

**SECTORAL ACTIVITIES PROGRAMME**

**An Issues Paper**

**Worker safety in the ship-breaking industries**

**Aage Bjørn Andersen**

Working papers are preliminary documents circulated  
to stimulate discussion and obtain comments

**International Labour Office  
Geneva**

February 2001

---

---

## Preface

Although the demolition of ships is a dirty and dangerous occupation by any standards, breaking them up on beachheads is particularly unsafe and hazardous, now that the work is no longer performed in dry docks. However, the feasibility of ship-breaking is not only determined by the price of scrap metal, but also by the existence of markets for the recycled products and goods, and by the abundance of low-cost labour.

The 279th Session of ILO's Governing Body (November 2000) recently endorsed a conclusion of the Tripartite Meeting on the Social and Labour Impact of Globalization in the Manufacture of Transport Equipment<sup>1</sup> recommending that:

- as a first step, the ILO should draw up a compendium of best practice adapted to local conditions leading to the preparation of a comprehensive code of practice on occupational safety and health in ship-breaking; and that
- governments should be encouraged to require ships to have an inventory of hazardous materials on board that is updated throughout the life of the vessel.<sup>2</sup>

This impetus coincides with initiatives in other international bodies such as the Technical Working Group of the Basel Convention (UNEP) on ship dismantling, or the work of the International Maritime Organization in relation to the recycling of ships.

The draft Programme and Budget for 2002-03 has also included the subject of improved working conditions at Asian ship-breaking sites as a priority for extra-budgetary funding. However, as factual knowledge about the type of hazards and the degree and frequency of accidents which workers are exposed to is not easily available, and since even less is known about what precautionary measures may be practical, the ILO has commissioned this "issues paper" to look at the current situation, and to come up with suggestions for possible improvement. It will be tested in a series of workshops in the countries mainly concerned (Bangladesh, India and Pakistan). Further details are available on the ILO's ship-breaking page ([www.ilo.org/safework/ship-breaking](http://www.ilo.org/safework/ship-breaking)).

Jukka Takala,  
Director,  
InFocus Programme on SafeWork.

Oscar de Vries Reilingh,  
Director,  
Sectoral Activities Department.

<sup>1</sup> ILO: *The social and labour impact of globalization in the manufacture of transport equipment* (Geneva, 2000), pp. 136-141 (see also: [www.ilo.org/sector](http://www.ilo.org/sector)).

<sup>2</sup> *Note on the Proceedings*, Tripartite Meeting on the Social and Labour Impact of Globalization in the Manufacture of Transport Equipment (Geneva, ILO, 2000), Conclusions, para. 15, p. 39 (see also: [www.ilo.org/sector](http://www.ilo.org/sector)).

---

## Contents

Preface .....	iii
1. Executive summary .....	1
1.1. The issues .....	1
1.2. Summary .....	1
1.2.1. The supply side: The world fleet of merchant vessels .....	2
1.2.2. The demand side: The ship scrapping capacity of the breaking majors .....	2
1.2.3. Current practice – Safety, health and environmental implications .....	4
1.2.4. Policies on ship disposal .....	5
1.2.5. Future ship disposal .....	6
1.3. Recommendations – ILO involvement .....	7
1.3.1. Decommissioning of ships for disposal .....	8
1.3.1.1. Decommissioning and sale for scrapping .....	10
1.3.1.2. Demolition – Principles of the breaking process .....	10
1.3.1.3. Disposal and recycling .....	10
1.3.2. Recommendations .....	11
2. Introduction .....	15
2.1. Objectives .....	15
2.2. Background .....	15
3. Current practices in ship-breaking .....	17
3.1. General .....	17
3.1.1. Scrapping locations .....	17
3.2. Principles of current practice .....	18
3.2.1. Decommissioning and sale for scrapping .....	19
3.2.2. Demolition – Principles of the breaking process .....	20
3.2.3. Disposal and recycling .....	21
3.2.3.1. Material stream/waste stream following demolition .....	22
4. Occupational safety, health and environmental implications .....	24
4.1. The current situation .....	24
4.1.1. Safety .....	24
4.1.2. Health .....	25
4.1.3. Environment .....	26
4.2. Effects of substances present .....	26
4.2.1. Health and the environment .....	26
4.2.1.1. PCB – Polychlorinated biphenyl .....	28
4.2.1.2. PVC (Polyvinyl chloride) .....	28
4.2.1.3. PAHs (Polycyclic aromatic hydrocarbons) .....	28
4.2.1.4. TBT (Tributyltin) .....	29
4.2.1.5. Oils – Hydrocarbons .....	29
4.2.1.6. Asbestos .....	29

4.2.1.7. Heavy metals .....	30
4.2.1.8. Other substances .....	31
4.2.2. Summary – Occupational safety, health and environmental concerns .....	32
4.2.3. New initiatives.....	32
5. Existing standards and practices.....	36
5.1. India .....	36
5.1.1. Exposure .....	36
5.1.2. Legislative framework.....	37
5.1.3. National initiatives.....	38
5.2. Bangladesh.....	39
5.2.1. Exposure .....	39
5.2.2. Legislative framework.....	40
5.2.3. National initiatives.....	40
5.3. Pakistan .....	41
5.4. China .....	41
6. National and international initiatives.....	45
6.1. Intergovernmental bodies.....	45
6.1.1. International Labour Organization (ILO) .....	45
6.1.2. International Maritime Organization (IMO).....	45
6.1.2.1. Status of the IMO engagement .....	48
6.1.2.2. The London Convention (IMO).....	50
6.1.3. United Nations Commission on Human Rights.....	50
6.1.4. United Nations Environment Programme – The Basel Convention .....	50
6.1.4.1. Ship scrapping and the Basel Convention .....	50
6.1.5. Commission of the European Communities.....	51
6.2. National governments .....	52
6.2.1. Involvement of the Danish Government.....	52
6.2.2. Involvement of the Netherlands Government.....	52
6.2.3. Involvement of the Norwegian Government .....	52
6.2.4. Involvement of the US Government.....	53
6.3. Other organizations/national and international conferences .....	54
6.3.1. Basel Action Network .....	54
6.3.2. Det Norske Veritas .....	54
6.3.3. Greenpeace International .....	55
6.3.4. International Chamber of Shipping .....	55
6.3.5. International Transport Workers’ Federation/International Metal Workers’ Federation .....	55
6.3.6. National and international conferences.....	56
7. Discussion of the issues.....	58
7.1. The starting point .....	58
7.1.1. Future disposal requirement – Influencing factors (future volume) .....	58
7.1.2. Disposal practice drivers (future capacity) .....	58
7.1.3. Social aspects of ship scrapping .....	59
7.1.4. International shipping – Expectations and resource management .....	60

---

7.2. Conclusions – Occupational safety, health and the environment.....	61
8. References .....	63

---

## 1. Executive summary

### 1.1. The issues

This issues paper highlights the procedures and practices adopted in the disposal of obsolete ships originating from the world fleet of merchant vessels with an emphasis on occupational safety and health (OSH) issues and on environmental aspects as ship-breaking is undertaken today by the world-breaking majors on beachheads in Asia.

The paper outlines disposal practices including those of:

- decommissioning and sale for scrapping;
- demolition – principles of the breaking process; and
- disposal and recycling methods,

with a focus on safe work.

It reviews existing legal and regulatory tools and makes an assessment of recent and previous work undertaken elsewhere by concerned agencies, national and international institutions and organizations, governments, NGOs and other stakeholders. Conclusions, recommendations and other relevant information from these organizations including plans for future work are presented.

Based on inputs from the abovementioned activities, the paper elaborates on these findings with the objective of identifying specific measures and actions that may be undertaken in the future by the ILO.

### 1.2. Summary

A ship consists mostly of steel. Consequently, at the end of its useful life, it becomes a sought-after source of ferrous scrap particularly suited for reprocessing into simple steel products such as steel rods used in civil engineering. The geographical migration of scrapping locations mirrors global industrial economic development. It seeks areas providing:

- a demand for scrap steel for reprocessing;
- a demand for second-hand equipment; and
- a supply of low-cost labour to carry out the labour-intensive extraction process.

The vast majority of the waste stream generated following the demolition or scrapping process is largely returned to “good use”. Usable equipment is sold on, such as pumps, motors, valves, generators, etc. which find alternative applications and the scrap steel is reprocessed. The latter, as an alternative to steel production from ore, represents a saving of some 70 per cent from an energy consumption perspective. Ship scrapping is truly a sustainable activity from a resource utilization point of view. Unfortunately, it is not so user-friendly when the means adopted are considered and the consequences it generates are compared with respect to:

- 
- occupational safety;
  - health; and
  - the environment.

### **1.2.1. The supply side: The world fleet of merchant vessels**

The world fleet of propelled seagoing merchant vessels larger than 100 gross tonnes (GT) was 86,817 units in 1999 representing a total of 543.6 million GT. The average age of the fleet was 20 years.

There are two main categories of merchant vessels:

- cargo carriers (cargo-carrying fleet);
- other vessels (miscellaneous vessels).

Both are experiencing a continuous growth reflecting the expansion of global trade.

The volume of ships to be scrapped is dominated by the cargo-carrying segment amounting to some 46,002 units with an accumulated tonnage of 777.8 million dwt or 515.4 million GT. This represents only some 50 per cent of the world fleet in numbers but accounts for as much as 95 per cent of the total world tonnage (GT). The importance of this category as a source for ship scrapping is overwhelming compared to the non-cargo carriers.

The average age of the cargo-carrying fleet is 18 years (1999). General cargo vessels make up the majority whilst the bulk carriers and crude oil tankers contribute the main tonnage (accounting for approximately 63 per cent of the total cargo-carrying fleet).

Almost all obsolete cargo-carrying vessels meet their fate at the scrapping sites of one of the breaking majors as illustrated by the size distribution presented in table 1.

The scrapping requirements for the world fleet of merchant vessels has been predicted as follows:

- average scrapping age of cargo-carrying vessels: 25-26 years;
- annual expected scrapping rate: 500-700 vessels;
- annual scrapping tonnage: 25 million dwt.

These figures are based on available statistics and ship registration data and represent a predictable trend for the next 15 years. The prediction suggests an increase in the need for ship disposal of some 10-15 per cent when compared to the average annual disposal figures for 1994-99.

### **1.2.2. The demand side: The ship scrapping capacity of the breaking majors**

Scrapping, disposal or breaking of obsolete vessels arriving from the ageing world fleet of merchant vessels is undertaken on the beaches of developing economies by the

intensive use of labour. The current breaking majors, accounting for more than 90 per cent of all tonnage scrapped, are presented in table 1.

**Table 1. The breaking majors and their respective market share (figures from 1999)**

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

India, Bangladesh and Pakistan have a relatively long and stable tradition in the ship scrapping industry. Ship scrapping was initiated by these nations already in the early 1970s. By the mid-late 1980s, these nations along with China accounted for the majority of global scrapping capacity. Due to increased taxation on the import of tonnage for scrapping introduced in the late 1980s, China was nearly eliminated from the market. Following the introduction of taxation by the other scrapping nations, China has returned and is slowly re-establishing its previous position.

The current breaking majors, located on the Indian subcontinent and South-East Asia, are conveniently close to the majority of trade routes and offer minimum transport distances for many vessels as they can often be stemmed with a cargo for delivery close to the final point of disposal. Further, they also meet other priority requirements vital for how the process is undertaken today:

- an abundance of low-cost labour willing to do this dirty and dangerous work (poverty/unemployment);
- an insufficient or unenforced legal framework;
- a ready market for recycling and the reuse of many dated items on the vessels, such as pumps, generators, compressors, etc;
- a long uniform inter-tidal zone/sufficient tidal difference (allowing vessels of a range of sizes to be “dry-beached”);
- minimum exposure (coastal protection) and stable weather conditions;
- a certain level of infrastructure.

The breaking majors all represent developing economies lacking investment capital but seriously in need of the employment and the earning potentials derived from ship-breaking and the associated activities represented by remanufacturing, reuse (second-hand sales) and recycling.

Almost all scrapping sites lack mechanized facilities allowing for access to the hull, i.e., no docks. Lifting capacity by cranes is either non-existent or insufficient. All demolition procedures are undertaken outdoors. The term “non-facilitated beach” or “first-generation facility” is really an accurate description since only a suitable beach and a sufficient supply of labour is required.



---

The capacity of current ship scrapping is difficult to assess. Current locations have no real limitation on expansion as capacity ultimately depends on how long the beach is and how many workers are available.

### **1.2.3. Current practice – Safety, health and environmental implications**

A vessel in operation has all the potential for being a risk to both occupational safety and health and to the environment. The well-established regulative regime governing international shipping covering all stages of building, operation and maintenance, addresses these issues and identifies minimum standards. This maritime legislative framework does not apply to the latter cycle of a vessel's life, namely its retirement and ultimately its "grave". Consequently there are at the moment no standards in relation to ship decommissioning and disposal.

The current procedures followed in the disposal of vessels retired from the world merchant fleet, are in serious breach even of the most basic norms or "good housekeeping" practice in all respects.

The consequences are of both an immediate and long-term nature and do not necessarily limit themselves to the local community.

#### **Occupational safety**

Workers' safety is jeopardized by the absence of basic precautions and work planning, including, but not restricted to:

- insufficient or no training;
- insufficient or no personal protection equipment;
- insufficient or no monitoring of work operations; and
- insufficiencies in facilities.

Due to the absence of norms about the standard the vessel should be in when it arrives for scrapping, the vessel represents in itself a number of potential risks. Basic risk-reducing or eliminating measures are often ignored and ultimately accidents occur. Some examples are:

- access to non-breathable atmospheres;
- hot work in explosive atmosphere; and
- uncontrolled closedown of systems (e.g. the discharge of CO<sub>2</sub> from fire-fighting systems in vacated spaces).

Lack of coordination for work procedures, the absence of facilities and the absence of safety control of those available, including cutting tools, also represent elements of risk causing bodily harm and injuries.

Accident reporting is partly non-obtainable and unreliable. Published statistical data on fatalities diverge by factors of between 5 and 10 between sources. The lowest reported figures suggest an annual fatality rate of 1 per cent (caused by accidents alone). Reported non-fatal incidents suggest a lower accident frequency rate (AFR) for ship scrapping than

---

that for ship repair and shipbuilding. This does not compare to the standards adopted in these two latter segments suggesting that there are considerable gaps in non-fatal reporting.

## Health

The main elements of exposure affecting workers' health would appear to be:

- the nature of the work procedures adopted (hard manual labour involving heavy lifting, etc.);
- long-term exposure caused by working operations and lack of personal protective equipment (PPE); and
- exposure to hazardous substances/toxins.

The workforce, often migrants, usually live in inadequate facilities on, or in, the immediate vicinity of the site. Noise, inadequate sanitary facilities and general exposure (e.g. discharges to sea, ground and air) originating from the site have obvious short- and long-term health implications.

The exposure to carcinogens and cancer-related substances such as PCB, PAH, heavy metals and asbestos is considerable. These substances are present in almost all vessels. Among some of the breaking majors, some hazardous materials are reprocessed and returned to the market (e.g. reprocessing of asbestos). The long-term effects of constant exposure to these substances are well known. Their health impact is severe and can be passed on to the following generations.

There are no reliable data on health implications and consequences within the ship scrapping industry. It is however evident that the exposure experienced by the workforce have serious short- and long-term effects and that the consequences will include fatalities as well as physical and mental disabilities.

## The environment

The consequences of general non-compliance within the ship scrapping industry of any standards in relation to the environment can be categorized by two main groups:

1. By occupying and expanding the areas required for breaking, the scrapping industry affects the surrounding environment as well as society. The established local community is reliant on basic industries such as fishing and agriculture and hence it may be claimed that there are conflicting interests. Failing fisheries have been reported in affected areas. Further, turning coastline segments into sites feasible for current scrapping may imply the removal or changes in the local environment (e.g., the loss of mangrove forests in Bangladesh).
2. Discharges and emissions to sea, sediments, ground and air cause both acute and long-term pollution. The lack of containment to prevent toxins from entering the environment is a major concern and represents a general threat to all living creatures.

### **1.2.4. Policies on ship disposal**

The European Union has recently undertaken a study on the technological and economic feasibility of scrapping vessels in Europe. This work was initiated following accusations suggesting that current disposal procedures were in breach of the 1989

---

Convention on Transboundary Movements of Hazardous Wastes and their Disposal (the Basel Convention under the administration of UNEP).

The US Senate has in effect prohibited the export of US vessels to the breaking majors and is currently looking into opportunities for establishing its own disposal capacity.

These two initiatives demonstrate that:

- the world community hesitates to accept the current procedures for disposing of vessels; and that
- opportunities (job creation) for well-established economies within the area of ship disposal are being looked into.

International agencies (IMO/UNEP) are at present assessing the implications of current disposal practices with the focus on the vessel (IMO) and on the environment (UNEP). Both organizations have addressed the need to include occupational safety and health issues and have called upon the ILO to take the lead on these matters.

A number of governments and NGOs including lobby organizations representing the shipping industry have demonstrated concern about ongoing disposal practices and about their consequences.

### **1.2.5. Future ship disposal**

At present there are no feasible alternatives to disposing of the current number of ships. The phasing out of ship scrapping in the breaking majors is only a distant possibility. It would represent a revolution in the economics related to traditional ship scrapping and may consequently have severe impacts on:

- ship renewal programmes;
- expected lifespan leading to an ageing of the world fleet.

The Basel Convention, in its present form, would not appear to have sufficient potential for improvement even if enforced. The Convention was never developed for this particular scenario and consequently does not have provisions which would be required for the specific characteristics of the shipping industry.

The input to developing economies of ship disposal is vital. Moving the industry would have a devastating effect on the local societies and may not lead to improvements in the quality of life/working conditions of the people engaged, nor for the environment. This suggests that the solution to this complex issue may not be to relocate ship disposal to better equipped economies, but to develop the existing sites and the procedures applied.

