

European Maritime Safety Agency (EMSA)
Study on the Certification of
Ship Recycling Facilities
Final Report

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Prepared Frank Stuer-Lauridsen, Klaus Winther Ringgaard, Mette Quaade,
Morten Hørmann, Garnt Feringa
Checked Frank Stuer-Lauridsen
Approved Klaus Winther Ringgaard

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Executive summary

The objective of the present study initiated by the European Maritime Safety Agency is to provide a model of an integrated management system (IMS) for the certification of ship recycling facilities to demonstrate safe and environmentally sound recycling of ships. The European IMS shall serve as a tool to promote and strengthen implementation of the draft IMO Convention on Safe and Environmentally Sound Recycling of Ships.

To design a model IMS, a gap analysis was carried out based on the existing and coming systems, the legal requirements, the lessons learned from ship recycling yards and implementation projects, and finally on responses to a questionnaire to the sector's key stakeholders.

The integrated guidelines in the area of ship recycling are, in particular, the guidelines of the IMO draft Convention on Safe and Environmentally Sound Recycling of Ships and the standards of the ISO 30000 Specifications for management systems for safe and environmentally sound ship recycling facilities. Both of these are integrated systems addressing safety, health and environmental issues in the same documents.

The ISO 14001 standard on environmental management systems, and to a lesser extent the OHSAS 18001 standard on occupational health and safety, are used in a number of certified ship recycling yards, but it is important to bear in mind that both are procedural standards as opposed to performance standards. Therefore, certification against the standards does not guarantee a certain performance by itself.

Other guidance documents issued by ILO, the Basel Convention secretariat, the NGO Platform on Ship breaking, the International Ship Recycling Association and various industry organisations each address the performance quality of recycling as does the legislation in individual recycling nations, albeit at very different levels.

Industry funded and national and international projects for upgrading of recycling have showed that the willingness to establish improved and certified conditions regarding safety, health and environment in the recycling facilities vary considerably between countries and amongst facilities. The study team has previous first hand experience from Turkey, China and Bangladesh, but was unfor-

tunately not able to obtain a permit from Indian Authorities to visit the ship recycling beaches at Alang.

The recycling stakeholders' responses to the distributed questionnaire showed that the expectations include a general upgrading of the recycling industry to an IMO defined minimum. Different quality levels of recycling facilities are expected and the existence of a simple certification system is welcomed and seen as a prerequisite for the ship owner's informed choice.

In summary, an improved system for ensuring appropriate conditions regarding safety, health and environment practises in ship recycling facilities must comprise:

- Integration of safety, health and environment procedures
- All activities of the recycling from pre-dismantling activities at sea to the final disposal of wastes from the facility
- Monitoring of key performance indicators related to the above
- Transparency through publicly available policies and reporting of indicators.

The coming IMO guidelines do not set all these requirements and a European integrated management system adding to these future management systems is proposed. The simple system for identification of ship recycling facilities will ensure that the facilities not only comply with the minimum requirements of the future IMO Convention, but also with specific requirements of the European Community. It is important to note that the IMO Convention is at the core of this system and that it will only require marginal additional effort for a facility already pursuing appropriate authorisation under IMO and/or certification from ISO 30000. It is built on a tiered approach allowing the recognition of improvements in different ship recycling methodologies.

The IMS proposed is organised as a voluntary business to business system similar to the ISO standards allowing facilities to decide on their market profile. It will bring into play certain European requirements related to handling and disposal of hazardous waste, occupational health and workplace safety, and in particular a requirement on performance monitoring and publication of progress.

The proposed European IMS includes:

- Manual and procedures compliant with the ISO 30000 or the draft IMO Convention Guideline (when fully developed)
- Requirement to include certain international conventions and regulations as the regulatory base for the system
- Requirement to measure and publicise HSE performance as a minimum for 10 specified performance indicators for which continuous improvements must be documented and a minimum benchmark passed

- Requirement to perform a dedicated risk assessment for each ship to be dismantled
- Requirement to explicitly handle specific HSE issues within the IMS.

In general, a concept for a three levelled system is described with the following levels from the minimum A level to the top AAA level as seen below.

