establish a mechanism for ensuring that Ship Recycling Facilities
comply with the requirements of this Convention. Such a mechanism may include an audit
scheme to be carried out by the Competent Authority (ies) or an organization recognized
by the Party.

Regulation 16 – Authorization of Ship Recycling Facilities

Ship Recycling Facilities which recycle ships to which this Convention applies, shall
be authorized by a Party. The authorization shall be carried out by the Competent
Authority(ies) and shall include verification of documentation required by this Convention
and a site inspection. The Competent Authority (ies) may however entrust the
authorization of Ship Recycling Facilities to organizations recognized by it.

The authorization shall be valid for a period specified by the Party but not
exceeding five years and shall be drawn up in the form set forth in Appendix 5.

**APPENDIX 5
FORM OF THE AUTHORIZATION OF SHIP RECYCLING FACILITIES**

**Document of Authorization to conduct Ship Recycling (DASR) in accordance with the
requirements of the Hong Kong International Convention for the Safe and
Environmentally Sound Recycling of Ships, 2009**

Issued under the provision of the Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships, 2009 (hereinafter referred to as "the Convention") under the authority of the Government of:

.....
(Full designation of the country)

by.....
(Full designation of the Competent Authority under the Convention)

Name of Ship Recycling Facility
Distinctive Recycling Company identity No.
Full address of Ship Recycling Facility
Primary contact person
Phone number
E-mail address
Name, address, and contact information of ownership company
Working language(s)

This is to verify that the Ship Recycling Facility has implemented management systems, procedures and techniques in accordance with Chapters 3 and 4 to the Annex to the Convention. This authorization is valid until and is subject to the limitations identified in the attached supplement. This authorization is subject to amendment, suspension, withdrawal, or periodic renewal in accordance with regulation 16 of the Annex to the Convention.

Issued at
(Place of issue of the authorization)

(dd/mm/yyyy)
(Date of issue) (Signature of duly authorized official issuing the authorization)

.....
(Typed name and title of duly authorized official issuing the authorization)

(Seal or stamp of the authority, as appropriate)

**SUPPLEMENT TO:
Document of Authorization to undertake Ship Recycling (DASR) in accordance with the
Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships, 2009**

Notes:

- 1 This record shall be permanently attached to the DASR. The DASR shall be available at the Ship Recycling Facility at all times.
- 2 All procedures, plans and other documents produced by the Ship Recycling Facility and required under the terms to which the DASR has been issued shall be available in the working language of the Ship Recycling Facility and in either English, French or Spanish.
- 3 The authorization is subject to the limitations defined by this supplement.

1 GENERAL TERMS

1.1 Requirements of the Convention

The Ship Recycling Facility meets the requirements that it be designed, constructed, and operated in a safe and environmentally sound manner in accordance with the Convention, including meeting the relevant requirements of:

- Regulation 16 – Authorization of Ship Recycling Facilities
- Regulation 17 – General requirements
- Regulation 18 – Ship Recycling Facility Plan
- Regulation 19 – Prevention of adverse effects to human health and the environment
- Regulation 20 – Safe and environmentally sound management of Hazardous Materials
- Regulation 21 – Emergency preparedness and response
- Regulation 22 – Worker safety and training
- Regulation 23 – Reporting on incidents, accidents, occupational diseases and chronic effects

Regulation 24 – Initial notification and reporting requirements
 Regulation 25 – Reporting upon completion
 These requirements are imposed on the Ship Recycling Facility by way of

.....
 (Identify the permit, licence, authorization, legal standards, or other mechanism that applies)

Ship Recycling Facility Plan identification/verification number:

1.2 Acceptance of ships

For ships to which the Convention applies and ships treated similarly pursuant to Article 3.4 of the Convention, the Ship Recycling Facility can only accept a ship for recycling in accordance with regulation 17 of the Annex to the Convention.

1.3 Safe-for-hot work and Safe-for-entry conditions

The Ship Recycling Facility is capable of establishing, maintaining and monitoring Safe-for-hot work and Safe-for-entry conditions throughout the Ship Recycling process.

1.4 Management of Hazardous Materials

The Ship Recycling Facility is designed, constructed, operated, and required to ensure that all Hazardous Materials’ management shall be safe and environmentally sound in compliance with the Convention and with all relevant local or national regulations/requirements.

1.5 Map and location of Ship Recycling operations

A map of the boundary of the Ship Recycling Facility and the location of Ship Recycling operations within it, is attached.

2 CAPABILITY OF SHIP RECYCLING FACILITY

2.1 Size of ships

The Ship Recycling Facility is authorized to accept a ship for recycling subject to the following size limitations:

Maximum Size	Other Limitations
Length	
Breadth	
Lightweight	

2.2 Safe and Environmentally Sound Management of Hazardous Materials

The Ship Recycling Facility is authorized to accept a ship for recycling that contains Hazardous Materials as specified in the following table subject to the conditions noted below:

Hazardous Material(*4)	Management of Hazardous Materials			Authorization/Limitations
	Removal Y/N (*2)	Storage Y/N	Process (*1) Y/N (*3)	
Asbestos				
Ozone-depleting substances				
Polychlorinated biphenyls (PCB)				
Anti-fouling compounds and systems				
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)				
Hazardous liquids, residues and sediments				
Paints and coatings that are highly flammable and/or lead to toxic release				
Other Hazardous Materials not listed above and that are not a part of the ship structure (specify)				

Notes: *1 Process means the processing of Hazardous Materials in the Ship Recycling Facility, such as:

- incineration of Hazardous Materials;
- reclamation of Hazardous Materials; and
- treatment of oily residues.

*2 If Yes (Y), indicate in the Ship Recycling Facility Plan the responsible personnel authorized to carry out the removal, with the certificate number or other relevant information.

*3 If No (N), describe in the Ship Recycling Plan where the Hazardous Materials are to be processed/disposed.

*4 These Hazardous Materials are specified in Appendices 1 and 2 and regulation 20 of the Convention.

Regulation 17 – General requirements

Ship Recycling Facilities authorized by a Party shall establish management systems, procedures and techniques which do not pose health risks to the workers concerned or to the population in the vicinity of the Ship Recycling Facility and which will prevent, reduce, minimize and to the extent practicable eliminate adverse effects on the environment caused by Ship Recycling.

Ship Recycling Facilities authorized by a Party shall, for ships to which this Convention applies only accept ships that:

- comply with this Convention or meet the requirements of this Convention (refer to Article 3)
- are authorized to be recycled

Regulation 18 – Ship Recycling Facility Plan

Ship Recycling Facilities authorized by a Party shall prepare a Ship Recycling Facility Plan. Then the Plan shall be adopted by the Recycling company, and shall include:

- a policy ensuring workers' safety and the protection of human health and the environment
- a system for ensuring implementation of the requirements set out in this Convention
- identification of roles and responsibilities for employers and workers when conducting Ship Recycling operations;
- a programme for providing appropriate information and training of workers for the safe and environmentally sound operation of the Ship Recycling Facility
- an emergency preparedness and response plan
- a system for monitoring the performance of Ship Recycling
- a record-keeping system showing how Ship Recycling is carried out
- a system for reporting discharges, emissions, incidents and accidents causing damage, or with the potential of causing damage, to workers' safety, human health and the environment
- a system for reporting occupational diseases, accidents, injuries and other adverse effects on workers' safety and human health

Regulation 19 – Prevention of adverse effects to human health and the environment

Ship Recycling Facility shall ensure that all Safe-for-hot-work and Safe-for-entry conditions are met and prevent any accidents, injuries, spills and emissions.

Regulation 20 – Safe and environmentally sound management of Hazardous Materials

Ship Recycling Facilities authorized by a Party shall ensure safe and environmentally sound removal of any Hazardous Material contained in a ship. The person(s) in charge of the recycling operations shall actively use the Inventory of Hazardous Materials and the Ship Recycling Plan, prior to and during the removal of Hazardous Materials.

Ship Recycling Facilities authorized by a Party shall ensure that all Hazardous Materials detailed in the Inventory are identified, labelled, packaged and removed to the maximum extent possible prior to cutting by properly trained and equipped workers.

All wastes generated from the recycling activity shall be kept separate from recyclable materials and equipment, labelled, stored in appropriate conditions that do not pose a risk to the workers, human health or the environment and only transferred to a waste management facility authorized to deal with their treatment and disposal in a safe and environmentally sound manner.

If a ship contains materials which are not within the capability of a recycling yard, then the ship owner's choice would be either to select another yard suitably authorized, or to organize precleaning of all materials which are outside the selected yard's capabilities.

Regulation 21 – Emergency preparedness and response

Ship Recycling Facilities authorized by a Party shall establish and maintain an emergency preparedness and response plan. The plan shall be made having regard to the location and environment of the Ship Recycling Facility, and shall take into account the size and nature of activities associated with each Ship Recycling operation. The plan shall:

- ensure that the necessary equipment and procedures to be followed in the case of an emergency are in place, and that drills are conducted on a regular basis
- provide for first-aid and medical assistance, fire-fighting and evacuation of all people at the Ship Recycling Facility, pollution prevention

Regulation 22 – Worker safety and training

Ship Recycling Facilities authorized by a Party shall provide for worker safety by measures including:

- ensuring the availability, maintenance and use of personal protective equipment and clothing needed for all Ship Recycling operations
- ensuring that training programmes are provided to enable workers to safely undertake all Ship Recycling operations they are tasked to do

Regulation 23 – Reporting on incidents, accidents, occupational diseases and chronic effects

Ship Recycling Facilities authorized by a Party shall report to the Competent Authority(ies) any incident, accident, occupational diseases, or chronic effects causing, or with the potential of causing, risks to workers safety, human health and the environment.

Regulation 24 – Initial notification and reporting requirements

A shipowner shall notify the Administration in due time and in writing of the intention to recycle a ship in order to enable the Administration to prepare for the survey and certification required by this Convention.

A Ship Recycling Facility when preparing to receive a ship for recycling shall notify in due time and in writing its Competent Authority(ies) of the intent. Furthermore Ship Recycling Facility shall prepare a ship specific Ship Recycling Plan. This Plan is to be approved by the Competent Authority and then shall be made available to the ship for its final survey. When the ship destined to be recycled has acquired the International Ready for Recycling Certificate, the Ship Recycling Facility shall report to its Competent Authority(ies) the planned start of the Ship Recycling. The report shall be in accordance with the reporting format in Appendix 6.

APPENDIX 6

FORM OF REPORT OF PLANNED START OF SHIP RECYCLING

The

(Name of Ship Recycling Facility)

located at

(Full Ship Recycling Facility address)

Authorized in accordance with the requirements of the Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships, 2009 (hereinafter referred to as “the Convention”) to conduct Ship Recycling under the authority of the Government of:

.....

(Full designation of country)

as indicated in the Document of Authorization to conduct Ship Recycling issued at

.....

(Place of authorization)

by
(Full designation of the Competent Authority under the Convention)

on (dd/mm/yyyy)
(Date of issue)

Hereby reports that the Ship Recycling Facility is ready in every respect to start the recycling of the vessel

(IMO number)

The International Ready for Recycling Certificate issued under the provisions of the Convention under the authority of the
 Government of

(Full designation of country)

by
(Full designation of the person or organization authorized under the provisions of the Convention)

on (dd/mm/yyyy)
(Date of issue)

is enclosed.

Signed

Regulation 25 – Reporting upon completion

When the partial or complete recycling of a ship is completed in accordance with the requirements of this Convention, a Statement of Completion shall be issued by the Ship Recycling Facility and reported to its Competent Authority(ies). This report must be compiled as shown in appendix 7. The Competent Authority(ies) shall send a copy of the Statement to the Administration which issued the International Ready for Recycling Certificate for the ship.

The Statement shall include a report on incidents and accidents damaging human health and/or the environment, if any.

APPENDIX 7	
FORM OF THE STATEMENT OF COMPLETION OF SHIP RECYCLING	
STATEMENT OF COMPLETION OF SHIP RECYCLING	
This document is a statement of completion of Ship Recycling for	
<i>(Name of the ship when it was received for recycling/at the point of deregistration)</i>	
Particulars of the Ship as received for recycling	
Distinctive number or letters	
Port of Registry	
Gross tonnage	
IMO number	
Name and address of shipowner	
IMO registered owner	
identification number	
IMO company identification	
number	
Date of Construction	
THIS CONFIRMS THAT: The ship has been recycled in accordance with the Ship Recycling Plan as part of the Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships, 2009 (hereinafter referred to as “the Convention”) at <i>(Name and location of the authorized Ship Recycling Facility)</i>	
and the recycling of the ship as required by the Convention was completed on: (dd/mm/yyyy)	
Issued at	
<i>(Place of issue of the Statement of Completion)</i>	
(dd/mm/yyyy)
<i>(Date of issue)</i>	<i>(Signature of the owner of the Ship Recycling Facility or a representative acting on behalf of the owner)</i>

At last Ship Recycling States are required to:

- establish the necessary legislation to ensure that Ship Recycling Facilities are designed, constructed, and operated in a safe and environmentally sound manner in accordance with the regulations of this Convention
- establish a mechanism for authorizing Ship Recycling Facilities
- establish a mechanism for ensuring that Ship Recycling Facilities comply with this Convention
- designate one or more Competent Authorities and a single contact point to be used by interested entities.

Following graphs provide an easy way to better understand the requirements and responsibilities of this Convention:

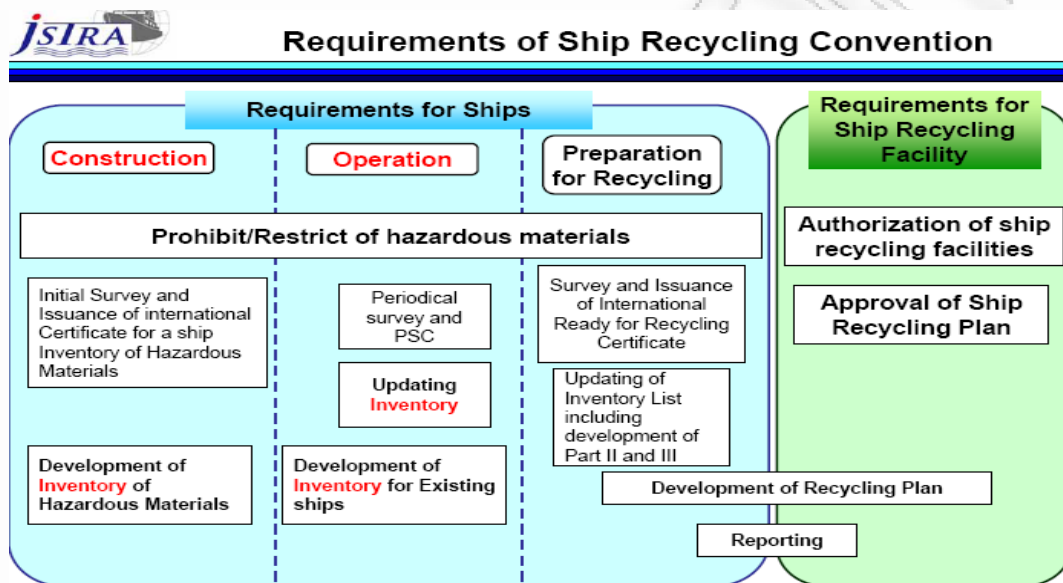


Figure: Requirements of Ship Recycling Convention – Source: Ship Recycling Convention - What does it require shipbuilders to do? - Tasuku Hirabara, Japan Ship Technology Research Association



Figure: Responsibilities of Industry Partners – Source: Ship Recycling Convention - What does it require shipbuilders to do? - Tasuku Hirabara, Japan Ship Technology Research Association

Diagrammatic representation of the process

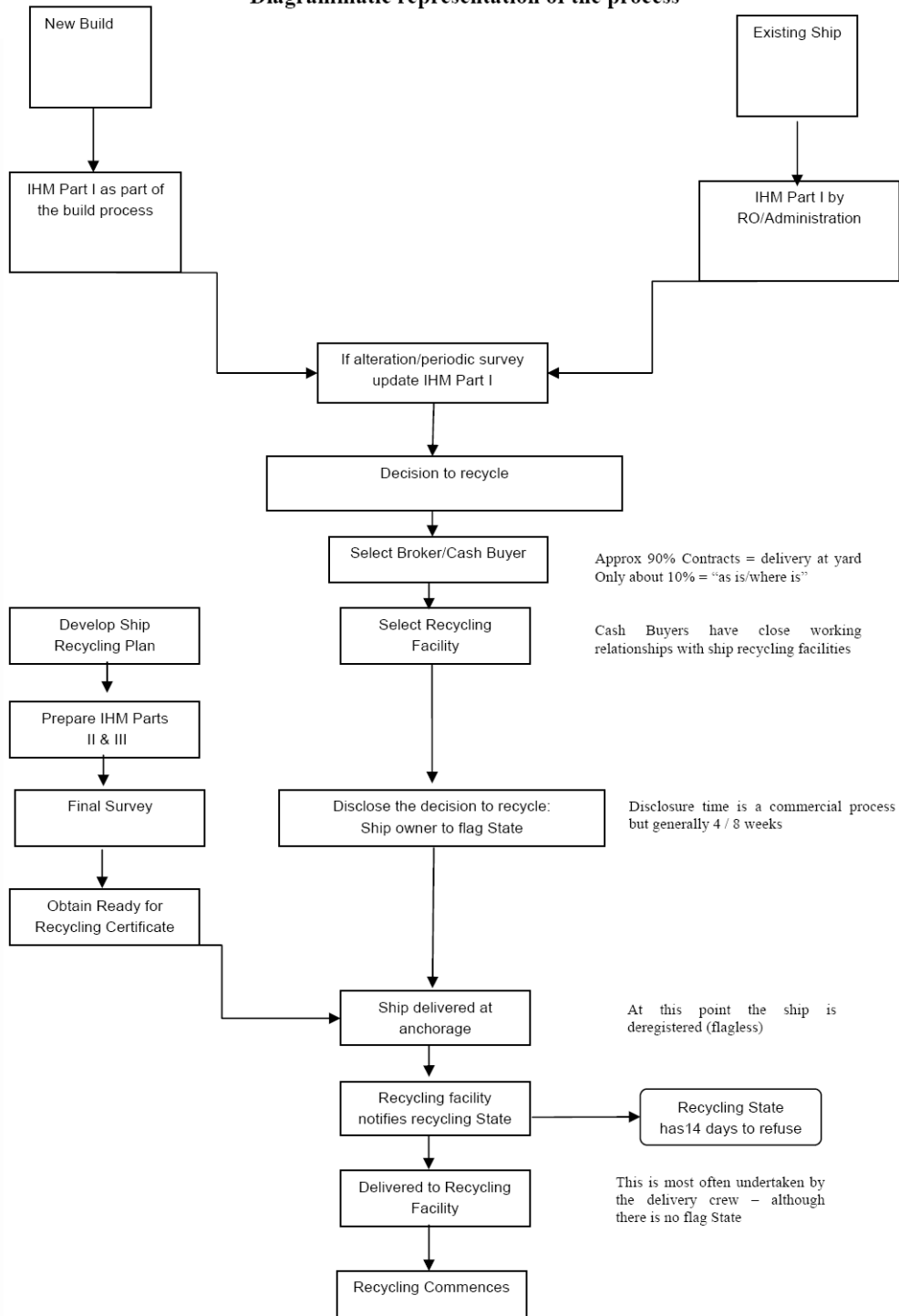


Figure: Process of ship recycling, Source: Examination of the practical application of the draft International Convention for the Safe and Environmentally Sound Recycling of Ships – a timeline for recycling a ship according to the draft Convention’s current regulations, Submitted by the United Kingdom, 18 May 2007

Thoughts on the Hong Kong Convention

Hong Kong Convention is the first attempt to set requirements on the ship recycling industry protecting workers' health and safety and ensuring the environmentally sound ship recycling. However following the study of the new IMO Convention several topics of concern arise:

- According to regulation 16 "Ship Recycling Facilities which recycle ships to which this Convention applies, shall be authorized by a Party. The authorization shall be carried out by the Competent Authority (ies) ...".

As stated under Article 2 of the same Convention "Competent Authority(ies)" means a governmental authority or authorities designated by a Party as responsible, within specified geographical area(s) or area(s) of expertise, for duties related to Ship Recycling Facilities operating within the jurisdiction of that Party as specified in this Convention. In other words compliance to this Convention of the Ship Recycling Facilities is to be judged by each state- Party separately, following most probably, criteria subject to domestic law frame. However this ambushes many dangers since there are crucial differences at the law frame between countries. Even more dangerous is the fact that not all countries face the same corruption level (Table No.7). In order to avoid the subjective character of auditing and authorizing of the Ship Recycling Facilities, European Union proposed the authorization of these Facilities to be conducted by independent international organizations like classification societies (for example). Furthermore local labor unions and non- governmental environmental organizations could ensure workers' safety and environmentally sound recycling.

- Another topic of concern is the way that the implementation of the Hong Kong Convention will affect the recycling capacity of the recycling states. Today there are no capacity constraints since decommissioning with the currently applied practice only requires a suitable beach, plenty of labour and a hinterland force requiring steel - all of which seems to be readily available in large quantities in some of the developing countries in Asia. When the Hong Kong Convention enters into force, existing Ship Recycling Facilities have only two options. Either to enhance their services and try to comply with the requirements of this Convention or to continue the business as usual without gaining the authorization by the Competent Authority (ies). On one hand compliance with the Convention's requirements needs much time while on the other hand ships which fly under the flag of a state Party could not be recycled at non authorized Facilities. This could lead to an oversupply of vessels for demolition that might not be able to be handled by the limited authorized Facilities. It is worth mentioning that today green recycling capacity is estimated to 30% of the total annual expected demand for demolition²⁴.

This is why under the article 17 of this Convention the following are stated:

"This Convention shall enter into force 24 months after the date on which the following conditions are met:.....3. the combined maximum annual ship recycling volume of the States mentioned in paragraph 1.1 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."

This criterion reflects the efforts of the IMO to avoid ships to remain un-recycled due to unavailability of authorized Ship Recycling Facilities.

- Hong Kong Convention does not prohibit the beaching as method of ship recycling. Many NGO's dealing with environmental issues expressed their opposition and still fight in order beaching to become prohibited. IMO from it's side did not restrict the use of beaching as a method of ship recycling for several reasons.

- a) In the last 10 years five countries (Bangladesh, India, China, Pakistan and Turkey) have recycled 96% to 99%, or an average of 97%, of all tonnage. There are three

²⁴ Green Paper on better ship dismantling, EU – SEC(2007) 645

recycling countries with large capacities (Bangladesh, China, and India), one with medium capacity (Pakistan) and one with small capacity (Turkey). It is worth saying that Turkey recycles more tonnage than the rest of the world put together. Ship Recycling Facilities at these countries use beaching as a method to do business. If beaching was prohibited by the Hong Kong Convention, then ship recycling facilities compliant with the Convention's requirements would be limited and a large issue of insufficient recycling capacity would arise.

- b) Furthermore recycling states are developing countries with high levels of poverty and unemployment. Ship Recycling Facilities offer thousands of works to unspecialized workers who otherwise will be unemployed with no other professional option.
- c) At last in an open free market like the ship recycling industry, a sharp implementation of strict environmental rules could lead to the transfer of business area to even less developed countries like for example Africa. This would be devastating for the future of this Convention.

- Hong Kong Convention is expected to enter into force in 2013 to 2015. This means that IMO is not in time for regulating under this Convention the great volume of single hull tankers which are to be recycled in 2010 as this is required by MARPOL.

- According to several estimations cost of implementing Hong Kong Convention for ship owners is 50 to 100\$ per ton LDT while ship yards will need approximately 200.000.000 \$ in order to construct necessary facilities and acquire several equipments. It is to be expected that not all major ship recycling States, nor all flag States, will become Parties to the new Convention immediately when it enters into force. As a result there will be two distinct recycling markets, one for recycling Convention ships and a separate one for non-Convention ships. The relatively low cost for changing a ship's flag and the also modest cost for an existing ship to comply with the requirements of the Convention make it very likely that ships will be able to cross the Convention barrier in either direction, depending on the prevailing economic factors and also depending on the ship owners' exposure to societal environmental concerns. Furthermore even if countries have the will to inspect via the Port State Authorities vessels which are to be recycled at the next port, it is very difficult for these authorities to know for certain where does the vessel goes when it leaves their port and prove that this vessel is to be demolished at next port.

- Finally it is easy to understand that this Convention has no future unless major flag states and recycling states adopt it.

Hong Kong Convention has not yet entered into force. However it is worth noting European Union's initiative to encourage all it's Member States to ratify the Convention as soon as possible. As stated in accompanying document to the Green Paper on better ship dismantling: *"Individual Member States are strongly encouraged to ratify the Hong Kong Convention as a matter of priority, so as to facilitate its entry into force as early as possible and to generate a real and effective change on the ground. In any case it has, however, to be noted that they remain bound also by the legal obligations of the Basel Convention and the EU Waste Shipment Regulation"*.

To date, the Convention has been signed, subject to ratification or acceptance, by France, Italy, the Netherlands, Saint Kitts and Nevis and Turkey²⁵.

²⁵ Status of multilateral conventions and instruments in respect of which the International Maritime Organization or its secretary-general performs depositary or other functions as at 31 January 2011, IMO

Top 20 largest shipping flags (October 2010)

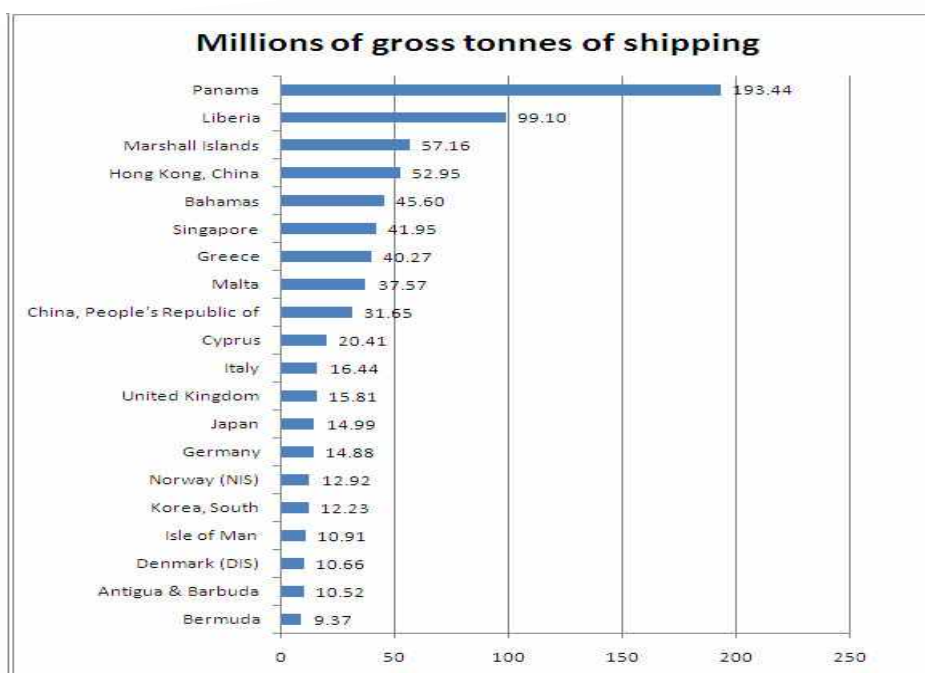


Figure No.13: Largest shipping flags, Source: <http://www.marisec.org/shippingfacts/worldtrade/top-20-largest-shipping-flags.php>

To date, the Convention has been signed, subject to ratification or acceptance, by France, Italy, the Netherlands, Saint Kitts and Nevis and Turkey.

Comparative Table²⁶:

	IMO Convention	Basel Convention	EU waste shipment regulation
<u>Scope:</u> ships	All end-of-life, privately owned ships apart from certain small ships (<500GT), no coverage of warships and other state-owned ships.	All end-of-life ships.	All end-of-life ships.
<u>Scope:</u> facilities	The first dismantling- and recycling site, but not any interim facilities or installations for subsequent processing and disposal of waste.	All waste management facilities, including collection, transport, interim- and final recovery and disposal.	All waste management facilities, including collection, transport, interim- and final recovery and disposal. Explicit coverage of interim operations.
Objectives and applicability	Control of ships from design, through construction, operation and at the recycling stage. However, specific requirements for authorisation and environmentally sound management of hazardous waste not clear until the IMO guidelines, that are currently been developed, are adopted. .	Prior informed consent procedure (PIC). The principle of environmentally sound management (ESM) of waste applies to all facilities that recover or dispose of waste and is defined by guidelines, also specifically covering ship dismantling. The Basel guideline on ESM for ship dismantling does not accept 'beaching' (impermeable floors are prescribed for full ship containment).	PIC procedure. "Basel ban" is implemented prohibiting exports of hazardous waste from OECD countries to all facilities in non-OECD countries. Exports of non-hazardous waste are not allowed to facilities which do not respect environmentally sound management. The EU regulation refers explicitly to the Basel Convention's technical guidelines on ESM

²⁶ An assessment of the link between the IMO Hong Kong Convention for the safe and environmentally sound recycling of ships, the Basel Convention and the EU waste shipment regulation

To sum up it is obvious to see the comparative advantage that the Asian recycling yards have against the European ones, since the first ones operate in open beaches and without the obligation to follow any environmental rules. On the contrary European recycling yards are equipped with up to date and new technology machines, they are often audited and should comply with strict environmental laws. In ship breaking countries in Asia, costs associated with health, safety and environmental standards are negligible. For example Bangladesh and Pakistan who claims the lion's share of the VLCC and ULCC market do not even require a "gas-free" certificate for tankers sent for demolition. Environmental regulations and mostly the Hong Kong Convention are efforts of the international community to set universal environmental standards for the ship recycling, which will also result to bridging the gap between Asian and European recycling yards in terms of operational cost.