The recycling aspects of ship disposal represent a considerable opportunity for developing economies. The elements of sustainability represented by the activity should be an encouragement to develop equally justifiable procedures. To reach this goal, actions and measures required to safeguard workers, their health and the environment are in urgent need. These involve not only the vessel and the scrapping facility but a range of issues and subjects with a socio-economic impact. Some of the areas requiring attention are:

- 
- *The vessel:*
    - existing vessels: preparation prior to scrapping;
    - new tonnage: design for disposal.
  - *The facility:*
    - containment;
    - material/waste handling;
    - reception and disposal;
    - sanitation.
  - *The organization of work:*
    - responsibilities;
    - requirements and enforcement;
    - plans:
      - operational procedures;
      - safety and emergency response;
      - training;
      - licensing/certification.
  - *Infrastructure:*
    - housing;
    - medical care;
    - social welfare;
    - education.

### **1.3. Recommendations – ILO involvement**

The recent 279th Session of the ILO's Governing Body (November 2000) endorsed a conclusion of the Tripartite Meeting on the Social and Labour Impact of Globalization in the Manufacture of Transport Equipment (May 2000), stating that, as a first step, the ILO should draw up a compendium of best practice adapted to local conditions leading to the preparation of a comprehensive code on occupational safety and health in ship-breaking, and that governments should be encouraged to require ships to have an inventory of hazardous materials on board that is updated throughout the life of the vessel, and requested the Director-General to bear this in mind when drawing up proposals for the future work of the Office. The draft Programme and Budget for 2002-03 also identifies the improvement of working conditions at Asian ship-breaking sites as a priority area for extra-budgetary activities (paragraph 166, page 42).

---

The issues involved in current practices related to the decommissioning of ships for disposal, (ship scrapping), have given rise to considerable concern among a number of agencies, institutions and organizations. In general, these concerns focus on two main areas:

- workers' safety and health;
- the environment.

Any ILO involvement would be expected to deal with traditional occupational safety and health issues. However, the environmental aspects have a considerable impact on the life of the workforce engaged in ship scrapping and associated activities, and should therefore also be addressed.

The very nature of ship demolition creates a matrix of procedures linking different areas:

- ship;
- environment;
- occupational/social safety and welfare;
- developing economies;

and involving a number of stakeholders in addition to intergovernmental agencies. The process of identifying initiatives for improvements cannot only single out specific areas, but will have to interact with all others. Consequently, it becomes evident that the process will require the involvement of stakeholders representing all areas. However, it becomes equally evident that a lead role should be played by one organization. Taking into account the broad interrelations between the main issues, those addressing environmental concerns and those addressing concerns related to occupational safety and health, it is evident that the ILO should have a major role to play. It is further suggested that the other agencies involved, e.g. IMO and UNEP, should participate. Important contributions may also be provided by UNDP, GEF, ISO (DEVCO – Committee on Developing Country Matters) and other organizations.





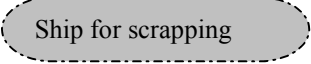


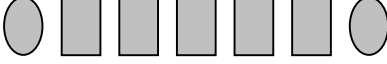


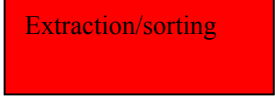


### **1.3.1. Decommissioning of ships for disposal**

The processes involved in current decommissioning for disposal can be categorized in three main groups: decommissioning and sale for scrapping; demolition – principles of the breaking process; and disposal and recycling. Table 2 presents these main categories with references to the processes and subsequently to the implications involved.

Contrary to some other industries, traditional ship design and construction practices do not provide any “end-of-life” (ELV) considerations. The vast majority of a vessel's “dry” weight represents reusable materials, dominated by steel at typically some 80-90 per cent depending on the type of the vessel. A considerable part of the remnants also represents an input, in particular, to remanufacturing industries and to the second-hand market. In order to utilize these resources, extraction is required. From this perspective, it becomes evident that ships represent by their very nature a considerable disposal challenge:

- by size – large floating constructions, required access for demolition denied when afloat;

Table 2. Decommissioning for disposal, the current process and implications arising

Location 		Offshore	Inter-tidal zone	Shore	Reuse <i>Remanufacturing</i> 1. <b>Reprocessing, recycling</b>
<i>Decommissioning for disposal</i>  		<b>Decommissioning and sale for scrapping</b>	<b>Demolition – principles of the breaking process</b>	<b>Disposal and recycling</b>	
<u>The process</u> 		  	 	 	Equipment Components Consumables Material Scrap steel
<u>Implications</u>  (Current situation)		Arrival in “as is” condition: <ul style="list-style-type: none"> <li>▪ Onboard ship gen. waste</li> <li>▪ No inventory details</li> <li>▪ No precautions taken</li> </ul> Minimum draught required for beaching: <ul style="list-style-type: none"> <li>▪ Minimum draught – maximum discharge</li> </ul>	Beaching: <ul style="list-style-type: none"> <li>▪ Containment</li> <li>▪ Stability</li> </ul> Section dismantling: <ul style="list-style-type: none"> <li>▪ Access: explosive/non-breathable atmospheres/unintentional releases (chemicals/gas)</li> <li>▪ Cutting, falling modules, transport to dry beach</li> </ul>	Site (“dry beach”): <ul style="list-style-type: none"> <li>▪ Storage: liquids/solids, hazardous waste, flammables</li> <li>▪ Cutting, burning (extraction by fires)</li> <li>▪ Transport</li> <li>▪ Sorting</li> </ul>	Export (from the scrapping site) of hazardous materials
<u>General</u> 	Occupational safety/the environment	Occupational safety and the environment: planning, procedures, training, monitoring, maintenance, drills, contingency			Issues of relevance to the procedures of decommissioning for disposal exported from scrapping site to adjacent recycling industries
	Health, social welfare	Housing, sanitary, medical, working hours, wages, minimum age			

- 
- extraction – solid construction requiring heavy labour-intensive procedures;
  - waste stream – sorting and preparations for reuse or recycling.

In order to identify recommendable initiatives or areas requiring attention, the individual decommissioning categories for disposal have been briefly assessed. Possible actions and/or measures, their improvement potential with respect to safety, health and the environment, implementation options and roles and responsibilities (stakeholders) have been identified. The results (presented in tables 4, 5 and 6) make references to the flow of the process as presented in table 1. It should be noted that actions and measures presented represent merely a suggested input to form a baseline for the development of a comprehensive programme and hence do not necessarily cover all related subjects. However, the methodology presented in table 1 and elaborated on in tables 4, 5 and 6 may be adopted and further developed in order to establish such a programme.

#### 1.3.1.1. Decommissioning and sale for scrapping

The first category of the disposal process focuses on the object (the ship). Improvement potentials have been considered for both existing vessels as well as for those to be constructed in the future. The findings are presented in table 4.

The feasibility of recycling can be considerably increased by maximizing the use of recyclable material and minimizing the use of non-recyclables as has been demonstrated by other industries (car manufacturers, manufacturers of electronic equipment, etc.). Such improvements may also affect the area of occupational safety and health by the replacement of hazardous materials and by adopting new construction methods or providing information relevant to demolition (for planning/precautions).

The monitoring of the building process opens up the opportunity for providing detailed inventories including material and substance identification, location and quantification.

In addition to design and documentation, the focus should also include looking at standards for the vessel to comply with before it is accepted for demolition.

#### 1.3.1.2. Demolition – Principles of the breaking process

Hull access by dry-beaching (inter-tidal zone), which has been adopted as the principal method of current ship scrapping, highlights the need for some kind of facilities. At present, these non-facilitated beaches are receivers of debris and contaminants of a wide spectrum generated during the demolition process. These enter the water and sediment and have a local impact on resources (fisheries/water in particular).

In addition, extraction, removal and transport to shore of heavy and sometimes complex components undertaken without or with only limited use of mechanical aids (cranes, etc.) introduces a number of safety and health issues.

Initiatives are required both with respect to facility requirements as well as to working procedures.

#### 1.3.1.3. Disposal and recycling

This category encompasses the procedures of extraction from sections and the sorting of the material stream generated. The operations are labour intensive and characterized by contradicting activities undertaken simultaneously within a small area.

Extraction suffers from the absence of equipment and insufficient facilities as well as from lack of planning.

The material stream is sorted by type and size. A considerable amount of the stream is temporarily stored. Disposal is random. Improved management of the waste stream, which really represents the liquidity of the business, may have the potential of improving profitability as well as reducing the present health, safety and environmental risks.

### 1.3.2. Recommendations

Most of the breaking majors have national regulations or guidelines addressing the issues at stake. In general, it can be claimed that these are not adhered to nor implemented. Measures or initiatives must take into account national or local legislative realities and be developed from actual and specific circumstances.

The challenges associated with occupational safety and health issues include environmental concerns. Changes are required at many levels and will include a number of topics. The involvement of all relevant stakeholders is essential and will include responsibility and commitment from:

- intergovernmental agencies;
- governments;
- national/local authorities;
- the industry stakeholders;
- the workers.

The identification of a project programme “Sustainable ship decommissioning for disposal and recycling” is recommended. The programme should not only have an overall objective and vision but also a local reference and include action and measurement of implementation schemes. A project programme should rest on inputs from the ship scrapping industries and from views of local/national authorities as well as from involved agencies, institutions and governments. The main areas to be addressed include that of the ship, the breaking facility and the social welfare of workers involved. Items of priority include those of a technical and social nature, incentives/implementation and awareness. The overriding issues are occupational safety, health and environmental concern.

The development of a project programme may use the safety, health, environment concept (SHEC) approach (briefly discussed in Chapter 7.2), adopted/presented in tables 2, 3, 4, 5 and 6 to identify scope and tasks at a higher level of detail both in relation to the associated technical and operational aspects as well as those related to a more generic need to improve aspects related to social welfare (medical services, housing, etc.).

**Table 3. Input to project programme development, refer to tables 2, 4, 5 and 6**

Areas to be addressed	Safety	Health	Environment	General	
				Social welfare	Overlaying
Ship	3, 9, 10, 11, 12, 15, 20	1, 2, 3, 4, 5, 6, 8, 10	1, 2, 4, 5, 7, 8	Housing, sanitary conditions, medical services, education.	Personal protective equipment, training, planning, awareness.
Scrapping site	11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 23	13, 16, 17, 18, 19, 20, 21, 23, 24, 25, 27	11, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27		



**Table 4. Actions of improvements – Offshore/decommissioning and sale for scrapping**

	<b>New vessel</b>	<b>Existing vessel</b>	<b>Prior to (or at) arrival</b>
<b>Possible actions and/or measures</b>	<p>Cradle-to-grave design philosophy (sustainable ship design) encompassing:</p> <ol style="list-style-type: none"> <li>1. Material selection (“green” materials, consumables, etc.).</li> <li>2. Detailed (electronic) inventORIZATION (updated according to maintenance/repairs/refits).</li> <li>3. Detailed demolition specification (to follow the vessel from building yard).</li> </ol>	<ol style="list-style-type: none"> <li>4. Establishment of “as is” inventory at final life stage.</li> <li>5. Removal of hazardous materials if feasible.</li> <li>6. Provide personal protective equipment (PPE), e.g. for asbestos removal and disposal.</li> </ol>	<p>Preparations:</p> <ol style="list-style-type: none"> <li>7. Sale and agreed “as is” condition.</li> <li>8. Cleaning (cargo areas (incl. cargo tanks), removal of ship-generated waste, etc.)</li> <li>9. Securing for demolition (safe atmospheres for access, demobilizing of unsafe systems, preparing for hot work, marking of hazards), shutdown of surplus systems.</li> <li>10. Provision of removal instructions/equipment (protective/monitoring tools) – “ready for demolition standard”.</li> </ol>
<b>Improvement potentials</b>	<b>Safety</b>		
	General safety improvement (specified demolition procedures identifies dangers).		Reducing/eliminating risk of certain incident types, e.g. explosions, suffocation.
	<b>Health</b>		
	Avoidance of exposure to hazardous materials. Allowing appropriate precautions to be adopted.	Controlling exposure to hazardous materials. Allowing appropriate precautions to be adopted.	Reducing risks of toxic exposure or asphyxiation.
	<b>Environment</b>		
	Reducing use of hazardous wastes.	Improving handling and disposal of hazardous wastes.	Waste reduction reducing environmental exposure.
<b>Implementation</b>	Development of classification notations – voluntary. Introduction of required OSH and environmental inventory (certificate).	Establishment of an inventory (verified by third party) – voluntary. Introduction of required OSH and environmental inventory (certificate).	Establishment of standard terms for sale for scrapping (contract). Establish a “ready for demolition” standard – voluntary. Introduction of a required letter of compliance (or certificate) with reference to “ready for demolition standard”.
<b>Roles and responsibilities</b>	IMO: shipowners, classification societies, flag States.	IMO: shipowners, classification societies, flag States.	IMO: shipowners, classification societies, flag States. UNEP (Basel Convention). ILO (decent/safe work). National authorities/local authorities.

**Table 5. Actions of improvements – Inter-tidal zone – Demolition – Principles of the breaking process**

	<b>Beaching</b>	<b>First-phase bulk demolition</b>	<b>General</b>
<b>Action and/or measures</b>	11. Facility upgrading; Containment, lifting/removal devices. 12. Ship inspection for safe demolition (link to item 10).	13. Planned removal/demolition procedures (i.e. based on site) (linked to item 9). 14. Equipment/tool upgrading (cutting/lifting/removal) 15. Workforce organization and training (i.e. “securing team” (CO <sub>2</sub> shutdown, ventilation, etc.)). 16. Monitoring, incident reporting, link to contingency (fire brigade/ medical expertise).	17. Work organization, planning, facility, layout (link to items 9 and 13).
<b>Improvement potentials</b>	<b>Safety</b>		
	Reducing incidents: falls, squeeze.	Reducing incidents: falls, squeeze, suffocation, explosions, fires, etc.	General contribution.
	<b>Health</b>		
	Potential long-term reduction in exposure (reduction in background levels in water/food).	Reduction of exposure to hazardous substances.	General contribution.
	<b>Environment</b>		
	Reducing discharges to sea by containment.	Reducing risks of acute discharges.	General contribution.
<b>Implementation</b>	Requirement/standard on ship scrapping facilities. Establish a “ready for demolition” standard (link to the ship, see table 2).	Site specific plans (categorized), certification requirements to scrapping sites.	
<b>Roles and responsibilities</b>	ILO, UNEP, national/local authorities/stakeholders (IMO).	ILO, UNEP, national/local authorities/stakeholders/ ship-breakers (sites).	

**Table 6. Actions of improvements – Shore – Disposal and recycling (extraction and sorting)**

	<b>Extraction</b>	<b>Sorting</b>	<b>Disposal/export</b>
<b>Action and/or measures</b>	<p>18. Facility equipment and layout – site categorization (for certification), linked to items 9, 13 and 17, see comments table 3.</p> <p>19. Work organization (linked to items 9, 13, 17, 18).</p> <p>20. Extraction methods.</p>	<p>21. Material stream management (waste (disposal), recycling, reprocessing, reuse (sales)).</p> <p>22. Sorting – quality improvement initiatives (e.g. ferrous/non-ferrous).</p> <p>23. Sorting methods.</p>	<p>24. Waste reception and disposal (linked to items 8, 11/MARPOL waste + demolition generated waste).</p> <p>25. Substance phase-out, e.g. avoiding unwanted substances to re-enter the market (asbestos).</p> <p>26. Monitor/report export from facility (including raw materials, items and waste (e.g. coating on plated for recycling)).</p> <p>27. Disposal methods.</p>
<b>Improvement potentials</b>	<p><b>Safety</b></p> <p>Reducing incidents: falls, squeeze, suffocation, explosions, fires , etc.</p> <hr/> <p><b>Health</b></p> <p>Reduction of exposure to hazardous substances (direct or through water/food). Reduction in strain (introducing mechanical aids).</p> <p>Reduction of risks for toxic exposure or asphyxiation. Reduction in strain (introducing mechanical aids).</p> <p>Reduction of exposure to hazardous substances (direct or through water/food). Reducing risks of toxic exposure or asphyxiation. Reducing long-term exposure.</p> <hr/> <p><b>Environment</b></p> <p>Reducing discharges to sea by containment. Reducing risks of acute discharges to sea, sediment and air.</p> <p>Reducing discharges to sea by containment. Reducing risks of acute discharges to sea, sediment and air.</p> <p>Reducing risks of long-term/acute discharges to sea, sediment and air.</p>		
<b>Implementation</b>	Requirement/standard on ship scrapping facilities. Operational guidelines (voluntary/mandatory).	Improved sorting – increased prices.	Contractual claim – owner required to purchase phased-out material (asbestos). Reduced contaminants – increased prices (e.g. steel plating).
<b>Roles and responsibilities</b>	ILO/UNEP/national/local authorities/stakeholders.	ILO/UNEP/national/local authorities/stakeholders.	ILO/UNEP/IMO/national/local authorities/stakeholders.

---

## 2. Introduction

### 2.1. Objectives

Ship-breaking on the beachheads of Asian developing countries is claimed to be among one of the world's most dangerous and hazardous occupations endangering the safety and lives of thousands of workers. More than 90 per cent of it takes place on the beaches of Bangladesh (Chittagong), India (Alang), Pakistan (Gaddani estate in Baluchistan) and in China.

The occupational safety and health hazards include exposure to asbestos, noxious fumes, explosions, toxic wastes, noise, falling objects, heavy weights, radiation, electric shock, etc. In general, the workers wear no personal protective equipment (PPE), such as goggles, helmets, shoes, gloves, respiratory devices, etc.

There are:

- few or no laws;
- few inspections;
- no implemented safety regulations;
- no protective equipment;
- no dry docks.

Employment rights are non-existent, there are no unions and no collective bargaining. Working and living conditions mirror a total absence of standards and norms.

In addition to the abovementioned factors this issues paper also cover areas of concern for safe work undertaken elsewhere, in particular on the environmental aspects of ship-breaking, in the recent/the current work within IMO, UNEP and other organizations.

The procedures used in current ship-breaking have been assessed in accordance with risk/exposure/danger and incident frequency. Further, existing national and international initiatives (legislative or voluntary) aiming to reduce the range of adverse health and safety implications, have been identified and addressed to the extent permitted by available information.

Based on the outputs from the tasks described, recommendations for specific measures and actions that may be undertaken by the ILO are presented (tables 2, 3, 4 and 5).