Table 0-1 Conceptual tri-levelled compliance system

Compliance levels	Overall indicators
Premium or AAA	High safety levels, extensive use of state-of-the-art disposal and elimination, double containment in cutting zones. This would typically be a dry dock facility.
Medium or AA	High safety level, proper disposal and incineration facilities, ship's hull used as containment, double containment for breaking keel. This may include pier breaking, slipways and redesigned beaching and landing.
Minimum or A	Adequate levels of worker's safety, no incineration of hazardous waste, secondary bunds and containment in primary cutting zone for keel not impermeable. Hot work and confined space certificates available. This may include improved beaching and landing facilities.
Non compliant	Non compliant facilities e.g. lacking disposal facilities, environmental management or without proper safety equipment

It should be emphasised that a European IMS system for sustainable ship recycling is not a repetition of IMO or ISO systems. It is assumed that ship recycling facilities, ready to be authorised by their national authorities, have already implemented at least their IMO based integrated management system derived from the guidelines for safe and environmentally sound ship recycling. Facilities need only to address a limited number of additional issues in order to be IMS certifiable. If these facilities already use the ISO 30000 as a vehicle for their integrated management system in the same way many shipping companies use ISO 14001 for part of the ISM code, the additional work is very limited and primarily concerned with monitoring of the indicators described in the following chapters.

The experiences from China, Turkey and Bangladesh show that the following four key issues are crucial in upgrading to sustainable recycling practises:

- Adequate safety procedures regarding e.g. gas-free conditions, confined spaces, hot work areas, barriers to dangerous areas, lighting of work and access areas
- Training and equipment to allow identification, removal, transport and storage of hazardous materials, particularly asbestos, but also PCBs, ozone depleting substances, heavy metals and other hazardous materials
- Increased mechanisation to avoid heavy manual lifts and manual transport and handling of dangerous, large or heavy objects

- Access to appropriate disposal facilities for hazardous materials, i.e. facilities operating to internationally recognised sound environmental management practises and standards.

Such experiences have also compelled Indian yards and the Gujarat Maritime Board to initiate upgrade activities in Alang.

The key issues were entered into an identification of 10 useful IMS indicators to monitor the performance of the yards via a DPSIR¹ approach and using the EC Recommendation 2003/532/EC on selection and use of environmental performance indicators.

Table 0-2 Description of the proposed 10 IMS indicators for health, safety and environmental performance at ship recycling facilities

Indicator	Measurement unit(s) for indicator
Training and awareness	Number of training hours per employee per employee category per year
Illnesses	Number of work related sick days per employee and year
Emergency preparedness	The number of hours of emergency training per employee per year and number of full scale yard drills
Lifting operations	The number of uncontrolled falls of objects during ship recycling operations within the last 12 operational months The maximum individual manual lifting load (both lifts in motion and stationary lifts) in kg
Accident rate	Number of accidents involving personal injuries normalised to per 100,000 man-years worked
Fatality rate	Fatal accidents occurred normalised to per 100,000 man-years worked
Pollution prevention from spills	The percentage of the area of each cutting zone equipped with impermeable surfaces and controlled drainage
Concentration of hazardous materials in soil, air, sediment and marine water within the facility	The concentration of relevant hazardous compounds in soil, air, sediment and marine waters within the facility as measured in environmental samples sampled during recycling operations
Environmental performance of waste disposal contractors	The percentage of the hazardous waste generated at the facility disposed according to international waste disposal requirements or similar national regulation
Emission of hazardous material to the environment	Demonstration of agreement between amounts of hazardous materials as recorded in final certificate, the completion report and the records of disposal

¹ Drivers, Pressures, Status, Impacts and Response

The indicators are entered into the tri-levelled IMS to provide progressed monitoring points where possible. In some cases it may be the same indicator, but the requirement for qualitative and quantitative information increases from A to AAA.

The minimum level (A) indicates implementation of the IMO draft Convention and Guidelines and will, under the current IMO draft, include the beaching facilities. If the European Community opts to exclude the beaching method from the approvable methods in this category there will presumably still be some of the facilities in Turkey employing simple versions of the landing method and possibly certain pier breaking facilities in China.

The AA is meant to include upgraded and improved versions of the pier breaking and slipway facilities, but may also comprise other methods without access to impermeable surface in the primary cutting zone, such as future innovative designs for the beaching and landing methods.

The crucial criterion to the AAA level is the impermeable flooring requirement for the primary cutting zone, and it is presently expected that only docking methods will qualify.

Table 0-3 Proposed performance benchmarks for each of the three tiers in the proposed tiered HSE performance label. IMO Convention and Guideline must be fulfilled. The requirements are cumulative and all those of lower level must be fulfilled at upper levels. Two criteria can be exempted for one year while maintaining a level