4.1.5 Green Recycling

Green recycling is ideally defined as scrapping performed in full accordance with the recycling guidelines. This includes environment, health and safety considerations in all processes from the preparation of a vessel for scrapping, through to the dismantling process itself and in the following management of products, including hazardous waste generated from the dismantling process.

Below figure shows the location of existing major scrapping sites, existing green recycling facilities and dormant green recycling facilities. As indicated in the figure green recycling facilities are mostly located in European countries and Northern America, while at dominating scrapping countries like Pakistan, Bangladesh and India there is a lack of green recycling facilities and scrapping sites are prevailing.

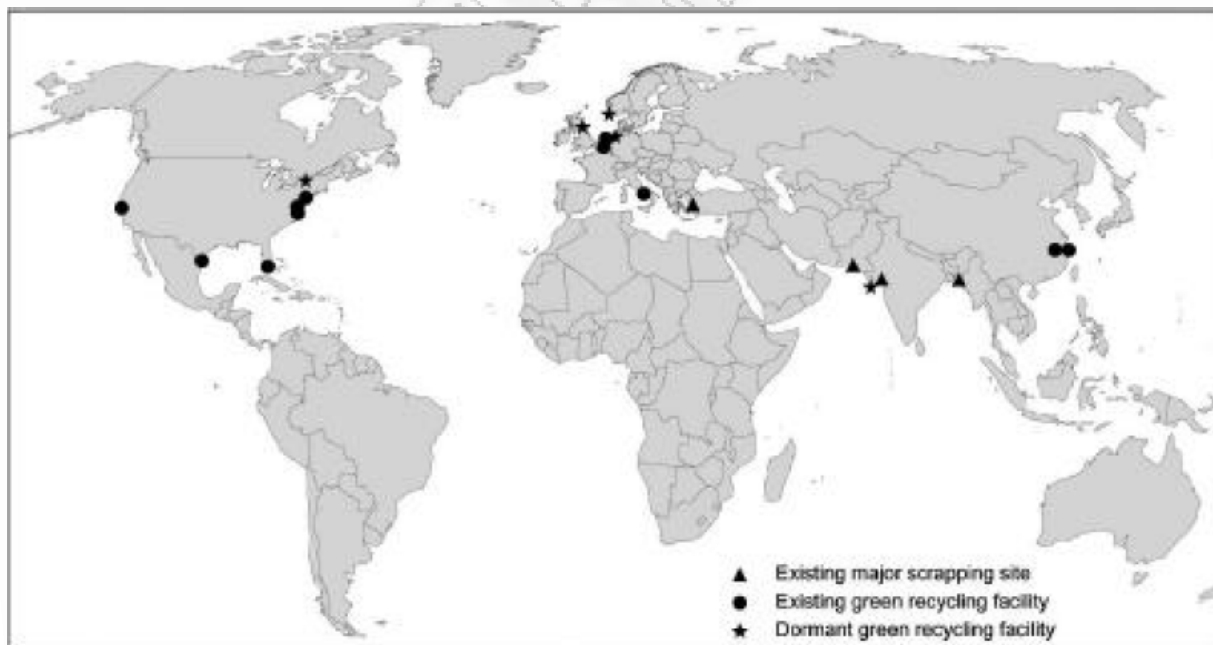


Figure: Recycling facilities and scrapping sites around the world – Source: European Commission Directorate-General Energy and Transport Oil Tanker Phase Out and the Ship Scrapping Industry
A study on the implications of the accelerated phase out scheme of single hull tankers proposed by the EU for the world ship scrapping and recycling industry, June 2004

Existing dry dock facilities constitute a possible capacity for green recycling of ships since they employ modern health, safety and environment standards such as those promoted by the guidelines of IMO, ILO and Basel Convention. However the availability of a dry dock facility depends on many things like the cost of labour, availability of steel

processing facilities (steel smelters or rerolling facilities), down stream waste treatment facilities etc. The present status of the facility is also an important factor in the evaluation of the possibility of the facility taking up ship recycling. Many dry dock facilities may be counted as dormant green recycling facilities but in reality most of these are already engaged in other profitable activities like ship repair and new building. This is why they do not seem interested in altering their operation and start recycling ships.

The identified existing green recycling capacity for larger tankers is limited and may optimistically reach around 780,000 LDT/year. Most of this capacity is found in China as seen in the table below.

Country	Existing green recycling capacity LDT/year
Italy	80,000
Belgium	120,000
Holland	30,000
China	550,000 *
USA	N/A
Total	780,000

*: The total yard capacity of two yards that has performed green recycling- not all may be approvable for green recycling

Table No.8: Existing green recycling capacity – Source: European Commission Directorate-General Energy and Transport Oil Tanker Phase Out and the Ship Scrapping Industry

A study on the implications of the accelerated phase out scheme of single hull tankers proposed by the EU for the world ship scrapping and recycling industry, June 2004

Green recycling also requires some extra costs like:

- **Manpower costs:** The new and more time consuming work routines increase the number of man hours used for the dismantling process and thereby the operating costs of the recycling facility. The time used for pre-cleaning a ship of 10,000 - 25,000 LDT before scrapping is initiated, has been estimated to around 4 to 7 weeks depending on the size of the vessel. This extra work load and cost stems almost entirely from requirements related to green measures.

- **Hazardous waste disposal costs:** Following table presents indicative examples of disposal costs for hazardous waste.

Compounds	Disposal cost, USD/ton	Calculated costs for waste disposal from 37,500 VLCC vessel, USD
Batteries: Pb, H ₂ SO ₄	175	37
Antifouling: TBT	506	12,150
Refrigerants: R22/F12	3,400	3,060
Heat insulation: Asbestos	950	5,700 - 7,600
Cable insulation: PVC	288	2,875
Fluorescent light tubes: Hg	2,413	241
Electrical capacitors: PCB	3,400	81
Oil residues	231 - 281	746,325 - 907,687
Total	-	770,432 - 933,695

Table No.9: Hazardous waste disposal costs – Source: European Commission Directorate-General Energy and Transport Oil Tanker Phase Out and the Ship Scrapping Industry
A study on the implications of the accelerated phase out scheme of single hull tankers proposed by the EU for the world ship scrapping and recycling industry, June 2004

- **Construction costs:** The capital costs for a green recycling facility are, of course, dependent on the capacity and the starting point of the facility - a green field development is much more expensive than extension or upgrading of an existing facility. Further, local factors as the wage level, additional infrastructure needed etc. will influence the size of the costs.

As shown in the following table the cost of establishing a green field European green recycling facility was in year 2000 by DNV estimated to around 96 million USD (EC, 2000). About 70% of these costs are for establishment of dry dock and dockside areas. Furthermore investment costs for the establishment of two other green recycling facilities in India and Netherlands are presented below. In addition, according to Eport AS, the estimated investment cost for a fully operational floating hazardous waste cleaning station is 10-15 million USD (Nilsen, 2004). This facility must operate in conjunction with a scrapping yard. The estimated annual cleaning capacity of the waste cleaning station is 250,000 - 350,000 LTD/year.

Facility	Location	Facility cost, USD
Example EC yard	EC	96
Pipavav	India	90
S.T.O.P.	The Netherlands	63
Eport	Asia	10 - 15

Table No.10: Investment costs, USD for establishment of green recycling facilities (0.8 Euro/USD), Source: European Commission Directorate-General Energy and Transport Oil Tanker Phase Out and the Ship Scrapping Industry
A study on the implications of the accelerated phase out scheme of single hull tankers proposed by the EU for the world ship scrapping and recycling industry, June 2004

Depreciation costs are regarded as an additional cost related to the operation of a green recycling facility and could best be covered by the facility earnings. The depreciation period for a ship recycling facility will typically be around 20 - 30 years.

In order to overcome these extra costs and make the green recycling a feasible option, number of actions should be undertaken. Basically there are three types of instruments available:

- **Regulation:** Implementation of a universal regulatory system able to guarantee health, safety and environment protection. Hong Kong International Convention for the safe and environmentally sound recycling of ships, 2009 is a characteristic example.
- **Economic instruments:** A number of instruments allowing ship owners to choose acceptable scrapping have been brought forward. Not considering the question of who shall carry the costs, using subsidies is the simplest way of making green recycling economically attractive
- **Information** means raising awareness among ship owners, authorities in breaker countries, workers and other stakeholders.

4.2 Labour Cost

Labour cost is usually the most important part of an industry's total cost. At this point we would like to examine differences existing between Asian and western ship breaking yards regarding labour cost as this is derived from wages and workers safety and health assurance.

4.2.1 Wages

Ship demolition is a labour intensive business either is conducted in ship yards or on beaches and thus labour costs play a predominant role in determining where ships are scrapped. Of course between the two methods, docking and beaching, there is difference as far as the level of workers is concerned. In docking highly educated and skilful workers are needed while in Asian beaches workers are coming from the poorest domestic provinces without any expertise on this kind of work. They are in great need of work due to bread-winning reasons and know that in ship demolition industry may have a chance to find a job.

At first by saying labour cost we mean salaries paid to workers occupied in the industry. As indicated below there are tremendous differences in the Gross National Income per capita between the asian and western countries. By saying Gross National Income (GNI) per capita we mean income generated in the economy per citizen. GNI per capita is expressed in international dollars, which have the same purchasing power as a US dollar has in the United States.

As we see in the below graph there is a chaotic gap between the asian and western economies. GNI per capita in Germany is 72 times higher than in Bangladesh in 2009. We also see that as the time goes by, the rate of income increase in western countries is much higher than that in asian countries. Furthermore we see great differences between the asian countries themselves. For example in 2009 GNI per capita in Turkey is approximately 15 times higher than in Bangladesh and 7.5 times higher than in India. These differences may be a good indicator to understand why ship demolition is mostly conducted in Asia and why some asian countries are more competitive than others, asian or not.

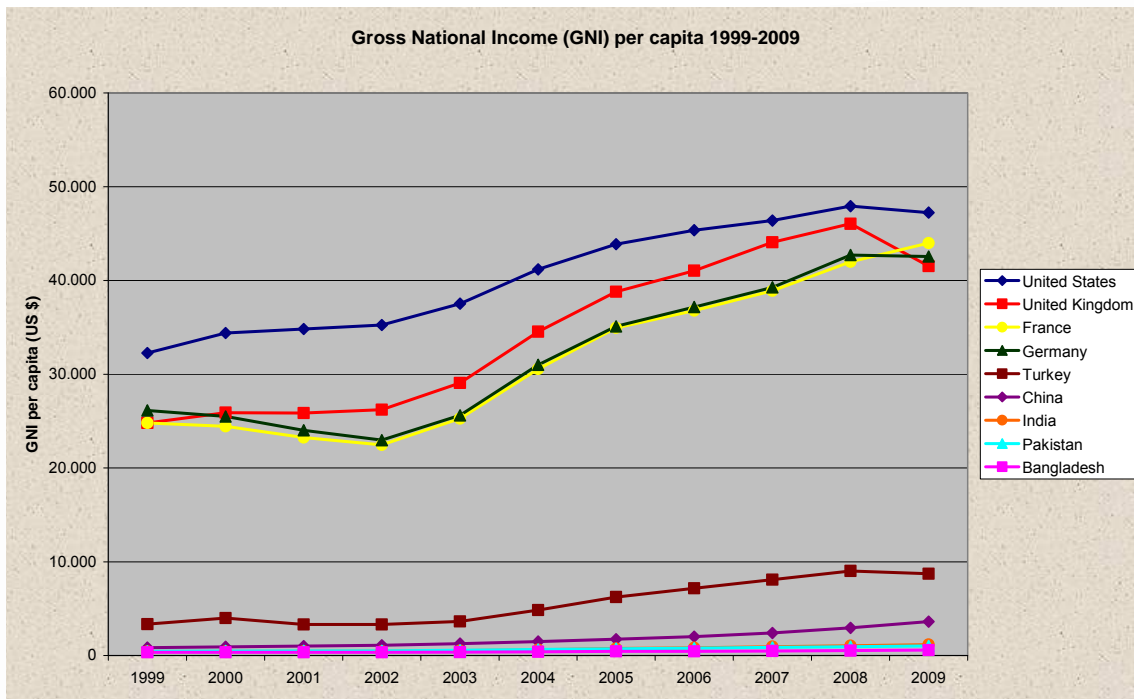


Figure No14 : GNI per capita for selected countries (1999-2009), Source: World Bank

Gross National Income per capita in US \$											
Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Country											
Bangladesh	340	350	350	350	370	410	440	450	480	520	590
India	440	450	460	470	530	630	740	820	950	1,040	1,170
Pakistan	470	490	500	510	560	640	730	790	860	950	1,020
China	840	930	1,000	1,100	1,270	1,500	1,740	2,010	2,410	2,940	3,620
Turkey	3,360	3,990	3,310	3,310	3,630	4,840	6,230	7,160	8,090	9,020	8,730
Germany	26,140	25,500	24,020	22,980	25,610	31,010	35,110	37,170	39,260	42,710	42,560
France	24,820	24,450	23,250	22,460	25,280	30,560	34,940	36,790	38,910	42,000	43,990
United Kingdom	24,810	25,910	25,860	26,230	29,080	34,540	38,800	41,040	44,070	46,040	41,520
United States	32,270	34,410	34,830	35,250	37,530	41,180	43,870	45,370	46,400	47,930	47,240

Table No11 : GNI per capita for selected countries (1999-2009), Source: World Bank

In order to better understand the abyss that separates the western economies from the asian ones as far as the labour cost is concerned, we collected some data from the ILO Global Wage Report 2008-2009 regarding minimum wages. As earlier mentioned Asian workers in scrapping industry are unskilled and therefore are paid the minimum possible. On the contrary the same does not happen in Europe or USA since in organised ship yards skilful workers are needed. However for convenience and comparison reasons we estimate that European and American workers are paid the minimum.

Table No12 provides information on minimum wages. Data are mostly from national sources and have been collected over the years by the ILO. The ILO defines a minimum wage as a wage which provides a floor to the wage structure in order to protect workers at the bottom of the wage distribution.

Countries	Ratification of ILO Conventions (as of 01.01.2008)		Level of the minimum wage (2007 or latest)
	Con No. 26	Con No. 131	PPP (US\$)
Bangladesh	0	0	69
China	1	0	204
India	1	0	113
Pakistan	0	0	118
Turkey	1	0	605
France	1	1	1402
United Kingdom	0	0	1431
United States	0	0	1014

Table No12 : Level of minimum wage for selected countries, Source: Global Wage Report 2008/09, ILO

The first two columns show the ratification as of 1 January 2008 of the Minimum Wage-Fixing Machinery Convention No. 26 and of the Minimum Wage Fixing Convention No. 131. A value of “1” indicates ratification, a value of “0” indicates an ILO member State which has not ratified, and a blank indicates that the country is not an ILO member State. Below table focuses on the main articles of C26 & C131.

C26 Minimum Wage-Fixing Machinery Convention, 1928

Article 1

1. Each Member of the International Labour Organisation which ratifies this Convention undertakes to create or maintain machinery whereby minimum rates of wages can be fixed for workers employed in certain of the trades or parts of trades (and in particular in home working trades) in which no arrangements exist for the effective regulation of wages by collective agreement or otherwise and wages are exceptionally low.
2. For the purpose of this Convention, the term **trades** includes manufacture and commerce.

Article 3

- (3) minimum rates of wages which have been fixed shall be binding on the employers and workers concerned so as not to be subject to abatement by them by individual agreement, nor, except with general or particular authorisation of the competent authority, by collective agreement.

Article 4

1. Each Member which ratifies this Convention shall take the necessary measures, by way of a system of supervision and sanctions, to ensure that the employers and workers concerned are informed of the minimum rates of wages in force and that wages are not paid at less than these rates in cases where they are applicable.
2. A worker to whom the minimum rates are applicable and who has been paid wages at less than these rates shall be entitled to recover, by judicial or other legalised proceedings, the amount by which he has been underpaid, subject to such limitation of time as may be determined by national laws or regulations.

C131 Minimum Wage Fixing Convention, 1970

Article 1

Each Member of the International Labour Organisation which ratifies this Convention undertakes to establish a system of minimum wages which covers all groups of wage earners whose terms of employment are such that coverage would be appropriate.

Article 2

1. Minimum wages shall have the force of law and shall not be subject to abatement, and failure to apply them shall make the person or persons concerned liable to appropriate penal or other sanctions

Article 3

The elements to be taken into consideration in determining the level of minimum wages shall, so far as possible and appropriate in relation to national practice and conditions, include

- (a) the needs of workers and their families, taking into account the general level of wages in the country, the cost of living, social security benefits, and the relative living standards of other social groups;
- (b) economic factors, including the requirements of economic development, levels of productivity and the desirability of attaining and maintaining a high level of employment.

Table No12 also provides the minimum wage expressed in international dollars using purchasing power parity (PPP) rates (an international dollar has the same purchasing power as a US dollar has in the United States).

Once again it is obviously shown the great difference in minimum wages between asian and western countries. These differences reflect of course the tremendous gap between labour costs in Asia and in Europe – USA.

Suggestively below tables show the day labour earned by several groups of scrap workers in Bangladesh²⁷.

CUTTER GROUP

Working hr/day	Percentage of Labour	Average salary (taka) /day
8	8.57	85.56
9	3.81	98.75
10	24.76	115.96*
11	20.00	109.31*
12	31.43	121.61
13	9.52	158.00
14	0.95	168.00
16	0.95	200.00

Table 1: Working hour and salary of cutter group.



Photograph 3 : A labour of cutter group is cutting iron plate.

PLATE GROUP

Working hr/day	Percentage of Labour	Average salary (taka) /day
6	1.83	150.00*
8	6.42	82.14*
9	6.42	75.71*
10	27.52	93.00*
11	19.27	91.81*
12	24.77	101.78
13	13.76	104.47

Table 2 : Working hour and salary of plate group.



Photograph 4 : Common scenario of plate/loading group in yard.

²⁷ Workers in ship breaking industries: A base line survey of Chittagong (Bangladesh), YPSA, 2005

Cutter group: Workers who cut different parts of ship by oxyacetylene flame

Plate/Loading group : Workers who carry on their shoulders and/or load iron pieces into trucks

Wire group : Workers who pull the wires

Hammer group : Workers who hit or beat the joint of iron and loosen the nails

Foreman: Link between the workers and the contractors. Foremen are responsible for recruiting workers for the yard.

* Salaries paid are subject to hours worked and every day performance of the worker.

WIRE GROUP

Working hr/day	Percentage of Labour	Average salary (taka) /day
8	16.67	72.50*
9	13.89	86.00*
10	19.44	87.14*
11	19.44	85.93*
12	8.33	90.00
13	8.33	104.00
15	8.33	138.33

Table 3 : Working hour and salary of wire group.



Photograph 5 : Labour of wire group are pulling wire on shoulders.

HAMMER GROUP

Working hr/day	Percentage of Labour	Average salary (taka) /day
8	10.00	150.00*
10	20.00	150.00*
11	30.00	150.00*
12	40.00	108.00*

Table 4 : Working hour and salary of hammer group.



Photograph 6 : Hitting on screw or iron is the criteria of hammer group.

FOREMAN

Working hr/day	Percentage of Labour	Average Salary (taka) / month
10	14.29	4800.00*
11	28.57	3300.00*
12	28.57	3975.00
13	14.29	4050.00
14	14.29	5400.00

Table 5 : Working hour and Salary of Foreman.

4.2.2 Labour costs related to workers safety and health assurance

Apart from the wages which get the lion's share in labour costs, employers are also obliged to provide to their workers a safe and healthy place to work covering also their social assurance. However this is more a practice of western countries and not of asian ones.

Bangladesh



Bangladesh is a small and densely populated country which has a long coastal belt of about 710 km. The only shipbreaking industry of the country has been developed in Sitakund areas, Chittagong since 1972. There are more than 20 active shipbreaking yards²⁸ in Sitakund, where about 25 - 30 000 labourers are working. The majority of them are from poor northern part of the country. Farmers from villages like Nandail (north of Kishorganj), Saria Kandi (near Bogra on the river side) or Chandan Baisha, Dac Bangla and Kolni Bari (south of Saria Kandi) leave their home places and go to work at the Chittagong ship breaking yards. Poverty, lack of employment and education forces them to work in this sector while they often bring together their relatives.

Apart from those working in the breaking yards directly, there are also about 20 forward and backward linkage industries based on shipbreaking, where thousands of people are working. These industries are steel mills, furniture shops, shops trading cables, paints or oil from scrapped ships. According to on the spot search by NGO like Greenpeace, 30 000 workers are employed directly and around 100 - 200 000 indirectly. On the contrary according to the Bangladesh submission to the IMO regarding ship breaking activities in the country (ILO/IMO/BC WG 1/7/1, 23.1.2005) about three million people are directly or indirectly employed in the industry.

Workers in yards are categorized according to their efficiency as general worker, sardar, who supervise the work of about 15-20 general worker, and Foreman, who supervise the work of 3-4 sardar and/or 50-60 workers. Each worker undertakes a specific task. In general the following working groups are formed:

- Cutter group: Workers who cut different parts of ship by oxyacetylene flame
- Plate/Loading group : Workers who carry on their shoulders and/or load iron pieces into trucks
- Wire group : Workers who pull the wires
- Hammer group : Workers who hit or beat the joint of iron and loosen the nails
- Foreman: Link between the workers and the contractors. Foremen are responsible for recruiting workers for the yard.

YPSA²⁹ team conducted a survey from September to November 2003 on five hundred people, involved in the ship scrapping industry either directly (workers in the yard), or indirectly (contractors, managers, workers in industries related to scrapping like furniture for example). Interviewed people were sampled randomly. Key findings of this survey are presented below. For the scope of this thesis we focused on the findings which derive from the answers given by workers who are occupied directly in the yard.

²⁸ http://www.gmsinc.net/gms/locations_bangladesh.php

²⁹ YPSA began its action on 20th May 1985. It is a voluntary, nonprofit, social development organization registered with the different departments of the people's republic of Bangladesh including NGO Affairs Bureau, Department of Social welfare, Department of Youth Development, Health and Family Welfare, Copyright office , Register of Joint Stock Companies and Firms and Micro Credit Regulatory Authority.

Age of labourers

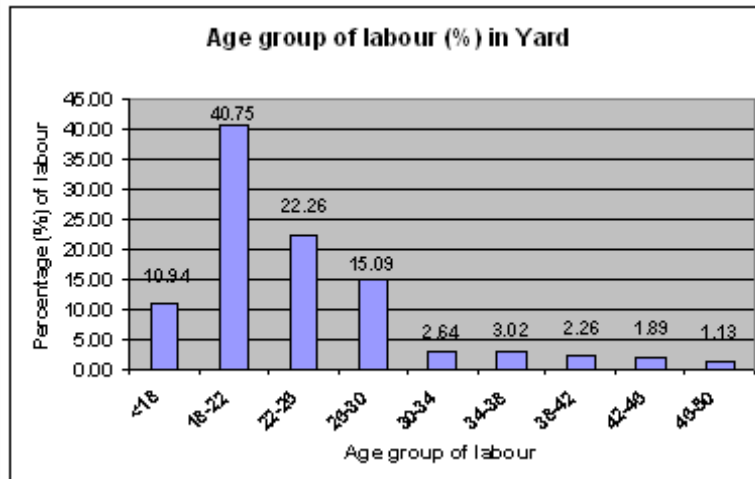


Figure No15: Age group of labour, Source: Workers in ship breaking industries: A base line survey of Chittagong (Bangladesh), YPSA, 2005

As shown in the figure above the majority of the workers (40.75%) are under age group 18-22. It is worth mentioning that 10.94% of workers are children which mostly undertake “light” tasks like washing, cleaning etc. Shipbreaking contractors prefer to recruit children as they are less expensive than their adult counterparts. Children work mainly as gas cutters assistants and move small iron pieces from one place to another. They either work in the yard from sunrise to sunset or do the night shift. On average they receive 50-60 taka/ day (1USD≈71 taka) for their efforts. There are no educational or recreational facilities.

Furthermore since this job requires much physical strength it is expected that men over 45 years old are very few.

Educational qualification of labourers

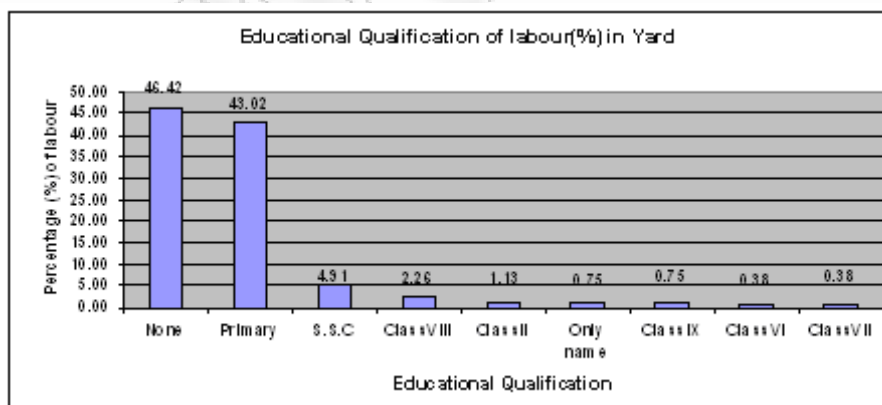


Figure No16: Educational qualification of labour, Source: Workers in ship breaking industries: A base line survey of Chittagong (Bangladesh), YPSA, 2005

Vast majority of workers are illiterate (46.42%) while 43.02% of workers are educated up to primary education.

As far as the medical treatment is concerned, 90.19% of workers reported that they do get no such treatment from the yard.

None of the workers signs a contract with the employer(s) and as a result they can not prove that they are working in this sector, they are deprived from their rights and their staying remains uncertain since they are easily replaceable.

Break time (one and a half hour each working day) is not paid and no vacations are permitted. Dominant motto is “No work, no money”.

No right to join or form a trade union is allowed.

According to workers the following problems were identified as the major ones:

- Very risky job
- Wages are not paid accurately and timely.
- Lack of pure drinking water
- Every day accidents - Hands and legs are always burned, feel pain in body and chest.
- Too much working pressure but poorer wages
- Necessary protective equipment (gloves, helmets, shoes & welding glass) is not provided.
- Lack of healthy toilet
- No security of life
- Serious accidents - Legs are often cut and injured
- Have to work in hot and rainy days

Occupational Health and Safety (OHS)

Shipbreaking workers are all engaged in dangerous physical labour. Ships containing hazardous materials are being cut up by hand, on open beaches, with no consideration given to safe and environmentally friendly waste management practices. Ships are not properly cleaned before beaching and generally an eyewash test is carried out to certify that a ship is free from dangerous chemical and fumes. Workers don't have safety equipments like helmets, goggles, gloves, boots and work suits, medical facilities and moreover financial security. In Bangladesh there are no casualty records kept, neither by the yard owners nor by the authorities. Over the last twenty years more than 400 workers have been killed and 6000 seriously injured according to the Bangladeshi media. However there are serious doubts on these estimations since only the explosion of the Iranian tanker TT Dena on 31 may 2000 is said to have caused 50 deaths. We also have to take under consideration thousands of cases of irreversible disease which have occurred and will occur in future due to the toxic materials that are handled and inhaled without minimum precautions or protective cares. These casualties resulted by diseases (hidden deaths) are not included into the official estimations. Furthermore workers are seasonal and since there no casualty records kept on time, it is often difficult to find anybody who can remember the stories of people who died due to accidents or diseases.

On average, one worker dies in the yards a week and everyday a worker is injured (End of Life Ships: the Human Cost of Breaking Ships). Shipbreaking workers are easily replaceable to the yard owners due to the severe unemployment.

More often types of accidents are intoxication by dangerous substances, explosions of leftover gas and fumes in the tanks, falling from the ships (which are up to 70 m high), being crushed by falling steel beams and plates and electric shocks.

Workers are not aware of hazards to which they are exposed. The overwhelming majority of workers wear no protective equipment and many of them work barefoot. Gas cutters and their helpers, cut steel plates without eye protection. “Unskilled” workers usually carry pieces of iron sheets on their shoulders without any weight limit existing. There is hardly any testing system for the use of cranes, lifting machinery or a motorized pulley. The yards re-use ropes and chains recovered from the broken ships without testing and examining their strength. There is no marking system of loading capacity of the chains of cranes and other lifting machineries.