### 2.2. Background

The process of breaking ships for the extraction of scrap steel for supply to the steelworks has migrated geographically since it started as an industrialized activity reflecting the movement of economic development. A significant share of the ageing fleet ready for retirement was processed in Europe and in the US up until the early 1970s when a shift to the Asian region was seen. Initially, Taiwan and South Korea became important receivers of decommissioned tonnage, but were soon followed by other nations in the same

---

region. As new countries moved into the ship-breaking industry, established breakers using skilled labour at equipped facilities (breaking yards) were unable to compete.

Today, the vast majority of merchant fleet vessels are scrapped by the intensive use of labour at non-facilitated beaches in countries where labour is readily available at a very low cost.

The demand for scrap steel and the availability of low-cost labour have been the driving factors in terms of the geographical location of ship-breaking centres. The industry has been on the move as a function of global industrial economic cycles and hence away from the introduction of cost-inducing initiatives such as regulations and taxes.

There is no specific international legislation governing the ship demolition process as such. There are, however, various standards, norms, regulations and international conventions that may have relevance for certain segments of the process. These may have applications for environmental matters, for safety issues and for aspects of health of an occupational nature and general employment rights.

The conditions under which current ship scrapping is undertaken have been studied in detail by DNV and others and are not in accordance with any general safety, health and environmental legislation or objectives. The nature of this non-compliance is fundamental to the scrapping process and downstream recycling and reuse procedures seem to be deeply rooted in the cultural, social and legislative environment of the countries concerned.

---

### 3. Current practices in ship-breaking

#### 3.1. General

Current ship-breaking is centred on the Indian subcontinent. India, Bangladesh and Pakistan together with China constitute more than 94 per cent in tonnage representing some 58 per cent of the annual number of ships scrapped. Scrapping statistics by location for 1999 are presented in table 7. From this it may be concluded that nearly all larger seagoing cargo-carrying retired merchant vessels will be scrapped by one of these four scrapping majors at some stage.

Table 7. Ship scrapping statistics for 1999

Breaker country	No. of vessels	Total (dwt)	Average size (dwt)
Bangladesh	44	4 156 096	94 456.7
China	26	1 277 523	49 135.5
India	264	7 932 948	30 049.0
Pakistan	35	3 015 112	86 146.0
Subtotal	369	16 381 679	44 395.8
Others	261	922 285	3 533.7
Total	630	17 303 964	27 466.7

#### 3.1.1. Scrapping locations

The breaking capacity on the Indian subcontinent and in South-East Asia is conveniently located close to the majority of trade routes. The Indian subcontinent covers the major trade routes of the Far East to the Middle East and Europe whilst China covers the trade routes within Asia and across the Pacific. By location, these sites offer minimum transport distances for many vessels as they can often be stemmed with a cargo close to the final point of disposal. Perhaps the only major trade routes not adequately served are those across the Atlantic and through to the Mediterranean and West African coastlines.

The choice of location for the establishment of scrapping sites is based upon some prerequisites. These may be summarized as follows:

- a long uniform inter-tidal zone/sufficient tidal difference (allowing vessels of a range of sizes to be “dry-beached”);
- minimum exposure (coastal protection) and stable weather conditions;
- availability of low-cost labour;
- a certain level of infrastructure.

The need for employment and the lack of available investment capital are key factors in common among the world’s scrapping majors. The current scrapping sites lack mechanized facilities allowing access to the hull. Lifting capacity is non-existent and all demolition procedures are undertaken outdoors. The term “non-facilitated beach” or “first-generation facility” is an accurate description. There may be some variations in procedures adopted by location, but in general the procedures used are virtually identical, with only

---

few exceptions. The re-entry of China as a scrapping major seems to represent an exception as it is increasingly investing in improving its scrapping methods by introducing modern technologies.

### **3.2. Principles of current practice**

Vessels heading for retirement, for whatever reason, are offered for sale on the scrapping market and sold to the highest bidder for delivery on site in an “as is” condition.

Due to the availability of manpower and the presence of a market for second-hand equipment and components, the scrapping procedure is based around the principle of maximum separation and mirrors a reverse “shipbuilding” process, being similar in that it is labour intensive but does not make use of technology commonly adopted in modern shipbuilding. This is first and foremost illustrated by the established principle of beaching the scrapping candidate (common practice at all the scrapping majors with few exceptions (China)).

Measured against standards or general norms expected within the industrialized countries, the current method of scrapping fails to comply with any environmental or safety standards in almost all respects.

The extent and nature of not observing any kind of standards is demonstrated by on-site case studies and available literature. It becomes instantly evident that the gaps to be bridged in order to achieve compliance with norms and expectations of the industrialized countries are potentially large and would require capital investment in facilities, process control and radically different working practices and conditions. Furthermore, a local legal and cultural framework would need to be in place to ensure that any new measures and actions introduced would be adhered to.

However, measured against local standards, the situation may not be so detrimental. Priorities are different and few alternative livelihood opportunities are afforded. There is no doubt that the impact of these industries on the local community and economy is considerable and this aspect must be taken into account when considering the introduction of any measures or actions. It would be difficult to ignore the social implications if a large volume of scrapping from these existing operations were to be removed as they generate employment and revenue for the local economy. On the other hand, this may be the very consequence if constructive improvements on both environmental issues and on occupational safety and health are not achieved.

As a result of abundant low-cost labour, the existing sites have the advantage of low operating costs. In addition, these less well-developed countries also provide a ready market for many of the components that result from the ship scrapping process, such as pumps and generators. These components would not necessarily comply with regulations nor expectations that would permit their reuse elsewhere.

In summary, the existing locations offer three critical factors:

- an abundance of low-cost labour willing to do this dirty and dangerous work;
- insufficient or unenforced legislative frameworks;
- a ready market to reuse many of the dated items on the vessels, such as pumps, generators, compressors, motors, etc.

---

### 3.2.1. Decommissioning and sale for scrapping

When a ship has become obsolete on the market it serves, or non-compliant for other reasons, and hence reaches the end of its useful life, it is usually offered for sale to a ship-breaker either through brokers or to “cash buyers”. These cash buyers will then resell to the ship scrappers.

- *Alternative 1:* The shipowner may sell the ship directly to a ship-breaking company, or more often through a broker. When the ship is sold to the ship-breaker company, the shipowner must provide for transportation of the ship to its final destination. The ship is sold for the obtainable market price at any time.
- *Alternative 2:* The shipowner sells the ship to a “cash buyer” company, which again will transport the ship to the ship-breaking location. The price obtained for the ship is then lower than in alternative 1.

The driving factor determining the price the market is willing to pay for the ship is a function of the amount of steel onboard. Consequently, ship type and lightship weight are essential parameters. However, the trading of second-hand equipment or components is essential in the profit-making process. It should be noted that the ship-breaking nations have introduced taxation on tonnage imported for scrapping. The level of this varies and affects the prices offered.

When the ship arrives at the scrapping site it is beached under its own power. This implies that the vessel must be “shipshape” and in compliance with valid certificates until actually positioned on the beach. Consequently, there are limited possibilities available in order to prepare the vessel for scrapping with respect to removal of harmful substances onboard prior to arrival “decontamination”. The principle of beaching requires the vessel to be under its own power and hence will not allow preparations affecting the required certificates of seaworthiness (towing is not an option).

There are no international requirements or standards in relation to the conditions or to the documentation needed for the vessel when destined for the breakers. Consequently, a shipowner will most often not have undertaken any onboard precautions nor will he be able to provide specifications about onboard hazardous materials. There may however be some national requirements in the country of the breakers. This is discussed under item 5. Such national requirements when enforced have however resulted in moving tonnage for scrapping to other countries where such “obstacles” are absent.

Since the scrapping candidate is still subjected to the laws of the seas including the provisions of both SOLAS and MARPOL, there may be valid requirements that might have relevance also to the scrapping process. Annexes I, II, IV, V and VI to the MARPOL Convention require the establishment of appropriate waste reception facilities for the reception of ship-generated waste (in accordance with the substances of the respective annexes). Table 8 provides an overview of the status of the Convention for the relevant scrapping majors.

Contractual documents are sometimes prepared by the breakers but more often by the broker or the “cash buyers”. “SALESCRAP 87” (provided to the shipping industry by BIMCO) is the only standard contractual format commonly used for supporting sales for scrapping. This document is currently under revision and an updated version is expected by the summer of 2001. This new edition is believed to include paragraphs on safety-related issues of importance in the further process of scrapping.



**Table 8. Status of the MARPOL Convention, scrapping majors**

		<b>Bangladesh</b>	<b>China</b>	<b>India</b>	<b>Pakistan</b>
MARPOL 73/78	Annex I/II	Not ratified	Ratified	Ratified	Ratified
	Annex III	Not ratified	Ratified	Ratified	Ratified
	Annex IV	Not ratified	Not ratified	Not ratified	Ratified
	Annex V	Not ratified	Ratified	Not ratified	Ratified
	Prot. 97 (Annex VI)	Not ratified	Not ratified	Not ratified	Not ratified

Notes: MARPOL (MARPOL 73/78) – International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocols of 1978 and 1997 relating thereto. Annex I – Regulations for the Prevention of Pollution by Oil. Annex II – Regulations for the Control of Pollution by Noxious Liquid Substances in Bulk. Annex III – Regulations for the Prevention of Pollution by Harmful Substances Carried by Sea in Packaged Form. Annex IV – Regulations for the Prevention of Pollution by Sewage from Ships. Annex V – Regulations for the Prevention of Pollution by Garbage from Ships. Annex VI – Regulations for the Prevention of Air Pollution from Ships.

### 3.2.2. Demolition – Principles of the breaking process

In principle, the process of ship scrapping consists of a sequential chain of operations undertaken at different locations.

- **Offshore.** Prior to beaching tanks are discharged and valuables (uncontaminated oil products, consumables and saleables such as electronic equipment) are removed. Ship-generated waste may be subjected to the provisions of national regulations if the respective nation has ratified obligating annexes of MARPOL.
- **Inter-tidal zone.** The vessel is beached under its own power and demolition is initiated (in a certain sequence).
- **The beach.** Further cutting into manageable sizes, extraction of components and sorting for transport to respective receivers are carried out.
- **Shore.** Supply of second-hand equipment and components to (local/regional) market and remanufacturing/recycling into new products/components (disposal and recycling).

These operations are detailed somewhat further in table 9.

**Table 9. The ship-breaking operation**

<b>Location</b>	<b>Operations</b>	<b>Comments</b>
<b>Offshore</b>	Onboard consumables, saleable (loose) equipment is removed. Tanks emptied (in some cases, tankers and cargo tanks may be washed). Vessel is made as light as possible in order to enable it to “climb” as high as possible up on the beach (i.e. discharge is done at site).	These operations are carried out at or near the breaking facility. If reception facilities are not available, tank residues/ballast water, etc. are discharged to sea.
<b>Inter-tidal zone</b>	The vessel is beached by own power to gain access for structural demolition. The ship bow/stern and sides are opened to gain further access to components of value. Hull plating, larger sections and structural items are opened/removed and sequentially extracted and winched/towed or floated ashore.	Antifouling, hydrocarbons in pipeworks, void spaces, remains in tanks etc., and debris (heavy metals, paint remains, dust (asbestos, etc.)) are deposited in the water/ground sediments/air. Emissions to air due to cutting.

Location	Operations	Comments
		Torch cutting, material handling and associated work operations induce potential dangerous situations: burns, falls from heights, overloading by carrying, squeeze, falling objects, suffocation, explosions, exposure to toxins and/or harmful material, etc.
The beach	Size reduction of recovered scrap steel by torch cutting. Sorting of recovered materials (scrap steel, components, etc.). Transport/export of materials and substances.	Leaks from collected liquid storage to soil due to insufficient or lack of containment. Debris (heavy metals, paint remains, dust (asbestos, etc.)), residues from systems/tanks, etc. deposited into sediments. Emissions to air due to cutting and fires (removal of insulation, etc.).  Ongoing cutting/sorting/transport operations causing potential dangerous situations: burns, falls from heights, overloading by carrying, squeeze, falling objects, suffocation, explosions, exposure to toxins and/or harmful material, etc.
Shore	Sorted materials are transported to nearby markets or reprocessing facilities. (Disposal and recycling).	Hazardous materials exported from the breaking site (e.g. paint remains on scrap steel platings for cold-rolling/smelting, reuse of hazardous materials (asbestos-containing substances (ACS)).  Transport, overloading by carrying. Operations within the reprocessing sites. Indices of incidents related to the nature of the reprocessing activity (reheating – burns, etc.).

### 3.2.3. Disposal and recycling

The waste/material stream following demolition is distributed and transported from the scrapping site to local enterprises for resale, remanufacturing or recycling. These reprocessing enterprises are usually located in the vicinity of the scrapping facility and often under the same or related ownership.

#### Resale

The trading of recovered usable items may take place in the vicinity of the scrapping facilities or items may be transported to central areas (main cities) for resale. The individual trade facilities tend to specialize in specific items. The following is a list of groups of items typically offered for direct resale (no reprocessing/remanufacturing):

- pumps, valves, motors, machines;
- navigational equipment;
- life-saving equipment (rafts, life buoys, life-vests, survival suits, etc.);
- personal protective equipment (helmets, work boots, gloves, goggles, overalls, etc.);

- 
- chemicals and paints;
  - steel components (anchors, chain, ventilation components, pipework, etc.);
  - sanitary equipment (toilets, sinks, bath-tubs, etc.);
  - furniture;
  - electrical cabling (intact) and batteries;
  - insulation material;
  - oil products (to manufacturing industries).

### *Remanufacturing/reprocessing*

A comprehensive part of the waste stream is reprocessed or remanufactured rather than recycled prior to sale. The following provide some examples:

- Steel remanufacturing: not all extracted steel work is characterized as scrap. “Undamaged” plating is remanufactured by cutting, grinding and hot work. Anchors, chain, engine structures, etc. may also be remanufactured by undergoing similar treatment.
- Oil remanufacturing: used (dirty) oils (lubricating oils) are reprocessed and offered for sale.
- Mineral reprocessing: insulation material (asbestos) is in some facilities reprocessed by manual crushing and sold to manufacturing industries.
- Copper reclaim: damaged cabling or non-saleable cabling is stripped for insulation either by burning or by mechanical stripping (sometimes also carried out at the scrapping site).

### *Recycling*

Real recycling in the sense that waste is used as a raw material in the production chain is first and foremost represented by scrap steel. This is the raw material for steel works and for cold-rolling facilities. The quality of the end product is a function of the quality of the available scrap, the sorting and the recycling process.

#### 3.2.3.1. Material stream/waste stream following demolition

The listing presented in table 10 identifies primary waste/material streams derived from the demolition process. The content of the “waste stream list” includes a variety of different substances commonly found in most categories of vessel.

The safe extraction ensuring safe handling of the waste stream is complex and has certain basic requirements beginning already with the preparation of the vessel.

---

**Table 10. Waste/material stream following demolition**

<b>Material stream</b>	<b>On board reference</b>
Ferrous scrap metal	Outfit and structural steel, hatch covers, pipes and pipe fittings, castings (stern frame), anchor and chains, propeller shaft, rudders, wires, sheet metals, tanks (non-integrated)
Non-ferrous scrap metal	<i>Copper:</i> cables, pipes, motor windings, fittings, domestic pipe work, etc. <i>Aluminium:</i> anodes, wheelhouse <i>Zinc:</i> anodes <i>Special bronze:</i> propellers, fittings
Machinery	Main engine, auxiliary engines, pumps, generators, boilers, separators, steering gear, deck machinery, cranes, etc.
Electrical and electronic equipment	Switchboards, consoles, control panels, navigational aids, domestic electrical items, instruments, sensors, etc.
Minerals	Asbestos and mineral wool for insulation, ceramics (domestic sanitary equipment), concrete, tiles, glass, windows, etc.
Plastics	Plastic pipework, fittings, furniture, light fittings, lifeboats, rafts, etc.
Liquids, chemicals and gases	Fuels, fuel oils, lubrication oils, hydraulic fluids, polluted waters, refrigerants, cargo residues, sludges, chemicals, etc.
Joinery	Timber, joinery bulkhead and deckhead panels, accommodation doors and frames, furniture and furnishings, composite timber products, etc.
Miscellaneous wastes	Domestic wastes, radiation sources (equipment, scale), mercury (i.e. in level switches, light fittings, thermometers), batteries, marine growth (fouling/ballast water and sediments)

---

---

## **4. Occupational safety, health and environmental implications**

### **4.1. The current situation**

The associated procedures and processes associated with decommissioning for scrapping and disposal/recycling induce exposure to surroundings involving hazardous substances and dangerous/harmful situations and operations. The effects of such exposure are generally well known and documented in other comparable industries.

Manual, low-paid unskilled workers are allowed to dismantle the ships and undertake the reprocessing/recycling operations without the provision of personal protective safety equipment. Scant attention is paid to health and safety issues and there is generally no systematic training of the workforce. Consequently, injuries and deaths are common place.

Housing and sanitary conditions are aggravated by provisional arrangements at the sites often put together with materials from the scrapping process. Health services and social welfare are non-existent or insufficient.

Environmental concerns are low on the agenda of both management and the workforce, with little or no attention paid to the pollution occurring as a result of their activities or to the harm this may cause when the pollutants enter the environment and food chain.

#### **4.1.1. Safety**

The working conditions are influenced by a surrounding characterized by large unsafe structures and the introduction of several simultaneous operations within a small area involving many individuals. Accidents causing injuries or deaths originate due to absence of:

- skills;
- appropriate plans and working procedures;
- precautions including the use of personal protective safety equipment;
- lack of facilities and safe working platforms and tools.

Injuries and deaths occur at every stage of the process. The reporting of incidents/accidents and injuries/deaths is in general non-existent.

The Gujarat Maritime Board (GMB) in India has however recently revealed figures related to accidents and casualties for the years 1997-99 (see table 11). These figures do not compare to figures presented by Greenpeace. The statistics presented by GMB also include causes of incidents (table 11).

**Table 11. Incidents at Alang for 1997-99 reported by Gujarat Maritime Board**

Year	No. of workers	Fatal incidents	Deaths	Non-fatal incidents	Injuries	Total No. of incidents
1997	25 000	31	46	3	23	34
1998	25 000	18	26	24	41	42
1999	25 000	26	30	28	36	54
Average	25 000	25	34	18 ( <i>26</i> )	33 ( <i>38</i> )	43 ( <i>48</i> )

Note: The bracketed figures in italics in the last three columns are the average based on the two latter years only as it seems that reported figures for non-fatal incidents in 1997 deviate from other data.