Indicator	Minimum A	Medium AA	Premium AAA
Training and awareness	All employees have within previous 12 months received HSE awareness training and 'at risk employees' are identified and have received specialised training	HSE awareness training for all employees and specialised training for 'at risk employees' within previous 6 months	HSE awareness training for all employees and specialised training for 'at risk employees' within previous 3 months
Illnesses	The average number of sick days per employee and per year is publicly available. As a minimum a nurse is available for the facility. Asbestos health checks within 1 month after employment and at least annually	A doctor and a clinic are available at the facility or within 3 km or 30 min. Health records for employees are kept	A doctor and a clinic are available at the facility or within 3 km or 30 min. Proactive health campaigns towards the employees are conducted by a doctor
Emergency preparedness	Availability of first aid and emergency response to all working areas during all times of work operations. All employees have received information on emergency procedures and staff with specific emergency response duties are trained	At least one full scale emergency yard drill have been performed within last 24 months	At least one full scale emergency yard drill have been performed within last 12 months
Lifting operations	Dismantled objects must not be allowed uncontrolled falls and no gravity cutting is allowed. The maximum size of cut or uncut objects must be set relevant to the mechanical lifting capacity. No manual lifting operations with an individual load of above 50 kg	No manual lifting operations with an individual load of above 30 kg	No manual lifting operations with an individual load of above 15 kg
Accident rate	Accidents are investigated and corrective and preventive actions implemented. The effectiveness of these is controlled and documented. Five years rolling average reduction targets are met.	Four years rolling average reduction targets are met. The max. rate being 12,000 accidents with more than three days absence per 100,000 men per year (normalised) or national targets whichever is lowest	Incidents and near-misses are also recorded, analysed and corrective and preventive actions implemented. Three years rolling average reduction targets are met. The max. rate being 6,000 acci-

² EU accident rate within some of the most dangerous work sectors: agriculture and construction according to European Agency for Safety and Health at Work

Indicator	Minimum A	Medium AA	Premium AAA
	The max. rate being 18,000 accidents with more than three days absence per 100,000 men per year (normalised) or national targets whichever is lowest		dents with more than three days absence per 100,000 men per year ² (normalised) or national targets whichever is lowest
Fatality rate	The fatality rate and reduction goals for the facility are publicly available. Compensations are paid. Five years rolling average reduction targets are met. The max. rate being 39 fatalities per 100,000 men per year (normalised) or national targets whichever is lowest	Four years rolling average reduction targets are met. The max. rate being 26 fatalities per 100,000 men per year (normalised) or national targets whichever is lowest	Three years rolling average reduction targets are met. The max. rate being 13 fatalities per 100,000 men per year ³ (normalised) or national targets whichever is lowest
Pollution prevention from spills	Hull used as impermeable barrier for non wetted parts with keel moved to area with impermeable flooring and drainage when cutting through final barrier		Double containment within all working areas
Concentration of hazardous materials in soil, air, sediment and marine water within the facility	Relevant reference levels are established. Monitoring frequency at least 1 per year	Monitoring frequency at least 1 per quarter	Monitoring frequency 1 per month or continuous
Environmental performance of waste disposal contractors	All waste treated according to ESM including non-destructive disposal techniques. All contractors must be properly licensed		All waste treated according to ESM incl. destruction and immobilisation
Emission reduction of hazardous materials to the environment	Documented facility compliance between sum of IHM and total disposal records	Documented compliance between IHM and final disposal records on a ship basis	PCHMs are verified. Documented compliance between IHM and final disposal records on a ship basis

The study makes a few final recommendations to a rapid implementation of a European IMS bearing in mind that the IMO Convention is to be adopted at a Diplomatic Conference in May 2009. A major recycling boom is expected already in the period from the adoption up to the entry into force (the interim) due to the accelerated phase out of single hulled tankers and a looming surplus of tonnage.

³ EU fatality rate within some of the most dangerous work sectors: agriculture and construction according to European Agency for Safety and Health at Work

Any ship recycling facility embarking on an adaptation to the IMO Convention and Guidelines should find it achievable to comply with the IMS. However, globally the ship recycling facilities have very different starting points and for a new IMS there will be challenges to be met. Amongst the challenges the three key issues are:

- To rapidly ensure availability of the IMS to the recycling market while the ambition levels, certification systems and budgeting issues are under consideration
- To provide a qualified accreditation system of the auditing and certifying organisations to ensure legitimacy and immediate market credibility
- To increase sector capacity and assist ship recycling facilities in upgrading to European certification system and performance goals.

Recommendations for how to address the challenges within the three key issues are detailed in the following sections.

Availability of IMS

It is recommended that a manual to the IMS and a publication outlining the indicators are rapidly published by an appropriate European entity, preferably no later than mid 2009. This would allow interested ship recycling facilities to become certified according to the IMS in the same process as their ISO certification and upgrade activities towards IMO Convention level.

Organisations and actors in implementation

It is proposed not to develop any new organisations as the certifying auditors may come from the existing organisations already involved in these activities, e.g. classification societies, standardisation bureaus and consultancies.