Figure: Shipbreaking yards, November 2004, Source: End of life ships, The human cost of breaking ships, Greenpeace

Treatment and compensation

When a non serious accident happens basic medical treatment is provided. In cases where a worker becomes disabled by a major accident, the common practice is him to be paid the transportation costs in order to return to his home place. However in more rare cases worker may be paid 10 to 15.000 taka (1USD≈71taka) and then forced to return to his home. In case of fatal accident contractor pays the cost of sending the body back to the victim's family and arranges for victim's burial. Treatment is different for the local workers. If a local loses his life by accident, his family receives 50.000 taka as compensation. By this way yard owners and contractors want to avoid any possible demonstrations by locals.



Figure: Unskilled workers carry truckable pieces of iron sheets on their shoulders, Source: Ship Breaking Activities and its Impact on the Coastal Zone of Chittagong, Bangladesh: Towards Sustainable Management , Young Power in Social Action (YPSA), July 2006



Figure: The hatches and pockets of vessel may contain explosive or inflammable gases, Source: Ship Breaking Activities and its Impact on the Coastal Zone of Chittagong, Bangladesh: Towards Sustainable Management , Young Power in Social Action (YPSA), July 2006



Figure: In the ship breaking area of Chittagong 10.94% labour are child, Source: Ship Breaking Activities and its Impact on the Coastal Zone of Chittagong, Bangladesh: Towards Sustainable Management , Young Power in Social Action (YPSA), July 2006

Constitution of People's Republic of Bangladesh

Basic articles of the Constitution of People's Republic of Bangladesh are presented below. Comparing these constitutional articles with the above mentioned every day work practice in Bangladesh ship yards, we see that the violation of human rights is more than obvious. It is easy to understand that the problem is not the non-existence of law but the non-implementation of it.

Articles:

11. Democracy and human rights

The Republic shall be a democracy in which fundamental human rights and freedoms and respect for the dignity and worth of the human person shall be guaranteed, and in which effective participation by the people through their elected representatives in administration at all levels shall be ensured.

14. Emancipation of peasants and workers.

It shall be a fundamental responsibility of the State to emancipate the toiling masses the peasants and workers and backward sections of the people from all forms and exploitation.

15. Provision of basic necessities.

It shall be a fundamental responsibility of the State to attain, through planned economic growth, a constant increase of productive forces and a steady improvement in the material and cultural standard of living of the people, with a view to securing to its citizens

(a) the provision of the basic necessities of life, including food, clothing, shelter, education and medical care;

(b) the right to work, that is the right to guaranteed employment at a reasonable wage having regard to the quantity and quality of work;

(c) the right to reasonable rest, recreation and leisure; and the right to social security, that is to say to public assistance in cases of undeserved want arising from unemployment, illness or disablement, or suffered by widows or orphans or in old age, or in other such cases.

19. Equality of opportunity.

(1) The State shall endeavour to ensure equality of opportunity to all citizens.

(2) The State shall adopt effective measures to remove social and economic inequality between man and man and to ensure the equitable distribution of wealth among citizens, and of opportunities in order to attain a uniform level of economic development throughout the Republic.

20. Work as a right and duty.

(1) Work is a right, a duty and a matter of honour for every citizen who is capable of working, and everyone shall be paid for his work on the basis of the principle "from each according to his abilities to each according to his work".

(2) The State shall endeavour to create conditions in which, as a general principle, persons shall not be able to enjoy unearned incomes, and in which human labour in every form, intellectual and physical, shall become a fuller expression of creative endeavour and of the human personality.

27. Equality before law.

All citizens are equal before law and are entitled to equal protection of law.

29. Equality of opportunity in public employment.

(1) There shall be equality of opportunity for all citizens in respect of employment or office in the service of the Republic.

(2) No citizen shall, on grounds only of religion, race, caste, sex or place of birth, be ineligible for, or discriminated against in respect of, any employment or office in the service of the Republic.

(3) Nothing in this article shall prevent the State from

(a) making special provision in favour of any backward section of citizens for the purpose of securing their adequate representation in the service of the Republic;

(b) giving effect to any law which makes provision for reserving appointments relating

to any religious or denominational institution to persons of that religion or denomination; reserving for members of one sex any class of employment or office on the ground that it is considered by its nature to be unsuited to members of the opposite sex.

37. Freedom of assembly.

Every citizen shall have the right to assemble and to participate in public meetings and processions peacefully and without arms, subject to any reasonable restrictions imposed by law in the interests of public order health.

38. Freedom of association

Every citizen shall have the right to form associations or unions, subject to any reasonable restrictions imposed by law in the interests of morality or public order;

INDIA

The Ship Recycling Yard at Alang located near Bhavnagar in Gujarat State on the western coast of Gulf of Cambay is considered to be the largest ship recycling yard in the world.



View of Alang Ship breaking yard

The ship recycling industry employs about 40000 workers each year in Alang alone (approximately 100 plots), while over 160 000 workers are employed in associated downstream activities. Female workers are very few due to the nature of the job which demands high physical strength. Some degree of child labour for the lighter work is common³⁰.

Most of ship breaking workers belong to the age group of 19 – 45 years. The labourers employed come from India's poorest States like Orissa, Uttar Pradesh (UP) and Bihar. As a result there is a cultural diversity in the work place. The reason behind higher level of migration from UP, Bihar and Orissa is due to low industrialization, higher population, illiteracy, poverty and lack of sources of live hood in these states. Locals leave villages in the Khurda, Nayagath and Ganjam districts of Orissa, where they can't earn a living and feed their families, since none of them posses land or any kind of property.

³⁰ GREEN PAPER On better ship dismantling, {SEC(2007) 645}, Brussels, 22.5.2007, COM(2007) 269 final

Orissa is frequently hit by cyclones and other natural disasters. Furthermore there has been substantial reduction in forest production and a lack of employment opportunities, resulting in heavy debt. So men leave their homes to work in various parts of India, including the important industry centres of Mumbai, Calcutta and Gujarat. About ninety percent of migrant Orissa labourers find a job in hazardous production sectors like ship breaking or the chemical industry. It is worth mentioning that in 1961 population at Alang area was estimated at seven to eight thousand (7-8000) people, while in 2002 combined population of yard and local villages was estimated at 60000 people.

The majority of workers (84%) choose to leave their families at their native places. Main reasons why workers come alone at Alang relate to the lack of proper residential facilities, lack of schooling facilities for their children at the yard and the general insecurity of income and jobs, since a worker can be discharged from his work at any time.

According to International Metalworkers' Federation (IMF) survey³¹ to 1650 workers, most ship breaking workers are illiterate as shown in the table below:

Level of literacy	
Workers	Percent
Illiterates	23
Primary School	32
Middle School	32
Senior Secondary	10
Higher Secondary & Graduate	3
Total	100

Table No17: Level of literacy, Source: International Metalworkers' Federation, **Status of Shipbreaking Workers in India - A Survey**, IMF-FNV project in India, 2004-2007

Once arrived at Alang, workers stay in shacks just outside the ship breaking plots without any ventilation, electricity or toilet facilities. Workers have to pay a house rent for these shacks ranging from Rs. 200 to 500 per month. Only few workers manage to get accommodation in the nearby villages. Since Alang is the largest ship breaking yard in the world, in each breaking plot there are approximately 300-350 workers. Gujarat Maritime Board³² provides 5000 litre drinking water to each plot every day, though this proves to be insufficient. The lack of water prevents adequate washing and cleaning of people, clothes, housing and cooking implements, contributing to very poor sanitation. Food is arranged by workers themselves.

Gujarat Maritime Board in India records 372 casualties due to accidents from the beginning of shipbreaking activities in 1983 up to mid 2004. But, when compared to eyewitness statements, these official 'figures' about deaths by accidents seem largely underestimated. For example, according to the figures of the Gujarat Maritime Board, seven workers lost their lives due to explosions and fire in 2003. However, eyewitnesses from a Greenpeace delegation found at least twenty people dead in two explosions in 2003. Furthermore five big accidents involving deaths happened that year. According to International Metalworkers' Federation (IMF) survey the rate of injury is 50 workers per

³¹ International Metalworkers' Federation, Status of Shipbreaking Workers in India - A Survey, IMF-FNV project in India, 2004-2007

³² Gujarat Maritime Board was created in 1982 under the Gujarat Maritime Board Act, 1981, to manage, control and administer the minor ports of Gujarat. GMB presently manages the 41 minor ports of the State with a vision 'To enhance and harness ports and international trade as vehicles for economic development'. It is the regulatory authority of the breaking yards of Alang/ Sosiya. GMB leases out a ship breaking plot to scrappers on a 10 years lease basis. Via these funds, GMB aims to improve workers living and working conditions by enhancing the infrastructure development.

day, while some of them die due to inadequate medical facility in the area. This indicates that the official 'statistics' are very much incomplete.

Skin diseases, ringworm, dysentery and anaemia are also some of the common health problems. Alcoholism is rampant and many HIV cases are being reported. According to local Bhavnagar Blood Bank office at Alang about 50 to 55 new cases of sexually transmitted diseases are being reported every week among the workers. These cases are linked to the fact that most workers leave their families behind and live for months or years alone.

An important cause of death among ship breaking workers is also the toxic waste-related diseases they suffer from. According to a doctor at the Red Cross Hospital in Alang, working one day at the ship breaking yard is equal to smoking 10-15 packs of cigarettes. A medical report presented to the Indian Supreme Court in September 2006 revealed that 16% of the workforce handling asbestos in Alang were found to be suffering from asbestosis and thus at serious risk of mesothelioma. As is known from medical research, the incidence of this form of lung cancer reaches its peak only several decades after exposure.

Frequent causes of accidents are presented below:

- Fire and explosions
- Falls from high inside the ship structures or on the ground
- Falling/ moving objects
- Trapping or compression
- Oxygen deficiency in enclosed spaces
- Electrocution
- Lack of Proper Protective Equipment (PPE)
- Eye Burning

One major problem is that despite many serious work-related injuries, the nearest full service hospital is 50 kilometres away in Bhavnagar. Alang itself is served by a small Red Cross hospital that offers only limited services.

Workers are being provided neither with the adequate training nor with the equipment to work in such a dangerous and toxic environment, although ship breaking is considered by the International Labour Organisation as one of the heaviest and most hazardous occupations in the world. Their general living conditions after migrating to the yards are extremely bad. They work without contracts and health or accident insurance and are not allowed to form trade unions. They are always under the fear of unemployment and because of this fear they accept all these exploitative conditions for the sake of livelihood.

However workers keep migrating in Alang since they can not generate income in their home places. Average daily wages in yard are of scale Rs. 30 (0.6 US\$) – Rs. 50 (1 US\$) – Rs. 80 (1.6 US\$)³³. Unskilled workers earn Rs. 30- Rs.50 and gas cutters Rs.80. Average working time is 10 hours a day, six days a week (except Sunday). However, most of times, workers end up doing overtime. This practice, as it is expected, leads to higher rates of accidents due to fatigue.

³³ Exchange rate as per 23.11.2010 Indian Rupee INR/USD\$= 0.02

Wages	
Frequency of wages	Percent
Rs. 50 to Rs. 100	81
Rs. 101 to Rs. 150	11
Rs. 151 to Rs. 200	7
Rs. 201 to Rs. 250	1
Total	100

Table No18: Wages of Alang workers, Source: International Metalworkers' Federation, **Status of Shipbreaking Workers in India - A Survey**, IMF-FNV project in India, 2004-2007

Average life expectancy of Alang workers is 40-50 years as per local newspaper information. No compensation is given to injured workers who are forced to leave their jobs. In case of fatal accident, victim's relatives receive Rs. 15 000 to Rs. 100 000 depending on the strength of negotiation. It is worth mentioning that most of ship breaking workers apart from themselves have to take care also members of their families who have been left behind in their home places. According to International Metalworkers' Federation (IMF) survey, number of dependants family members ranges from 2 to 13. As an Indian worker from Khaling village stated : *'If I go to Alang maybe one person will die, but if I stay five people will die'*.

On the other hand the Gujarat Maritime Board (GMB), in an effort to enhance the working environment in the breaking yards in Alang, organized a training and welfare centre. It's designed to train workers on risk management, security and safety in the ship breaking yards. Three kinds of training are provided in this centre: basic training, advanced training and training for the foremen. The basic training is for three days for about 30 to 35 workers. After the basic training, advanced training is available. After successful completion of the training, centre issues a certificate, which workers can use in order to have access to health facilities. Following training has been completed till 31/08/2008:

- Basic safety for all - 14693 labourers
- Gas cutter training - 2585 labourers
- Asbestos removal training - 442 labourers
- Basic Fire fighting - 595 labourers
- Basic safety refresh - 83 labourers
- Master / Mukadam - 66 labourers

The centre uses posters, steel pictures, and video clippings to educate the workers. Sometimes workers watch films or documentaries about safety. GMB also purchased land in order to build adequate housing for workers.



Figure: Training Centre in Alang Ship Breaking Yard, Source: Impacts and Challenges of a large coastal industry, *Alang-Sosiya Ship-Breaking Yard Gujarat, India* UNESCO 2004

Law Frame in India

Human rights of equality, freedom, dignity, non exploitation, protection of children along with the protection of the environment are guaranteed by the Constitution of India. Basic articles of the Constitution are presented below indicating that the proper law frame in order to regulate activities like ship breaking exists, however it is not implemented.

Constitution of India

Right to Equality

14. The State shall not deny to any person equality before the law or the equal protection of the laws within the territory of India.

16. (1) There shall be equality of opportunity for all citizens in matters relating to employment or appointment to any office under the State.

Right to Freedom

19. (1) All citizens shall have the right

(a) to freedom of speech and expression;

(b) to assemble peaceably and without arms;

(c) to form associations or unions;

(d) to move freely throughout the territory of India;

(e) to reside and settle in any part of the territory of India

(g) to practise any profession, or to carry on any occupation, trade or business.

21A. The State shall provide free and compulsory education to all children of the age of six to fourteen years in such manner as the State may, by law, determine

Right against Exploitation

23. (1) Traffic in human beings and begar and other similar forms of forced labour are prohibited and any contravention of this provision shall be an offence punishable in accordance with law.

24. No child below the age of fourteen years shall be employed to work in any factory or mine or engaged in any other hazardous employment.

38. 1[(1)] The State shall strive to promote the welfare of the people by securing and protecting as effectively as it may a social order in which justice, social, economic and political, shall inform all the institutions of the national life.

2[(2) The State shall, in particular, strive to minimise the inequalities in income, and endeavour to eliminate inequalities in status, facilities and opportunities, not only amongst individuals but also amongst groups of people residing in different areas or engaged in different vocations.

39. The State shall, in particular, direct its policy towards securing

(a) that the citizens, men and women equally, have the right to an adequate means of livelihood

(b) that the ownership and control of the material resources of the community are so distributed as best to subserve the common good

(c) that the operation of the economic system does not result in the concentration of wealth and means of production to the common detriment

(d) that there is equal pay for equal work for both men and women

(e) that the health and strength of workers, men and women, and the tender age of children are not abused and that citizens are not forced by economic necessity to enter avocations unsuited to their age or strength

(f) that children are given opportunities and facilities to develop in a healthy manner and in conditions of freedom and dignity and that childhood and youth are protected against exploitation and against moral and material abandonment.

39A. The State shall secure that the operation of the legal system promotes justice, on a basis of equal opportunity, and shall, in particular, provide free legal aid, by suitable legislation or schemes or in any other way, to ensure that opportunities for securing justice are not denied to any citizen by reason of economic or other disabilities.

41. The State shall, within the limits of its economic capacity and development, make effective provision for securing the right to work, to education and to public assistance in cases of unemployment, old age, sickness and disablement, and in other cases of undeserved want.

42. The State shall make provision for securing just and humane conditions of work and for maternity relief.

43. The State shall endeavour to secure, by suitable legislation or economic organisation or in any other way, to all workers, agricultural, industrial or otherwise, work, a living wage, conditions of work ensuring a decent standard of life and full enjoyment of leisure and social and cultural opportunities and, in particular, the State shall endeavour to promote cottage industries on an individual or co-operative basis in rural areas.

43A. The State shall take steps, by suitable legislation or in any other way, to secure the participation of workers in the management of undertakings, establishments or other organisations engaged in any industry.

45. The State shall endeavour to provide, within a period of ten years from the commencement of this Constitution, for free and compulsory education for all children until they complete the age of fourteen years.

48A. The State shall endeavour to protect and improve the environment and to safeguard the forests and wild life of the country.

Furthermore the Supreme Court of India³⁴ gives the needed guidance in the ship breaking area but consequently has difficulties to get its directions and judgements enforced. In it's Judgement of 14 October 2003 the Indian Supreme Court judged amongst others:

- Before a ship arrives at a port, it should have proper consent from the concerned authority or the State Maritime Board, stating that it does not contain any hazardous waste or radio-active substances.
- The ship should be properly decontaminated by the ship owner prior to breaking.

³⁴ The Supreme Court has power to issue directions or orders or writs, including writs in the nature of *habeas corpus*, *mandamus*, *prohibition*, *quo warranto* and *certiorari*, whichever may be appropriate, for the enforcement of any of the rights conferred by the Constitution.



Figure: Shipbreaking yards, November 2004, Source: End of life ships, The human cost of breaking ships, Greenpeace

PAKISTAN



The Gadani ship breaking area is the centre of the ship breaking industry in Pakistan. It is located in Gadani, Pakistan, about 50 kilometres northwest of Karachi and consists of about 130 operating yards. Ships to be broken up are run aground on the beach under their own power, then gradually dismantled. As the weight of the ship lessens, it is dragged further onto the beach until completely scrapped. The majority of ships scrapped on Pakistani beaches are oil tankers, since Pakistani breakers are specialised in large tonnage vessels.

In common with other breakers in the region (India, Bangladesh), scrapping industry at Gadani uses large amounts of local cheap labor with minimal mechanical assistance. Yard employs around 6000 workers. The workers in Gadani, Pakistan are mostly Pashtu people from the Northern Territories close to the Afghan border. They are seasonal workers, spending the other part of their time working as farmers in their homelands. They are quite poor and what you would call fundamentalists in their Islamic beliefs³⁵. Hundreds of laborers gather at Gadani from all over the Pakistan hoping to find a job. They work for \$2-\$3 a day, in line with Pakistan's average wage, with no safety gear and no health plan — and they are thankful to have a job since unemployment is rampant.

Labor organizations have denounced working conditions at Gadani. Laborers rush about at their tasks, weaving around giant piles of scrap. Dozens of other workers cut away at two-ton slabs of metal with acetylene torches while enormous steel plates capable of squashing a man swing near their heads. No one wears a hardhat. By far the hardest and most dangerous job is done by the welders who work inside the hull, dangling in total darkness amid overpowering fumes from oil and the gas from their torches. Companies pay \$3,300 to the families of those killed and for the cost of getting the body home. There is no medical facility at Gadani and just one ambulance to take injured men on the hour's drive to a hospital in Karachi. One laborer stated "I've seen lots of accidents and I've seen lots of people who've lost their lives." A yard owner asked whether he has a policy for dealing with hazardous materials like asbestos, he replied "When we find asbestos, we put it in a hole in the ground and cover it up"³⁶

International environmental groups like Greenpeace fear that ship-breaking industry will be a disaster for the ecosystem along the Arabian Sea coast. Greenpeace calls the ship-breaking business "one of the most deadly in the world," noting the old ships hold large amounts of toxic chemicals, asbestos and heavy metals. Disposal is subject to strict regulations in Europe and the United States, but no such rules are enforced in Pakistan or the other major ship-breaking countries³⁷.

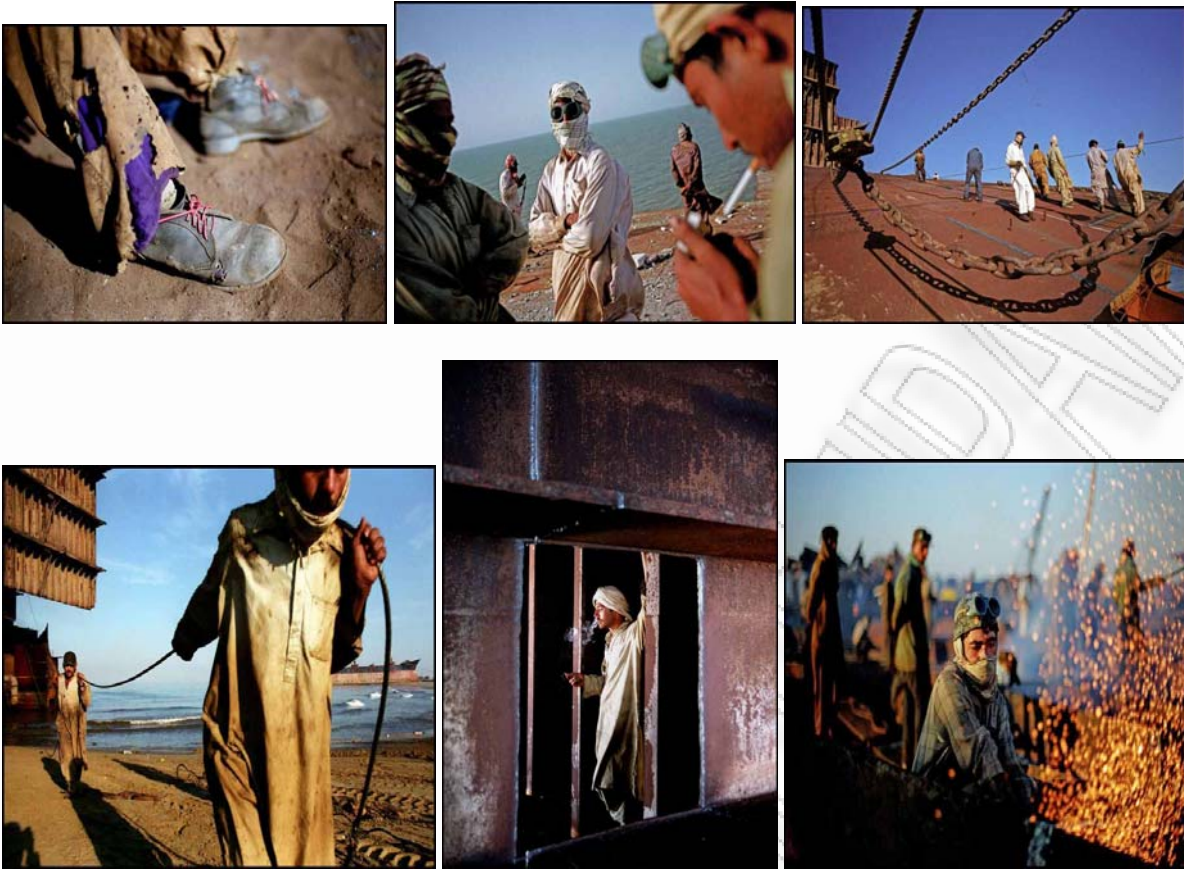


Figures: Ship breaking yards in Pakistan

³⁵ <http://www.zoriah.net/blog/2009/12/gmb-akash-ship-breaking-in-pakistan.html>

³⁶ http://www.bbc.co.uk/insideout/northeast/series9/week_nine.shtml
http://www.youtube.com/watch?v=mRJYgNc_TNc

³⁷ http://www.msnbc.msn.com/id/3674428/ns/us_news-environment



Figures: Ship breaking yards in Pakistan

Constitution of the Islamic Republic of Pakistan

As shown in the following articles, Constitution of Pakistan guaranties the respect of fundamental human rights like the freedom of association, the equality among citizens, social justice and economic well being of the people. Once again it is obvious that law exists but it is not implemented.

3. Elimination of exploitation

The State shall ensure the elimination of all forms of exploitation and the gradual fulfilment of the fundamental principle, from each according to his ability to each according to his work.

11. Slavery, forced labour etc. prohibited.

2. All forms of forced labour and traffic in human beings are prohibited.
3. No child below the age of fourteen years shall be engaged in any factory or mine or any other hazardous employment

16. Freedom of assembly

Every citizen shall have the right to assemble peacefully and without arms, subject to any reasonable restrictions imposed by law in the interest of public order.

17. Freedom of association

- 1) Every citizen shall have the right to form associations or unions, subject to any reasonable restrictions imposed by law in the interest of sovereignty Pakistan, public order or morality.

25. Equality of citizens

1) All citizens are equal before law and are entitled to equal protection of law.

Right to education

25A The State shall provide free and compulsory education to all children of the age of five to sixteen years in such manner as may be determined by law.

37. Promotion of social justice and eradication of social evils.

The State shall:

- (a) promote, with special care, the educational and economic interests of backward classes or areas;
- (b) remove illiteracy and provide free and compulsory secondary education within minimum possible period;
- (c) make technical and professional education generally available and higher education equally accessible to all on the basis of merit;
- (d) ensure inexpensive and expeditious justice;
- (e) make provision for securing just and humane conditions of work, ensuring that children and women are not employed in vocations unsuited to their age or sex, and for maternity benefits for women in employment;
- (f) enable the people of different areas, through education, training, agricultural and industrial development and other methods, to participate fully in all forms of national activities, including employment in the service of Pakistan

38. Promotion of social and economic well-being of the people.

The State shall :

- (a) secure the well-being of the people, irrespective of sex, caste, creed or race, by raising their standard of living, by preventing the concentration of wealth and means of production and distribution in the hands of a few to the detriment of general interest and by ensuring equitable adjustment of rights between employers and employees, and landlords and tenants;
- (b) provide for all citizens, within the available resources of the country, facilities for work and adequate livelihood with reasonable rest and leisure;
- (c) provide for all persons employed in the service of Pakistan or otherwise, social security by compulsory social insurance or other means;
- (d) provide basic necessities of life, such as food, clothing, housing, education and medical relief, for all such citizens, irrespective of sex, caste, creed or race, as are permanently or temporarily unable to earn their livelihood on account of infirmity, sickness or unemployment;
- (e) reduce disparity in the income and earnings of individuals, including persons in the various classes of the service of Pakistan

China



China has approximately 90 breaking yards dotting the deltas and lower reaches of the Pearl and Yangtze rivers. Total ship dismantling capacity is currently between 3 - 3.5 million LDT a year. The major ship-breaking yard is Zhang Jiagang in Jiangsu Province and there are additional breaking yards in Fujian and Guangdong provinces. China is the only country where scrap ships are not beached and as a result ship breaking there looks less dramatic than on Indian or Bangladeshi beaches. Vessels are broken up in docks since beaching is forbidden. In China there are four major ship breaking yards as follows:

1. Chang Jiang Shipbreaking Yard, operated by the China National Shipbreaking Corporation in Jiang Yin, on the Yangtze river, China,
2. Zhangjiagang Yuanwang Iron & Steel Co. Ltd, Deji, on the Yangtze river, China,
3. Gujing Shipbreaking Company, Xinhui City. Guangdong Province (Joint venture by Xinhui City and China State Shipbreaking Company), on the Pearl river delta, China,
4. Shuangshui Shipbreaking Company, Xinhui City. Guangdong Province, on the Pearl river delta, China (Green peace, 2001)³⁸.

Many ship recycling yards such as the Zhongxin and Shuangshui yards in Jiangmen, and the Xiangang Changjiang yard in Jiangsu province have obtained international certification in Environmental Management –ISO 14001 and in Occupational Health, Safety Management –OHS18001. These major yards have mastered the technology to dismantle all types of ships with the exception of those that are nuclear-powered.

Labour cost remains the same reason why ship scrappers prefer China in order to have the vessels demolished. In China, workers earn between 300RMB and 700RMB per month (US\$33-US\$78).

Even though vessels are broken up in docks, working conditions are not much better than those in India or Bangladesh. As witnessed by Greenpeace China investigation team at two scrapyards in southern China, workers are only protected by their straw hats and light shoes while working in a very primitive and dangerous environment. Only a few wear hard hats, rubber boots and cotton gloves. Workers do not have proper protective masks to guard against toxic fumes generated from steel-cutting process, they only use towels to cover their faces. Greenpeace China campaigners interviewed a number of workers who revealed that they do not wear protective gear or breathing apparatus when

³⁸ Ship Breaking Activities and its Impact on the Coastal Zone of Chittagong, Bangladesh: Towards Sustainable Management , Young Power in Social Action (YPSA), July 2006

handling harmful carcinogenic asbestos or stripping the material from the vessel. Asbestos was removed without proper protection and it was later sold for re-use to industries producing heating systems.

As far as the environment is concerned, yards were heavily polluted by oil, heavy metals and other toxic substances. Samples taken by Greenpeace from those two sites proved that asbestos was lying around and that soil samples collected from there contained asbestos. Greenpeace studies proved that sediments of the Pearl and Yangtze river are also polluted by toxic substances from old ships³⁹.

On the other hand China National Ship recycling Association (CNSA) claims that industry has invested greatly in environmental protection as well as in employees' health and safety. The yards properly treat ballast and bilge waters from the ships at waste water disposal centers. Asbestos, PCBs and other hazardous materials are transferred to qualified subcontractors for further treatment and disposal. Workers in the industry maintain a high level of knowledge through good, on-going training and their safety comes first⁴⁰.