The accident frequency rate (AFR) based on the published figures from Alang, assuming a working year of 2000 hours per worker amounts to 0.96 accidents per million work hours. This is considerably lower than for the shipbuilding and ship repair industries. The AFR for shipbuilding industries in Asia has declined from approximately ten to five accidents per million work hours in the period 1994-99. The numbers do not compare to factual knowledge regarding safety issues and hence, it is suggested that incident reporting from Alang is incomplete.

The numbers from table 11 suggest, however, a fatal casualty rate of 1 per cent. This must be considered high by any standards.

**Table 12. Causes and frequencies – Incidents at Alang, India, Gujarat Maritime Board (%)**

Cause	Falling items	Falls	Fire/explosion	Slipping	Suffocation	Wire/rope snapping	Others
Frequency	32	17	12	8	4	3	24

Reported incidents from other sites are from those of major size and sometimes include multiple casualty figures. This may suggest that single incidents or incidents of a smaller scale do not reach the attention of the authorities outside the scrapping region.

Table 12 ranks fires and explosions as the third most frequent cause of incidents. This is an overrepresentation in comparison with e.g. the shipbuilding industry but does however compare with reports on incidents from other scrapping majors (Bangladesh). Taking into account that India is enforcing the “safe for hot work” certification requirement, the ratings appear somewhat surprising and may again suggest that only major accidents are reported upon.

There are no available statistics or data indicating the relationships between type of injury and cause (type) of incident.

#### **4.1.2. Health**

There are little or no available data or reports on workers’ health. This suggests that there is no, nor never has been, any systematic monitoring of health among workers engaged in ship scrapping in these regions.

Workers are exposed to situations which are potentially negative for their health due to the working procedures adopted such as:

- 
- torch cutting without protection (eye injuries, see illustration – figure 1);
  - heavy lifting (wear and tear, back injuries, see illustration – figure 2);
  - noise (hearing defects);

and from the exposure of hazardous substances such as:

- chemicals (PCB, PCV, PAH, tin-organic compounds (TBT), oils and gas);
- asbestos (see illustration – figure 3);
- heavy metals;
- fumes (dust, fume/gas components: dioxines, isocyanates, sulphurs, etc.);

and equipment used:

- mobile fire extinguishers contain either water or sodium bicarbonate (baking powder). These chemicals will not have any environmental effects in case of discharge. Although in general the toxicity of the powders used are low, they are unpleasant to breathe and can cause respiratory tract injury if inhaled in sufficient quantity.

#### **4.1.3. Environment**

The substances mentioned between items 4.2.1.1 and 4.2.1.8 may all be harmful to the environment and the incorrect handling of them may cause serious pollution including the contamination of drinking water as well as the food chain affecting the health and the welfare of the workforce and the larger community. Pollution resulting from these activities have both immediate and long-term effects.

It should be noted that a number of the present scrapping facilities are located in the direct vicinity of significant fisheries. It has been reported that the fish stocks have seriously deteriorated following the establishment of scrapping activities. The conflict between the scrapping industry and the fisheries is illustrated in figure 4.

The major environmental concern is lack of containment to prevent toxins from entering into the water, sediment/ground and/or the air. From an occupational safety and health point of view, these factors add to the significance of insufficient precautions, facilities and planning of work.

## **4.2. Effects of substances present**

Substances resulting from the demolition process may cause direct and indirect threats to health and/or to the environment. They may also have long-term effects due to accumulation and/or by entering into the food chain.

### **4.2.1. Health and the environment**

The following provides an initial insight into potential threats to health and to the environment in relation to scrapping caused by the presence of hazardous substances.



**Figure 1. Lacking personal protection equipment**



**Figure 2. Heavy labour-intensive work**

**Figure 3. Asbestos reprocessing  
(mask provided by cameraman)**



**Figure 4. Conflicting interests**





---

#### 4.2.1.1. PCB – Polychlorinated biphenyl

PCBs (polychlorinated organic compounds containing two benzene rings) were first produced on a commercial basis in 1929 and have been used in printing inks, as a softener in plastics (floor coverings, gaskets) and as insulators in transformers/capacitors. It may be found in glues, sealing materials and cable insulation. PCBs are highly toxic and will bioaccumulate and persist in the environment.

Exposure to PCBs has been associated with a variety of adverse health problems. PCBs have been linked to cancer, liver damage, reproductive impairments and immune system damage. Exposure has also been linked to behavioural damage and neurological damage. Occupational exposure studies have provided further evidence that PCBs are dangerous to human health. Workers at a capacitor manufacturing facility in the US showed an increased mortality rate as a result of specific cancers. Although overall mortality rates were not elevated, a statistically significant excess of deaths due to liver and biliary tract cancers was observed. Recently, the US Environmental Protection Agency classified PCBs as a carcinogen.

Pollution by PCBs from shipbuilding has been investigated in Nagasaki Bay, Japan, where elevated concentrations in sediments and organisms were found. PCB was detected in all samples, and in three specific sediment samples more than 10,000 micrograms/kg (10 micrograms/g) was detected. According to generally accepted standards, sediments that contain more than 300 micrograms/kg are to be considered strongly polluted.

Incomplete incineration of PCB can produce dibenzofuraner/dioxins, which are highly toxic (see PVC below).

#### 4.2.1.2. PVC (Polyvinyl chloride)

PVC is used in a wide variety of products for different applications and commonly found in cables, floor coverings and plastic devices of different types. PVC contains more than 50 per cent chlorine. When burnt, combustion products of extreme complexity are produced consisting of several hundred compounds. The combustion of PVC produces large quantities of hydrogen chloride gas. If inhaled, this can react with water vapours and humidity and form hydrochloric acid in the lungs. A fluid build-up leading to possible ulceration of the respiratory tract can be the result. In addition, the burning of PVC products produces carbon monoxide, dioxins and chlorinated furans. Dioxins are among the most toxic substances known. Some congeners are toxic at concentrations below  $10^{-12}$  g m<sup>3</sup> in air.

A study conducted in Taiwan has shown that an environmental problem was caused by the open air combustion of discarded electric cords and cables, sheathed in polyvinyl chloride (PVC), in a special waste metal retrieval area. The report states “ the resulting air pollution was severe”.

Dioxins and furans are two of the most toxic products known because the dose that can cause disease is lower than that for any other man-made chemical. They are linked to cancer and birth defects. These highly toxic substances are either inhaled directly or deposited on soil, water and in crops and thereby threatening the food chain.

#### 4.2.1.3. PAHs (Polycyclic aromatic hydrocarbons)

PAHs are composed of two or more benzene rings. Approximately 250 different PAH compounds are known. Some 30 PAH compounds and several hundreds of derivatives are

---

classed as carcinogenic. This makes PAHs the largest single class of carcinogens known today.

PAHs can be formed by incomplete decomposition of any organic material containing carbon and hydrogen, e.g. oil products and residues. The combustion of oil may also lead to the formation of PAHs.

The biological degradation of PAHs decreases normally with increasing molecular weight (more difficult to break down PAHs with increasing number of benzene rings). They are persistent and have well-documented serious long-term effects both from the environmental and from a health perspective.

#### 4.2.1.4. TBT (Tributyltin)

TBT is an organometallic substance that can have effects at very low concentrations – sub-nanogram quantities per litre. These are mostly related to imposex, e.g. in gastropods and thereby the balance in the ecosystem. TBT is therefore considered to be one of the most serious toxic compounds in the aquatic environment. Its use is now strictly controlled in most parts of the world. However, it is still the most commonly used anti-fouling product and will continue its dominance until the International Maritime Organization (IMO) TBT ban is in place (2008).

TBT, which is one of the active components in anti-fouling (used to reduce ship resistance by preventing hull fouling), has been found to be extremely toxic to various aquatic organisms, particularly to larva and the juvenile stage of oysters and fish. It has also been found that TBT accumulates in the sediment and bioaccumulates in molluscs.

Elevated TBT concentrations have been established in the vicinity of ship repairing facilities and elevated values can be expected at the scrapping sites. In a study looking at the distribution of TBT in Asian waters, the highest values were found in areas with high shipping activity.

#### 4.2.1.5. Oils – Hydrocarbons

Hydrocarbons such as crude oil and refined petroleum products are complex substances consisting of numerous different compounds. Alkanes and aromatic hydrocarbons are the main classes of hydrocarbons in crude oil, where the former have low toxicity and the latter include environmentally harmful polycyclic aromatic hydrocarbons (PAHs). Also other hydrocarbon components in the crude oil, e.g. alkylated phenols and decalines can have detrimental effects on the marine environment and human health.

#### 4.2.1.6. Asbestos

Asbestos-containing material (ACM) may be found in thermal system insulation and on surfacing materials. Some other applications may also be found. When ACM deteriorates or is disturbed, asbestos breaks up into very fine fibres that can remain suspended in the air for long periods and possibly inhaled by workers and operators at the facility or by people living nearby. The most dangerous asbestos fibres are invisible. Once they are inhaled, the fibres can remain and accumulate in the lungs. Breathing high levels of asbestos fibres can lead to an increased risk of lung cancer, mesothelioma (a cancer of the chest and abdominal linings), and asbestosis (irreversible lung scarring that can be fatal). Symptoms of these diseases do not show up until many years after exposure. Most people with asbestos-related diseases have been exposed to elevated concentrations in connection with their work.

---

When health hazards associated with asbestos were revealed in the late 1970s, legislation on the use of asbestos was initiated. The US EPA regulation on asbestos dates back to 1989, but was amended in 1991 leaving only six asbestos-containing product categories subject to the asbestos ban. The European Commission imposed a ban on the remaining use of asbestos through the Asbestos Directive in 1991. This prohibits the use of five out of six types of asbestos. The remaining type (white, chrysotile) was banned in 14 categories of asbestos. A full and complete asbestos ban will enter into force across the EU no later than 2005. It should be noted that a number of States around the world imposed strict regulations on the use of asbestos at a much earlier stage. Denmark was a pioneer in this area when a ban on the use of asbestos was introduced in 1972. Sweden banned marketing of certain asbestos products in 1975 and followed up with a product ban in 1976 (crocidolite, or blue asbestos). The Netherlands followed in 1977 and then a string of other nations unveiled new stricter regulations on marketing, manufacturing and the use of different asbestos products.

Asbestos on a ship is still not necessarily regulated as hazardous waste everywhere. In fact, in some countries asbestos is recovered by manual crushing and then recasted for reuse. This is illustrated by figure 4. Depending on national regulations, the scrapping facility must accommodate whatever requirements there may be. However, the potential health impacts associated with the use of asbestos are of such a severe nature that minimum precautions are necessary. This includes the protection of workers when extracting asbestos from the vessel, the securing of the disposal of asbestos and measures preventing asbestos from re-entering the market.

Typically, asbestos is disposed of by burying it in the ground.

Asbestos may be found in considerable amounts on board. Sampling has revealed quantities in the region of 7-11 tons for vessels in the size category 100,000-250,000 dwt. It should be noted that vessel size is not necessarily decisive for heat insulation requirements.

#### 4.2.1.7. Heavy metals

Metals of concern associated with the ship-breaking industry are toxic heavy metals such as lead (Pb), mercury (Hg) and cadmium (Cd). These are biologically non-essential metals that can cause harm to human health and/or ecological systems. Other metals in the breaking industry, are iron (Fe) alloys (steel), aluminium and zinc (Zn). The metals can be found in many products onboard a vessel in varying quantities. Steel on the one hand is present in very large quantities, while mercury in most cases only occurs in very small amounts (in paints, batteries and instrumentation).

A study measuring airborne metal concentrations in ten steel foundries, 15 iron foundries, and 11 copper alloy foundries, showed that exposure to lead, copper and zinc may represent a serious health hazard.

**Mercury (Hg)** is a toxic heavy metal and a persistent, bioaccumulative pollutant that affects the nervous system. On board ships, mercury can be found in thermometers, electrical switches, level switches and light fittings. Accidental spills of mercury can lead to dangerous mercury exposure. Consumption of contaminated fish is also an important route of mercury exposure. Mercury must be handled as hazardous waste according to national regulations.

**Lead (Pb)** is toxic, and is found in batteries, paints and in components in motors, generators, piping, cables and others. The deleterious effects of lead upon human health have been commonly known for a long time. Young children are most vulnerable to its toxic effects. Long-term exposure to even low levels can cause irreversible learning

---

difficulties, mental retardation and delayed neurological and physical development. In adults, exposure to lead affects primarily the peripheral nervous system and can cause impairment of hearing, vision, and muscle coordination. Lead also damages the blood vessels, kidneys, heart and the reproductive system.

An investigation at four ship-breaking operations in Canada revealed widespread excessive exposure to lead by employees. Air sampling results for lead were above recommended standards at all locations. Another study conducted on workers from a scrapping/ship yard in Taiwan showed that the workers involved with steel cutting have higher lead values in blood and urine than the dock workers. The study involved 140 oxyacetylene torch metal burners and 21 dock workers without direct lead exposure as the control group.

Lead chromate (present in paint pigments) is documented as a carcinogen both to humans and other organisms. It may also damage embryo development and cause infertility.

Improper disposal of batteries and paints containing lead can cause a threat to health as well as to the environment.

**Copper (Cu)** is an essential trace metal which is widely used in the transmission of electricity, paint, alloys and pipework. Elevated copper levels have been detected in marine organisms but the effect of accumulated levels is uncertain. Copper is highly toxic.

**Zinc (Zn)** is handled in large quantities at scrapping sites, mainly due to widespread usage in anodes. There is a possibility that dissolved impurities in zinc anodes such as Cadmium (Cd) and Pb can have an adverse effect on the environment. However, the concentrations in the anodes are relatively low compared to the total amount of zinc.

**Aluminium (Al)** is present in large amounts in anodes but does in this form not represent any acute pollution or toxic source of major concern.

**Iron (steel)** does not in itself represent a problem to human health.

Scrap steel will contain a considerable amount of coatings and paint products. These are exported from the scrapping site to the steel recycling facilities. Their discharge to the air following steel recycling may contain toxic gas components.

#### 4.2.1.8. Other substances

**Isocyanates** are often used in processes such as spray-painting and polyurethane coating. Occupational exposure can cause respiratory diseases such as asthma. The exposure levels likely to be generated by ship scrapping activities are unknown.

**Sulphuric acid** is corrosive and can cause severe burns (skin/eyes). However, any sulphuric acid spilt, will most likely be of small amounts. If batteries are undamaged, they will not have an environmental effect. However, if batteries are stacked in piles, accumulated leakages can become considerable and should be a cause for concern.

The CFC class of compounds (chlorofluorocarbon) contains only carbon, chlorine and fluorine. Freons were developed in the 1930s as a non-toxic, non-flammable and chemically inert refrigerant replacement for sulphur dioxide and ammonia. The chlorine and fluorine in CFCs, have the potential of depleting the ozone layer and thus reducing the protection from ultraviolet-B radiation. Shipborne CFCs are believed to contribute 10 per cent of the global emissions.

---

Due to the growing concern on stratospheric ozone depletion and its attendant dangers, a ban was imposed on the use of CFCs in aerosol spray dispensers in the late 1970s by the United States, Canada and the Scandinavian countries. In 1990, 93 nations agreed to end production of ozone-depleting chemicals by the end of the century. In 1992 most of those same countries agreed to end their production of CFCs by 1996.

**Radioactive material** may be present on board a ship in liquid level indicators, smoke detectors or emergency signs. These sources generate low-level radioactive waste, but handling and disposal of such waste is usually strictly regulated. Ionizing radiation is hazardous to human health and the environment and can cause severe forms of cancer and/or damage to genetic material endangering future generations. Any release of radioactive material could increase the radiation exposure to the population and must therefore be avoided.

**Ballast tank sediments** constitute a large amount of organisms including viruses and bacteria that can be a threat to both human health and to the environment. The discharge of ballast water sediments has previously been connected to the outbreak of cholera epidemics (Peru, 1991).

#### **4.2.2. Summary – Occupational safety, health and environmental concerns**

As has been demonstrated above, ship scrapping in its current state represents a serious threat to the safety and health of the workers engaged. Its impact on the environment is considerable.

Scrapping is undertaken in developing countries which are heavily dependent on primary industries (agriculture and fisheries). There are obvious conflicts of interests between these and ship scrapping.

Environmental concerns are first and foremost related to the harmful substances involved and the lack of containment allowing toxins to enter the environment and the food chain. There are no data available on the long-term effects on the environment. The nature of the scrapping sites (large inter-tidal zone) allow tidal wash-out and hence, immediate effects may be avoided on the shore. However, a decline in fisheries has been claimed in some of these areas.

Worker safety is suffering from serious inadequacies in almost all respects. These deficiencies are obvious at all steps of the process and include non- or insufficient planning, training, personal protection equipment, facilities, etc. Accident reporting is non-existent or unreliable.

Standards for workers' health are not adhered to. There are no or limited emergency medical facilities. Long-term monitoring of workers' health is non-existent. Apart from the nature of the work, i.e. heavy labour causing wear-and-tear-related defects, the long-term exposure to harmful substances is likely to have severe effects on life expectancy.

Exposures to hazards during the extraction process related to ship disposal are listed in table 13.

#### **4.2.3. New initiatives**

The industry is to some extent recognizing its failure to apply any kind of standards and there are some initiatives aiming for changes. The most promising current activities

---

associated with the development of ship scrapping as an industry, may be illustrated by emerging initiatives:

- An Australian ship scrapping project led by Australian Steel and a number of big backers (Deutsche Bank, AMEC, ABB, etc.). However, this has been three years in the planning and a number of site selections have been rejected, other sites have been selected and the project team would consider a suitable opportunity in Europe.
- The development/opening of a new ship demolition yard at Pipanav in India has been planned with Japanese help – most notably loans for 85 per cent of the project cost. This is a dock-based facility comprising two very large docks (700m x 60m) which are being equipped to be more environmentally friendly and less hazardous than the nearby beaching facilities at Alang. The design capacity of this facility is eight VLCCs per year. The facility may be opened in 2001. A similar project in Egypt was initiated in 1998 with Japanese funding. It is believed that the latter was the originator but it did not materialize and was moved to an alternative site.
- Finally, the recent announcement by P&O Nedlloyd on cooperation with a Chinese facility including upgrading to enable it to meet international standards indicates a growing concern also among shipowners.