To ensure legitimacy and credibility it is proposed to have only one organisation globally responsible for accreditation of the auditing and certifying organisations in the ship recycling sector. The responsibility for accreditation may be offered in tender within the technically competent organisations already involved in accreditation.

Presently, the draft IMO Convention does not acknowledge voluntary certification systems. It would obviously increase the implementation effectiveness of IMS if a Party could require ships flying its flag to be recycled in facilities adhering to a specific management system, i.e. IMS, ISO or the like.

Capacity development and awareness raising

The implementation strategy should aim at promoting the IMS within the recycling facilities themselves, national authorities and the associated industries: the ship-owners and cash buyers, the steel mills, the subcontractors and the equipment retail businesses. Thus, both a promotion component and a technical capacity development component should be included:

Promotion component:

- It is important to seek commitment from the shipping community to their active request for a voluntary certification and auditing scheme in the recycling yards, e.g. via the European Ship Owners Association, ISRA and the like
- Promotion may also include a joint award to a green recycler and ship owner for sustainable collaboration, i.e. recycling of a vessel under IMS conditions
- Publically available list of all IMS facilities and vessels recycled under IMS conditions
- Publication of IMS indicators for yards at central internet location
- Subsidise five free IMS certifications in (third) world and five in Europe.

Awareness and capacity component:

- Develop a brief IMS implementation manual (checklist type) with focus on indicators to be freely distributed
- Offer a web-tool guiding interested ship recycling facilities through a virtual upgrade process depending on the starting points (the four IMO methods)
- On a short notice the use of existing technical assistance instruments towards countries using beaching may be considered for upgrade or, if necessary, relocation of their ship recycling activities. These may include:
 - Sector specific aid and bilateral assistance
 - Business to business programmes
 - Technology transfer of hardware and software
 - Cleaner development mechanism programmes.
- On the longer term, support to the development of safe and environmentally sound solutions for IMS certified facilities via existing technical and research programmes.
- On a medium term, the European IPPC Bureau may organise and produce a BAT reference document (BREF) for ship recycling.

It may be considered to invite member states to require that vessels flying their flag must be recycled at facilities enrolled in the European IMS. It would be possible to initiate this before the IMO Convention enters into force.

A key financial mechanism of the recycling industry is the Letters of Credit that today are issued by cash buyers to the ship recyclers when a recycling facility purchases a ship for recycling. Today, a credit crunch is eminent and it is increasingly difficult to finance investments, also for ship breakers. It may therefore work also in the short term to establish a European fund to finance such Letters of Credit. To provide an incentive the funds should allow for a competitive interest rate and be made available either via the cash buyers, banks, di-

rectly to the recyclers or via any other appropriate channel. Obviously, a condition to such Letters of Credit supported by European Community funds must be that the ship recycling facility adheres to the IMS.

Financing

The financing principle of the upgrade and certification should be in line with the polluter-pays-principle and will presumably be factored in as a deduction in the price for the ship to be recycled.

The technical and financial capacity of recycling facilities in developing nations may not allow for their commitment to the European IMS programme. Work must be undertaken in the first place to meet the requirements of the IMS certification at a time when the IMO Convention is not yet in force, and although the certification and auditing in the long run must be sustained through the contribution from its users, it may be necessary during the initial phase partly to cover the implementation costs of the IMS for recycling facility, particularly in developing countries via mechanisms as mentioned above.

Foreword

This study was initiated by the European Maritime Safety Agency (EMSA) by Service Contract EMSA-07-OP/07/2007 of 12 December 2007.

The overall objective of the study is to provide a model of an integrated management system for the certification of ship recycling facilities to demonstrate safe and environmentally sound recycling of ships. The management system shall serve as a tool to promote and strengthen implementation of the draft Convention on safe and environmentally sound recycling of ships.

The study was carried out by the Contractor COWI/LITEHAUZ led by Mr K. Winther Ringgaard (Project Manager, COWI) and Dr F. Stuer-Lauridsen (Deputy Project Manager, LITEHAUZ). Both also served as maritime environmental experts in the project team which also comprised Ms M. Quaade (Integrated Management System expert, COWI), Mr G. Feringa (ship recycling practices expert, independent consultant) and Mr M. Hørmann (public participation expert, COWI).

The views and opinions expressed in the study reflect those of the team of experts conducting the study and do not necessarily represent the views and opinions of EMSA.