Figure: The waste water treatment center at Zhongxin's Xinhui yard, Source: Present Situation and Future Development of the Ship Recycling Industry in China, Mr. Xie Dehua Executive vice-chairman & Secretary-general of China National Shiprecycling Association, June 6, 2007 Hong Kong, China

Law Frame in China

As mentioned earlier, working conditions in China's breaking yards are much better comparing to those in other Asian countries, however still there is much place for improvement. Following articles from Constitution of China state the protection of fundamental human rights making it clear that the necessary law frame already exists.

Constitution of People's Republic of China⁴¹

Article 33

All citizens of the People's Republic of China are equal before the law.
The state respects and guarantees human rights.

³⁹ http://www.ban.org/Library/shipbreaking_china.html

⁴⁰ Present Situation and Future Development of the Ship Recycling Industry in China, Mr. Xie Dehua Executive vice-chairman & Secretary-general of China National Shiprecycling Association, June 6, 2007 Hong Kong, China

⁴¹ http://english.gov.cn/2005-08/05/content_20813.htm

Article 35

Citizens of the People's Republic of China enjoy freedom of speech, of the press, of assembly, of association, of procession and of demonstration.

Article 42

Citizens of the People's Republic of China have the right as well as the duty to work.

Through various channels, the state creates conditions for employment, enhances occupational safety and health, improves working conditions and, on the basis of expanded production, increases remuneration for work and welfare benefits.

Work is a matter of honor for every citizen who is able to work. All working people in state-owned enterprises and in urban and rural economic collectives should approach their work as the masters of the country that they are. The state promotes socialist labor emulation, and commends and rewards model and advanced workers. The state encourages citizens to take part in voluntary labor.

The state provides necessary vocational training for citizens before they are employed.

Article 43

Working people in the People's Republic of China have the right to rest.

The state expands facilities for the rest and recuperation of the working people and prescribes working hours and vacations for workers and staff.

Article 45

Citizens of the People's Republic of China have the right to material assistance from the state and society when they are old, ill or disabled. The state develops social insurance, social relief and medical and health services that are required for citizens to enjoy this right.

Article 46

Citizens of the People's Republic of China have the duty as well as the right to receive education.

The state promotes the all-round development of children and young people, morally, intellectually and physically.

Green ship recycling general regulation

This regulation issued on 14th February 2005 reflects the concept of security and environmental protection in ship recycling industry. It sets all requirements that have to be met ensuring that dismantling is conducted with an environmentally sound manner and with respect to the human life and health.

More detailed it sets the requirements in order to :

- Control water, noise and air pollution
- Ensure health and safety of employees
- Certify the “green” ship dismantling companies

4.3 Increased domestic demand for steel

Ship-recycling industry produces huge quantum of re-rollable steel without exploiting natural resources. Normally at least 70 % of the total light displacement tonnage of a ship broken constitutes of re-rollable scrap. These are converted into bars and rods that are used in the construction sector.

This is very important for the dominant ship breaking countries like Bangladesh since they face lack of domestic natural resources like iron ore and can instead use steel scrap derived from ship breaking industry. According to Ship Recycling Industries Association (India) capital investment required for producing 2 million tones of steel through ship-recycling route will not be more than Rs. 300 crore as compared to over Rs. 6000 crore required via alternative route.

Furthermore ship breaking countries satisfy a large percentage of their annual needs in steel via the ship breaking industry. For example 80% of steel needed annually in Bangladesh comes from the ship breaking yards in Chittagong. In India, it accounts for 15% of the country's total steel output, while at ship breaking industry's peak, during the mid-late 1990s, the iron and steel industry combined with secondary activities was estimated to be worth in excess of US\$ 500 million per annum contributing significantly to the revenues earned by the State government. As a result these countries are able to reduce as much as possible steel imports and save a significant amount of money in foreign exchange. Taking into account these countries' poor economy and their weak domestic currencies compared to USD dollars, this option offered by the ship breaking industry is very important for the local economy.

Finally ship breaking industry is a great steel source for the construction sector of developing countries. According to the World Bank, China had a GDP growth of 9.1% and India 7.7%⁴² in 2009. Since these countries do not implement so high qualitative standards as European countries, they can benefit from the steel derived from the ship breaking.

4.4 Domestic market for second hand equipment and machinery

Even though there are serious doubts whether ship recycling in Asian countries is a green one, it is undoubted that it is a total "recycling". Every possible item can be trade able in Asian domestic markets like India, Bangladesh etc. On the contrary, there are no such second hand markets in western countries due to higher technological standards and more qualitative preferences of European and American consumers. Again this makes the developing countries more attractive for decommissioning of ships.

Scrap steel makes up most of the value of a decommissioned ship, however valuable second hand material (copper, aluminium) and equipment (engines, generators, cranes etc.) account for approximately 3-4% of the total value of a scrapped ship (see Table No3). These machineries and equipment are sold to related local industries at cheap rates. The garment manufacturing factories use the discarded engines and generators; boilers are used mainly in rice mills, garment washing plants, knitting plants and other industries. Thus encourages the small scale industry by reducing their capital investment in machineries.

Furthermore various household accessories and products like kitchen appliances, kitchen machinery, office and home furniture, photos, lamp shades, plastic buckets, toilet seats, bathroom fittings, mirrors of all dimensions, cupboards and sideboards, crockery and cutlery, flower pots and pot holders, used cables, steel pipes, nuts and bolts, screws, electric motors, bulbs and light fittings, wood, partition sheets etc are sold to locals, hotels or restaurants at very cheap prices. These markets are an opportunity for locals with very

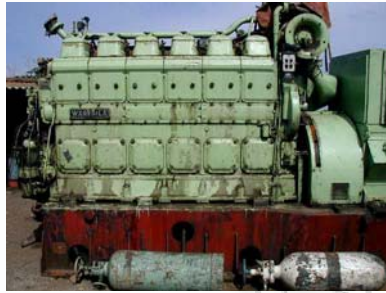
⁴² <http://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG>

low income to better their every day life while at the same time is certainly an extra income for ship scrappers who sell these demolished items to traders.

Alang Bazaar is one of the biggest second hand markets. There are shops under huge tents which sell everything from consumer to industrial goods procured from the vessels arrived at Alang. Apart from the household accessories mentioned above there are also second hand generators shops and machinery shops that are usually called marine stores. Machineries like air compressors, chilling units and drilling machines, welding generators, oil purifiers, oil pumps, water pumps, heat exchangers, condensers, diesel generators, alternators, marine engines etc. are available at these stores. All items are weighted and being sold on per kg basis.



Chilling Compressor



Engine



Electric Cable



Furniture



Kitchen Ware



Motors

Figures: Second hand markets, Source: Ship Recycling Industries Association (India)
http://www.sriaindia.com/photo_gallery.html

4.5 Beaching tides which favour the scrapping technique of beaching

India- Alang⁴³

In India ship breaking activities are carried out in Alang, a coastal town in the state of Gujarat. The yard is located on the Gulf of Khambat, 50 kilometers southeast of Bhavnagar. This place has the best continental shelf available for ship breaking in the whole of Asia. The geographical features of the area including a high tidal range, wide continental shelf, 15 degree slope, and a mud free coast, are ideal for any size ships to be beached easily during high tide.

More detailed geographical advantages of Alang are presented below, as per Ship Recycling Industries Association of India:

- Alang has a very high inter-tidal gradient. This enables the ship to beach right at the shore during high tide and when the tide recedes the ship stands almost at a dry-dock. This not only makes work easy but also makes easy in terms of collecting the valuables and the waste items from the sand.
- Due to high tidal gradient, larger ships can come straight into the shore. This reduces the total working time on each ship.

⁴³ http://www.gmsinc.net/gms/downloads/pdf/2010-India_Beaching_Tides.pdf

- The rainfall is mild and work can be carried out throughout the year.
- Since Alang is sheltered from high velocity winds or excessive humid conditions, ship recycling is a perennial activity and safe.
- Due to the relatively moderate rainfall and shelter from strong tides and winds and also because of the absence of rocks around the area, the Alang yard can recycle smaller ships easily. Therefore, the numbers of ships that can come to this yard are many. In contrast, Gaddani in Pakistan and Chittagong in Bangladesh have strong winds and strong tides respectively and hence they can only demolish very large vessels. Chinese seacoast has typhoons all through the monsoon season and hence ship recycling cannot go throughout the year in an uninterrupted manner.

Bangladesh- Chittagong⁴⁴

Chittagong Area is suitable for ship breaking, since it offers:

- A long, flat uniform intertidal zone
- An extended beach with tidal difference of 6 meters
- Protection by the Bay of Bengal
- Stable weather conditions
- Connention to the capital Dhaka by road and railway

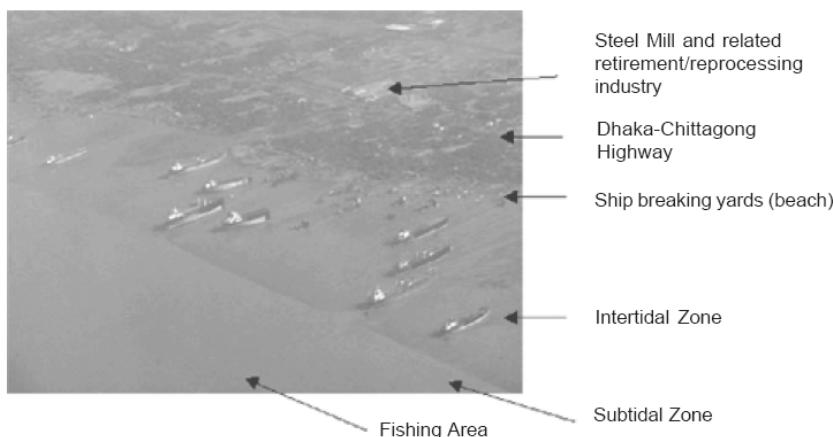


Figure: Overview of the ship scrapping area of Chittagong, Source: Ship Breaking Activities and its Impact on the Coastal Zone of Chittagong, Bangladesh: Towards Sustainable Management , Young Power in Social Action (YPSA), July 2006

Pakistan – Gadani

Tidal variation in Pakistan is only between 1 to 3 meters. However high tides are not needed in Gadani, since most of the yards have deep natural drafts suitable for beaching almost all vessels of any size.

Below web site presents the tide calendar in Karachi for 2011:

<http://www.mobilegeographics.com:81/calendar/year/2990.html>

⁴⁴ http://www.gmsinc.net/gms/downloads/pdf/2010-Bangladesh_Beaching_Tides.pdf

4.6 Exchange rate between American dollar and local currencies

EXCHANGE RATES	
1 USD \$	45.08 INR (Indian Rupees)*
	84.46 PKR (Pakistan Rupees)*
	6.58 CNY (Chinese Yuans)*
	69.12 BDT (Bangladeshi Taka)
* January 2011 exchange rates, Source: http://www.oanda.com/currency/converter/	

As earlier mentioned exchange rates affect the competitiveness of the ship scrapping yards, as the operating costs of yards are paid in local currency (except from the vessels for decommissioning which are paid mostly in USD dollars)

As shown above except from the Chinese Yuans other Asiatic currencies are much weaker compared to American dollar. This gives an extra competitive advantage to Asian ship breaking yards since they pay their operational costs in domestic currency while European or American ship breakers pay in Euros or USD dollars respectively.

4.7 Cyclical nature of demolition market

As earlier mentioned, supply of vessels for decommissioning is affected by the following parameters:

- Freight market conditions
- Cost of keeping the ship in operation
- Age profile of existing fleet
- The size of current fleet
- Regulation

When freight market conditions are favourable for ship owners, this means that international trade volumes are increased and size of current fleet is not so large as to lead to oversupply of vessels, which would create descending pressure to freight markets. Furthermore it means that existing regulation does not discourage ship owners from operating or even expanding their fleet. Also since freights are high, they can cover operational costs of ship and finally only very old vessels are led to scrapping yards.

However freight market is a very volatile one and its conditions can not be easily predicted. When freights are high and scrapping volumes are low, it is easy to face this revenue reduction in Asia since ship breaking yards (beaches) can be shut down in one day. Unfortunately it does not happen the same in American and European recycling yards. The operator of a modern recycling facility needs some market standards in order to build a business model which would at least cover its amortisation costs. This is why European operators concentrate mostly in less competitive markets like offshore structures, fishing boats and inland waterway vessels, which are of limited size and availability, even though the large majority of ships for scrapping comes from the tankers and bulk carriers.

5. Benefits from ship breaking industry

The parameters mentioned above apart from explaining reasons why Asian countries are dominant in the ship breaking industry also explain why this industry is so important for their domestic economies. To sum up ship scrapping industry provides following benefits:

- Employment to thousands of workers directly and/ or indirectly
- Steel without exploiting natural resources while at the same time reduces steel imports saving a lot of money in foreign exchange
- Machineries and products of ships which are traded in second hand markets at cheap rates
- Important source of revenue to the Governments through the payment of taxes. For example in Bangladesh government earns annual revenue of about Tk. 700 crore through import duties (7.5%), yards' taxes (2.5%) etc.

Above mentioned economic benefits are the main reasons why developing countries like Bangladesh encourage the ship breaking industry in their interiors since they can not afford to lose it. They may underestimate the environmental and human casualties in order to remain competitive and gain the benefits derived from the domestic ship breaking industry. In the submission of Bangladesh to ILO/IMO/BC WG 1/7/1 on 23 January 2005 the following are stated:

15. The importance of legal infrastructure for the protection of the marine environment and occupational safety and health cannot be over-emphasized. From this point of view Bangladesh attaches the highest importance to the development of its legal infrastructure for regulating the ship recycling industry.

17. Bangladesh attaches the utmost importance to the adequate and effective regulation of this industry and intense work is currently under way to control ship recycling activities in a safe and environmentally sound manner, whilst appreciating the positive influence of the industry on the socio-economic conditions of the country.

18. Since the implementation of the relevant guidelines on ship recycling involves substantial investments, Bangladesh would welcome the transfer of technology and aid funding for capacity building to improve the infrastructure, training and the best working practices in the recycling facilities.

In conclusion below graph shows suggestively the industries affected by the ship recycling industry:

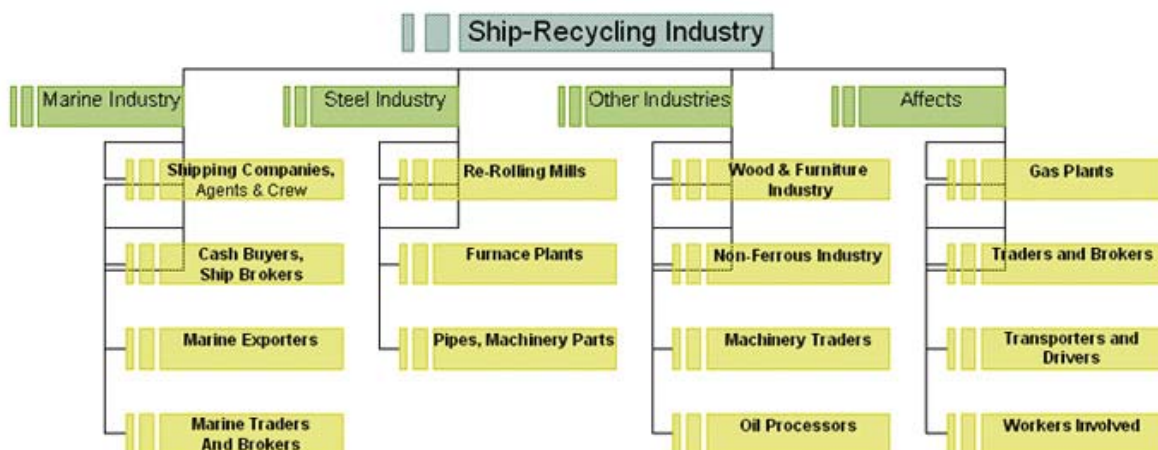


Figure No17: Domestic industries affected by the ship recycling industry, Source: Ship Recycling Industries Association (India), <http://www.sriaindia.com/employment.html>

5.1 Developments in local economies after the establishment of the ship breaking industry

Local communities experienced many changes in their economical structure after the establishment of ship breaking activities. For example in 1961 at Alang most of the villagers were involved in agriculture and animal husbandry, with a small sea-faring minority engaged in fishing and allied activities. However increased movement of people into the area, due to the development of ship breaking industry there, has resulted in an increase in land prices up to 100 times. As a result many villagers sold their land and changed their professions. Very few are directly occupied in the yard. Most of them are involved in ancillary activities like tea shops or shops where they resell items recovered from the ships. Furthermore some villagers rent accommodation to migrant workers.

Since ship breaking yard attracted many men, farmers now have to look further for male labourers and to pay the newcomers more money to compete with the ship-breaking yard. Apart from higher wages, farmers possessing water sources, used for irrigation and domestic needs, were selling the water on the open market (including to meet demands from the ship-yard), further reducing overall agricultural production. Thus agriculture became more costly and less profitable.

Finally since ship breaking created a general commercial movement, non-existent money markets began to develop for credit and savings. As more cash began to flow through the local economy, credit became available from new banks, merchants and moneylenders. This was used to improve homes and upgrade the working equipment of artisans and farmers. In the early years of Alang yard, 91% of the villagers were in debt as they availed themselves of the new opportunities for business and took out investment loans. Over the years, however, a quarter of the respondents had accumulated savings in co-operatives and banks.

6. Major ship breaking countries

Until the 1960s, ship breaking activity was considered as a highly mechanized operation that was concentrated in industrialized countries - mainly the United States, the United Kingdom, Germany and Italy. The UK accounted for 50% of the industry, while Scotland ran the largest ship breaking operation in the world. During the 1960s and 70s, ship breaking activities migrated to semi industrialized countries, such as Spain, Turkey and Taiwan, mainly for the availability of cheaper labour and the existence of re-rolled steel market. . From early 1980s when economic growth in these countries was stabilized, wages and standards of living were raised and environmental protection standards became higher, ship recycling activity passed on to the next level of developing countries of the Indian subcontinent (India, Pakistan, Bangladesh) and China. Main reasons for industry's establishment in this area are availability of cheap labour, moderate enforcement of laws, low level of environmental awareness, huge demand of iron and steel etc. From 2000 to 2009 approximately 86% of total number of scrapped vessels was demolished in these four countries.

Below figures show the developments of demolition market in each country separately. First two figures No18&19 show number of vessels demolished in India, China, Pakistan, Bangladesh and rest of the world (other) during the period 2000-09, while next two figures No20&21 show the vessels demolished in terms of DWT in India, Pakistan, China and Bangladesh during the same period (2000-09).

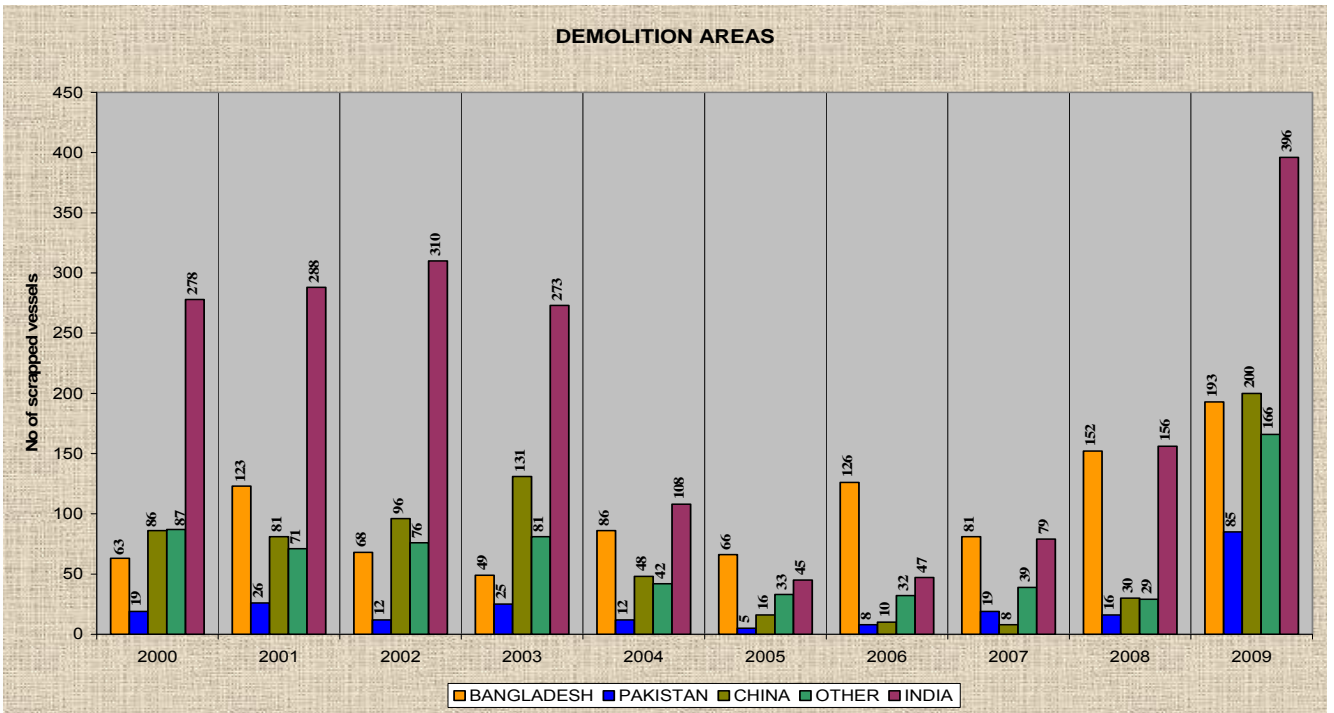


Figure No18: No of scrapped vessels (2000-09), Source: Clarkson's Shipping Intelligence Network

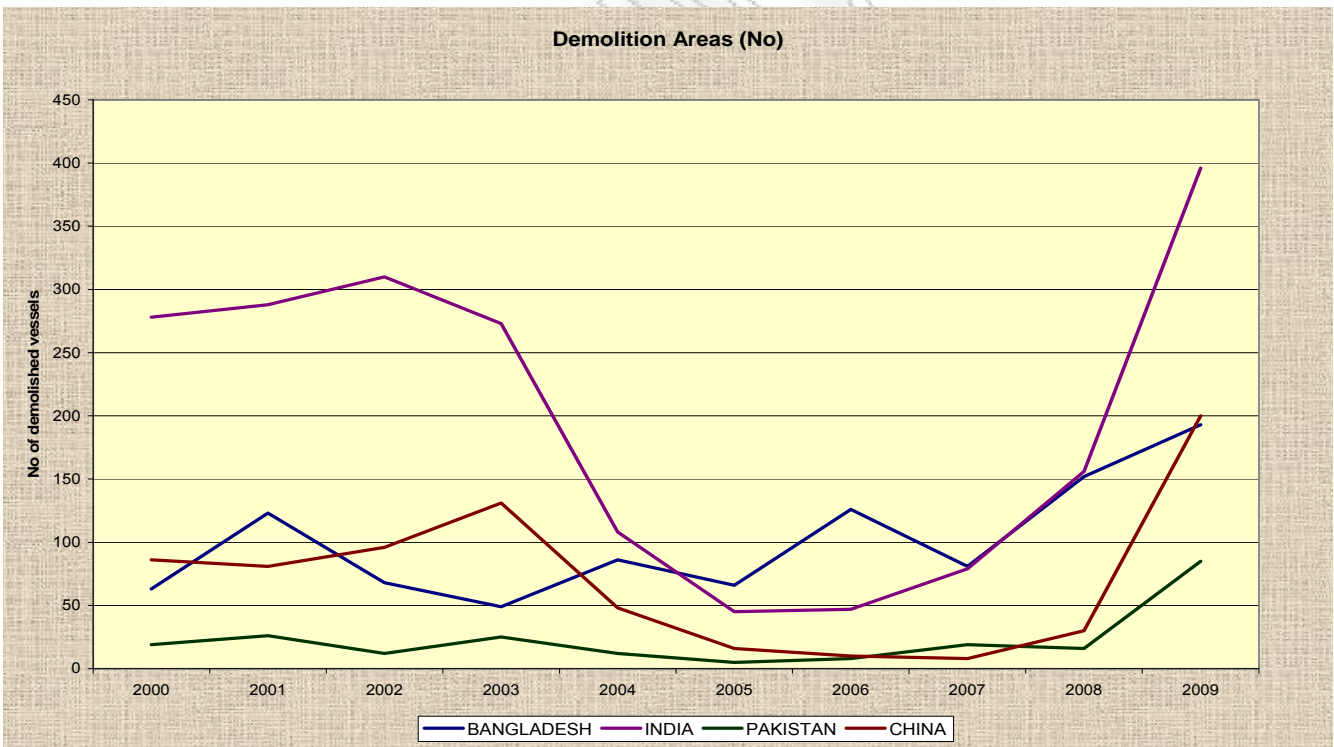


Figure No19: No of scrapped vessels (2000-09), Source: Clarkson's Shipping Intelligence Network

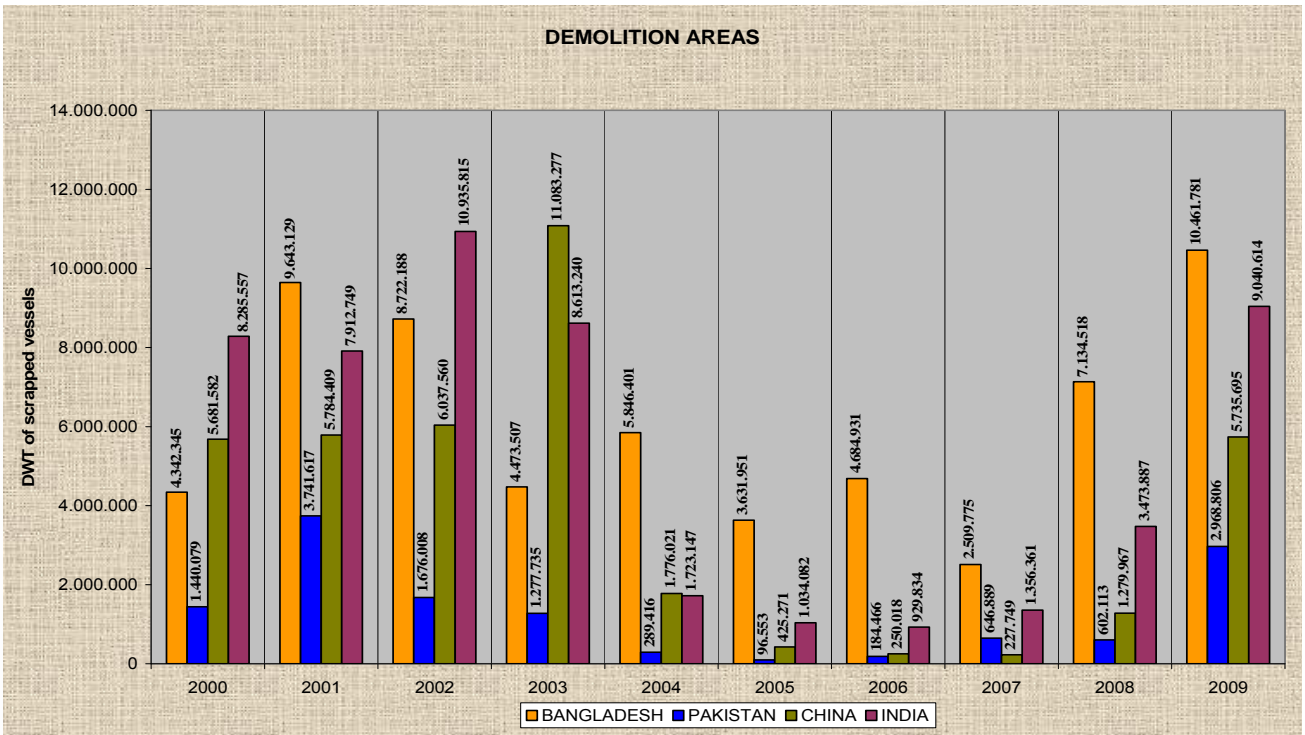


Figure No20: DWT of scrapped vessels (2000-09), Source: Clarkson's Shipping Intelligence Network