It should be noted that recent initiatives at existing sites on occupational safety and health issues have been announced including the establishing of waste reception facilities and medical centres.

**Table 13. Exposure to hazardous substances – Extraction procedures**

Dismantling activity	Workers' exposure	Measures	Environmental exposure	Measures	Safety exposure	Measures	European legislation
<b>Asbestos removal and disposal</b>	Exposure to asbestos fibres, especially through inhalation, may cause asbestosis or cancer.	<ul style="list-style-type: none"> <li>• Approved respirators</li> <li>• Protective clothing.</li> <li>• Head covering.</li> <li>• Gloves.</li> <li>• Foot covering.</li> <li>• Face shield/goggles.</li> <li>• Decontamination areas and procedures.</li> </ul>	Exposure of people working and living in the neighbourhood, and migration of asbestos fibres to bodies of water.	<ul style="list-style-type: none"> <li>• Wet asbestos/misting.</li> <li>• Regulate area for removal.</li> <li>• Prompt cleanup and disposal.</li> <li>• Containment in leak-tight wrapping.</li> <li>• Exhaust ventilation equipped with HEPA filter.</li> <li>• Enclosure of processes producing dust.</li> </ul>			Directives 76/769/EEC 83/477/EEC 87/217/EEC 91/689/EEC etc.
<b>PCB removal and disposal</b>	Exposure through inhalation, ingestion, or absorption through the skin may cause adverse health effects.	<ul style="list-style-type: none"> <li>• Protect from exposure to airborne PCBs in the workplace.</li> <li>• Appropriate personal protective clothing or equipment, depending on removal and disposal scenario.</li> <li>• Respirators, if necessary.</li> </ul>	PCBs are toxic and persistent in the environment. The most carcinogenic PCBs tend to bioaccumulate.	<ul style="list-style-type: none"> <li>• Sampling, PCB conc. &gt; 50 ppm is hazardous waste.</li> <li>• Proper storage facilities.</li> <li>• Labelling and segregation of PCB-containing waste.</li> <li>• Proper transportation and disposal.</li> </ul>	Toxic furans and dioxins are produced when PCBs are heated, e.g. in fire-related incidents.	<ul style="list-style-type: none"> <li>• Keep fire-extinguishing equipment available.</li> </ul>	
<b>Bilge and ballast water removal</b>	Toxic organics, i.e. solvents or PCBs, may cause serious health effects. Discharge of toxic organics may cause release of poisonous gases.	<ul style="list-style-type: none"> <li>• Careful cleaning before any hot work.</li> <li>• Ventilation of tank/ compartment and testing for vapours and oxygen before entry.</li> <li>• Training.</li> </ul>	Metal exposure: consumption of contaminated seafood may cause health problems. Oils and fuels may poison marine organisms and physically soil the environment (birds, fish, plants, etc.). Invasion of alien aquatic species that may disturb the ecological balance.	<ul style="list-style-type: none"> <li>• Test for pollutants (i.e. chromium).</li> <li>• Proper transfer equipment and booms.</li> <li>• Proper storage and disposal, dependent on contamination level.</li> <li>• Discharge permit or proper pretreatment, if required.</li> <li>• Management plans for oil spill prevention, response and recovery.</li> </ul>	Flammable vapours or gases may evolve from residues in tanks or compartments.	<ul style="list-style-type: none"> <li>• Careful cleaning before any hot work.</li> </ul>	
<b>Oil and fuel removal</b>	Oils and fuels may exhibit toxic characteristics. Main exposure routes are inhalation and consumption of contaminated fish and water.	<ul style="list-style-type: none"> <li>• Careful cleaning before any hot work.</li> <li>• Ventilation of tank/ compartment and testing for vapours and oxygen before entry.</li> <li>• Training.</li> </ul>	Oils can have adverse effects on the environment, e.g. by physical damage of wildlife and their habitats. Light refined petroleum products are toxic and represent a fire hazard. Oil spill threatens natural resources, birds, mammals and marine	<ul style="list-style-type: none"> <li>• Proper transfer equipment and booms.</li> <li>• Meet national storage and disposal requirements.</li> <li>• Management plans for oil spill prevention, response and recovery.</li> </ul>	Refined petroleum products represent a fire hazard.	<ul style="list-style-type: none"> <li>• Remove oil and fuel thoroughly.</li> <li>• Careful cleaning, ventilation and testing for vapours/gases before any hot work.</li> <li>• Meet national storage and disposal requirements.</li> <li>• Management plans for oil spill prevention</li> </ul>	

Dismantling activity	Workers' exposure	Measures	Environmental exposure	Measures	Safety exposure	Measures	European legislation
			organisms.			<p>response and recovery.</p> <ul style="list-style-type: none"> <li>• Post signs that prohibit sources of ignition.</li> </ul>	
<b>Paint removal and disposal</b>	Chemicals/solvents used in stripping evolve VOCs and hazardous air pollutants. Abrasive blasting and mechanical removal generate particulates (i.e. lead dust). These emissions are toxic and may cause cancer. Main exposure route is inhalation.	<ul style="list-style-type: none"> <li>• Appropriate personal protective equipment, incl. respiratory protection, and often eye and skin protection.</li> <li>• Test paint/coating for toxicity and flammability, and remove prior to cutting, if necessary.</li> <li>• Blasting equipment must be regularly inspected.</li> </ul>	Wastes (incl. blasting residues and paint chips) may have negative effect on the environment through contamination of soil and surface waters.	<ul style="list-style-type: none"> <li>• Proper management and disposal of waste from removal of paint/coating.</li> <li>• Measures to prevent or minimize pollution of runoff water.</li> </ul>	Paints and coatings may be flammable.	<ul style="list-style-type: none"> <li>• Test paint/coating for flammability, and remove prior to cutting if necessary.</li> <li>• Use explosion-proof lights.</li> <li>• Keep fire-extinguishing equipment available.</li> </ul>	
<b>Metal cutting and metal disposal</b>	Torch cutting generates fumes, smoke and particulates (incl. manganese, nickel, chromium, iron, asbestos, and lead) that may have toxic effects.	<ul style="list-style-type: none"> <li>• Make sure area is tested and declared safe for hot work prior to cutting.</li> <li>• Workers must use suitable eye, hand and body protection.</li> <li>• Respiratory protective equipment and/or ventilation under certain circumstances.</li> <li>• Clothing must not contain flammable material.</li> <li>• Noise protection.</li> <li>• Careful handling of compressed gas cylinders.</li> <li>• Training.</li> </ul>	Improper storage and disposal of scrap metal and wastes from cutting processes may contaminate soil and water. Environmentally hazardous fumes may evolve when metal and/or paint is heated, e.g. during hot work.	<ul style="list-style-type: none"> <li>• Remove toxic or flammable coatings prior to cutting</li> <li>• Fluff from shredding must be stored and disposed of in accordance with regulations</li> <li>• Cable burning in open air may be prohibited</li> <li>• Waste water from cutting operations must be properly managed</li> <li>• Scrap metal that is not recycled must be properly managed and disposed of</li> </ul>	Pockets of flammable substances represent a fire and explosion hazard when cutting metal.	<ul style="list-style-type: none"> <li>• Make sure area is tested and declared safe for hot work prior to cutting</li> <li>• Move fire hazards away from object to be cut</li> <li>• Avoid sparks or heat transfer</li> <li>• Immediately remove gas hoses from compartments when not in use</li> </ul>	
<b>Removal and disposal of miscellaneous ship machinery</b>	Workers handling ship machinery components may be exposed to contaminants, such as asbestos, PCBs, oil and fuels.	<ul style="list-style-type: none"> <li>• See protective measures from processes above.</li> </ul>	Ship machinery components may be contaminated with hazardous materials, such as asbestos, PCBs, oil and fuels. Improper storage may also lead to lead contamination.	<ul style="list-style-type: none"> <li>• Ship machinery components must be handled, stored and reused/recycled/disposed of in an appropriate manner to avoid contamination of soil, surface water and ground water.</li> </ul>	Oils, fuels, etc. may represent a fire and explosion hazard when being disassembled.	<ul style="list-style-type: none"> <li>• Carefully remove flammable and explosive hazards before dismantling</li> </ul>	

Due to the high number of accidents caused by falling and moving objects, rigid helmets (hard hats) and hard-toed shoes should be required in most areas of a ship-breaking yard.



---

## 5. Existing standards and practices

At present there are no international standards directly aimed at regulating and controlling the decommissioning and subsequent scrapping of ships. However, several national as well as international instruments do exist that may influence the ship retirement scenario. The most important binding intergovernmental tools in this context are:

- The 1989 Convention on Transboundary Movements of Hazardous Wastes and their Disposal (the Basel Convention).
- 1972 London Dumping Convention (1996 Protocol).
- The 1993 Council Regulation (EEC) No. 259/93 on the Supervision and Control of Shipments of Waste within, into and out of the European Community (Shipment Regulation).

The ban amendment of the Basel Convention specifically prohibits the export of hazardous wastes from OECD member States to non-OECD member States. Many of the hazardous materials found onboard a vessel at its end-of-life stage appear on the Basel hazardous waste list. However, the Convention was not developed for the particular case of the disposal of the ageing vessels of the world fleet. The status of its applicability with respect to ship-breaking is somewhat unclear and it would be difficult to implement it in the scrapping context.

Most nations involved in ship scrapping make reference to some form of national regulations, guidelines and/or recommendations covering the ship scrapping industries including the issues of site licensing as well as occupational safety, health and environmental concerns. However, there is little evidence suggesting that these have been implemented in any scale.

### 5.1. India

India is the world's leading ship-breaking nation by volume. The activities are centred along the beaches of Alang in the Indian State of Gujarat. This state has a considerable level of industrial activity accounting for some 13 per cent of total value added in industry to the total economy. The contribution from ship scrapping is considerable.

Insufficiencies in relation to workers' safety, health and to the protection of the environment has been affirmed by several independent assessments at both Alang and other scrapping sites. Lately, Greenpeace has been allowed access to the area of Alang and has undertaken further assessments. The results of these are expected during the first quarter of 2001.

#### 5.1.1. Exposure

Soil and sediment samples from the investigations undertaken have revealed high concentrations of heavy metals, arsenic and tributyl tin (TBT). These contaminants originate from oil residues, debris following the extraction process, paints, anti-fouling coatings and anti-corrosive agents. The lack of waste reception and disposal capability has been documented and particular focus has been given to the careless handling of hazardous substances such as ACM. Waste oil is reported combusted with other waste material in open fires producing smoke fumes containing PAHs. People working at the scrapping

---

yards in Alang are exposed to these contaminants 24 hours a day as they live in accommodation in the immediate vicinity of their workplace.

### **5.1.2. Legislative framework**

The Central Pollution Control Board in Delhi has prepared environmental guidelines for ship-breaking industries aiming to “minimize the effect of ship-breaking industries on the surrounding environment through proper siting of industries and by preparing and implementing an environmental management plan (EMP) and a disaster management plan (DMP)”. The guidelines include a description of the appropriate pollution control measures regarding solid waste, air pollution, water pollution and noise. It also includes aspects of workers’ safety. Regular monitoring on the implementation of the EMP is the responsibility of the concerned State Pollution Control Board (SPCB). The Environmental Management Division is responsible for the monitoring of water pollution and air pollution on a regular basis.

Working conditions and the absence of environmental concern documented in assessments undertaken, suggest a mismatch between the incentives represented by the guideline and the actual conditions at the scrapping facilities, leading to the conclusion that the guideline has not been implemented.

GMB introduced new regulations on 31 August 2000 covering safety measures for the beaching of vessels. The following provides an overview of the substance of the regulations:

#### **Beaching**

- Documentation – gas-free certification.
- Permission to beach a vessel.
- Limitations on number of ships and the location of these (distance between vessels) per plot.

#### **Precautions prior to the start-up of cutting operations**

- Permission to be issued by GMB following the removal of hazardous substances.
- The provision of fire-fighting capacity.
- Supervision by GMB safety officers in cooperation with the owner of the plot.
- Identification of all workers engaged (by the issue of ID cards and the introduction of monitoring by card-reader at plot entrance).

#### **Incident-reporting procedures**

- Introduction of penalties/temporary cancellation of required operation permissions in event of incidents/accidents.

The response by the ship scrapping industries to these requirements was seen shortly after the introduction when the breakers of Alang called an indefinite strike from 19 October 2000. Following meetings between the State Chief Minister (Gujarat) and the ship-breaking industry, the implementation of the new regulations was postponed and the strike called off. At present, it is somewhat unclear as to what status these new regulations have.

---

### **5.1.3. National initiatives**

The Gujarat Maritime Board (GMB), the administrator of the areas in which the scrapping activities of Alang are undertaken, has recently responded to the considerable media attention and the increased focus on safety and environmental issues by some stakeholders. The Port Development Gujarat Programme (PODEG) has been initiated and, following a workshop on ship recycling industries held on 19 February 2000 in Bhavnagar, India, it was concluded that the most predominant problems were related to the issues of workers' safety, housing and the management of hazardous wastes. Following the workshop, the need for a programme of action was identified.

The following summarizes initiatives, actions and findings reported by GMB following in the wake of the workshop:

- A review of incidents and accidents over the past three years has been undertaken and a reduction in fatal accidents has been reported. The numbers are in stark contrast to the figures presented by other sources. The introduction of requirements in relation to "safe for hot work" is identified as a main contributor to the achievement.
- An assessment has identified lack of skills and insufficient training as a major cause of accidents. Illiteracy and the psychological state of the workforce is also linked to the occurrence of incidents.
- The Indian Technical Institute (ITI) in Bhavnagar, has been engaged to develop a training programme for the site foremen (Alang has at all times some 100 active scrapping plots with an average of three foremen per plot). The programme focuses on safety, health and environmental issues and has a duration of two days. The target is to provide this training to all foremen within one year. The workers on each plot will then be given a half-day oral introduction to elementary precautions regarding the issues of occupational safety, health and environmental concern.
- An awareness-raising campaign has been initiated focusing on safety. GMB has printed 80,000 posters providing safety principles in three local languages supported by illustrations. These are used and distributed at the individual plots.
- An international request for tenders for the development of a waste management plan was published. An Indian consultant was chosen to undertake the work estimated to run over a period of eight months. It is believed the project was initiated in September 2000. The project will be supervised by a committee of Indian university professors.
- Housing plans for 30,000 workers have been announced. The financing of these have not been clarified and there will be no progress on this matter until this issue is resolved.
- Plans have been made for a labour safety institute to be located near the scrapping facilities. The objective of this is to collect knowledge on techniques and procedures aimed at ensuring safe working conditions and to provide education of foremen and workers.

GMB has identified a need for further measures and has called for support on:

- Developing a textbook for safe and environmentally sound ship-breaking. The board stresses an urgent need for this.
- Financial aid for the creation of facilities recommended by the waste management plan (incinerators, landfills, treatment, etc.).

- 
- Assistance on the subject of handling wastes containing PCB.
  - General financial support:
    - help in establishing general acceptance that these costs must be covered by the stakeholders (shipowners/plotowners).

## 5.2. Bangladesh

The scrapping of ships takes place at several sites along the coast of Bangladesh. The area of Fauzdarhat, a 16-km beach south-west of Chittagong, is undoubtedly the most important. Parallel ship-breaking activities taking place here represent the second largest facility in the world with respect to the numbers of vessels being scrapped. In size (number of vessels scrapped per annum), only Alang/Mumbai (India) has a larger facility. However, these facilities are characterized by attending to a smaller tonnage than at Chittagong.

Chittagong is the largest facility for large vessels, scrapping some 52 per cent of all vessels above 200,000 dwt (1997-98). The reason for this is the large tidal difference providing an inter-tidal zone particularly suitable for beaching large vessels, but maybe even more important, the absence of requirements in relation to precautions for “hot work” operations.

Ship-breaking was initiated in this area in 1969 and has now grown into a considerable industry employing a large number of people, not only in the breaking process itself, but also in refining and material reuse. It is believed that more than 100,000 individuals earn their livelihood from the scrapping activities of Chittagong.

### 5.2.1. Exposure

An on-site assessment was carried out by DNV (Det Norske Veritas) in May 2000 at the ship-breaking facilities of Chittagong, Bangladesh, in order to verify the environmental impact of demolition activities at an actual ship-breaking site and to assess the operational procedures adopted. The findings and conclusions of this study have been used to identify a methodological approach for improving conditions associated with safety, health and the environment. Several other studies have demonstrated extensive pollution of the ship-breaking area in Chittagong. The on-site assessment performed showed high concentrations of oil in the water and sediment, high levels of heavy metals, PCB and tributyl tin (TBT) in soil samples. Asbestos was omnipresent. These findings support the assertion of environmental contamination caused by ship-breaking activities.

Issues at odds with the principles of environmental sound management, occupational safety and health were identified at the breaking facilities:

- Drinking water for the workers is extracted from tubewells that are sunk in each ship-breaking yard.
- Rest-room facilities for the workers are not provided in the yards.
- Gas cutters and their helpers cut steel plates almost around the clock without eye protection, uniforms, protective gloves or boots. Workers carry weights far above the limits prescribed in the local regulations.
- Enclosed spaces on the ship are not properly cleaned prior to beaching and may contain dangerous chemicals or fumes. Workers enter, unconscious of the hazards,

---

and suffer from suffocation, injuries to the lungs, etc. Some spaces may also contain explosive gases, and when the gas cutters drill holes in order to release the gases, severe explosions and fires are sometimes the consequence.

The study did not reveal any safety or environmental measures, nor did it confirm compliance to the regulatory requirements outlined in item 5.2.2.

The scrapping plots at Fauzdarhat are located in the immediate vicinity of fishing villages. The contradiction between fisheries and the scrapping industry is obvious.

### **5.2.2. Legislative framework**

A national regulatory framework for managing ship scrapping seems to be established. This includes:

- an approval procedure for the site operator under the responsibility of the Ministry of Commerce and Industry;
- the issue of a “berthing certificate” for each individual vessel to be scrapped (port authorities under the Ministry of Shipping);
- the issue of a “hot work” certificate (under the Explosive Department).