Abbreviations and glossary

Abbreviation/ acronym	Name	Explanation
Accreditation		Organisations that issue credentials or certify third parties against official standards are themselves formally accredited by accreditation bodies. The accreditation process ensures that their certification practices are acceptable, typically meaning that they are competent to test and certify third parties, behave ethically, and employ suitable quality assurance
Audit		The process of evaluation of a system to ascertain the validity and reliability of information
Authorisation		The approval process of national authorities of recycling states or responsible organisations for ship recycling facilities according to the IMO Convention on Safe and Environmentally Sound Ship Recycling
BC	Basel Convention	The Convention on the Control of Trans-boundary Movements of Hazardous Wastes and their Disposal
CEN	Comité Européen de Normalisation	The European Committee for Standardization publishes voluntary technical standards which promote free trade, the safety of workers and consumers, interoperability of networks, environmental protection, exploitation of research and development programmes, and public procurement
Certification		The approval process for ship recycling facilities according to other schemes e.g. ISO, OHSAS or national schemes
Deadweight, DWT	Dead Weight Tonnage	The lifting or carrying capacity of a ship when fully loaded. The deadweight is the difference, in tonnes, between the displacement and the lightweight. It includes cargo, bunkers, water (potable, boiler, ballast), stores, passengers and crew.
Decommission		The decision and process of taking a ship out of service. Often used regarding navy vessels.
Demolition		The process of taking a ship apart. Mostly used for on shore operation.
Dismantling		The process of taking a ship apart. Term preferred by the Basel Convention and used in their guideline. Also a preferred term with the European Commission (DG Environment).
DPSIR	Drivers, Pressures, State, Impact and Responses	Framework developed by the European Environment Agency (EEA) first as a tool for the development of a strategy for Integrated Environmental Assessment and which has since been more widely adopted by the EEA, acting as an integrated approach for reporting, e.g. in the EEA's State of the Environment Reports.

Abbreviation/ acronym	Name	Explanation
EEA	Environmental Environment Agency	
EHS, HSE, SHE		Common combinations of Environment, Health and Safety used in management organisations
EMAS	Eco-Management and Audit Scheme	EU management tool for companies and other organisations set out in Regulation (EC) No 761/2001
EMS	Environmental Management Systems	Procedures for environmental issues
EMSA	European Maritime Safety Agency	European Maritime Safety Agency
ESM	Environmentally Sound Management	Specifically referring to the BC Technical Guidelines for the Environmentally Sound Management of the Full and Partial Dismantling of Ships and The Stockholm Convention
Gas free	Gas free (for hot work)	Gas Free Certificate - A certificate stating that the air in a tanker's (empty) cargo tanks is safe.
GT	Gross Tonnage	The internal capacity of a vessel measured in units of 100 cubic feet
HACCP	Hazard Assessment of Critical Control Point	A tool used in the food industry for hazard management
HAZOP	Hazardous Operation	A tool used in the Oil and Gas sector for hazard management
ICS/ISF	International Chamber of Shipping/International Shipping Federation	The international trade association for merchant ship operators
ILO	International Labour Organisation	The UN agency seeking the promotion of social justice and internationally recognized human and labour rights
ISO	International Organisation for Standardization	ISO has developed the widespread environmental standard, ISO14000, often referred to as ISO 14001.
IMO	International Maritime Organisation	The United Nations' agency responsible for improving maritime safety and preventing pollution from ships
IMS	Integrated Management System	Management system including environment, health and safety together with quality
Lightweight, LDT	Light displacement tonnes or Lightweight	The lightweight is the displacement, in t, without cargo, fuel, lubricating oil, ballast water, fresh water and feed water, consumable stores and passengers and crew and their effects, but including liquids in piping.
MEPC	Marine Environment Protection Committee	IMO's senior technical body on marine pollution related matters
ODS	Ozone Depleting Substances	
OECD	Organisation for Economic Co-operation and Development	Includes the countries Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Korea, Luxembourg, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Spain, Sweden, Switzerland, Turkey, United Kingdom, United States.
OH&S, OHS	Occupational Health and	Procedures for occupational health management

Abbreviation/ acronym	Name	Explanation
	Safety	
OHSAS	Occupation Health and Safety Assessment Series	OHSAS 18000 is an Occupation Health and Safety Assessment Series. Often the reference is to the standard OHSAS 18001.
PAS	Publicly Available Specification	Standard document by the International Organisation for Standardization. A PAS will be reviewed at least every three years to decide either to confirm the PAS for three more years, revise the PAS, process the PAS further to become either a technical specification or an International Standard, or to withdraw the PAS.
P&ONL	P&O Nedlloyd	Private shipping company, who have performed an extensive IMS project at two ship recycling facilities in China. The company is now part of Maersk Line
Recycling		The process of taking a ship apart. Term preferred by the shipping industry and IMO. When procedures to safeguard the environment, workers' health and safety are applied - "green recycling".
Scrapping		The process of taking a ship apart. Term preferred in the US EPA guideline and often used in the reused metal business.
Ship breaking		The process of taking a ship apart
US EPA	United States Environmental Protection Agency	United States Government Environmental Authority
WSR	Waste Shipment Regulation	Regulation (EEC) No 259/93 on the supervision and control of shipments of waste within, into and out of the European Community. Implements the Basel Convention.