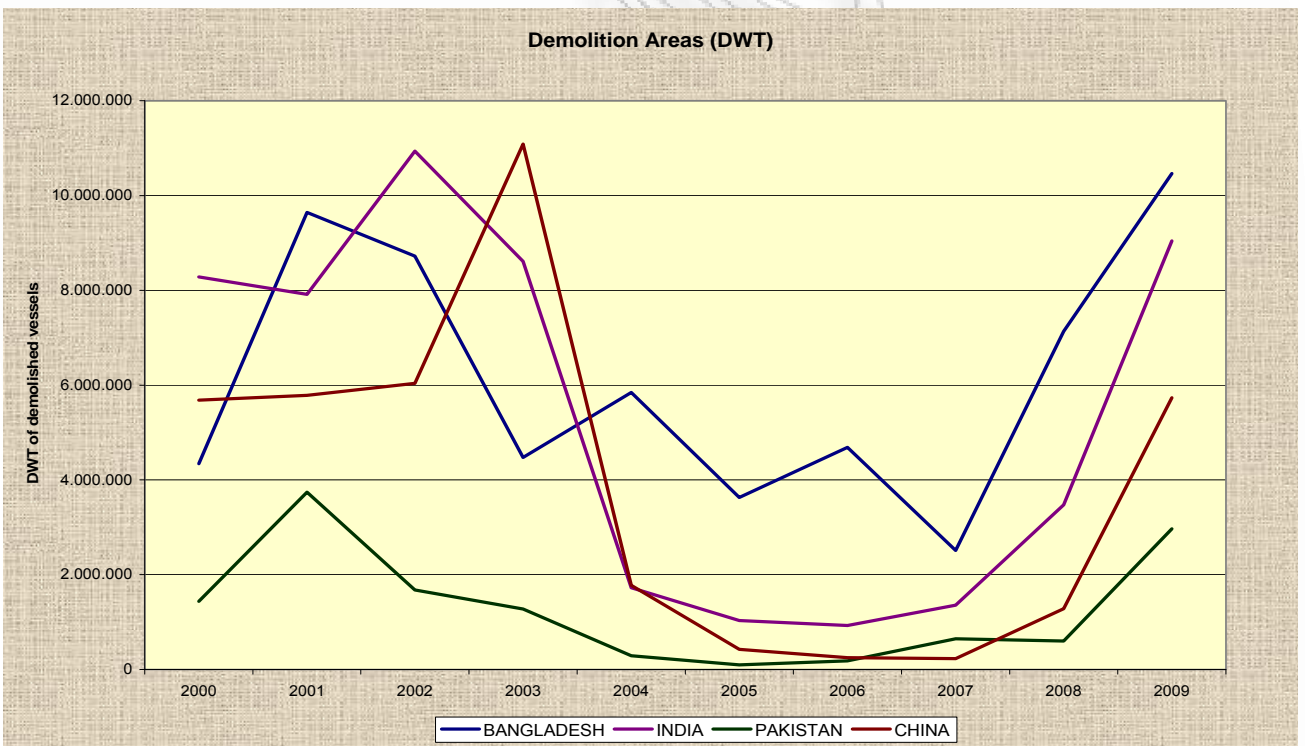
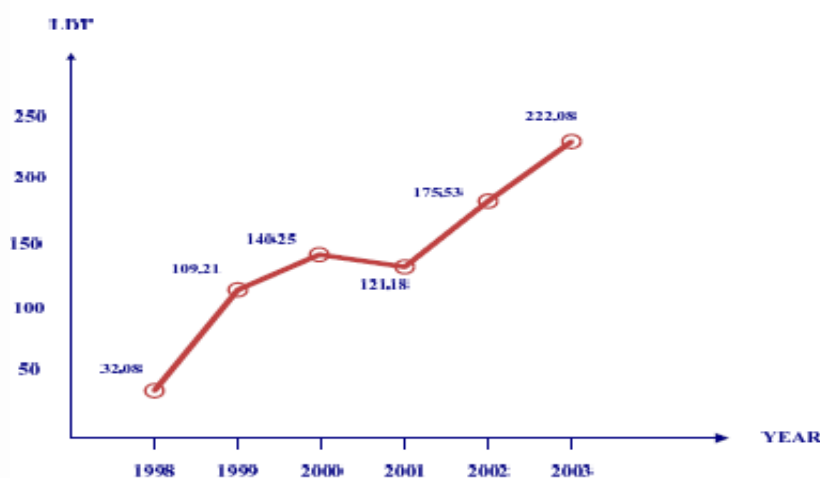


Figure No21: DWT of scrapped vessels (2000-09), Source: Clarkson's Shipping Intelligence Network

- **China**

In 1960's ship recycling industry began to grow. Peak years were recorded during the period 1991-93, when Chinese ship recycling shared 50% of world's total volume. Next four years (1994-97) industry faced a downturn. Many factors such as government reforms, tax reform, and reduced infrastructure construction, lowered the demand and thus prices of steel and scrap metals. The quantity of ship to be dismantled and the number of ship recycling companies in China decreased greatly. During the period 1998-2003 the government adjusted its industry policy and ships sent for demolition in China increased again. Total volume of ships dismantled reached 8,000,000 LDT in this five year period (Figure No22). At this point it is worth mentioning that during the period 2002-03 there is an increase in vessels demolished in terms of DWT which is sharper than this in terms of quantity of vessels (Figures No19&21). This means that in this period large ships were sent for demolition in China increasing this way China's market share in terms of DWT.



unit: TEN THOUSAND LDT

Figure No.22: Vessels demolished in China in terms of DWT (1998-2003), Source: Present Situation and Future Development of the Ship Recycling Industry in China, Mr. Xie Dehua, China National Ship recycling Association, June 6, 2007 Hong Kong, China

In 2004 until 2007 there was a dramatically decrease in vessels sent for demolition due to the rise of world merchandise trade and tremendous increase in demand for transportation services. The Chinese government in order to sustain its market share used subsidies to promote the industry. For example, in 2004, the customs duty on ships for demolition in China was only 5 percent and a capital subsidy of 14 percent was provided to ship breaking companies⁴⁵.

However in 2008 and 2009 demolished vessels were increased again due to international financial crisis. (Figures No19&21)

As far as the demolition prices is concerned according to figures No23&24&25, prices both of tankers (VLCC) and of bulk carriers (Capesize, Panamax, Handysize) were increased in 2003. That year China broke the USD 300/ldt price barrier for the first time in demolition history. That explains the sharp rise of demolished vessels in terms of DWT during that year. In years after 2004 demolition prices recorded for China are the lowest ones compared to other major ship breaking countries. However it is worth mentioning that China is the only major ship recycler, where ships are demolished in docks, beaching method is prohibited and at least primitive environmental and safety precautions are taken.

⁴⁵http://www.wilsoncenter.org/INDEX.CFM?TOPIC_ID=1421&FUSEACTION=TOPICS.ITEM&NEWS_ID=218593

China is best market for large tankers (VLCC's and ULCC's), since only gas free for Man Entry certificate is required and recycling is more efficient than in Indian Sub-continent due to docks and quay based facilities. China is not a keen buyer of specialised ships⁴⁶.

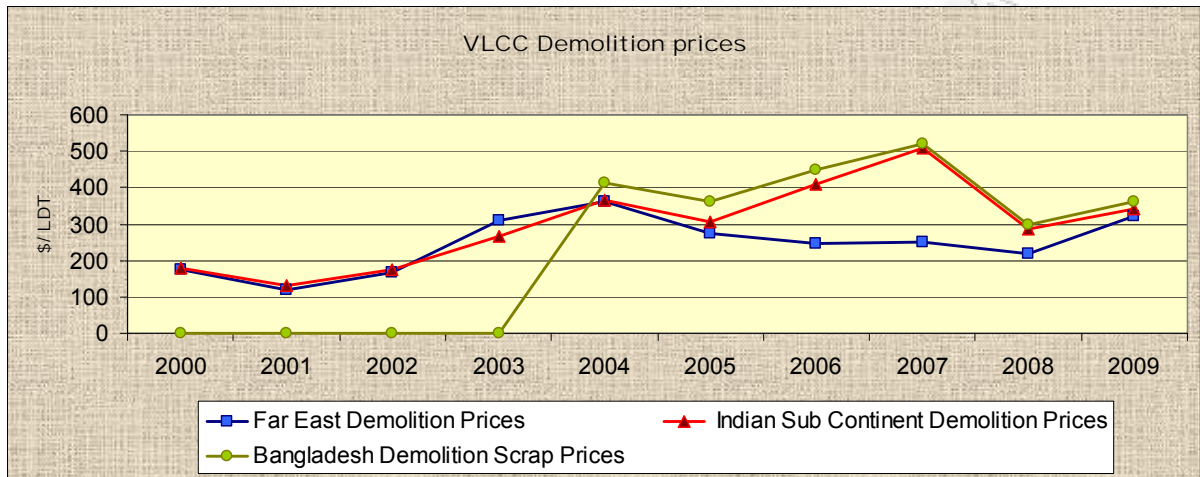


Figure No.23: Demolition prices (VLCC) 2000-09, Source: Clarkson's Shipping Intelligence Network

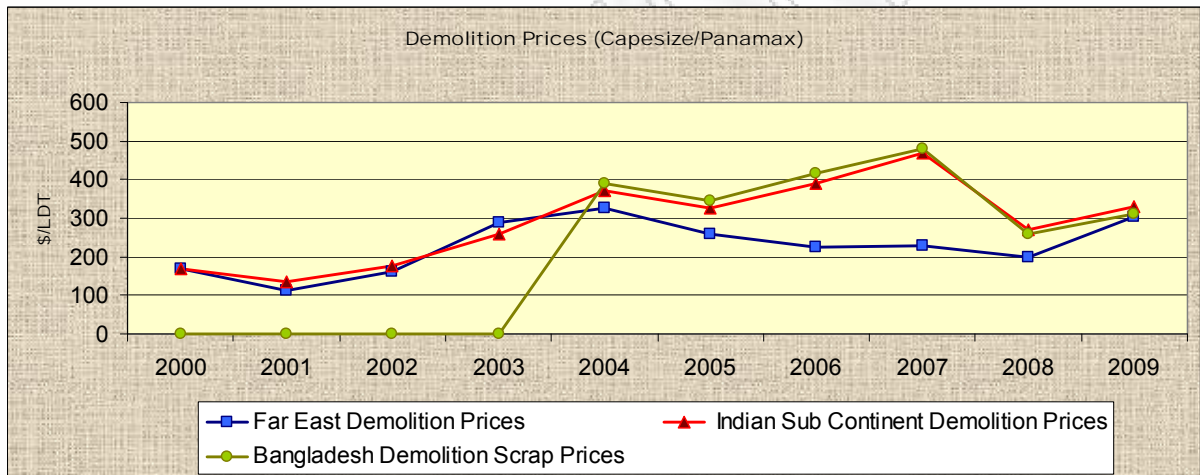


Figure No.24: Demolition prices (Capesize- Panamax) 2000-09, Source: Clarkson's Shipping Intelligence Network

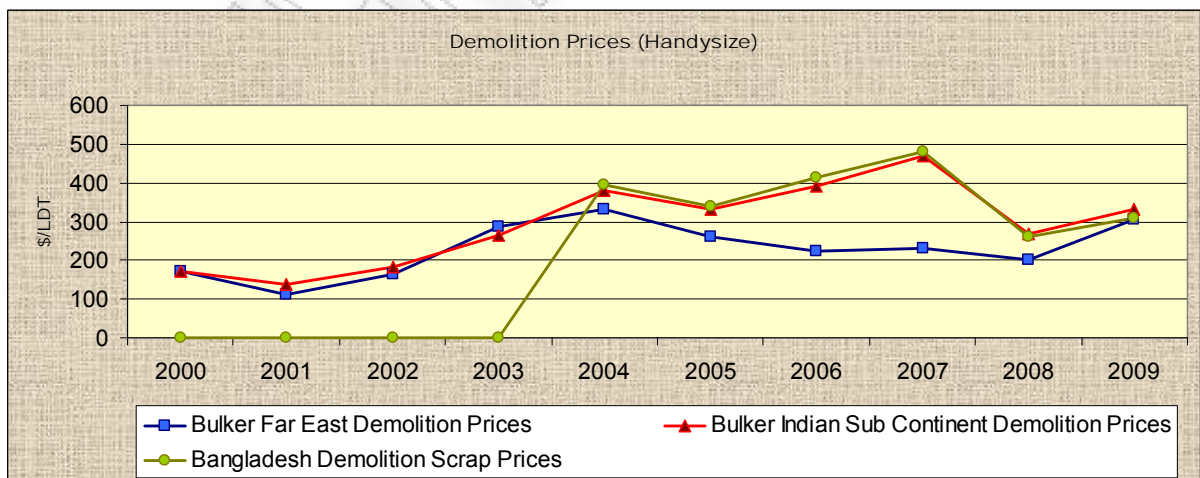


Figure No.25: Demolition prices (Handysize) 2000-09, Source: Clarkson's Shipping Intelligence Network

⁴⁶ http://www.gmsinc.net/gms/locations_china.php

- **India**

Ship breaking activity started at Alang, India in 1983. The industry expanded largely at a time when it was squeezing in China in the nineties due to Chinese government reforms. Since then, the yard has witnessed spectacular growth and has emerged as a leading ship Breaking Yard in the world.

One of the reasons why the ship recycling activity became a boon for India was that, the middle of 1980's was a time of the rise of electric arc furnace and a rise in demand for steel melting scrap. The re-rolling mills were already facing an expansion around the middle of 1970's and they now grew up very fast in North and West India. The re-rolling mills were driven mainly by the boom in the construction sector in these parts that emerged as a result of rapid urbanization. Ship recycling became a source of steel scrap, whether for melting or directly re-rollable material in the re-rolling mills. In terms of price, ship-breaking scrap historically is more expensive than scrap from railways or other melting scrap, but it is cheaper than ingots from the electric arc furnaces and the billets and the semis from the integrated steel plants. Hence, ship-recycling scrap conventionally has proved to be a direct competitor of the integrated steel mills in their market for semis.

As shown in Figure (No19) up to 2003 India was the leader of the demolition market in terms of quantity of vessels broken. However in Figure No21 we see that in terms of DWT of vessels broken, China and Bangladesh were competing India closely. This means that even though more vessels are broken in India, these are smaller ones compared to those broken in China and Bangladesh.

In 2004 until 2007 there was a dramatically decrease in vessels sent for demolition even though demolition prices were increased. This is explained by the rise of world merchandise trade and tremendous increase in demand for transportation services.

In 2008 and 2009 due to international financial crisis, an oversupply of vessels for demolition was presented. Thus volumes of vessels broken increased again and demolition prices fell in 2008.

Regarding ship breaking prices in India it is worth noting that they are close correlated with those offered by Bangladeshi yards, indicating Bangladesh as a major competitor. This is why ship breakers in India are much concerned by the fact that they have to pay 15% customs duty and 16% excise duty which is quite high compared to the 5% of each tax levied in Pakistan and Bangladesh.

India is the best market for specialized ships such as RORO's, reefers passenger ships (leading market), dry vessels. It has the largest number of recycling facilities, experienced recyclers, wide variety of buyers from ULCC buyers to smallest fishing trawlers and offers premium for bunkers, Non-ferrous items, certain machinery items such as main engine, generators, etc⁴⁷.

- **Bangladesh**

The ship recycling industry of Bangladesh started its operation in 1972. However industry began to grow after an explosion in an oil tanker at Alang in 1997. Due to this accident, government of India banned the import of big ships for breaking without first issuing a gas free certificate. These bureaucratic changes and the stricter control discouraged many businessmen who stopped importing big ships. Bangladeshi ship breakers recognizing the huge amount of potential profits of this industry started to import these big ships instead of India and became dominant in the international market of big scrap vessels. India continued to import more ships however Bangladesh started to break bigger ships. It is also worth noting that from 2004 and later, Bangladesh gets the higher market share of tonnage demolished (Figure No21).

⁴⁷ http://www.gmsinc.net/gms/locations_alang_india.php

According to Bangladesh's national toxic waste import ban as well as its responsibilities as a Party to the Basel Convention, vessels have first to be cleaned from hazardous materials and then be dismantled. In reality, vessels are theoretically inspected and authorities facilitate the import of toxic ships that other countries refuse to import. This is how Bangladesh managed to be competitive in demolition market.

Bangladeshi demolition market follows more or less same trends of other demolition markets (China and India), since all domestic markets are closely affected by the developments in the world merchandise trade. Regarding demolition prices data are available from 2004 and later and it is obvious that are strongly correlated with these offered by India.

Bangladesh is a leading recycler of tankers and a very competitive market for VLCC's and ULCC's. Only a gas free for men entry certificate is required, while India requires full gas free documentation. Major disadvantages are the short beaching tide windows and the high risk of piracy which implies the hire of watchmen at anchorage⁴⁸.

- **Pakistan**

Gadani ship-breaking yard is the world's third largest ship breaking yard. Total number of developed plots is 132 out of which only 31 plots are under the control of the Balochistan⁴⁹ Development Authority. The remaining 101 plots have been declared to be property of private owner.

Years from 1969 to 1983 is considered to be the golden period of the ship breaking industry. However in the 1980s, increased competition from rival ship breaking yards in Alang, India, and Chittagong, Bangladesh, coupled with a relatively high import duty for decommissioned vessels, led industry into depression. After producing an average of 1.000.000 tones of scrap in the 1980s, by 2001 the yard produced less than 160,000 tones and for ten months had no new vessel arrivals. In response, in 2001 the Government of Pakistan reduced ship breaking duties from 15% to 10% and offered further incentives if industry activity improved. This new policy resulted into the increase of tonnage demolished in 2001 (Figure No21). In years after 2001 tonnage dismantled fell again mostly due to the developments into the international trade. In 2009 market flourished again due to the international financial crisis and the decreased demand for transportation services.

Pakistan is considered a good market for tankers and only gas free for men entry certificate is required⁵⁰.

⁴⁸ http://www.gmsinc.net/gms/locations_bangladesh.php

⁴⁹ Balochistan is province of Pakistan,

http://www.balochistan.gov.pk/index.php?option=com_content&task=view&id=713&Itemid=1058

⁵⁰ http://www.gmsinc.net/gms/locations_pakistan.php

7. Variables that affect the probability of scrapping

The study of econometric analysis of the demolition market by Knapp et al. (Marine Policy, 2008) applies econometric modelling to an extensive data set spread over a 29-year period and gathered from multiple sources. It provides a holistic approach to the topic of demolition market by combining various variables of interest such as basic ship particulars and their changes over a vessels life time, the economic condition of the shipping markets which influence the cash flow of the owner and hence the decision to scrap the vessel.

According to this study following results can be excluded:

Results of demolition models—partial effects of variables of interest except flag

Variable of interest	India coefficient	Bangladesh coefficient	China coefficient	Turkey coefficient	Pakistan coefficient
Ln(Age)	1.174	1.035	1.037	1.122	0.740
Ln(Tonnage)	0.346	0.758	0.686	-0.237	0.211
Ln(Earnings per day)	-2.307	-1.338	-2.472	-1.475	-1.720
Ln(Scrap Prize)	2.58	3.514	1.938	1.636	1.951
Owner-OECD	Benchmark	Benchmark	Benchmark	Benchmark	Benchmark
Owner-DEVC	n/s	n/s	n/s	n/s	1.219
Owner-EEUR	n/s	n/s	n/s	1.367	n/s
Owner-LSDC	n/s	n/s	-2.561	n/s	n/s
Owner-Unknown	1.257	n/s	0.456	n/s	1.316

Note: n/s, non-significant; otherwise 1% significance level

Table No.19: Partial effects of variables of interest in the probability of scrapping, Source: Econometric analysis of the ship demolition market, Marine Policy, 7 February 2008

- *Ship's age* is significant and positive towards its probability of being scrapped.

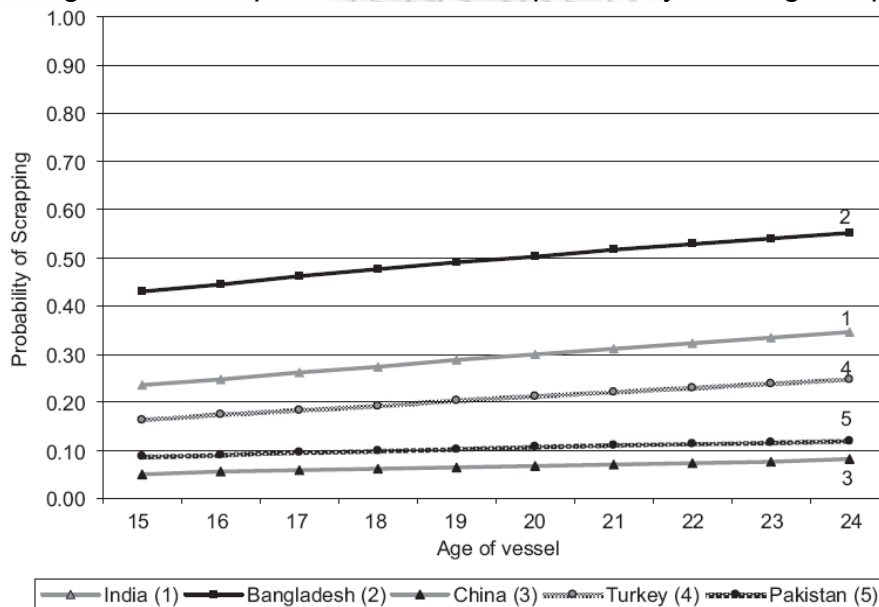


Figure No.26: Effect of age on the probability of scrapping, Source: Econometric analysis of the ship demolition market, Marine Policy, 7 February 2008⁵¹

The steepness of the curve for age does not vary considerably across scrapping locations although Bangladesh shows a higher base probability for tankers followed by India, Pakistan and China.

⁵¹ The graphs are calculated based on an average ship profile for a tanker with the same ship particulars for each scrapping location and with the following particulars: 20 years old, 28,000 gt, Romanian flag, owner Unknown, non-IACS Class, average scrap price and scrap prices for tankers as per data set. The partial effect of the variables of interest is then visualized by calculating the probability of scrapping for several scenarios.

- *Tonnage* has also a positive effect on the probability of scrapping.

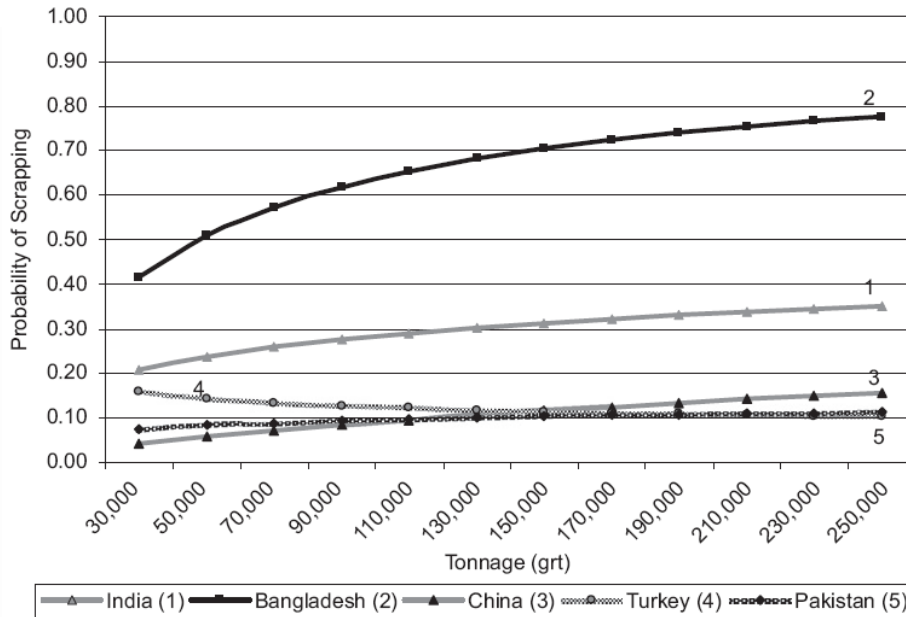


Figure No.27: Effect of tonnage on the probability of scrapping, Source: Econometric analysis of the ship demolition market, Marine Policy, 7 February 2008

Bangladesh and India show a steeper curve compared to the others while the slight negative effect for Turkey can be seen from the graph. This means that larger vessels are most likely been scrapped in Bangladesh or India compared to other locations, while smaller ships are most likely to be scrapped in Turkey.

- *Earnings* are all negative confirming the hypothesis that an increase in earnings decreases the probability of a ship being scrapped as owners would rather use it as a cash cow if market permits.

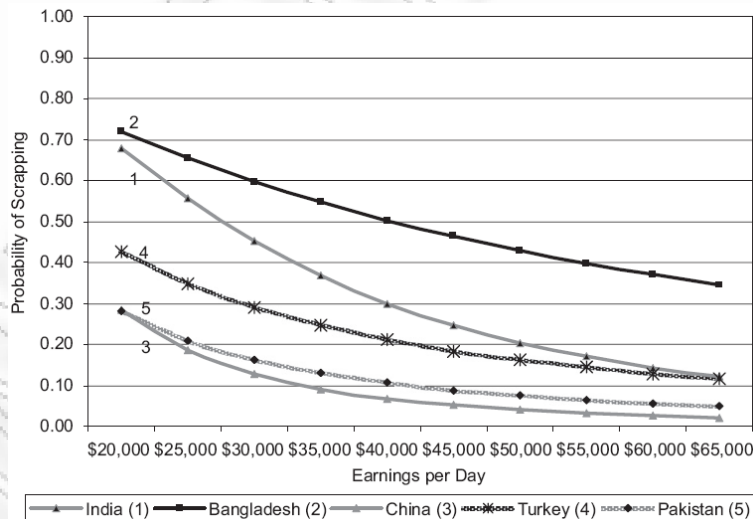


Figure No.28: Effect of earnings on the probability of scrapping, Source: Econometric analysis of the ship demolition market, Marine Policy, 7 February 2008⁵²

⁵² Average earnings and scrap prices are used to calculate the base probability

- The positive sign for *scrap prices* is again intuitive as higher scrap prices enhance the probability of ships being scrapped.

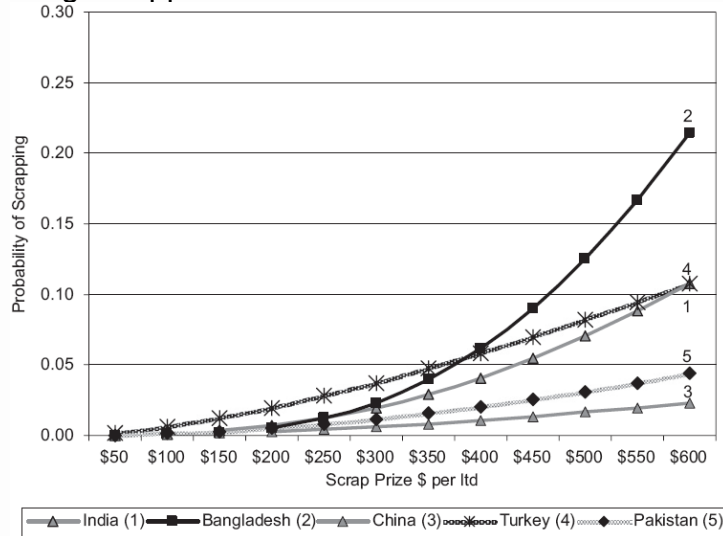


Figure No.29: Effect of scrap price on the probability of scrapping, Source: Econometric analysis of the ship demolition market, Marine Policy, 7 February 2008

One can easily see that the negative relationship between earnings and the probability of scrapping is the weakest for Bangladesh. On the other hand an increase in scrap prices has a stronger effect on Bangladesh. Thus figures No28&29 clearly show that Bangladesh's status as a major location for ship recycling is more sensitive to the underlying market conditions compared the other four key nations considered in this study. This result is justified by the relatively late entry of the nation in ship scrapping and its build-up of a clientele most sensitive to fluctuations in scrap prices.

- With respect to *ownership*, one can see some different patterns across the demolition countries.

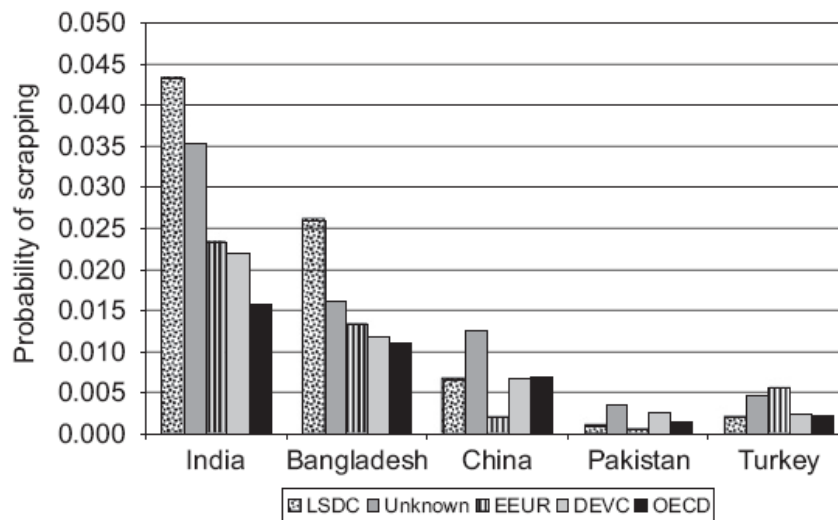


Figure No.30: Probability of scrapping by ownership country, Source: Econometric analysis of the ship demolition market, Marine Policy, 7 February 2008⁵³

⁵³ Since vessels can change ownership easily, the maximum percentage of the vessel under a certain ownership is used here for the visualization of the probabilities

LSDC: Least developed countries

EEUR: East European countries

DEVC: Developing countries

OECD: Organization for economic cooperation and development

Owners from least developed countries have a higher probability of recycling ships in India and Bangladesh. For both these nations, the category of unknown ship-owners have the next highest level of probability of scrapping followed by those from the former Soviet Union and Non-OECD Eastern Europe. Owners from OECD countries show some importance in India, followed by Bangladesh and China.