Further, there is a provision under the Environmental Law of 1997 requiring that each and every industry including that of ship-breaking must have an environmental clearance certificate” from the Department of the Environment (DoE), Ministry of Forest and Environment. To achieve this, the ship-breaking site must establish an environmental management plan (EMP). The Environmental Law is also supposed to cover safety measures, occupational health, waste management, monitoring programmes and disaster management. In addition there are some provisions on socio-economic issues.

The site assessment undertaken by DNV did not reveal any evidence that any of these precautions or requirements were adhered to.

### **5.2.3. National initiatives**

During the summer of 2000 there were at least two major incidents at Chittagong causing the loss of lives. On 31 May the oil tanker T/T Dena (of former Iranian flag) exploded and is believed to have caused the loss of some 20-25 lives. In June, a similar incident occurred but probably with a lower number of casualties. Both accidents were caused by torch-cutting in explosive atmospheres.

Following these incidents, a first demonstration ever was held in Chittagong against the conditions under which ship-breaking is undertaken (18 June 2000). It is believed that the demonstration was initiated by the “Committee for Social and Environmental Development” (COSED – reportedly originating from the University of Chittagong) and the Chittagong Environmental Journalist Association (CEJA).

Following the demonstration, there has been some contact between representatives of these organizations and the International Federation of Human Rights. Further, the Government revealed plans to establish a hospital and a fire brigade in the ship-breaking areas. The Department of Environment (DoE) has also lodged a legal claim against the company at which the incidents occurred. Ultimately, the DoE dropped the claim and initiatives announced by the Government have still not materialized. A two-day training

---

programme was, however, arranged for some foremen which is thought to have been in cooperation with the Bangladesh Environmental Lawyers Association (BELA).

COSED has revealed plans to arrange a seminar: “Environmental pollution of Chittagong and its sustainable management”. This has been postponed due to “serious political unrest” and it is uncertain as to when this will take place.

### **5.3. Pakistan**

Pakistan is at present the third largest ship-breaking major. Its scrapping activity is similar to that of Bangladesh, hence vessels are scrapped by beaching.

Ship scrapping in Pakistan is mainly that of large tonnage reflecting that the majority of vessels scrapped are tankers, again suggesting that there are either no or few restrictions implemented relating to precautions such as “safe for hot work” requirements.

The administration and organization of scrapping in Pakistan is not known in detail. This preliminary study made several inquiries without results. A brief review of the literature did not succeed in identifying any references on environmental issues or on occupational safety and health in the scrapping sector. NGOs have reported on plans to assess the industry in Pakistan, but nothing was available.

### **5.4. China**

China offers the essentials of low labour costs and market opportunities. A high demand for construction steel and a well-developed infrastructure are important factors that over the last few years have enabled China to return as a major in ship-breaking after being virtually absent for some years. More important, however, are recent changes in the taxation of vessels imported for scrapping, making Chinese breakers more competitive.

Breaking operations in China differ from the other three majors on the subcontinent in that the use of dock-like facilities and/or quay-based facilities have been introduced. The improved potential of safeguarding the environment represented by the introduction of technology (cranes, docks, etc.) has been promoted widely and has attracted some shipowners looking for scrapping capacity. The China National Ship Scrapping Association, representing approximately 15 large breaking yards, has recently completed its second promotional tour in one year in Europe under the banner of “clean recycling of ships in China”. It is however assumed that the conventional “breaking on the beach” approach is still widely practised in many yards.

The following is a listing of current principles of ship-breaking and recycling in China adopted and presented by representatives of the “China National Ship Scrapping Association”:

#### ***Aspects/requirements at the yard***

- The vessel to be broken up alongside quay and ashore.
- The yard shall have waste reception and storage facilities and separate storage facilities for hazardous materials as per environmental and safety regulations.
- The yard shall have separators to deal with the sludge/oil remnants.

- 
- The yard shall have an emergency plan or procedures in order to deal with oil spills, personal accidents, fire and accidents with hazardous materials.
  - The yard shall have facilities to provide first aid to injured persons.
  - The yard to be equipped with fire-fighting equipment.
  - The yard to be guarded against unauthorized entrance.
  - The yard shall work with safety regulations and procedures.
  - The yard shall work with prevention procedures.
  - The yard shall work with procedures to protect the environment and present an environmental policy.
  - The yard shall have a health programme for their workers.
  - The yard shall have a safety maintenance programme for their equipment.
  - The yard shall have clear working procedures to which all employees should adhere.

### ***Certificates/licences***

- The yard shall be a member of a general/master organization for demolition yards that issue rules of conduct.
- The yard to be licensed to break up vessels and present the authority that issued the licence.
- The yard to work with approval of the environmental authorities and present a licence that has been issued in this respect.
- Environmental authorities shall regularly inspect the yard.
- The yard to present an import licence if required to buy vessels.
- When using subcontractors, either for breaking up and/or transport/collecting waste products and/or transport/handling of hazardous materials, it shall regularly be checked that they are properly licensed.
- Rules and regulations in existence in respect of handling and disposal of hazardous products to be followed up by the yard.

### ***Staff/employees***

- The staff shall be trained to handle and store hazardous materials and to provide first aid to injured persons.
- The staff shall be trained for fire-fighting and to handle oil spills.
- The workforce on the yard shall wear safety helmets, safety shoes, eye protective glasses and working gloves.

- 
- The workforce on the yard shall wear face masks when dealing with toxic materials or materials which generate toxic fumes.
  - The workforce, handling asbestos or materials containing asbestos, shall wear protective clothing and masks.
  - The workforce cutting steel by torch shall be protected against inhaling possible toxic fumes originating from paints.

### ***Working procedure***

- Assessment of which hazardous products the vessel contains before a vessel is accepted for demolition and recycling.
- Employees shall be appointed to make sure that internal and external rules and regulations are adhered to by all involved.
- Cutting of steel preferably to be done by hydraulic scissors or water jet.
- The keel shall be broken up ashore.
- All residual oils from the vessel shall be taken ashore; oil-trapping gates to be prepared.
- The last remnants of fuel/diesel oil and sludge shall be removed by pumping fuel/diesel remnants to bilge pools on shore and use separator to handle the remnants before scrapping the vessel.
- The asbestos from the vessel's structure to be removed by workers wearing protective clothes and masks.
- Measures shall be taken to prevent asbestos dust/fibres entering the air while removing loose asbestos.
- Electric cable insulation which is hazardous to be removed in the same way as removing asbestos. Burning this insulation is prohibited.
- Asphalt/bitumen sticking to steel to be scratched off.
- Insulation sticking to steel shall be removed by workers wearing protective clothes and masks, scratch off the insulation sticking to steel and separate waste.

### ***Possible hazardous (waste) products***

- Batteries shall be sent to licensed dealers who have special skill to handle them.
- Diesel oil shall be pumped and gathered on shore and sent to licensed dealers for handling.
- Electrical components shall be cut off, tested for electricity before dismantling.
- Fibre/glasswool slabs shall be sprayed with water to reduce dispersion.
- Fire detectors shall be handled by workers wearing protective clothes and masks.



- 
- Freon/Halon (in bottles and in vessel's cooling systems) shall be handled by licensed dealers.
  - Fuel oil (remnants) shall be pumped and gathered on shore, passed through separator before disposed of.
  - Granulated cork shall be handled by licensed dealers.
  - Lubricating oil shall be pumped and gathered on shore, passed through separator before disposed of.
  - Paint remnants shall be collected by licensed dealers.
  - Plastics/PVC shall be removed to shore from vessel and sorted and then collected by licensed dealers.
  - Polyurethane foam (sprayed) shall be handled by licensed dealers.
  - Polyurethane sheets shall be removed to shore from vessel and sorted and then collected by licensed dealers.
  - Rubber shall be removed to shore from vessel and sorted and then collected by licensed dealers.
  - Transformer oil shall be removed to shore from vessel and sorted and then collected by licensed dealers.
  - Wall panels/bulkheads (could contain some asbestos as heat-resisting material), asbestos shall be removed first and panels/bulkheads shall be removed to shore and sorted and then collected by licensed dealers.

### ***Inspections***

- The yard shall accept regular inspection/supervision by the seller or their nominated representatives during demolition of the vessel.
- The yard shall accept visits from third parties, including press or persons representing environmental groups.
- The yard shall provide the seller with a full set of documentation, including pictures, after the demolition is completed. The documentation shall also verify deliveries to licensed dealers mentioned above.

The State Environmental Protection Agency issued a report in December 1999 on "Environmental protection in dismantling of imported scrap-ships in China". Apart from presenting some historical perspectives, the report confirmed an increase in tonnage for scrapping going to China from the latter half of the 1990s. It further confirmed that most of the vessels are still beached, but its states that: "On the basis of ship-breaking, we shall create other demolition methods and techniques with Chinese features. So the ship-breaking industry will have a bright future in China".

The report includes concerns regarding the environmental impact of the process.

The Chinese National Environmental Protection Bureau has published a technical manual on preventing pollution from ship demolition. It is understood that this does not cover workers' safety issues to any extent.

---

## **6. National and international initiatives**

### **6.1. Intergovernmental bodies**

A number of intergovernmental agencies have announced concerns regarding the issues related to workers' safety, health and the environment within the strict limits of their respective mandates. The interrelations between the areas (or issues) involved contribute to the complexity of addressing the topic of ship scrapping. A rational handling of the topic would suggest coordination under the leader of one of the concerned agencies.

#### **6.1.1. International Labour Organization (ILO)**

The ILO has monitored the ongoing work of both IMO and UNEP on the issue of ship scrapping and has been invited to address the issues concerning occupational health and safety. However, the subject was already on the ILO agenda already in the late 1980s but failed to attract active involvement.

However, the recent 279th Session of the ILO's Governing Body (November 2000) endorsed a conclusion of the Tripartite Meeting on the Social and Labour Impact of Globalization in the Manufacture of Transport Equipment stating that, as a first step, the ILO should draw up a compendium of best practice adapted to local conditions leading to the preparation of a comprehensive code on occupational safety and health in ship-breaking, and that governments should be encouraged to require ships to have an inventory of hazardous materials on board that is updated throughout the life of the vessel, and requested the Director-General to bear this in mind when drawing up proposals for the future work of the Office.

The ILO's Sectoral Activities Programme developed a background paper on ship-breaking in Bangladesh (1999). Following the increased focus on the topic since then, this work was recently supported by a discussion paper (2001), "Is there a decent way to break up ships?" This document provided general information on the adopted practices, on the volume of vessels requiring disposal, on scrapping locations, on the national distribution of ship operators and on the location of the shipbuilding industry (i.e. the identification of the stakeholders). The paper also demonstrated how the initial requirement of developing a compendium of good practice could be met by the use of extracts from already existing ILO international labour standards.

The ILO has also produced a documentary video (released in 2001) entitled "The Shipbreakers", as a part of an awareness campaign to focus on occupational safety and health issues.

#### **6.1.2. International Maritime Organization (IMO)**

The subject concerning the disposal of merchant vessels was formally brought into the IMO arena in 1998 when Norway proposed to the Marine Environmental Protection Committee (MEPC) at its 43rd Session (MEPC 43) to include the subject on the IMO's agenda (MEPC 43/18/1). Prior to this (at MEPC 42), Norway had brought the issue up during plenary sessions. The following discussion was reflected in the report from the meeting (MEPC 43/21):

After an extensive exchange of views, the majority of the delegations who spoke supported the inclusion of ship scrapping in the work programme of the Committee. Recognizing the divergence of views and that more information on

how to deal with this complicated issue would help the Committee to make a decision, the Committee decided to include the item of ship recycling in the agenda of MEPC 44 and invited Norway and other interested members to provide more information to the next session of the Committee particularly on how this matter should be handled by IMO.

Response to the invitation was received as follows (table 14).

**Table 14. Response to MEPC 43 on ship recycling**

Reference	Submitted by	Comments
MEPC 44/16	Friends of the Earth	Scrapping as a vector for the introduction of non-indigenous organisms.
MEPC 44/16/1	The Netherlands	Proposes that future discussions should focus on: development of technical guidelines and codes of conduct; establishment of a ship recycling technology programme; development of preventive measures; assessments of financial consequences of ship recycling; establishment of a correspondence group.
MEPC 44/16/2	Norway	Proposal for an IMO workplan (see table 15).
MEPC 44/16/3	Brazil	IMO involvement should be channelled through the Convention on Prevention of Marine Pollution by Dumping of Wastes and other Matters (London Convention).
MEPC 44/16/4	ICS, BIMCO, INTERTANKO, INTERCARGO, OCIMF, ICFTU	Provide in principle support to IMO on including the topic to its agenda and furthermore support the initiative to establish a correspondence group. Provide information on the establishment of an industry working group (ICS) aiming to produce a "Code of practice" addressing the issues involved.

Norway proposed an IMO workplan on the issue of recycling ships (table 15).

**Table 15. Proposed IMO workplan on ship recycling**

	MEPC 44	MEPC 45	MEPC 46	MEPC 47
Key actions	Adopt recycling of ships in the work programme Establish a correspondence group Define cooperative body	Endorse the report of the correspondence group Adopt terms of reference for a working group Start of working group	Working group Adopt draft assembly resolution on the need for international measures on the recycling of ships including target dates	Working group Decide on draft structure of an international regime
Communication IMO committees		Marine Safety Committee (MSC), (Technical Cooperation Committee, (TCC))	(MSC)	(MSC)
Communication UN bodies	UNEP/Basel Convention, ILO	UNEP/Basel Convention, ILO	UNEP/Basel Convention, ILO	UNEP/Basel Convention, ILO

During the discussions at MEPC 44, a number of initiatives were referred to:

- The Committee was informed about the UNEP initiative (fourth UNEP Ad Hoc Committee for the implementation of the Basel Convention) where the parties gave a mandate to the Technical Working Group of the Basel Convention to collaborate with the IMO on the subject in order to prepare guidelines for environmentally sound management on the dismantling of ships and to discuss related legal aspects with the

---

Consultative Subgroup of Legal and Technical Experts of the Basel Convention (MEPC 44/INF.22).

- The first Ship Recycling Summit was held a week prior to MEPC 43. A document was provided (MEPC 44/INF.14), reporting on the summit.
- The Committee on Sustainable Development called on the IMO and encouraged States to ensure that responsible care is applied in the disposal of ships.
- Reference was made to resolution MEPC.53(32) on the development of the capacity for the smooth implementation of the amendment to Annex I of MARPOL 73/78 recommending that member governments (in particular those involved in shipbuilding and shipping industries) take initiatives in cooperation with the shipbuilding and shipping industries to:
  - develop ship scrapping facilities at worldwide level and to promote research and development programmes to improve efficient scrapping techniques;
  - establish adequate ship scrapping facilities as soon as practicable;
  - provide technical assistance and transfer of technology to developing countries in their efforts to develop ship scrapping facilities.

The discussion during MEPC 44 revealed general agreement in that the IMO has a role to play in reducing the safety and environmental risks associated with the disposal of vessels. The Committee agreed to consider this matter further at MEPC 46 and decided to establish a correspondence group (CG) to facilitate the discussion. The terms of reference of the CG are presented in table 16.

**Table 16. Terms of reference, IMO Correspondence Group on ship recycling**

---

**Bearing in mind that the IMO's role is to focus on the design, operation and preparation for recycling of ships, the group would:**

---

1. Gather information on current practices concerning the recycling of ships.
  2. Identify relevant information from documents already submitted to MEPC and discussions that have taken place in the Committee on the issue during its 42nd and 43rd Sessions
  3. Identify the safety and environmental risks associated with current practices.
  4. Collect information regarding procedures introduced by governments and industry to reduce the environmental and safety risks associated with the recycling of ships.
  5. Collate information to be received from the secretariats of ILO, the Basel Convention, the London Convention and industry on their activities and perceived responsibilities associated with the recycling of ships.
  6. Gather views on areas where IMO may usefully contribute to the reduction of safety and environmental risks associated with the recycling of ships, and in doing so, identify the originators of such views.
  7. Provide a report for discussions to MEPC 46.
- 

It was agreed that the coordination of the CG should be carried out by the representative of Bangladesh for shipping and IMO matters (Captain Moin Uddin Ahmed). Further, the Committee requested the IMO secretariat to contact the secretariats of the Basel Convention, the ILO and the London Convention to provide information on ship recycling to the CG.

The subject of ship recycling was not on the agenda of MEPC 45.

---

### 6.1.2.1. Status of the IMO engagement

In correspondence with the terms outlined by MEPC, the CG will present its report to MEPC 46. This meeting is scheduled for 23-24 April 2001. The document is already available (MEPC 46/7).

The CG received participation from 16 member States and 12 organizations (MEPC observers), see table 17.

**Table 17. IMO CG on ship recycling**

Member States			Observing organizations		
Bahamas	Bangladesh	Brazil	AWES	BIMCO	FOEI
Canada	China	Cyprus	Greenpeace	IACS	ICFTU
Denmark	Greece	India	ICS	ILO	ITOPF
Japan	Netherlands	Norway	IUCN	Basel Conv.	London Conv.
Panama	United Kingdom	United States			
Vanuatu					

The report requests the Committee to note the group's view on the perceived roles of the various bodies and to consider future work in the light of recommendations provided.

The report recognizes that there are deficiencies in national regulations on the issues of occupational health, workers' safety and on environmental concerns and further on the enforcement of standards. Furthermore, the absence of an international frame governing ship recycling practices is acknowledged. The report does not however reflect upon actual practices and actual impacts caused by the process in any detail.

Under the heading of "Environmental and health issues", the report suggests that the safety and environmental practices vary quite widely and that some sites may not measure up to international expectations. Furthermore, the report warns against generalizing allegations about neglect of employee welfare.

The report contains information of a generic nature on the general topic of ship decommissioning and describes the current situation with respect to the breaking as well as the recycling process. Legal issues are briefly discussed. Chapter 8 contains information related to workers' safety and stresses some areas to address: safety awareness, industrial safety measures, workers' health protection, environmental safety measures, contingency planning and emergency response, working conditions and terms of employment.