1 Introduction

Over the last two decades the annual average number of scrapped oceangoing vessels has ranged from 300 to 600 or some 3-6 million tons lightweight. In the early 1990's the lower range was seen and the higher numbers were recorded during the poor freight market conditions governing the turn of the millennium when the tonnage of the commercial fleet was trimmed. In the most recent years the unprecedented favourable market conditions have caused the scrap rate to drop to less than two million LDT a year as every ship owner wants to keep tonnage trading.

Over the next 2-10 years several conditions affecting the rate of recycling will come into play: firstly, the freight markets appear to be cooling off a bit due to a global economic slowdown since late 2007; secondly, the introduction of considerable new tonnage will put a downward pressure on freight rates and this is a decisive factor in driving decommissioning of ships; finally, the mandatory IMO single hulled tanker phase out scheme stipulates a 2010 deadline that will affect several million tons of tanker tonnage.

All in all, the impact in tandem of declining market conditions and a changing regulatory environment will undoubtedly lead to a massive decommissioning and recycling volumes will soar. The phase out of single hulled tankers may contribute up to 9 million tons lightweight and the scrapping backlog from the years of booming market conditions may add 15 million tons lightweight to the recycling yards⁴.

Regardless of the actual tonnage decommissioned, recycling of obsolete vessels is generally considered a positive and sustainable industrial activity since a) it provides for reuse of the means of production and b) it rejuvenates the fleet and adds to the increasingly efficient and safe transport at sea. However, for a number of years now voices have been raised in concern that the increased safety at sea occurs at the expense of worker's health and environmental conditions at the scrapping beaches in developing nations, particularly in India, Bangladesh and Pakistan. Therefore, to improve on these conditions an international Convention on Safe and Environmentally Sound Recycling of Ships is currently in drafting by the IMO as the core organisation in dialogue with the Secretariat of the Basel Convention and the ILO.

⁴ Data from COWI/DHI (2007) Ship Dismantling and Pre-cleaning of Ships.

The draft International Convention on Safe and Environmentally Sound Recycling of Ships place responsibilities on flag states, port states and recycling states. One of the issues particularly addressed in the draft Convention and its proposed Guidelines is that the recycling activities under the jurisdiction of a recycling state are required to be duly controlled. The means to do so is the national authorisation mechanism for recycling yards. Irrespective that regulation of land-based activities is not a core area for IMO it is also a particularly complicated area since such authorisation and enforcement of it typically involves the coordination of a number of line ministries and their legislative mandates. In addition, the implementation of the future International Convention on Safe and Environmentally Sound Recycling of Ships will be anchored in the Party's national legislation and a sovereign interpretation of safe and environmentally sound recycling practises, which may take different yet compliant shapes from country to country.

Even for a ship owner willing to do the effort it is difficult to achieve reasonable transparency with respect to safe working procedures, environmental discharges and disposal options in the recycling facilities. Already today, certifications by the international and voluntary ISO and OHSAS standards are popular in ship recycling and a number of facilities in Europe, China, Turkey and India all boast ISO 14001 or OHSAS 18001 certificates although differing significantly in their approach to safety, health and environmental issues. On that account, the ship owner organisations and a number of flag states have maintained that the market for safe and environmentally sound ship recycling lacks transparency with respect to standards and applicable rules.

The European Commission has recently issued not only the draft Green Paper on Ship Recycling but also a draft Maritime Policy supporting the process on the International Convention on Safe and Environmentally Sound Recycling of Ships in IMO. It has been emphasised by the EC that the process in IMO must lead to tangible improvements and not the least to an equivalent level of control.

In support of the draft Convention the present study sets out to analyse the required components of an integrated safety, health and environment management system to assist in the implementation of the future IMO Convention. Part of the task has been to identify performance indicators for such a system and to assess their suitability for provision of comparison between yards employing different recycling methods under different national regimes. It is the aim to produce a voluntary mechanism allowing the responsible ship owner to chose upgraded facilities and be assured that the recycling was acknowledged and accepted as 'safe and environmentally sound'.

2 Review of relevant standards, schemes, requirements and practices

Several standards, guidelines and schemes within health, safety and environmental management are available today, some of which are being applied within the ship recycling industry. These standards are generally not aimed at the ship recycling industry and the specific HSE issues and challenges within this. Therefore alongside the number of benefits associated with the standards, a number of potential gaps do also exist in applying the standards to the ship recycling industry.