- Effect of vessel's type on the probability of scrapping

Results of demolition models—partial effects of other variables

Other variables	India coefficient	Bangladesh coefficient	China coefficient	Turkey coefficient	Pakistan coefficient
DH	-1.112	n/s	n/s	n/s	n/s
General cargo	Benchmark	Benchmark	Benchmark	Benchmark	Benchmark
Container vessel	n/s	n/s	0.556	-1.799	n/s
Dry bulk	n/s	n/s	n/s	-0.937	0.828
Other	n/s	n/s	n/s	-1.404	n/s
Passenger	n/s	-1.429	n/s	-0.874	n/s
Tanker	-1.226	0.534	-0.574	-0.804	1.507

Table No.20: Partial effects of other variables (vessel's type) on the probability of scrapping, Source: Econometric analysis of the ship demolition market, Marine Policy, 7 February 2008

It seems India is not preferred for recycling double hull tankers. The probability of a general cargo vessel being scrapped is higher in India (compared to tankers) and Bangladesh (compared to passenger ships). China seems to scrap more container vessels and fewer tankers compared to general cargo ships. Pakistan and Bangladesh seems to scrap more tankers. Pakistan also seems to scrap more dry bulk carriers.

- Effect of ship's registry on the probability of scrapping

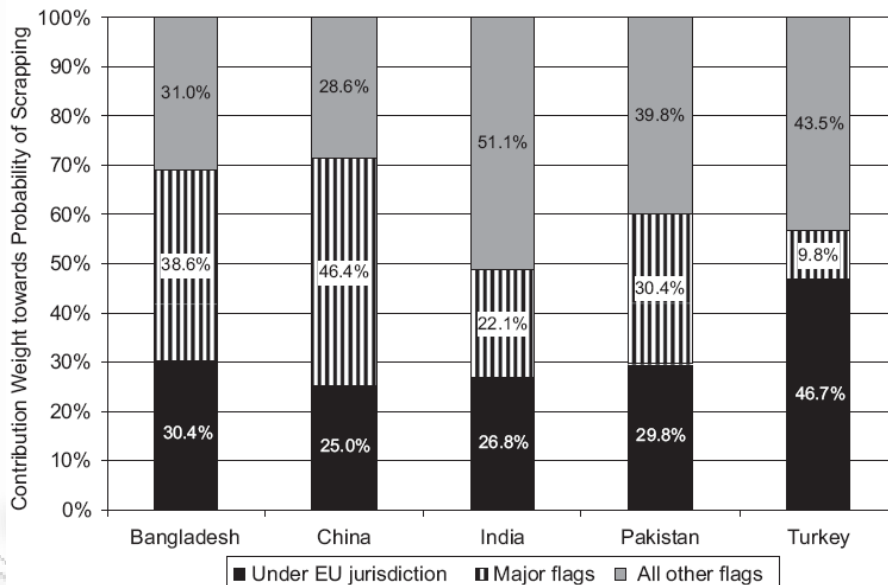


Figure No.31: Effect of ship's registry on the probability of scrapping, Source: Econometric analysis of the ship demolition market, Marine Policy, 7 February 2008⁵⁴

Figure No31 presents a visualization of the possible impact on major ship recycling locations based on registry of ships to be recycled. The graph converts the average probabilities of flag groups into contribution weights based on all flags. This is to show the

⁵⁴ The first category "Under EU jurisdiction" includes Cyprus, Malta, Greece, Germany, United Kingdom (including: Isle of Man, Gibraltar, Bermuda, British Virgin Islands, Channel Islands and Anguilla), the Netherlands (including Netherlands Antilles and Aruba), Italy, Denmark (including Danish International Register), Spain (including Canary Islands), Sweden, France (including French overseas territories), Romania, Portugal and Madeira, Belgium, Finland, Luxembourg, Poland, Ireland, Bulgaria, Estonia, Latvia, Slovakia, Austria, Czech Republic, Hungary, Slovenia and Norway (including Norwegian International Register). The second category comprises the major flags as per tonnage including Bahamas, Panama, Liberia, Singapore and Japan. The third category is an average of all other flags.

importance of some flag groups with respect to ratification of the IMO ship recycling convention for a particular demolition country.

The figure shows the relative importance for EU registries for Turkey with a contribution weight of 46.7% compared to 25% for China, 26.8% for India and around 30% for Bangladesh and Pakistan. The highest contribution weight for the major flag states not under EU jurisdiction can be found for China (46.4%) and Bangladesh (38.6%). The highest contribution of all other flags is for India with 51.1%.

Given these findings, an implementation of the convention at EU member state level will most likely affect Turkey while a non-ratification of the convention of some of the major flag states will most likely affect China. India on the other hand seems to be less dependent on flags under EU registry or from the major flag states since 51% of the contribution weight comes from all other flag states.

8. World merchandise trade and demolition market

At this point we would like to examine the correlation between the world merchandise trade and the demolition market and study how much the first affects the second.

Figure No32 shows the growth of world merchandise trade in value terms from 2000 to 2009, while figure No33 shows number and DWT of vessels demolished from 2000 to 2009. As indicated in the figure No32, 3 years landmark (2001, 2003 & 2009) are pointed, which present significant changes of trade growth.

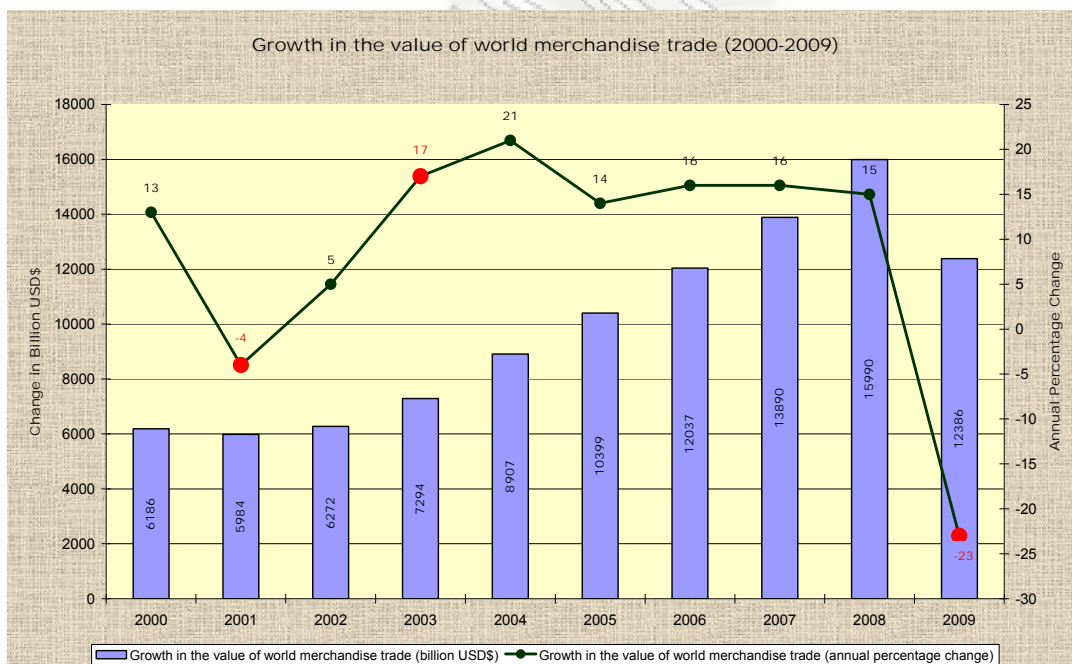


Figure No32: Growth in the value of world merchandise trade 2000-2009, Source: International Trade Statistics 2001-10, World Trade Organization

World trade presented a decrease in value terms in 2001 due to dot-com bubble. Then it had an increased route reaching its peak in 2004, mostly due to the rise of China, and finally dramatically dropped in 2009 (-23%) due to financial crisis. On the contrary, below Figure No33 shows that demolition market moved on the opposite direction compared to trade.

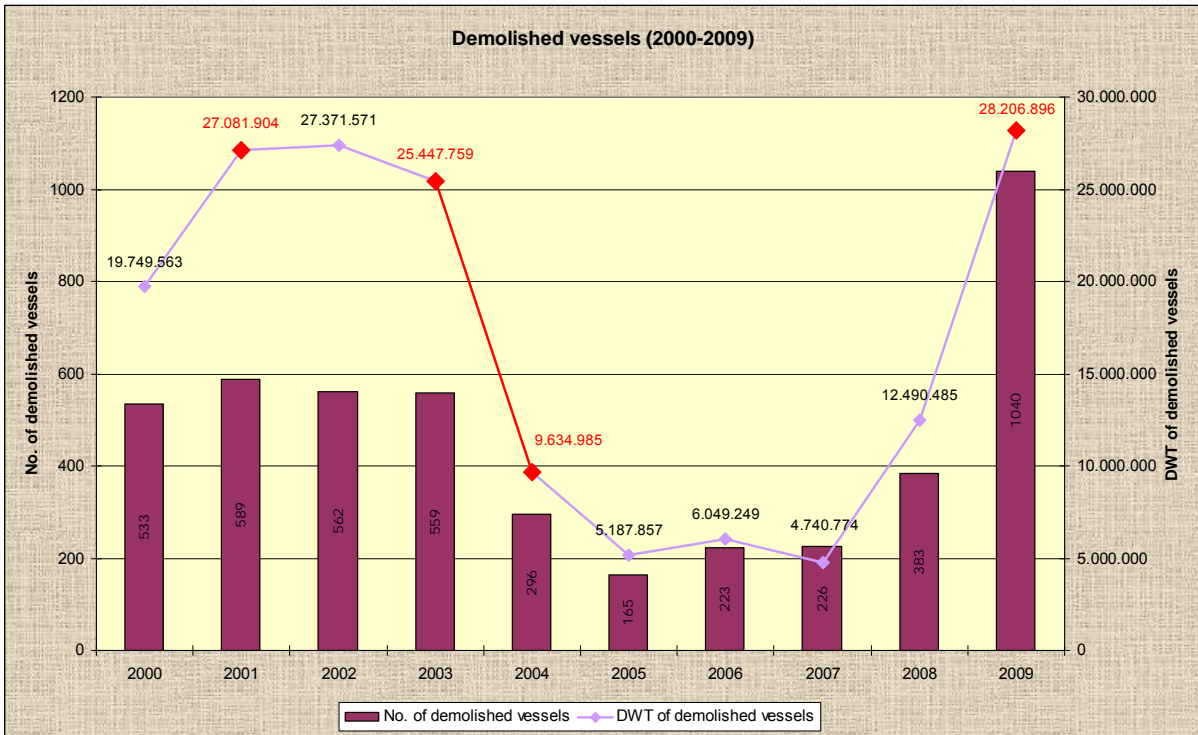


Figure No33: Demolished vessels (2000-2009), Source: Clarkson's Shipping Intelligence Network

In 2001 number of demolished vessels was increased and started to fall in 2003 presenting low rates till 2007. Finally there was a sharp increase in supply of vessels for demolition in 2009.

Below figures show in particular tankers and bulk carriers sold for demolition from 2000 to 2009, since these types of vessels are dominant and affect mostly shipping trade.

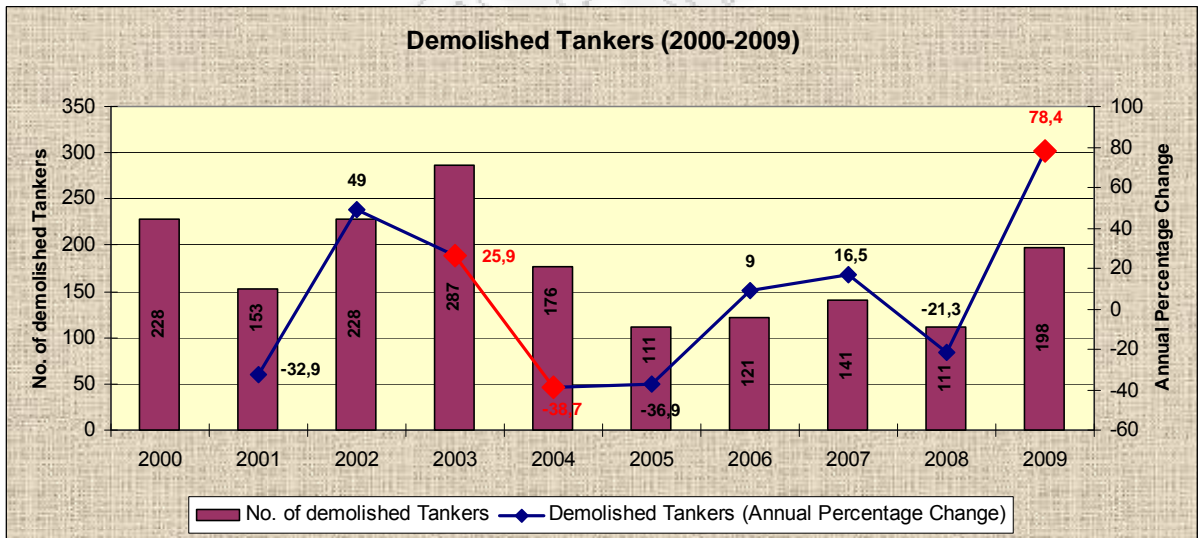


Figure No34: Demolished tankers (2000-09), Source: Clarkson's Shipping Intelligence Network

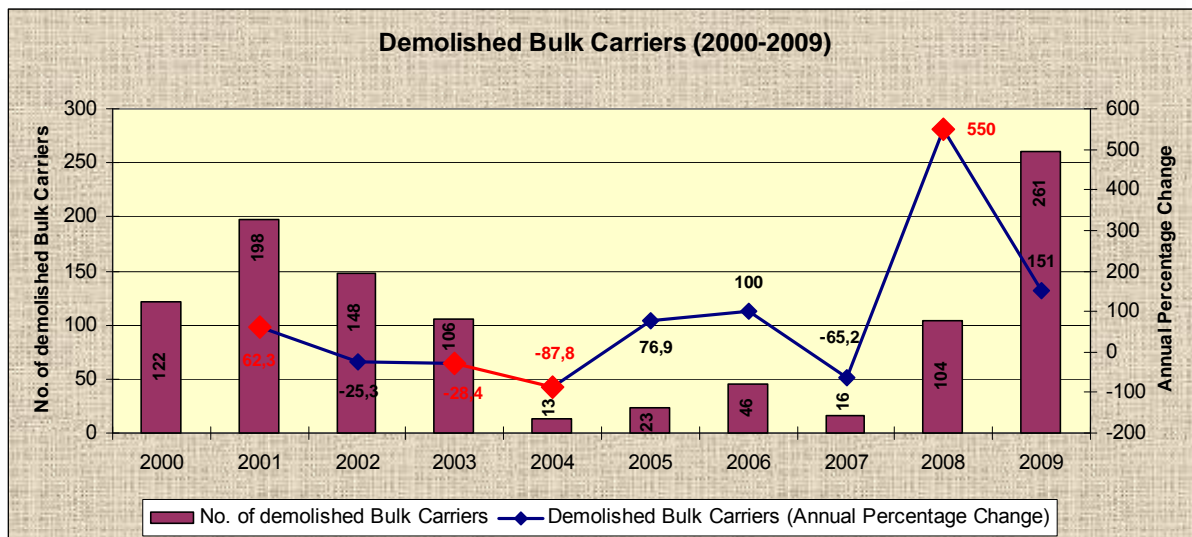


Figure No35: Demolished bulk carriers (2000-09), Source: Clarkson's Shipping Intelligence Network

- 2001



Figure No36: World Merchandise Exports by product 2001, Source: **World Trade Developments in 2001 and Prospects for 2002**, International Trade Statistics 2002, World Trade Organization

As shown in the Figure No32 world merchandise trade had an annual percentage decrease of -4% from 2000 to 2001. The pattern of world merchandise exports by product category in 2001(Figure No36) reflects the main features of the slowdown in the global economic activities in 2001. Firstly, the burst of the IT bubble led to a decline in IT expenditure which resulted to an unprecedented shrinkage of international trade in office and telecom equipment of nearly 14%⁵⁵.

⁵⁵ The "dot-com bubble" (or sometimes "IT bubble"[1] or "TMT bubble") was a speculative bubble covering roughly 1995–2000, during which stock markets in industrialized nations saw their equity value rise rapidly from growth in the more recent Internet sector and related fields. The period was marked by the founding of a group of new Internet-based companies commonly referred to as dot-coms. Companies were seeing their stock prices shoot up if they simply added an "e-" prefix to their name and/or a ".com" to the end, which one author called "prefix investing. These companies offered their services or end product for free with the expectation that they could build enough brand awareness to charge profitable rates for their services later. The motto "get big fast" reflected this strategy. During the loss period the companies relied on venture capital and especially initial public offerings of stock to pay their expenses while having no

Secondly, the sharp reversal from strong growth in 2000 to a contraction of output during the course of 2001 left its mark on products which exhibited a high sensitivity to cyclical variation such as non-ferrous metals and iron and steel. Both price and demand developments contributed to these large cyclical variations.

Thirdly, the decline in crude oil prices by 9% has been the major factor in the 8% decrease of world fuels exports, as the volume of fuels traded remained roughly unchanged from the preceding year.

Finally, textiles recorded an above average export decrease in 2001 confirming a long-term trade pattern.

The only major product group which recorded an increase in its export value was chemicals. The strength of trade in chemicals was principally the result of dynamic growth in pharmaceutical products⁵⁶.

While above mentioned features resulted in a decrease in the world merchandise trade, on the contrary they led to a positive growth in the demolition market (Figure No33). More detailed, while number of demolished tankers was decreased (-32.9%), bulk carriers sent for demolition in 2001 were increased by 62,3% (Figures No34&35). Therefore positive growth of demolished bulk carriers was that boosted total demolition market upwards decelerated by the opposite growth of demolished tankers. These developments can be explained due to large trade cyclical variations. These variations seen in 2001 due to the dot-com bubble and consecutive price and demand developments led to a reduction in demand for bulk carriers transportation services. T/C freights recorded in 2001 for all types of bulk carriers were lower than those in 2000 (Figure No37) and as a result there was an incentive for ship owners to send their end of life ships for demolition instead of keeping them in operation.

source of income at all. The novelty of these stocks, combined with the difficulty of valuing the companies, sent many stocks to dizzying heights and made the initial controllers of the company wildly rich on paper. This combined with a period of relative wealth, with many 'ordinary' people with spare cash investing and day-trading, which caused a lot of money to chase the available investment opportunities. Venture capitalists saw record-setting growth as dot-com companies experienced meteoric rises in their stock prices and therefore moved faster and with less caution than usual, choosing to mitigate the risk by starting many contenders and letting the market decide which would succeed. The low interest rates in 1998-99 helped increase the start-up capital amounts. A combination of rapidly increasing stock prices, market confidence that the companies would turn future profits, individual speculation in stocks, and widely available venture capital created an environment in which many investors were willing to overlook traditional metrics such as P/E ratio in favor of confidence in technological advancements. (http://en.wikipedia.org/wiki/Dot-com_bubble)

⁵⁶ **World Trade Developments in 2001 and Prospects for 2002**, International Trade Statistics 2002, World Trade Organization

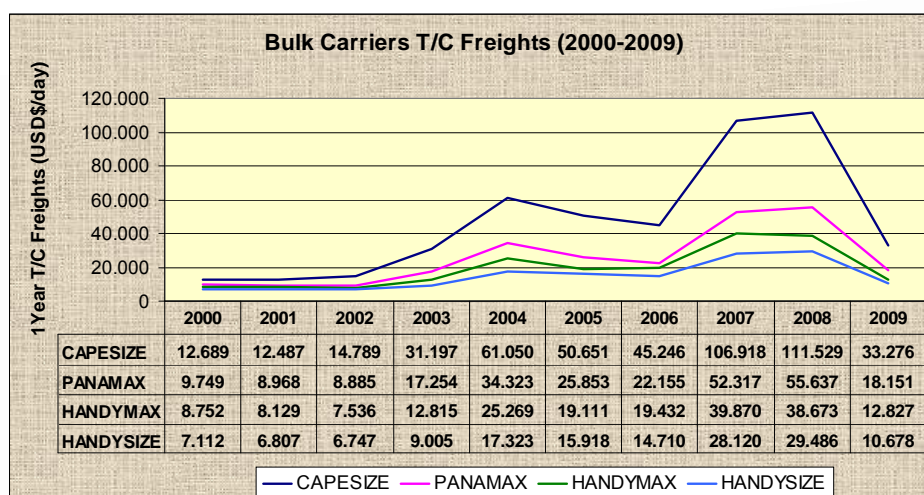


Figure No37: Bulk Carriers 1 Year T/C Freights (2000-09), Source: Clarkson's Shipping Intelligence Network

- **2003**

World merchandise trade was increased by 17% in 2003. Higher commodity prices, in particular for fuels, contributed significantly to a rebound in the merchandise exports of oil exporting countries in the Middle East, Africa and among the transition economies. As a result these higher commodity prices boosted the value of merchandise trade.

Regarding features of world merchandise trade by region three developments can be observed. First, the continued rise in the US trade deficit sustained output in other regions. All six regions⁵⁷ outside North America recorded a surplus in their goods and services balances in 2003. In Asia and in particular East Asia, the surplus has led to a large build-up of foreign exchange reserves.

Second feature is the rise of China as a major exporter and importer. China's surging import demand for oil and other primary commodities has contributed significantly to higher price levels. China replaced Japan as the biggest Asian market both for Asian and EU exporters. Although China's imports expanded faster than exports in 2003, the country still recorded a significant trade surplus. In 2003 China's merchandise export growth was two times faster than that of world exports. China became the largest source of imports in Japan and the second largest for the European Union after the United States. On the United States market, China replaced Mexico as the second largest supplier after Canada in 2003. China's shares in world exports of office and telecom equipment, textiles and clothing range from nearly 13 per cent to 23 per cent. In office and telecom equipment, its exports have become larger than those of the United States, Japan and the extra-regional exports of the European Union. China is also the world's largest supplier of textiles and clothing if intra-EU trade is not taken into account.

Third a new division of labour in Asia has occurred. Many producers in Japan and other high income economies in the region no longer export their finished goods to North America and Western Europe but ship high value added components to China for assembly and send the end products from China through their affiliates to the Western markets. These high income countries have also shifted large parts of their labour intensive industries such as clothing to China.

As far as the commodity structure of world merchandise trade in 2003 is concerned, some significant changes can be observed (Figure No38).

⁵⁷ The seven major geographic regions are Africa, Asia, Latin America, the Middle East, North America, the transition economies and Western Europe

Chart 5

World merchandise exports by product group, 2003

(Annual percentage change)

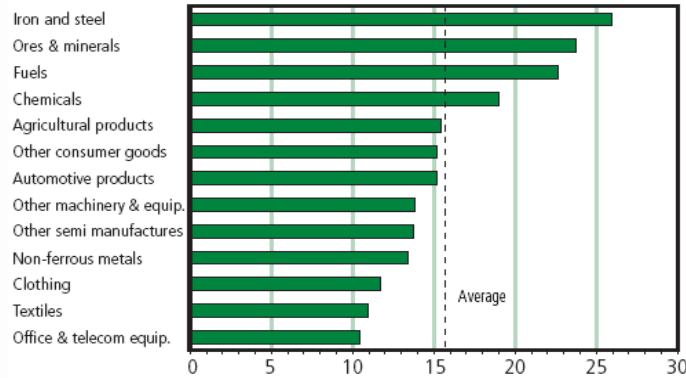


Figure No38: World merchandise exports by product group 2003, Source: **World Trade Developments in 2003 and Prospects for 2004**, International Trade Statistics 2004, World Trade Organization

First, following the burst of the IT bubble, global trade in office and telecom equipment lagged well behind total growth of merchandise trade. Second, growth in exports of chemicals began to accelerate after 2000 relative to overall merchandise trade growth due to a surge in demand for pharmaceutical products.

Iron and steel trade was also significantly increased in 2003. Although price developments were an important feature, the most important factor was the surge in import demand from Asia. China replaced the United States as the world's largest steel importer.

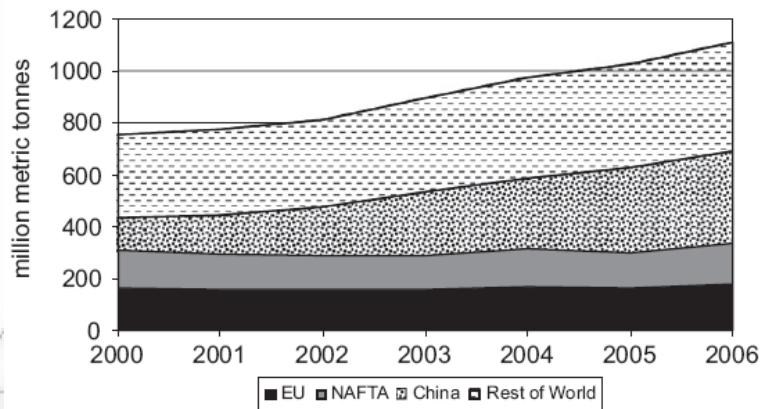


Figure: Apparent world steel use 2000-2006, Source: Econometric analysis of the ship demolition market, Marine Policy, 7 February 2008

Finally world textiles and clothing were generally moderate. However it is worth mentioning changes occurred in this market within the Asian region. Four major Asian textiles exporters (Rep. of Korea, Chinese Taipei, Japan and Indonesia) recorded a steep value decline of their shipments between 2000 and 2003. In contrast, China and Pakistan increased their textiles exports by two thirds and more than one quarter respectively. The gains in market share of these two countries combined constituted nearly 6 per cent of world trade over the three years 2000-03, which was nearly matched by the losses of the four traders indicated above⁵⁸.

As far as the demolition market is concerned, according to Figure No33 there was a decrease in number of vessels sent for demolition in 2003, which became even higher next year, 2004. This decrease was driven by the bulk carriers' demolition market which presented in 2003 a reduction of 28.4%. Supply for demolition for both tankers and bulk

⁵⁸ **World Trade Developments in 2003 and Prospects for 2004**, International Trade Statistics 2004, World Trade Organization

carriers was dramatically dropped next year 2004 (-38.7% & -87.8% respectively), indicating the increased demand for transportation services due to positive growth of world trade (Figures No34&35). Finally we can see that bulk carriers' demolition market is affected by developments in world trade more extended than tankers' demolition market is. This could be explained by the rise of China and the tremendous needs for iron and steel materials raised by the domestic economy and mostly the construction sector.

At last freight market impresses the positive growth of world merchandise trade since freights for both tankers and bulk carriers are significantly increased between years 2003 and 2004 (Figures No39&40).

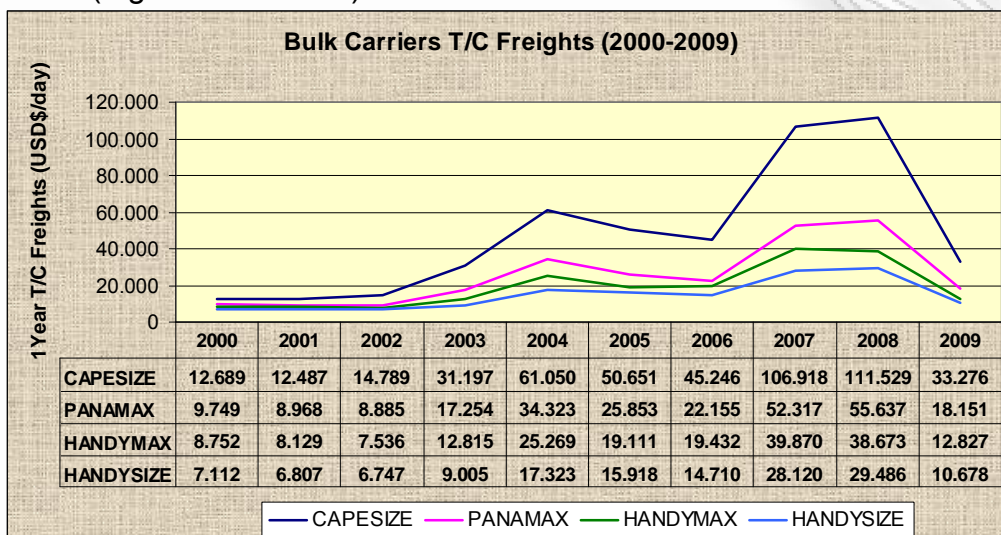


Figure No39: Bulk Carriers 1Year T/C Freights (2000-09), Source: Clarkson's Shipping Intelligence Network

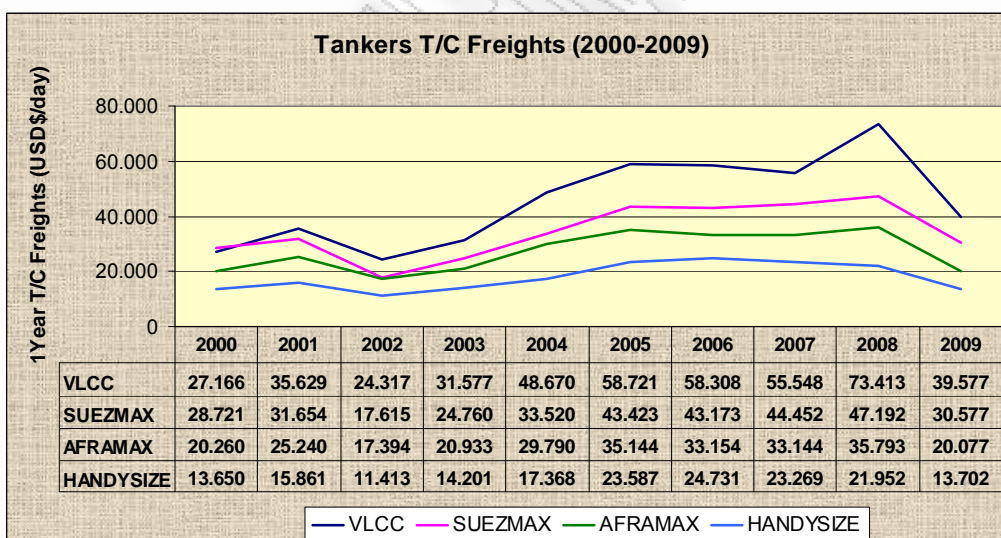


Figure No40: Tankers 1Year T/C Freights (2000-09), Source: Clarkson's Shipping Intelligence Network

- **2009**

As expected, financial crisis affected the international merchandise trade. The crisis, initiated by failings in the sub-prime mortgage market in the United States and quickly spreading across world financial markets, has had a different impact across regions. International merchandise trade continued to increase rapidly during the first half of 2008⁵⁹. However full impact of crisis became evident across all regions only in the fourth

⁵⁹ World Trade Developments, International Trade Statistics 2009, World Trade Organization

quarter of 2008 and later in 2009 when trade entered into a phase of steep decline as indicated in the below figure⁶⁰.