Annex 3 to the report identifies safety and environmental risks associated with the current practices. Two main categories of risk in relation to ship recycling are presented:

- (a) the release of substances potentially harmful to human health and/or the environment;
- (b) the safety and welfare of workers involved in ship recycling.

A concluding statement suggests that: "... the nature and variety of the potential risks which have been identified are such that, in the view of the Correspondence Group, a common strategy needs to be developed to address them".

Further, all parties should be asked to consider how they and others may assist in addressing the issues (ship scrapping companies, shipowners and their national and international organizations, local and national governments, the ILO, IMO, ISO and parties

---

to applicable international conventions). Furthermore that many of the general issues (i.e. hazards, use of asbestos) are already addressed by the ILO but not specifically for ship-breaking. However, none of the relevant ILO Conventions has been ratified by the countries concerned.

### *Perceived roles*

The CG states that the subject involves many stakeholders: shipbuilders and repairers, classification societies, flag States, maritime regulatory bodies, environmental interests, international, regional and national authorities and the ship-breakers themselves and representatives of their workforce. These need to be involved in the debate and take appropriate responsibility for addressing the issues. Consequently, it is suggested that no single body can or should have the responsibility for all its aspects. However, it is concluded that one single body is required to coordinate this work. It is further suggested that this is a role which the IMO, and its MEPC, could undertake.

The perceived responsibilities are suggested as follows:

1. **IMO** – Overall responsibility for coordinating issues associated with ship recycling and responsibility for monitoring issues arising during ship design, building and operation which might impact on recycling, including preparations for recycling on board.
2. **The International Labour Organization (ILO)** – Responsibility for establishing standards of operation in shore-based industries involved in ship recycling, concentrating on considering the application of its already existing standards and recommendations to ship recycling and developing guidance for the ship recycling industry in these and other areas – to take the lead on working conditions in and around vessels once they have been beached.
3. **The Basel Convention on Transboundary Movements of Hazardous Wastes and their Disposal** – Recognizing the limited application of the Convention to the vast majority of ships which are recycled, to concentrate on the identification and safe handling/disposal of hazardous wastes and on reducing the use of materials which generate such wastes.
4. **The 1972 London Convention** – Continuing to monitor the disposal of ships at sea and encouraging recycling as the preferable option.
5. **The industry** – Continuing its work on developing a Code of good practice, covering inter alia ship recycling operations (which would include encouraging the preparation and use of a pre-recycling inventory), seeking endorsement of and comments on its work from MEPC at regular intervals the future and working with classification societies in improving plans to decommission ships in a safe and environmentally sound manner.
6. **Environmental groups** – Continuing to monitor and report on ship recycling issues in a responsible manner.
7. **Nations** – To develop, adopt and enforce, as appropriate, within appropriate international organizations, international standards relevant to ship recycling.

### *Future work*

The document does not provide any specific recommendations for further work. However, it does supply a listing of initiatives received from the contributing partners.

---

### 6.1.2.2. The London Convention (IMO)

The Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, commonly referred to as the London Convention or LC '72 is administered by the IMO. It covers deliberate disposal at sea of wastes or other matter from vessels, aircraft and platforms. It does not cover discharges from land-based sources, wastes generated incidental to normal operation of vessels, placement of materials for purpose other than mere disposal, provided such disposal is not contrary to the aims of the Convention. LC '72 consists of 22 articles and three annexes.

The Convention has developed guidelines for the assessment of wastes or other matter that may be considered for dumping for vessels. These may provide a valuable reference input to the ship scrapping scenario. The London Convention has not addressed the topic of ship scrapping specifically.

### 6.1.3. *United Nations Commission on Human Rights*

The United Nations Commission on Human Rights – under the economic, social and cultural rights agenda of ECOSOC – has monitored effects on the illicit movement and dumping of toxic and dangerous products and wastes by corporations and enterprises from industrialized countries in developing countries that do not have the national capacity to deal with them in an environmentally sound manner. This constitutes a serious threat to the human rights, to life, good health and a sound environment for everyone. The mandate of the Special Rapporteur was prolonged in 1999 for a period of three years to proceed with this work.

### 6.1.4. *United Nations Environment Programme – The Basel Convention*

The current ship scrapping scenario is alleged to be in breach of the 1989 Convention on Transboundary Movements of Hazardous Wastes and their Disposal (Basel Convention under the administration of UNEP). The Convention and its application with respect to the issue of ship disposal is still unclear. The spirit of the Convention lies in a requirement to ensure that developing countries are not exploited by industrialized nations by becoming a “waste-bin” for generated hazardous wastes. The ban on export of waste from OECD to non-OECD countries, if applied to the disposal of ships, will have considerable effects on established practice.

Legal assessments have concluded that the Convention is somewhat unclear and will not be efficient in its present state when applied to the area of ship disposal. It has been strongly suggested that a necessary legal framework should be developed through the IMO.

#### 6.1.4.1. Ship scrapping and the Basel Convention

The Conference of the parties decided to address the subject of the dismantling of ships at their fifth meeting (COP 5). The Technical Working Group (TWG) of the Basel Convention was instructed to initiate work on the development of technical guidelines for the environmentally sound management of the dismantling of ships. This work is now under way and expected to be finished in February/March 2001. The development of the technical guidelines is undertaken by Norway as lead country, with the Netherlands and India as participating partners.

These guidelines will include a list of hazardous wastes and substances under the Basel Convention and further make provisions for the proper removal of hazardous wastes

---

and substances including the collection, sorting, and disposing/recycling of wastes in an environmentally sound manner. A draft table of contents of the guidelines including the list of hazardous wastes can be viewed at <http://www.basel.int/>(Technical Working Group, final report of the 17th Session).

The 17th Session of the TWG (held in Geneva from 9 to 11 October 2000) set up a working group (China, Germany, India, Japan, Norway, United Kingdom, United States, IMO, ILO, ICS). The report from the group addresses in particular the item concerning workers' conditions: "Health and safety is addressed by adding the identification of workers' safety and health hazards to an item under point 4.4. Detailed guidelines should be worked out by other organizations than the Basel Convention. ILO should be invited to undertake this task".

### **6.1.5. Commission of the European Community**

The Commission of the European Community has focused its attention on the subject with reference to the interpretation of the Basel Convention that the scrapping of OECD tonnage outside the OECD area is subjected to the regulations of the Convention. Since all European Union States are OECD members, the Commission has investigated the technical and economical feasibility of scrapping vessels (not limited to merchant vessels) within Europe.

The report from this work is expected shortly and is believed to address the following main issues:

- Mechanisms and differences in mechanisms involved in the decommissioning and scrapping decision processes.
- Volume of tonnage and distribution with reference to type, age and size.
- Future decommissioning and scrapping forecast to 2015.
- Share of vessels under EU control.
- Reuse and return to market potential.
- Current practice.
- Capacity considerations.
- Development of first- (second-) generation ship demolition facilities ("the alternative scrapping approach").
- Economic and commercial factors.

On the topic of environmental concern and that of OSH with respect to current ship demolition, a preliminary statement from the work concludes that:

... it failed to comply to the most general expectations in terms of precautions with the potential of causing serious safety violations and causing harm to workers' health and the environment. The absence of overlaying plans and policies, lacking facilities, lacking procedures, lacking skills requirement and appreciation of training needs represents sufficient inadequacies to draw the conclusion of general non-compliance.



---

The report (DNV report No. 2000-3527) is expected to be available during the first quarter of 2001.

## **6.2. National governments**

A number of national governments have called for the need for changes in the adopted disposal procedures of retired vessels. Some national initiatives have been channelled through intergovernmental organizations whilst some nations have addressed the issue directly.

### **6.2.1. Involvement of the Danish Government**

Ship scrapping received considerable attention in Denmark following a programme shown on Danish television revealing the conditions at Alang (1997). The documentary produced by Danish state television depicted the environmental conditions as well as the safety of the workers engaged. It revealed that a Danish state-owned vessel had been sold via intermediaries for scrapping to avoid the potential legal implications with reference to the Basel Convention. This case has now been brought to the courts.

Denmark has actively supported the implementation of this topic in the work programme of the IMO.

### **6.2.2. Involvement of the Netherlands Government**

Despite being a small shipping nation, measured by the size of its national merchant fleet, the Dutch Government announced an early interest in the subject of ship scrapping. Its involvement can be related to its proactive policy on environmental issues in general and that it is a major and important port State. The Netherlands also has a history as an instigator on issues of sustainable development also in developing countries.

### **6.2.3. Involvement of the Norwegian Government**

Norway is a considerable stakeholder in international shipping also in historical terms. This involvement exceeds that of owning ships by including involvement in the associated areas such as ship registration (NIS – Norwegian International Ship Register), classification and insurance. The Norwegian Government has an adopted policy of being proactive on issues involving the topic of safety as well as that of environmental concern in relation to shipping. This is widely supported by the Norwegian Shipowners' association.

Following increased focus on adopted practices as seen among the scrapping majors of the Indian subcontinent and in the wake of an incident involving a Danish state operator evading state policy in the decommissioning process, the Norwegian Ministry of Environment initiated a fact-finding study in 1998. This, entitled "Decommissioning of ships – Environmental protection and ship demolition practices" (DNV report No. 99-3065) aimed to establish a better basis for assessing current and future environmental problems related to ship scrapping. This work was later followed up by the project "Decommissioning of ships – Environmental standards" (DNV report No. 2000-3156/3157/3158/3159 and 3169) which is more comprehensive and addresses also the issues of contamination of resources affecting human health as well as workers' conditions.

The contributions in the form of proposals from Norway to the IMO are based upon the works mentioned above.

---

#### 6.2.4. Involvement of the US Government

Ship decommissioning reached the public's attention with full strength following a series of articles by Gary Cohn and Will Englund published by the *Baltimore Sun* – "Breaking up – is hard to do". The series, a Pulitzer prize winner, brought to light the distressing human and environmental consequences of scrapping ships in Third World countries and triggered a re-evaluation of US ship scrapping policies. Ultimately, the US Senate (Barbara Mikulski) called for new regulations while compelling a high-level sector-wide gathering to discuss means of improving current ship scrapping procedures. Congressional leaders called for review of the matter before the Interagency Ship Scrapping Review Panel, which brought its findings before the congressional Subcommittee on Coast Guard and Maritime Transportation. A Bill, HR 4156, to limit the scrapping of US ships overseas was presented. This Bill was similar to the Senate defence appropriations bill amendment introduced by Senator Barbara Mikulski. The press announcement presenting the Bill made references to its background:

Last December, the *Baltimore Sun* published an exposé of current ship scrapping practices. It revealed ships beached on Third World shores where indigent workers, earning a few pennies a day, are exposed to PCBs, lead paint and asbestos. To continue allowing foreign countries with few environmental and labour laws to scrap US ships is just not acceptable. It is time that we return the jobs to US companies who will be more environmentally conscious and treat their workers better.

HR 4156 prohibits the navy and the Maritime Administration (MARAD) from scrapping old, obsolete ships outside the US, unless both the Environmental Protection Agency (EPA) and the Labor Department certify that a foreign country's environmental and safety regulations are similar to the US and are enforced. In addition, the Bill establishes a pilot programme under which the navy will contract with domestic ship scrappers/shipyards on a "best value" basis. Bidders must prove their ability to follow all regulations including all environmental and worker safety regulations instead of simply submitting the highest bid. The navy will share in any profits from the sale of scrap.

The UN Economic and Social Council, Commission on Human Rights (1998) reported that accusations against the US Government had been made in supporting the export of US navy vessels and other ships to "extremely hazardous recycling operations in developing countries". The Interagency Ship Scrapping Panel gave its support to this practice while acknowledging that the vessels were likely to contain hazardous materials and that the recipient developing countries did not possess necessary environmental or occupational safety standards to prevent harm. The US confirmed that it had allowed the export of vessels for scrapping but referred to actions already taken as described above.

The US Maritime Administration (MARAD) has initiated the MARAD Ship Scrapping Program. The aim is to establish a long-term ship scrapping/disposal programme to dispose of obsolete National Defence Reserve Fleet (NDRF) vessels. The National Defence Authorization Act for Fiscal Year 2001 identifies 39 priority vessels slated for disposal. MARAD intends to release a draft request for proposal (RFP) during the second quarter of 2001.

The US Environmental Protection Agency (EPA) published during the late spring of 2000 the document "A guide for ship scrappers – Tips for regulatory compliance". This is a comprehensive and detailed reference comprising environmental issues in particular. It does, however, refer to procedures and regulations that also embrace aspects of workers' safety and health.

---

### **6.3. Other organizations/national and international conferences**

Following the increased media focus on the conditions at the scrapping sites in the developing countries over the last two to three years, a number of organizations and institutions with related interests have shown interest in the subject. Some have presented facts and findings whilst others have focused on solutions.

#### **6.3.1. Basel Action Network**

The Basel Action Network (BAN) has co-worked with Greenpeace on the issue of ship scrapping.

BAN has worked in India in particular and has covered not only environmental matters but also the crossovers between environment and working conditions. BAN is involved in a joint action committee of cooperation where Indian trade unions, CEC and Greenpeace are partners.

#### **6.3.2. Det Norske Veritas**

Det Norske Veritas (DNV) was commissioned to establish a factual base for the Ministry of the Environment (Norway) in 1998. This work (“Decommissioning of ships – Environmental protection and ship demolition practices”) presented a status and short-term forecast of volume of ships requiring scrapping including their flag state distribution. Further it addressed the issues of:

- scrapping location (location of the scrapping industries);
- onboard substance/material composition including a case study of a very large crude-oil carrier (VLCC);
- safety, health and environmental hazards associated to ship scrapping.

Following conclusions and recommendations, DNV initiated the project “Decommissioning of ships – Environmental standards”. The items addressed in this work included:

- that of preparations prior to actual demolition including precautionary actions in order to reduce safety and environmental risks associated with the process of scrapping a specific vessel and the requirement to verify onboard substances;
- the development of a methodology on the establishment of guidelines – a best practice approach, for scrapping facilities;
- the implication of legal interpretations of the Basel Convention;
- the project proposed tools: guidelines for decommissioning, environmental verification, ship inventory dossier – environment (SIDE). This is equivalent to a green passport as proposed by others.

DNV is currently assessing these tools in real case scenarios.

DNV was also commissioned by the European Commission to assess the technological and economic feasibility of ship scrapping in Europe and by UNEP to

---

develop technical guidelines for the environmentally sound management of the dismantling of ships.

### **6.3.3. Greenpeace International**

Greenpeace has focused on the issue of ship scrapping with emphasis on environmental issues as well as those concerning occupational safety and health. There are two reports available focusing on these issues. The organization has carried out studies at Alang, and is expected to report on this shortly. Further, an update on conditions within this industry from China is announced to be under way.

Greenpeace has not reported on ship scrapping in Bangladesh nor in Pakistan.

The organization has revealed some casualty figures which have been heavily disputed by the ship scrapping lobby organizations.

### **6.3.4. International Chamber of Shipping**

The International Chamber of Shipping (ICS) took the initiative to establish the Industry Working Party on Ship recycling” (IWPSR) in February 1999. The background for this initiative was the requirement of an industry response to the growing concerns expressed by governments, NGOs and the industry itself on the matters of:

- the legal position of vessels sold for recycling;
- the conditions and safety provisions for workers in ship-breaking industries;
- the lacking environmental concerns.

The IWPSR consists of the following organizations: Baltic and International Maritime Council (BIMCO); International Tanker Owners Pollution Federation (ITOPF); International Association of Dry Cargo Shipowners (INTERCARGO); International Transport Workers’ Federation (ITF); International Association of Independent Tanker Owners (INTERTANKO); Oil Companies’ International Marine Forum (OCIMF); International Chamber of Shipping (ICS).

The International Association of Classification Societies (IACS) and the European Community Shipowners’ Association (ECSA) are present as observers during the meetings of the group.

The primary IWPSR mandate was to establish a Code of practice on ship recycling which is now available in a draft version. The code also includes an inventory format on onboard hazardous materials. The code encourages owners to adopt a proactive policy on the scrapping issue not only restricted to issues concerning the vessel and the onboard substances.

### **6.3.5. International Transport Workers’ Federation/ International Metal Workers’ Federation**

The International Transport Workers’ Federation (ITF) supported the early Greenpeace initiatives and is participating in the IWPSR work.

The International Metal Workers’ Federation (IMF) has been actively involved in health and safety aspects and has undertaken a fact-finding mission to India. Their

---

initiatives have focused on shore-side working conditions. A report from India (January 2000) states that, "it is imperative that global action be taken to ensure removal of dangerous substances before ships are sold for scrapping".

The findings from the mission are to be presented at the IMF world conference in 2001.

The following is a cut-out of a press release following the mission:

The IMF Shipbuilding Department Working Group visited India last December (1999) as part of a campaign to secure better working conditions and trade union rights in the ship-breaking sector. The fact-finding mission toured ship-breaking sites in Alang, Sosiya and Mumbai, as well as the nearby scrap-handling yards and re-rolling mills in Bhavnagar (south Gujarat, west India, on the Gulf of Cambay).

The group reported on the extremely crude ship scrapping process, with ships driven and dragged onto beaches or riverbanks. Following removal of any fuel and oil as well as all reusable items such as electrical equipment, white goods, engines and timber, the vessels are cut into manageable pieces by workers using oxygen/gas burners. More than 90 per cent of the steel content is re-rolled, mainly into reinforcing bar but also some bright bar for the engineering sector, with the remainder going to mini-mills for remelting.

In addition to some 25,000 workers directly employed in ship scrapping at Alang and Sosiya, over 160,000 are employed in associated downstream activities which provide a much-needed source of jobs. The bulk of the workers at the ship-breaking sites come from villages great distances away, with few if any able to read or write. There are no trade unions operating in this sector. Wages range between Rs.70-120 per day (US\$1.75-3.00), with most of it sent back to the family in the village. Living conditions are very primitive, with shacks built from materials salvaged from the scrapped ships and no running water or sanitary provisions of any kind. A small Red Cross first-aid post was on site, but the nearest hospital was over 45 minutes away, in Bhavnagar. There are provisions for hostel accommodation and a hospital, but no indication when construction will begin.