The existing international health, safety and environmental management standards, guidelines, schemes etc., relevant for the ship recycling industry, are described and analysed in this chapter. Focus is on their applicability within ship recycling and their suitability to ensure an environmentally sound recycling of ships and a safe working environment at the facilities.

2.1 International standards and systems

During the last decades industries on a global scale have embraced a number of internationally recognised management systems, notably on quality management. Procedures addressing risks potentially associated with production and delivery of services and goods are frequently required by law or by business partners, particularly when import and export trade is in question.

Well known examples are the ISO and CEN standard series and the standard procedures published by the OECD, but also national systems such as British Standard and the Deutsches Institut für Normung (DIN) enjoys widespread recognition.

Generic risk management systems such as HACCP and HAZOP moved forward in recent years as ways to identify and manage safety, health and environment related challenges to industrial activities.

However, it should be clear that the purpose of these management systems is to provide procedures for complying with performance requirements or goals laid down in national legislation or policy documents that are independent of the management systems. Some of these international standards are analysed in brief in the following section.

2.1.1 ISO-standards

The International Organisation for Standardization, ISO, is a non governmental organisation that has developed more than 16,500 International Standards and other types of normative documents. ISO standards range from standards for traditional activities, such as agriculture and construction, through mechanical engineering, manufacturing and distribution, to transport, medical devices, information and communication technologies, and to standards for good management practice.

The standards relevant for the ship recycling industry belong to the latter category and comprise the ISO 14000, the ISO 9000 and the ISO 30000 series. These are all based on the Plan-Do-Check-Act cycle to ensure continuous improvements. All three ISO series cover standards for management system.

In addition also ISO 19011: Guidelines for quality and / or environmental management system auditing should be mentioned. This guideline provides guidance on the principles of auditing, managing audit programmes, conducting management system audits as well as guidance on the competence of the auditors.

In the following a more thorough analysis of the most relevant ISO standards for ship recycling has been carried out. The objective of the analysis is to pinpoint the main gaps and challenges if the standards are used as an instrument for ensuring safe and environmentally sound recycling.

ISO 9000 series

The ISO 9000 series includes:

- **ISO 9000:2000, Quality management systems – Fundamentals and vocabulary.** This is a guidance document and includes the basics of quality management systems in terms of principles and vocabulary.
- **ISO 9001:2000 Quality management systems – Requirements** specifies the set of requirements for a quality management system and is the standard against which organisations are assessed if they want a certified QMS system according to ISO 9001. ISO 9001 is "a generic management system standard". "Generic" means that the same standard can be applied to any organisation, large or small, whatever its product or service, in any sector of activity, and whether it is a business enterprise, a public administration, or a governmental department.
- **ISO 9004:2000 Quality management systems - Guidelines for performance improvements** covers continual improvement. This gives advice on what to do to enhance a mature system. This standard very specifically states that it is not intended as a guide to implementation.

ISO 9001:2000 specifies requirements for a quality management system where an organisation needs to demonstrate its ability to consistently provide products that meets customer requirements, and aims to enhance customer satisfaction through the effective application of the system.

The standard includes requirements for continued improvement of the system and the assurance of conformity to customer and regulatory requirements.

The framework for the quality management system is similar to the ISO 14001 environmental management system. The systems are compatible and a quality management system will often be used as the basis upon which an environmental management system is developed.

ISO 14000 series

The ISO 14000 series includes a number of standards and guidance documents. The most relevant in this context are:

- **ISO 14001:2004: Environmental management systems - Requirements with guidance for use** specifies the set of requirements for an environmental management system and is the standard against which organisations are assessed if they want an certified EMS system according to ISO 14001. ISO 14001 is a generic management system standard.
- **ISO 14004:2004: Environmental management systems - General guidelines on principles, systems and support techniques**, provides guidance on the establishment, implementation, maintenance and improvement of an environmental management system and its coordination with other management systems.
- **ISO 14020:2000: Environmental management systems - Environmental labels and declarations -- General principles**. This standard includes guiding principles for the development and use of environmental labels and declarations. It is a three levelled system based on increasingly complex assessment of the life cycle of products.
- **ISO 14031:1999: Environmental management systems - Environmental performance evaluation – Guidelines**. This gives guidance on the design and use of environmental performance evaluation within an organization. It is applicable to all organizations, regardless of type, size, location and complexity. This standard does not establish environmental performance levels.
- **ISO 14032: Environmental management - Examples of environmental performance evaluation (EPE)**. This is a companion document to ISO 14031 and provides real-life examples of EPE that represent a range of applications from simple to elaborate. The examples show how EPE can be conducted in businesses of any size, type or geographical location.
- **ISO 14040:2006: Environmental management -Life cycle assessment - Principles and framework**. This specifies the requirements and the procedures necessary for the compilation and preparation of the definition of goal and scope for a LCA, and for performing, interpreting and reporting a Life Cycle Inventory analysis (LCI).
- **ISO 14044:2006: Environmental management - Life cycle assessment - Requirements and guidelines**. This specifies requirements and provides guidelines for life cycle assessment including: definition of the goal and scope of the LCA, the life cycle inventory analysis phase, the life cycle

impact assessment phase, the life cycle interpretation phase, reporting and critical review of the LCA, limitations of the LCA, relationship between the LCA phases, and conditions for use of value choices and optional elements.