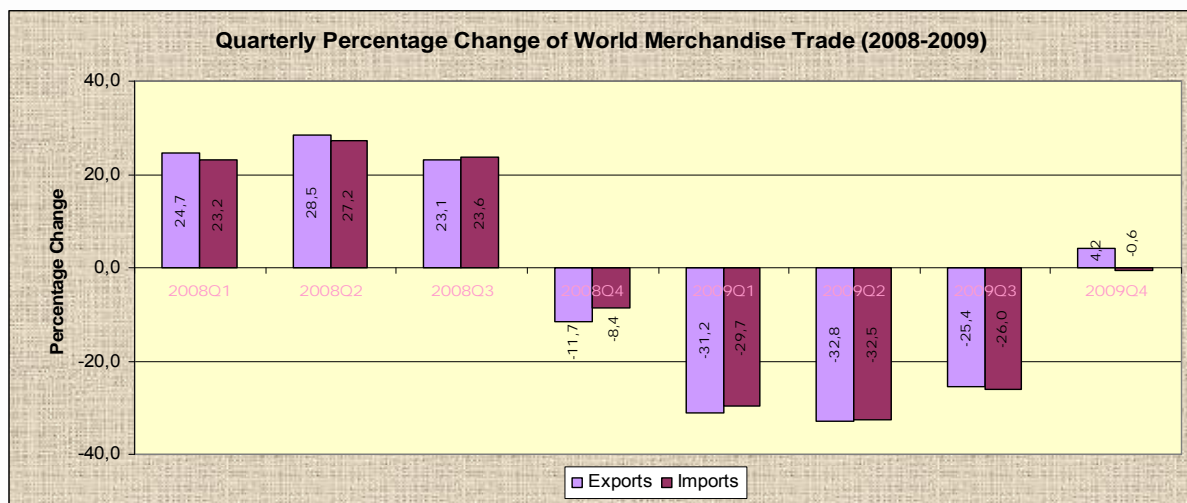


Figure No.41: Quarterly Percentage Change of World Merchandise Trade (2008-2009), Source: World Trade Organization

World merchandise exports declined in 2009 by 12 per cent. The steep fall in trade is due to a combination of factors, such as weak demand, falling commodity prices, global supply chains, the simultaneous impact of the economic crisis across countries and regions, and limited access to credit in general, and trade finance in particular.

Volume of world merchandise exports and gross domestic product, 2000-2009

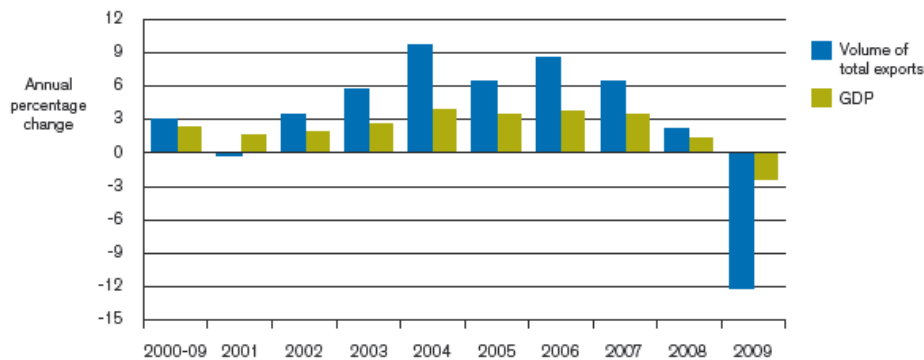


Figure No42: Volume of world merchandise exports and gross domestic product 2000-2009, Source: **World Trade Developments**, International Trade Statistics 2010, World Trade Organization

In 2009 as far as the exports is concerned, China overtook Germany as the lead exporter of merchandise, while USA remained in third position. Regarding imports, USA remained the world's leading importer and China took the second place⁶¹.

Studying merchandise trade of fuels and other minerals in 2009 we can state a significant decline of exports by 36% in value terms. As expected, imports also presented a sharp decline in 2009. The European Union, the United States and Japan slashed their imports of fuels and other minerals by 40 to 44 per cent in value terms in 2009. Of the emerging economies, the three major importers of fuels and other minerals – China, the Republic of Korea and India – reduced their imports by 19 per cent, 35 per cent and 32 per cent respectively⁶² (Figures No43 &44).

⁶⁰ http://www.wto.org/english/res_e/status_e/quarterly_world_exp_e.htm

⁶¹ **World Trade Developments**, International Trade Statistics 2010, World Trade Organization

⁶² Merchandise Trade by product, International Trade Statistics 2010, World Trade Organization

Exports of fuels and mining products

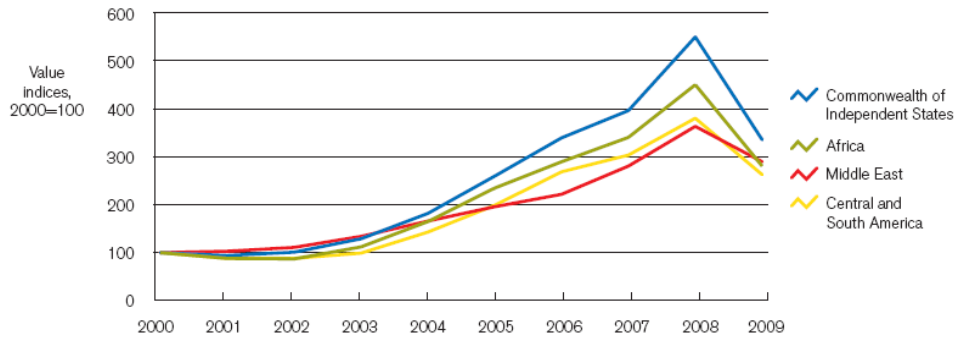


Figure No43: Exports of fuels and mining products in **value terms** 2009, Source: Merchandise Trade by product, International Trade Statistics 2010, World Trade Organization

Imports of fuels and mining products

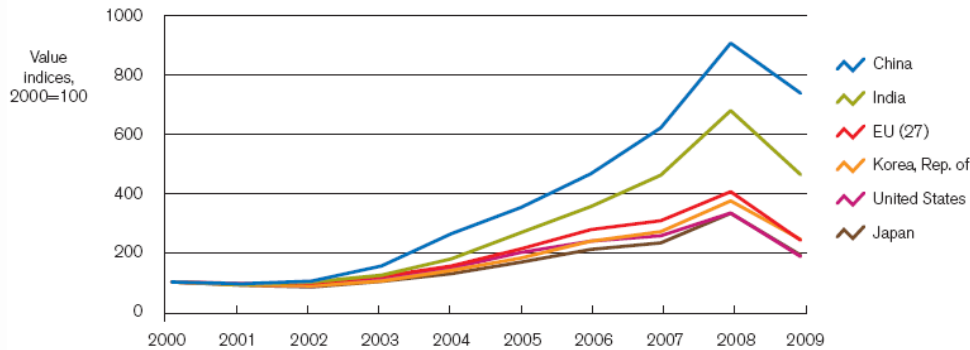


Figure No44: Imports of fuels and mining products in **value terms** 2009, Source: Merchandise Trade by product, International Trade Statistics 2010, World Trade Organization

However imports in value terms do not always indicate what really happens in volume terms. China decreased its imports of fuels in value terms since there was a sharp drop of dollar prices in 2009, however in volume terms China increased its imports by 22%. Furthermore its imports of coal more than tripled and crude oil imports rose by 14%, following the government stimulus package.

Imports of fuels and mining products, 2007-2009

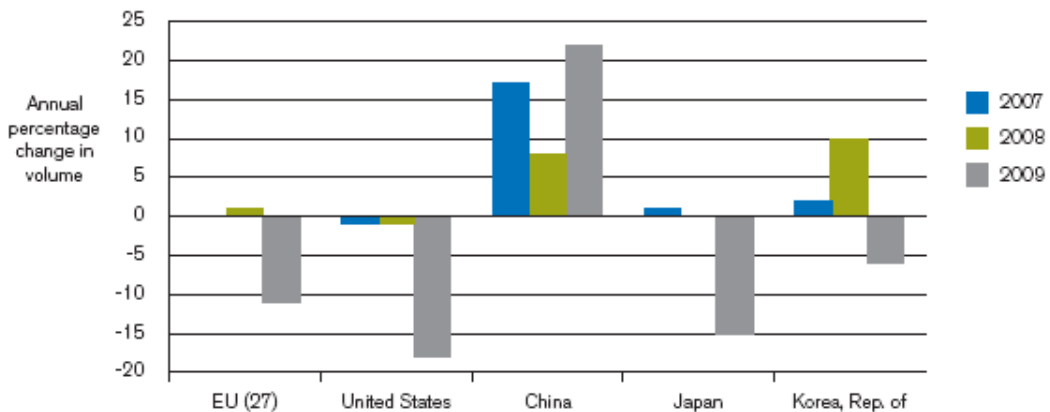


Figure No45: Imports of fuels and mining products in **volume terms** 2007-09, Source: Merchandise Trade by product, International Trade Statistics 2010, World Trade Organization

Regarding trade in manufactured goods, decline trend was evident in every market. World trade in automotive products was slashed by a third as a result of a fall in demand and the credit crunch. Global trade in office and telecom equipment slipped by 16 per cent. The decline in world trade in chemicals (14 per cent) was mitigated by a 3 per cent increase in trade in pharmaceutical products. Finally world trade in clothing decreased by 13.5 per cent in value terms in 2009. (Figure No46)

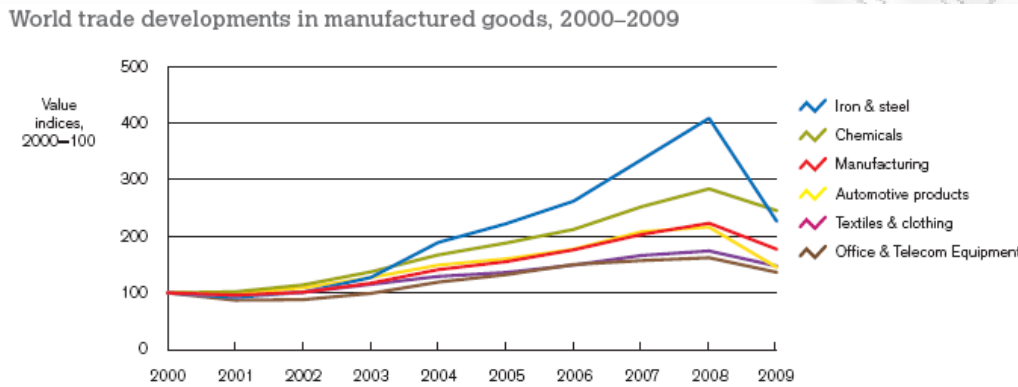


Figure No46: World trade developments in manufactured goods in value terms 2000-09, Source: Merchandise Trade by product, International Trade Statistics 2010, World Trade Organization

Depressed demand in the construction and automobile sectors squeezed world trade in iron and steel by 45 per cent in value terms in 2009. Imports decline was modest only in China (-2%) due to an increase in domestic demand resulting from the country's stimulus package.

Imports of iron and steel

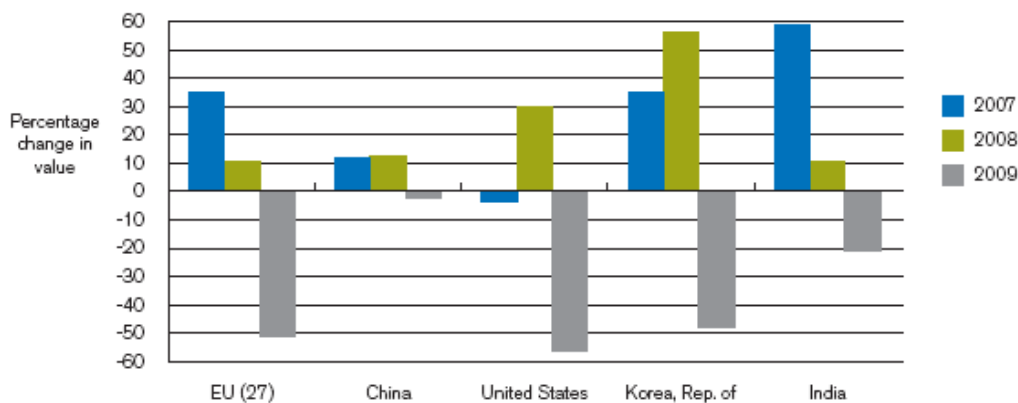


Figure No47: Imports of Iron and Steel 2007-09, Source: Merchandise Trade by product, International Trade Statistics 2010, World Trade Organization

On the contrary, there was a sharp increase in supply of vessels for demolition in 2009. As shown in Figures No34&35 both tankers and bulk carriers sent for demolition were significantly increased. Since world merchandise trade was reduced due to financial crisis, demand for transportation services was also negatively affected and freights fell sharply in 2009 for all types of tankers and bulk carriers (Figures No39&40). As a result ship owners preferred to send their vessels for demolition instead of keeping them in operation. Finally it is worth mentioning that crisis affected firstly (2008) and more extended the bulk carriers market due to the great depression in demand in construction and automobile sectors and therefore in demand for iron and steel.

9. Correlation between world merchandise trade and freight market

Below table shows the weighted average from 2000 to 2009 of 1 Year T/C freights (USD\$/day) for both bulk carriers and tankers. More detailed, freights are given in the above mentioned figures No39&40.

Years	Growth in the value of world merchandise trade (billion USD\$)	BULK CARRIERS 1Year T/C Freights - Weighted Average (USD\$/day)	TANKERS 1Year T/C Freights - Weighted Average (USD\$/day)
2000	6186	10.599	23.514
2001	5984	10.069	28.365
2002	6272	10.829	18.321
2003	7294	21.567	23.895
2004	8907	42.483	34.035
2005	10399	34.037	42.958
2006	12037	29.949	42.232
2007	13890	69.823	41.247
2008	15990	73.146	47.149
2009	12386	22.943	27.204
Correlation Coefficient		0,86	0,81

Table No21: World Trade growth and average freights (2000-2009), Source: Clarkson's Shipping Intelligence Network & International Trade Statistics (2001-2010), World Trade Organization, Equasis

Furthermore below figures No48&49 show the correlation between world trade and average freights.

Correlation coefficient between world trade and weighted average freights for bulk carriers was estimated at 0.86, while for tankers at 0.81. This indicates that there is a strong correlation in the same direction between the growth of world merchandise trade and the freight market.

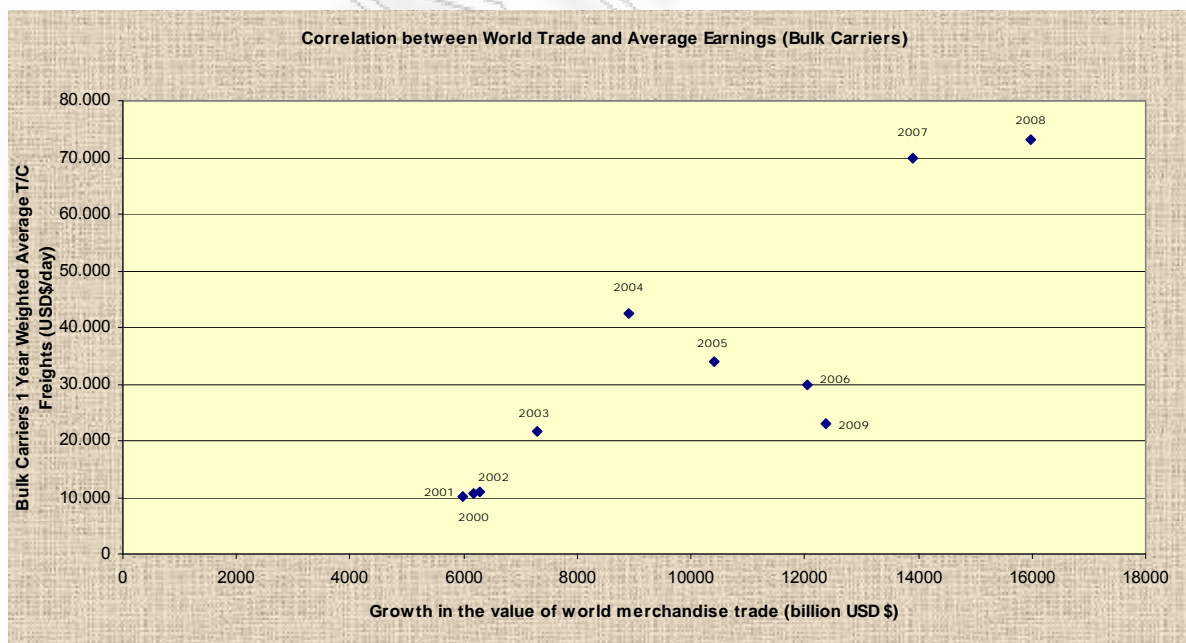


Figure No.48: World Trade and Weighted Average freights for bulk carriers (2000-09), Source: Clarkson's Shipping Intelligence Network & International Trade Statistics (2001-2010), World Trade Organization, Equasis



Figure No49: World Trade and Weighted Average earnings for tankers (2000-09), Source: Clarkson's Shipping Intelligence Network & International Trade Statistics (2001-2010), World Trade Organization, Equasis

10. Conclusions

Following the above mentioned information and data the following conclusions can be excluded:

a) As far as the theoretical frame of the demolition market is concerned, demand and supply side are those that set the equilibrium in the demolition market. Supply side refers to the ship owners and their decision on when to sell for scrap. Factors that drive this decision are the freight market conditions, cost of keeping the vessel in operation, age profile of existing ship, size of current fleet and regulation. The higher the price offered by the ship scrappers the more vessels are sold for scrap by ship owners and vice versa.

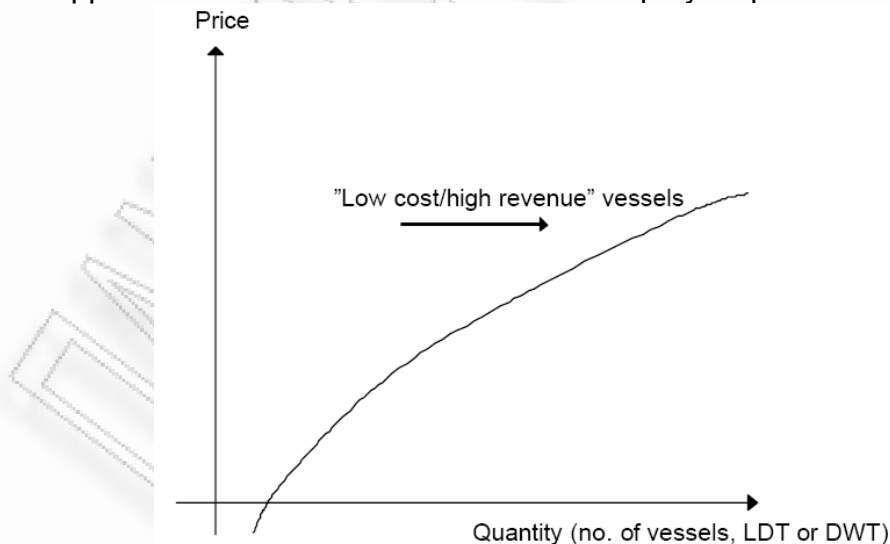


Figure: Supply curve of vessels for demolition , Source: European Commission Directorate-General Energy and Transport Oil Tanker Phase Out and the Ship Scrapping Industry

A study on the implications of the accelerated phase out scheme of single hull tankers proposed by the EU for the world ship scrapping and recycling industry, June 2004

On the other side demand refers to the ship breakers and their decision on whether to stay in the industry or not. Breakers are to compare their expected revenues versus their running costs in order to decide. Domestic demand for steel and other reusable items

is the main source of their revenues. As the quantity of vessels sold for scrap increases, the scrap prices offered by the ship scrappers decrease. Negative prices mean that there is such an oversupply of vessels for scrap that ship owners have to pay the ship scrappers in order to demolish their ships or that the operational costs of the yard are so increased that needs to be paid in order to afford to break the ship.

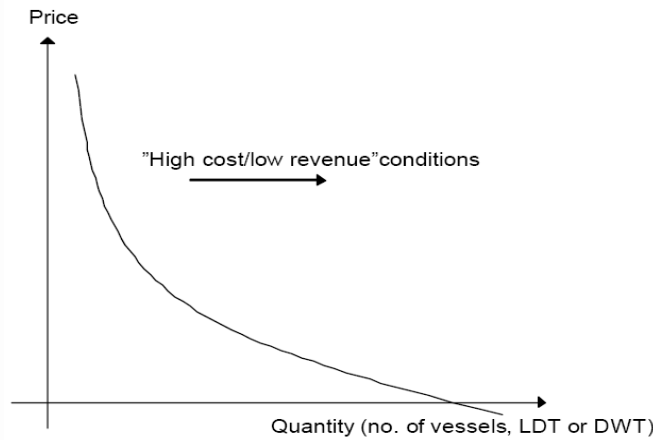


Figure: Demand curve of vessels for demolition , Source: European Commission Directorate-General Energy and Transport Oil Tanker Phase Out and the Ship Scrapping Industry
A study on the implications of the accelerated phase out scheme of single hull tankers proposed by the EU for the world ship scrapping and recycling industry, June 2004

Equilibrium is set by composing supply and demand sides. At a certain quantity (q^*) of vessels sold for scrap, a certain scrap price is to be offered (p^*).

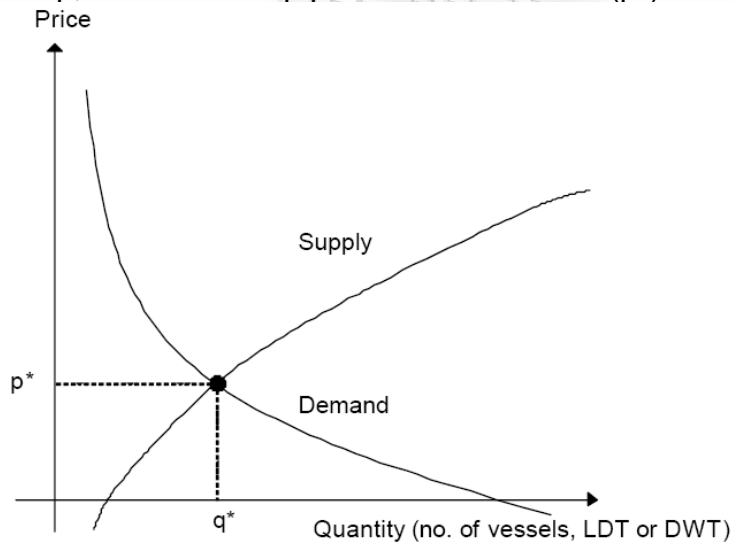


Figure: Demolition market equilibrium, Source: European Commission Directorate-General Energy and Transport Oil Tanker Phase Out and the Ship Scrapping Industry
A study on the implications of the accelerated phase out scheme of single hull tankers proposed by the EU for the world ship scrapping and recycling industry, June 2004

Key factors that affect the balance are the following:

- **Freight Rates:** When freight rates are high, ship owners are more hesitant to sell their vessels for scrap and prefer to keep them in operation. This will lead to fewer vessels sold for demolition and higher scrap prices offered by the ship scrappers.

Technically supply curve is shifted upwards intersecting demand curve at a new point (New Equilibrium).

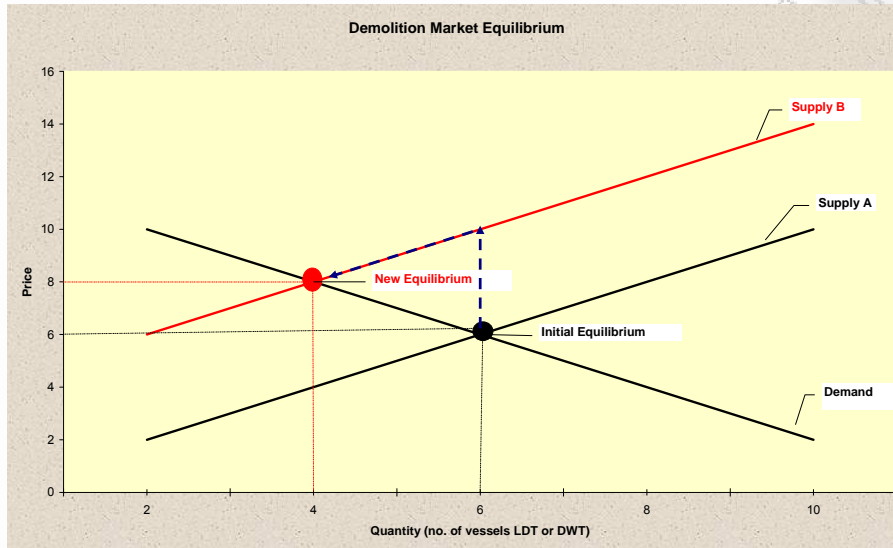


Figure : Shift of supply curve due to freight rates increase

- **Phase out schemes:** When a regulation dictates the phase out of certain ships before the ship owners would otherwise find it optimal to scrap them, this will increase the ships sent for demolition. As a result scrap prices will decrease and more ship scrappers will appear in the market. Technically, as shown in the below graph, supply curve is moving downwards intersecting demand curve at a new point (New Equilibrium). Recent example of such regulation is the amended MARPOL 73/78 which dictates the gradual single hull tankers phase out.

In cases when the oversupply of vessels is such that can not be satisfied by the existing “low cost” ship scrappers, then “high cost” ship scrappers will also join the business and scrap prices may become negative (ship owners have to pay in order to have their vessels scrapped). When more ships are scrapped, keeping all other stable, supply of the sea transport services declines. This leads to increased freight rates which on their turn lead to increased demand for new vessels.

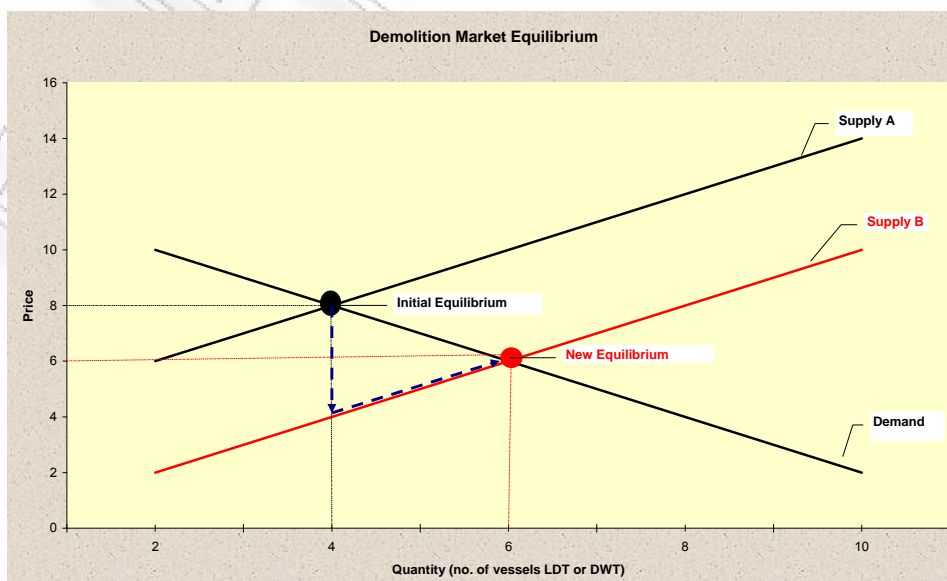


Figure : Shift of supply curve due to phase-out regulation

- Fluctuations in steel prices:** If steel prices increase, then ship scrappers will be willing to pay more for the vessels, prices will increase and more vessels are to be sold for demolition. As a result demand curve will shift upwards (Demand B) and will intersect supply curve at a new point (New Equilibrium).