The ship scrapping owners are seemingly unaware of health dangers posed to the workers or even to themselves by exposure to PCBs, heavy metals and asbestos during the ship scrapping process and underlined the fact that the Indian Government has not banned the use of asbestos. One individual even suggested that because of its insignificance in terms of its proportion of the total weight of a scrapped ship, asbestos was not an important issue!

### **6.3.6. National and international conferences**

The first summit on ship scrapping (recycling)

The first summit on ship scrapping (recycling) was held in Amsterdam in June 1999 with the objective of raising awareness and considering actions. The following participants contributed: United States Congress, European Commission, IMO, Dutch Ministry of Transport, Norwegian Maritime Directorate, United States Maritime Administration, United States coast guard, Greenpeace, Japanese Shipbuilders' Association, Japanese Shipowners' Association, ICS, International Shipping Federation, BIMCO, IACS, World Bank, Iron Steel Scrap and Ship-breakers Association of India, Committee of EU Shipbuilders' Association, Dutch Maritime Network, Lloyds Register of Shipping and Eckhardt Marine GmbH.

---

The summit was initiated by the Dutch Maritime Network and the Dutch Ministry of Transport to:

1. Table all relevant aspects and concerns evolving from ship scrapping.
2. Consider actions that can lead to the sustainable development of environmentally sound and safety-conscious scrapping and building of ships.
3. Evaluate consequences of solutions suggested during the conference.

The summit concluded that:

Even though conditions at scrap yards in developing countries, for the most part, are abominable even by the most remedial standards, it would be of little value to rob these countries and these people of an extremely valuable source of income without replacing it in some way. For these countries to adhere to any regulatory changes they will need not only financial assistance but also guidance on many levels, to improve conditions and help reach compliance with any regulations eventually promulgated. Industry, policymakers, and NGOs working together can develop reasonable alternatives to current practices that will limit the damage to the major maritime players or affected scrapping countries. Since shipping is without question international in scope, proposed solutions must be agreed upon and adopted with international consensus.

The summit failed to conclude on actions and solutions. A second summit is scheduled for 11 June 2001 and will be held in Amsterdam.

#### Global workshop on ship recycling industries

The global workshop on ship recycling industries (India) came about following the cooperation that developed from the PODEG project and was first held in February 2000. More than 120 people took part in the first workshop.

A second workshop was planned to take place on 15-16 February 2001 in Ahmedabad, Gujarat State. This was, however, postponed following the earthquake that struck this area in late January. The workshop was expected to attract some 200 individuals. The participants would have been officials, politicians as well as representatives from the industry and NGOs.

---

## 7. Discussion of the issues

The assessments and initiatives undertaken during the recent years have first and foremost emphasized the topic of the environment and in particular the environmental aspect at the scrapping sites themselves.

Many of these illustrate the close connections between the environmental aspects and the concerns related to occupational safety and health.

Increasing attention is drawn to the fact that the general non-compliance – with respect to any kind of standard – in relation to environmental as well as occupational safety and health is exported with the waste/material stream from the scrapping sites to the reprocessing facilities. These are often owned by the same interest responsible for the operation of the scrapping sites.

### 7.1. The starting point

The very core of the issue of workers' health and safety in ship scrapping is founded in the disposal requirement of obsolete ships and the challenges associated with that.

#### 7.1.1. *Future disposal requirement – Influencing factors (future volume)*

The world fleet of ocean-going vessels is continuously renewed. The vessels being replaced reflect a technical era of the past. The arrival of the supertanker in the early 1970s introduced vessels considerably larger than ever seen before. The ability to build large ships has since affected other ship-type segments. The shift of industries and globalization are changing transport requirements and affecting both the development and the distribution of ship types. Parcel carriers such as the container vessel are descriptive of this development. This pattern of technological development formed by changes in transport requirements will ultimately affect the processes of ship disposal.

Eventually, all vessels, independent of size or type, meet the same destiny. The average age of merchant ships at the point of decommissioning is governed by factors such as regulations, design criteria, condition, functionality, etc. The attainable age varies somewhat between types, but is fairly predictable. The future supply of vessels for scrapping, predicted in a 15-year perspective, is presented in table 18.

#### 7.1.2. *Disposal practice drivers (future capacity)*

Shortcomings and mismatches in relation to basic precautions on the topic of occupational safety, health and environmental protection have been demonstrated and revealed by both intergovernmental agencies, national governments and NGOs. The early criticism on methods and approaches adopted was quite firmly rejected by the stakeholders and there was little or no willingness to look for changes.

Current practice in ship scrapping may be claimed to illustrate a process of development in reverse and hardly represents a first-generation approximation to the challenge of ship disposal. It has come into existence due to the complete absence of operational frameworks and precautionary/regulatory infrastructure and to the existence of poverty and the availability of willing cheap labour. The methods applied have evolved

from the prime objective of profit-making and, thus, this has been the main driver shaping the concept of current scrapping procedures.

Media exposure and growing awareness materializing in new policies are however introducing a differentiated view and will slowly impact on the established scrapping principles. The increasing attention being paid to the issue of ship-breaking, including also the legal aspects, has turned rejection into the recognition for action. The threat seen by the major breaking nations in the potential of tonnage for scrapping being moved away to other markets, is slowly changing attitudes. This is demonstrated in particular by India and China. Even though the process of recognizing that harmful impacts are caused by the methods used, and in appreciating that changes are emerging, efficient responses have not yet been devised. In the meantime ships will continue to arrive at the scrapping centres simply because there are no alternatives.

**Table 18. World fleet scrapping requirement in a 15-year perspective**

<b>Year</b>	<b>DWT</b>	<b>No.</b>	<b>Tanker No./ DWT</b>	<b>Bulker No./ DWT</b>	<b>Dry cargo No./ DWT</b>	<b>Combos No./ DWT</b>	<b>Gas No./ DWT</b>
2001	25.5	757	199/ 13	227/ 7.9	303/ 2.55	23/ 2.04	8/ -
2002	25.5	757	199/ 13	227/ 7.9	303/ 2.55	23/ 2.04	8/ -
2003	28.7	598	155/ 14.6	179/ 8.9	240/ 2.9	18/ 2.3	6/ -
2004	28.7	598	155/ 14.6	179/ 8.9	240/ 2.9	18/ 2.3	6/ -
2005	28.7	598	155/ 14.6	179/ 8.9	240/ 2.9	18/ 2.3	6/ -
2006	28.7	598	155/ 14.6	179/ 8.9	240/ 2.9	18/ 2.3	6/ -
2007	21.9	541	141/ 11.2	163/ 6.8	216/ 2.2	16/ 1.7	5/ -
2008	21.9	541	141/ 11.2	163/ 6.8	216/ 2.2	16/ 1.7	5/ -
2009	21.9	541	141/ 11.2	163/ 6.8	216/ 2.2	16/ 1.7	5/ -
2010	21.9	541	141/ 11.2	163/ 6.8	216/ 2.2	16/ 1.7	5/ -
2011	21.9	541	141/ 11.2	163/ 6.8	216/ 2.2	16/ 1.7	5/ -
2012	19	368	96/ 9.7	110/ 5.9	147/ 1.9	11/ 1.5	4/ -
2013	19	368	96/ 9.7	110/ 5.9	147/ 1.9	11/ 1.5	4/ -
2014	19	368	96/ 9.7	110/ 5.9	147/ 1.9	11/ 1.5	4/ -
2015	19	368	96/ 9.7	110/ 5.9	147/ 1.9	11/ 1.5	4/ -
Av.	25.3	579	151/ 12.9	174/ 7.9	232/ 2.5	17/ 2.0	6/ -

### **7.1.3. Social aspects of ship scrapping**

An obsolete vessel still constitutes a considerable value not only as a source of raw material but also as a source of equipment and components that may find use in different sectors. The supply and thereby the impact of the ship scrapping activity on the adjacent society is considerable. Whilst the scrapping activity at the beaches of Chittagong, Bangladesh, provides work for some 25,000 people, the stream of waste/material arriving from the beach occupies an additional 100,000 people in the nearby areas. These are engaged in sales, repair/remanufacturing and reprocessing. In this area in particular, there are some 400 steel reprocessing plants. The situation is much the same at the other scrapping centres of the world.



---

The level of utilization of waste materials arriving from ship scrapping is particularly high. A ship is made up mostly of steel so this may not be so surprising. However the utilization of second-hand equipment such as onboard pumps, generators, electrical motors, cables, sanitary equipment contributes to an overall impressive return to use. This is possible in a developing economy where there is a shortage in almost all areas and would not be attainable in other economies, i.e. within Europe. From this point of view, the contribution to sustainable development from the scrapping industries should be recognized. However, the methods adopted in the process do not comply with the spirit of sustainability nor to basic understanding of decent work.

It should be noted that the recycling and reuse of equipment and material do have downsides. The extraction process required for component recovery may be a contributing factor to the harmful and risky procedures adopted. Furthermore, it may not be desirable to return some substances or products to society for further use as these may be inefficient or dangerous/harmful. The reprocessing of asbestos and hence the production of products containing asbestos may be claimed to be an example of harmful recycling, which should not take place.

#### **7.1.4. International shipping – Expectations and resource management**

Just as it is unacceptable to exploit a workforce through low-paid work in an unsafe environment or by utilizing children, it is likewise unacceptable to dispose of materials and substances in a fashion which may cause harm to the workforce, the society, to our environment or to the future generations.

The application of the principles of sustainability to resource management is achieving broad acceptance and recognition by employers and workers and also in society in general. This is mirrored by the fast-growing acceptance of reuse and recycling of materials wherever possible. Developing countries are aware of the importance of the principles of sustainable development as well as those of the protection of human safety and health. Agriculture and fisheries are the backbone of these economies and the importance of protecting these are obvious. However, strained economies and acute challenges in other sectors may prohibit the long-term strategic focus necessary for making lasting changes both in respect to human health, workers' safety and the environment.

The expectations on international shipping regarding their obligations in relation to the disposal of ships will originate with the main stakeholders:

- shipbuilders;
- shipowners;
- operators;
- cargo owners, manufacturing industries and importers/exporters;
- ship registers.

These are all heavily dominated by corporations and institutions established in the industrialized world. The non-commitmental attitude adopted by the shipping industry with respect to ship disposal up to this point, is mirrored by the obvious non-observance of any standards. On the one hand, the developing economies cannot afford to lose the income provided from scrapping and recycling industries; on the other, the shipping industry as a whole has not been willing pay the price of safe disposal.

---

Shipping is traditionally a highly profitable business and in this light, and also reflecting on responsibilities regarding disposal within other industries, it may be reasonable that the industry should have obligations in relation to safe disposal. This follows the principles of “the polluter pays” and “end-of-life” which has been adopted in most other industries. However, the “polluter” may not be limited only to the last owner of the vessel at the time of disposal, but may include other stakeholders along the way.

## **7.2. Conclusions – Occupational safety, health and the environment**

The decommissioning of ships for scrapping and disposal/recycling consists of a string of subsequent actions that can be grouped into rough categories all of which represent elements of potential threat in relation to safety, health and the environment. Consequently, they also reflect the potential of improvements which need to be made. These categories were presented in Chapter 3:

1. Decommissioning and sale for scrapping (3.2.1).
2. Demolition – Principles of the breaking process (3.2.2).
3. Disposal and recycling (3.2.3).

An inventory consisting of guidelines, procedures, standards and requirements referring to the actual operations covering both the ship-breaking process as well as that of reuse or recycling can be identified by dividing operations into categories 1, 2 and 3 as above. This methodical approach has been adopted and is presented in tables 2, 4, 5 and 6.

Such an inventory may include a mutual section for practices related to the identification and handling of materials, items and hazards and should cover both environmental aspects as well as occupational safety and health as these are closely interconnected. This approach may lead to the identification of minimum requirements for the ship, the ship-breaking facility (and operations) and the associated recycling facilities. It should also address incidents and associated requirements (contingency preparedness). At a developed stage, such inventory will in effect provide a safety-health-environmental concept (SHEC) for ship decommissioning for disposal process.

Such a concept will cover both precautions e.g. requirements to the vessel, work operations and the facility itself and may address items as illustrated below:

- |                           |  |
|---------------------------|--|
| 1. Precautions            | Requirements to the vessel. May include material documentation (inventorization), cleaning (“gas free for hot work”), marking, the provision of special protective gear, etc.  |
| 2. Facility layout        | Work task separation (requirements to work surfaces and drainage), material separation (waste separation facilities).  |
| 3. Operational procedures | Use of machinery and tools (procedures when using winches/cranes, touch cutters, etc. (clearance zone, protective gear), handling of hazardous substances (procedures for personal protection, storage and transport). |

Recommendations or guidelines should reflect and comply with national regulations where applicable.

---

The SHEC approach may be developed to represent as a methodical tool for a specific (national) scenario containing references to relevant norms, standards, regulations, etc. and should address and make provisions for implementation, maintenance and continuous improvement including monitoring.

Social conditions and general worker rights are also issues. Challenges related to these topics may be considerably more complex than those related to the actual scrapping, disposal and reuse cycling. However, some priority subjects with considerable impact to the overall issue are obvious:

- housing and living conditions;
- the provision of health services (health monitoring);
- employment contracts and agreements.

---

## 8. References

- Basel Action Network, India, Personal correspondence with Mr. Ravi Agarwal.
- , Report on the Basel Convention’s 17th Technical Working Group (TWG) and Second Legal Working Group (LWG) (Geneva, 9-13 Oct. 2000).
- Basel Convention Press Release, <http://www.basel.int/press/TWGOctDay2.html>
- Chiang, H. C. and Chang, P. Y. 1989, Lead intoxication in ship-scraping employees in Taiwan. *Kaohsiung Journal of Medical Science* 5(5), 284-290.
- China – State Environmental Protection Agency, Dec. 1999 (China) “Environmental Protection in Dismantling of Imported Scrap Ships in China”.
- Clarkson Research Studies. *Shipping Review and Outlook*, Spring 1998.
- DNV BA 340 (Gry Dølsplass), Ship scrapping data based on Fearnleys (personal communication), Oct. 1998.
- DNV report No. 2000-3158, “Ship-breaking Practices/On Site Assessment, Bangladesh – Chittagong”, May 2000.
- DNV report No. 2000-3527, “Technological and Economical Feasibility of Ship Scrapping in Europe” (2001).
- DNV report No. 99-3065, Decommissioning of Ships – Environmental Protection and Ship Demolition Practices (1999).
- Drewry Shipping Consultants, *Ship Scrapping – Locations, Activity, Price Trends and Problems*, Briefing Report, Oct. 1996, and recent data on ship scrapping by location (personal communication), Oct. 1998.
- Greenpeace, *A Global Environmental, Health and Labour Challenge*, Mar. 2000.
- , *Ship-breaking in Asia* (ITWF, Basel Action Network, Indian Trade Unions), Sep. 1999.
- , *Ship-breaking in China*, Apr. 1999.
- , *Steel and Toxic Wastes for Asia* (Mar. 1999).
- Gujarat Maritime Board, list of stipulations to be followed by ship-breakers, The use of safety appliances/precautionary measures/fire safety precautions/environmental conditions and housekeeping, facilities to be provided (2000).
- ILO, *Is there a decent way to break up ships?* (January 2001).
- , Report from the Tripartite Meeting on the Social and Labour Impact of Globalization in the Manufacture of Transport Equipment (Geneva, 8-12 May 2000), and *Note on the Proceedings*.
- , Sectoral Activities Programme, *Ship-breaking in Bangladesh: A background paper* (Oct. 1999).
- , *The Ship-breakers*, Video covering ship scrapping in Chittagong, Bangladesh

---

IMO, MEPC 46/7, Report from the Correspondence Group on Ship Recycling (2001).

Indian Central Pollution Control Board in 1997, "Guidelines for the environmentally sound management in the ship-breaking industry".

Institution of Chemical Engineers (IchemE), environmental conference, Environment, 1997, <http://www.environment97.org/text/reception/r/keypapers/papers/s11.htm>

International Chamber of Shipping (ICS), Industry Working Group on Ship Recycling, Code of Practice on Ship Recycling.

International Metal Workers' Federation, Report from IMF Shipbuilding Working Party, 12-13 Oct. 2000.

Islam, K. L. and Hossain, M.M. 1986, Effect of ship scrapping activities on the soil and sea environment in the coastal area of Chittagong, Bangladesh Marine Pollution Bulletin, Vol. 17., No. 10, pp. 462-463.

Lloyd's Register of Shipping, World Fleet Statistics, 1999. Lloyd's Register of Shipping, London 2000. (<http://www.lr.org/information/publications>).

–, World Casualty Statistics, 1998.

Lloyd's ship demolition database for the year 1999, (DNV, 2000).

London Convention, LC 22/8.

Molven, A & A. Goksøyr (eds.) 1992: Programme on Marine Pollution (PMF). Organohalogenes and PAH's in the marine environment. State of the Art and Research needs. Royal Norwegian Council for Scientific and Industrial Research.

Norwegian Maritime Directorate, Legal Aspects of Scrapping of Vessels (2000) (Prof. Geir Ulfstein).

Personal Correspondence, Dr. Yusuf Sharif Kahn, University of Chittagong, Bangladesh.

–, Mr. Jon Whitlow (ITF).

–, Mr. S.H.Pau/Mr. Heming Yan, China National Shipscrapping Association.

–, Mr. Shakir (BELA).

Peter, C., 1998, The Encyclopaedia of Ecology and Environmental Management. Blackwell Science Ltd.

Society of Naval Architects and Marine Engineers. Transactions, Vol. 102, 1994. Environmentally Safe and Economically Sound Method of Ship Scrapping.

United Nations Economic and Social Council, E/CN.4/1999/46.

United Nations Environment Programme, UNEP/CHW/TWG/16/12, UNEP/CHW/TWG/17/15, UNEP/CHW/TWG/17/8/Add.1, UNEP/CHW/TWG/17/CRP.7/Rev.2.

US Environmental Protection Agency webpage (<http://www.epa.gov/reg5foia/asbestos/index.html>).

---

US: A Guide for Ship Scrappers – Tips for Regulatory Compliance Environmental Protection Agency (EPA 2000).

US: EPA PCB study (2000).

“World Shipping Encyclopaedia” Fairplay Publications Ltd., 20 Ullswater Crescent, Coulsdon, Surrey, CR5 2HR, UK.