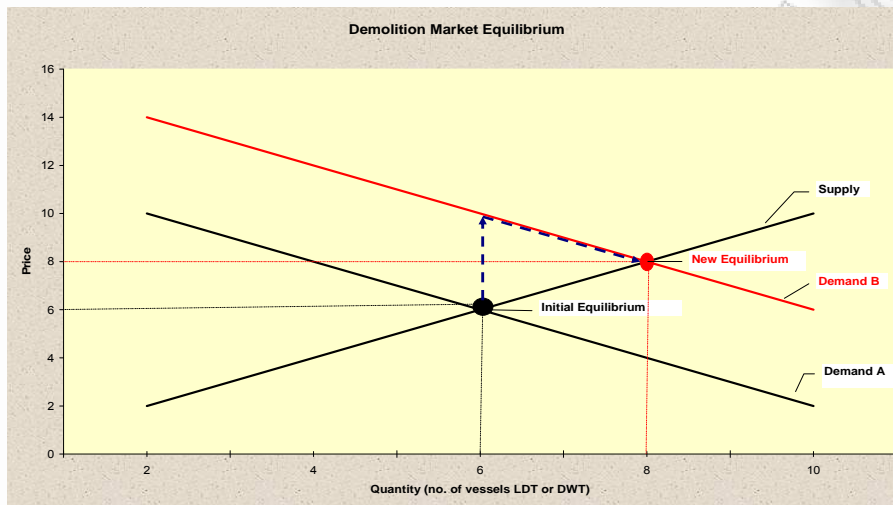


Figure : Shift of supply curve due to fluctuations of steel price

- Health, safety and environmental regulation:** Regulations set for the protection of workers' health, safety or protection of environment usually increases the costs of scrapping a ship. However most of these regulations are implemented locally and affect certain ship scrappers. In cases where a regulation affects a major number of ship scrappers, this increase in the cost of scrapping will lead to a decrease of the demand of ships for scrap. As a result demand curve will shift downwards (Demand B) and scrap prices offered will be lower.

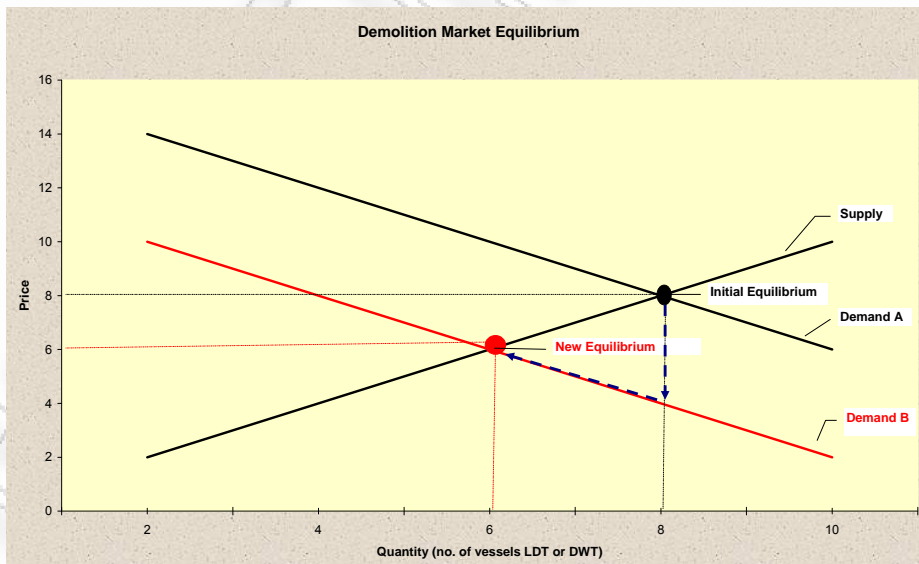


Figure: Shift of supply curve due to implementation of health, safety and/or environmental regulation

Furthermore according the study of econometric analysis of the demolition market by Knapp et al. (Marine Policy, 2008) crucial variables that affect the probability of scrapping are the following:

- *Ship's age* is significant and positive towards its probability of being scrapped.

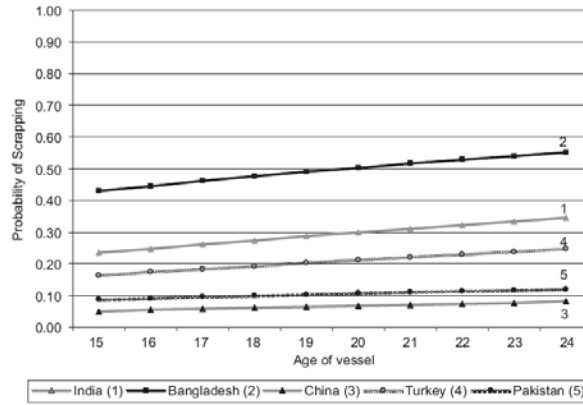


Figure: Effect of age on the probability of scrapping, Source: Econometric analysis of the ship demolition market, Marine Policy, 7 February 2008⁶³

- *Tonnage* has also a positive effect on the probability of scrapping.

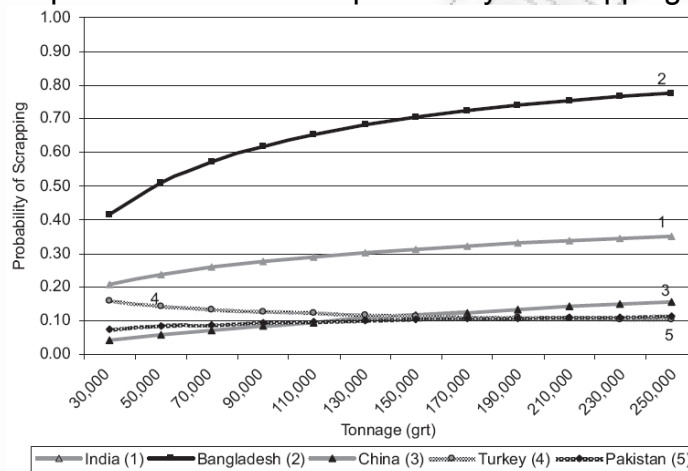


Figure: Effect of tonnage on the probability of scrapping, Source: Econometric analysis of the ship demolition market, Marine Policy, 7 February 2008

- *Earnings* are all negative confirming the hypothesis that an increase in earnings decreases the probability of a ship being scrapped.

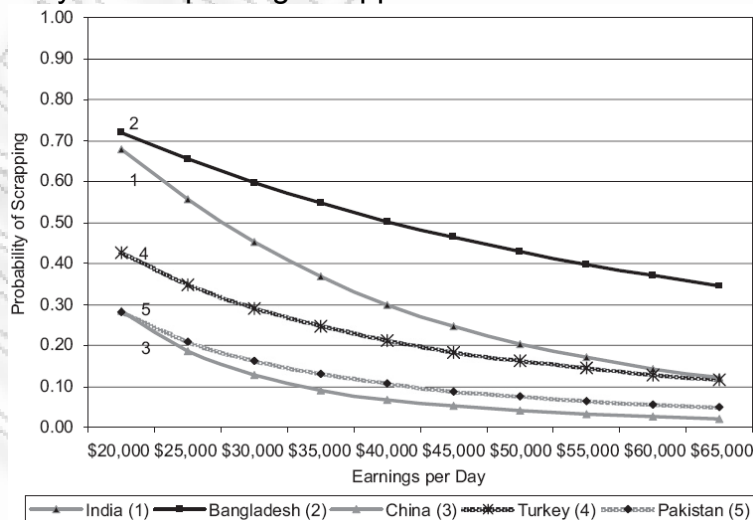


Figure: Effect of earnings on the probability of scrapping, Source: Econometric analysis of the ship demolition market, Marine Policy, 7 February 2008⁶⁴

⁶³ The graphs are calculated based on an average ship profile for a tanker with the same ship particulars for each scrapping location and with the following particulars: 20 years old, 28,000 gt, Romanian flag, owner Unknown, non-IACS Class, average scrap price and scrap prices for tankers as per data set. The partial effect of the variables of interest is then visualized by calculating the probability of scrapping for several scenarios.

- The positive sign for *scrap prices* is again intuitive as higher scrap prices enhance the probability of ships being scrapped.

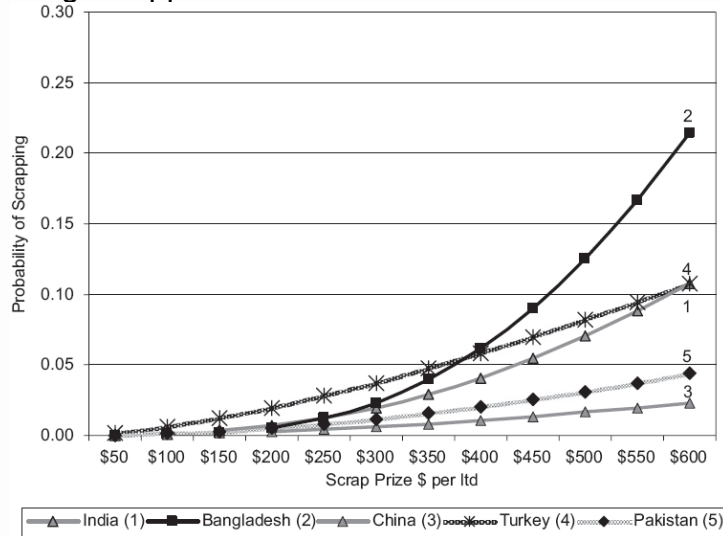


Figure: Effect of scrap price on the probability of scrapping, Source: Econometric analysis of the ship demolition market, Marine Policy, 7 February 2008

- Effect of *ship's registry* on the probability of scrapping

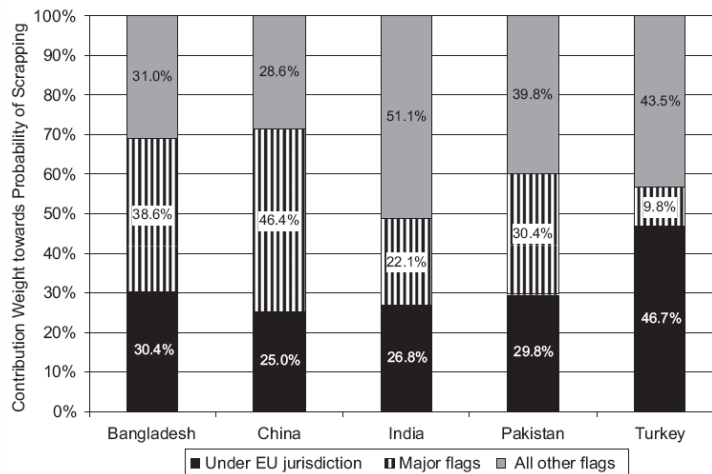


Figure: Effect of ship's registry on the probability of scrapping, Source: Econometric analysis of the ship demolition market, Marine Policy, 7 February 2008⁶⁵

Above figure shows the importance of some flag groups with respect to ratification of the IMO ship recycling convention for a particular demolition country.

Given these findings, an implementation of the convention at EU member state level will most likely affect Turkey while a non-ratification of the convention of some of the major flag states will most likely affect China. India on the other hand seems to be less dependent on flags under EU registry or from the major flag states since 51% of the contribution weight comes from all other flag states.

⁶⁴ Average earnings and scrap prices are used to calculate the base probability

⁶⁵ The first category "Under EU jurisdiction" includes Cyprus, Malta, Greece, Germany, United Kingdom (including: Isle of Man, Gibraltar, Bermuda, British Virgin Islands, Channel Islands and Anguilla), the Netherlands (including Netherlands Antilles and Aruba), Italy, Denmark (including Danish International Register), Spain (including Canary Islands), Sweden, France (including French overseas territories), Romania, Portugal and Madeira, Belgium, Finland, Luxembourg, Poland, Ireland, Bulgaria, Estonia, Latvia, Slovakia, Austria, Czech Republic, Hungary, Slovenia and Norway (including Norwegian International Register). The second category comprises the major flags as per tonnage including Bahamas, Panama, Liberia, Singapore and Japan. The third category is an average of all other flags.

b) Regarding the demolition areas, as indicated in the below figure the demolition market is dominated by Asian countries like India, Bangladesh, China and Pakistan.

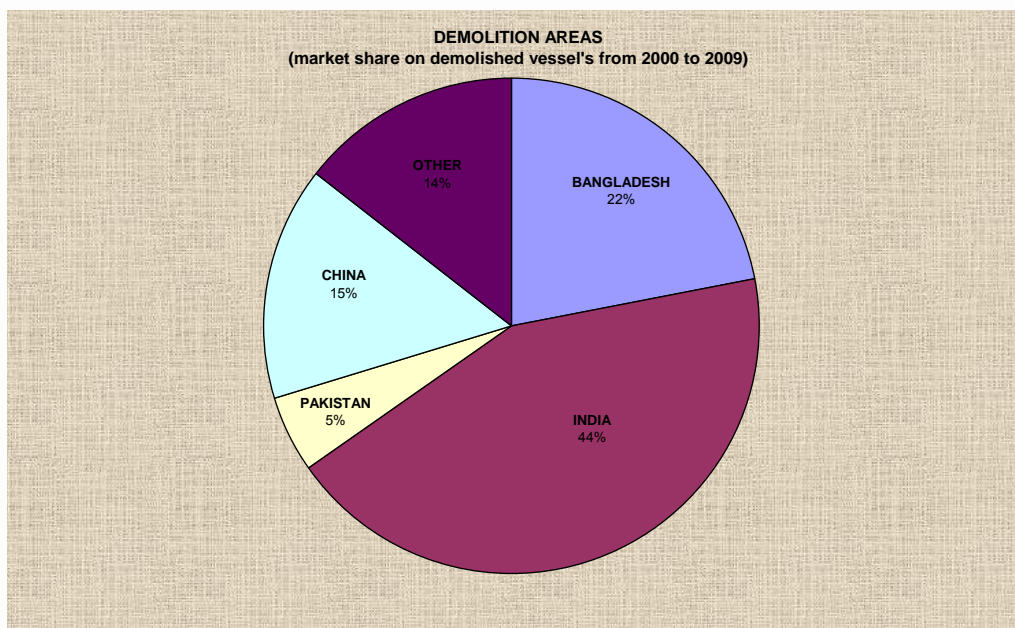


Figure: Demolition Areas, Source: Clarkson's Shipping Intelligence Network

Shipyards in Indian Sub Continent and Asia offer higher scrapped prices than European- American yards to ship owners and this is why they are more competitive. Main reasons which offer to Asian shipyards the advantage to offer higher scrapped prices are the following:

8. lax environmental regime
9. low labour cost
10. increased domestic demand for steel
11. domestic market for second hand equipment and machinery
12. beaching tides which favour the scrapping technique of beaching
13. exchange rate between American dollar and local currencies
14. Cyclical nature of demolition market. *(Since there is no standard inflow of scrapped vessels, no fix income is generated in order organized yards to be able to estimate and cover their fix costs and develop their business plan)*

After many years of efforts from many international organizations to manage the environmental and human impacts of ship dismantling as this is being conducted mostly in Asian ship yards, IMO took the initiative to construct an institutional framework, mandatory for all Parties. This is the Hong Kong international convention for the safe and environmentally sound recycling of ships, 2009.

HKC deals with the requirements before the ship enters the recycling facility (preparation for recycling) and sets regulations for the sound operation of the vessel during it's whole life. This raises many concerns since there is limited green recycling capacity estimated to 30% of the total annual expected demand for demolition. Also implementation of HKC means further cost for the Ship Owner estimated to 50-100\$ per ton LDT and for ship yards approximately 200.000.000 \$. Due to this extra cost there are many concerns that two distinct recycling markets are to be created one for Convention ships and one for non-Convention ships. There is also strong possibility that many ship owners are going to change their vessels' flag in order to avoid the implementation of the HKC in case their present flag states become Parties of this Convention.

d) As earlier mentioned China, India, Bangladesh and Pakistan are the major ship breaking countries. Peak years recorded for China were in 1991-93, while in 2003 China broke the USD 300/ltd price barrier for the first time in demolition history.

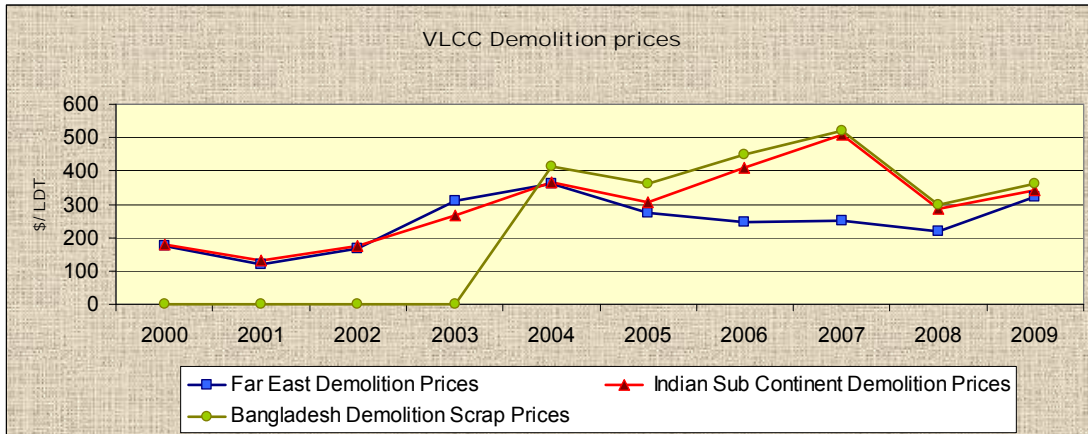


Figure: Demolition prices (VLCC) 2000-09, Source: Clarkson's Shipping Intelligence Network

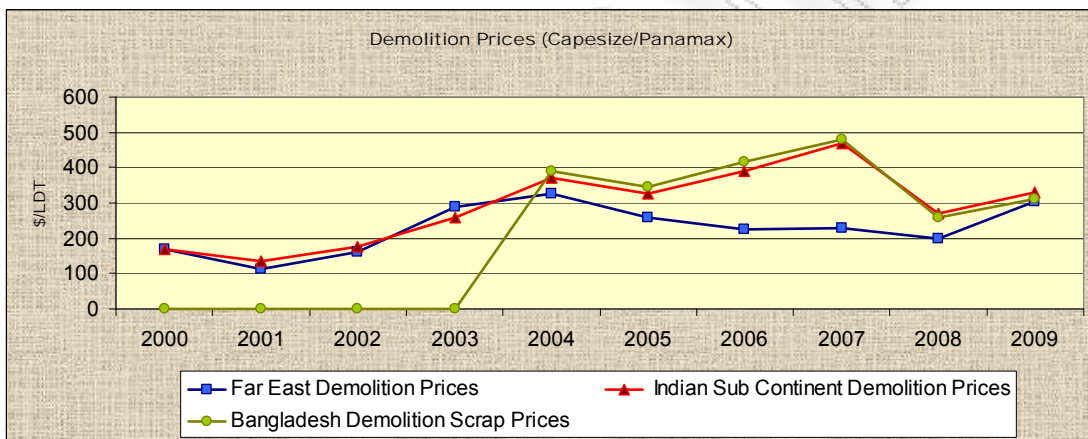


Figure: Demolition prices (Capesize- Panamax) 2000-09, Source: Clarkson's Shipping Intelligence Network

Ship breaking industry flourished in India in mid 90's. Up to 2003 India was leader of the market in terms of number of vessels scrapped. However in terms of DWT was strong competed by China and Bangladesh which means that even though India demolishes more vessels it also demolishes smaller ones. It is also evident from the figure below that from 2004 and later Bangladesh gets the higher market share of tonnage demolished.

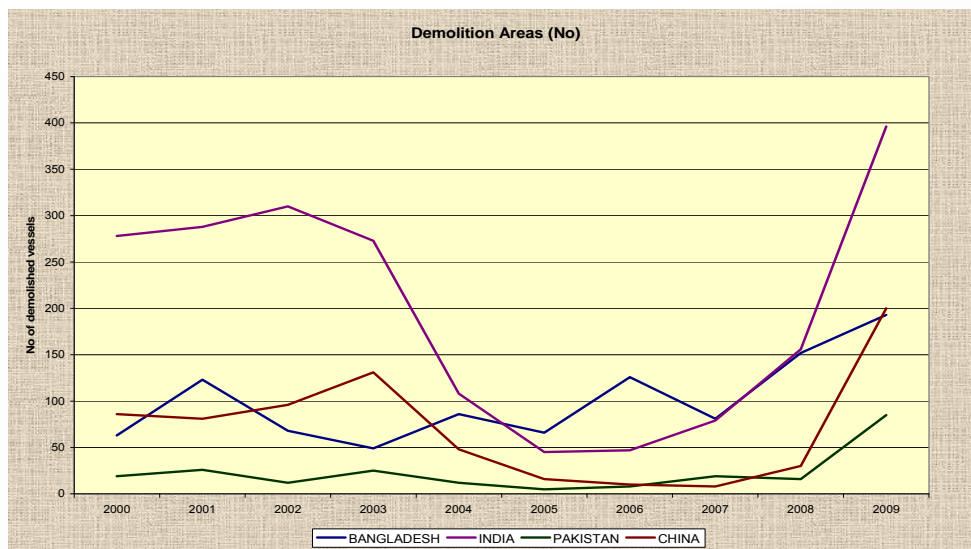


Figure: No of scrapped vessels (2000-09), Source: Clarkson's Shipping Intelligence Network

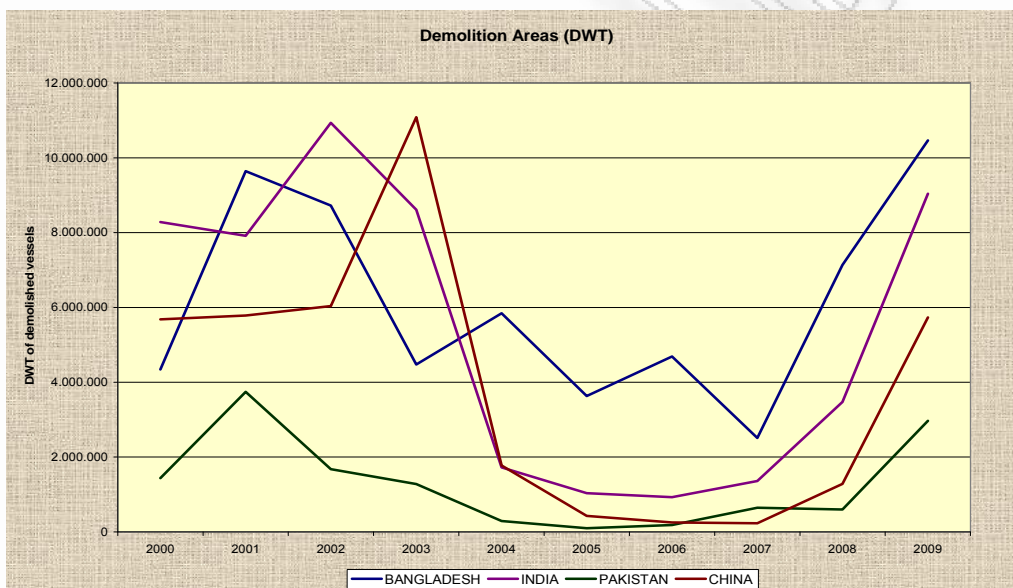


Figure: DWT of scrapped vessels (2000-09), Source: Clarkson's Shipping Intelligence Network

d) Finally for the scope of this thesis we collected several data of the years 2000-2009 in order to examine the correlation between the world merchandise trade on one hand and the demolition and freight market on the other hand. Years chosen as benchmark were 2001, 2003 and 2009 due to the dot com bubble, rise of China and financial crisis respectively. As expected world trade is negatively correlated with the demolition market and positively with the freight market. This means that growth in the world trade leads to growth in the freight market and depression to the demolition market.

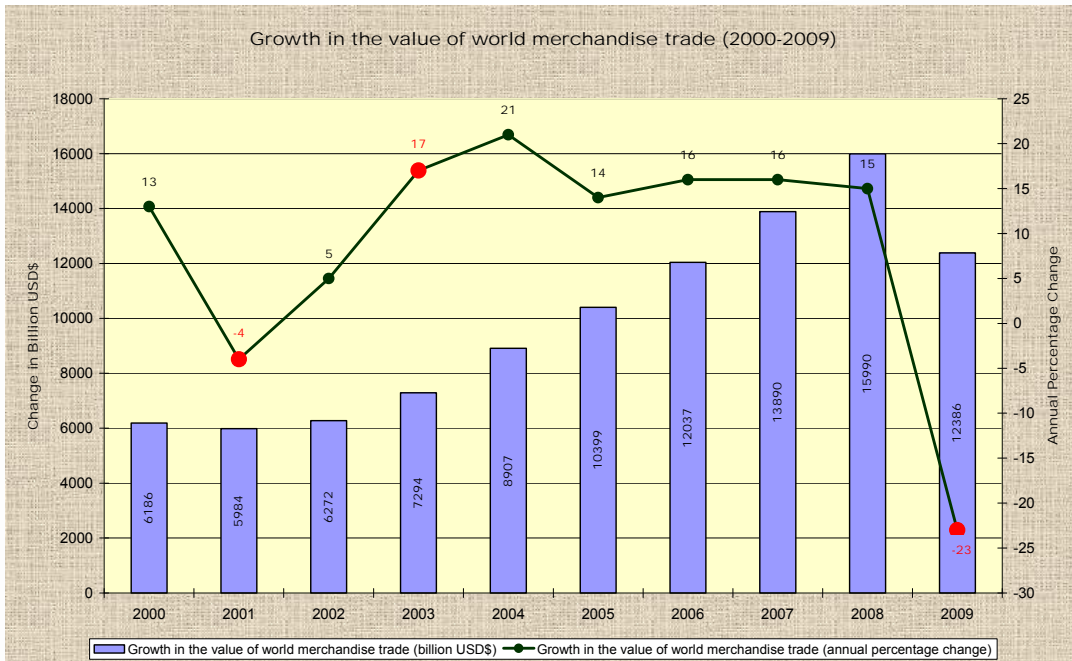


Figure: Growth in the value of world merchandise trade 2000-2009, Source: International Trade Statistics 2001-10, World Trade Organization

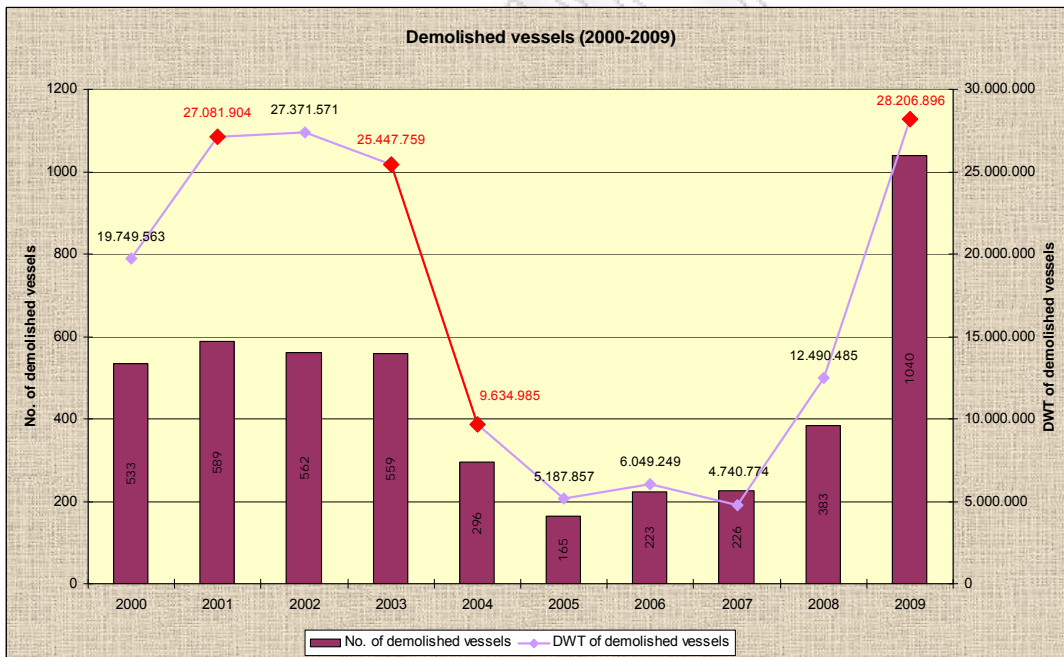


Figure: Demolished vessels (2000-2009), Source: Clarkson's Shipping Intelligence Network