Frequently, the series of standards are referred to as ISO 14001, because this is the number of the actual environmental management standard. All other sections in the series are guideline documents.

ISO 14001

The first section of the ISO 14001 standard directs the organisation to identify its activities, products, or services that can or already impact the environment significantly.

Secondly, the organisation must develop an environmental policy “appropriate to the nature and scale” of the activities, products, or services with significant environmental impacts. There must be a specific commitment to prevent pollution. Top management must define the policy and ensure that it is communicated to all employees. In the policy, the organisation must commit to comply with all pertinent environmental legislation, regulations, and/or legal requirements. Perhaps most important, the section directs the organisation to set, review, and document definable environmental objectives and targets at relevant functions and levels within the organisation.

In the third section of the standard, the organisation must develop a program for achieving its management objectives. The program will include assigning responsibility for objectives at “each relevant function and level of the organisation” and establishing a time frame for their accomplishment.

The fourth major section of the standard calls for the implementation and operation of the environmental management program. This section includes provisions to educate employees or members at each relevant function and level about the organisation’s environmental management system and their roles and responsibilities in achieving the organisation’s goals. In addition, the provisions call for training of employees or members to carry out their tasks within the environmental management system. Finally, within Implementation and Operation, there must be procedures for preventing and mitigating any environmental impacts from accidents and emergency situations. The Checking and Corrective Action section directs the organisation to monitor and measure operations with significant environmental impacts on a regular basis. The organisation must establish and maintain a documented procedure for evaluating compliance with pertinent environmental laws and regulations. The standard calls for a continuous audit of compliance with and performance of the environmental management system. Finally, the standard requires that top management review the environmental management system and provide changes to policy, objectives or operations when necessary which should lead to greater efficiency and continual improvement.

The management system applies to those environmental aspects that the organisation identifies as the most significant and which it can control and influence. The standard does not by itself state specific environmental performance criteria. The minimum level will be the local legal requirements.

The extent of the application will depend on factors such as the environmental policy of the organisation, the nature of its activities, products and services and the location where and the conditions in which it functions i.e. legal requirements.

ISO 14001 does not include a requirement for the organisation to make its environmental performance available to the public. The ISO 14001 standard must be followed by third-party verification to obtain certification towards the standard.

ISO 19011

ISO 19011 is related to the ISO 9000 and 14000 series of standards as it provides guidance on the principles of auditing, managing audit programmes, conducting management system audits as well as guidance on the competence of the auditors. The guideline is applicable to the audit of quality and/or environmental management systems.

Focus in the standard is on the audit process and on the qualifications of the auditors. This includes rather comprehensive and specific requirements with regards to knowledge and skills in environmental aspects, science and technology.

ISO 30000 series

The ISO 30000 series includes (with six more planned):

- **ISO/PAS 30000:2008: Ships and marine technology - Ship recycling management systems - Specifications for management systems for safe and environmentally sound ship recycling facilities.** The standard specifies the requirements for a HSE management system for ship recycling facilities against which organisations are assessed if they want a certified HSE management system according to ISO 30000. The ISO/PAS 30000 is a new standard. The first version was published in spring 2008. It is only applicable to ship recycling facilities.
- **ISO/PAS 30003:2008: Ships and marine technology - Ship recycling management systems - Requirements for bodies providing audit and certification of ship recycling management.** The standard contains principles and requirements for bodies providing the audit and certification of ship recycling management systems.
- The six which are planned and under development:
 - ISO 30001 - Best practice for ship recycling facilities -Assessment and plans

- ISO 30002 - Guidelines for selection of ship recyclers (and pro forma contract)
- ISO 30004 - Guidelines for implementing ISO 30000
- ISO 30005 - Information control for hazardous materials in the manufacturing chain of shipbuilding and ship operations
- ISO 30006 - Illustration of the location of hazardous materials on-board ships
- ISO 30007 - Guideline for measures to prevent asbestos emission and exposure at ships recycling.

ISO 30000

ISO 30000 is a PAS (Publicly Available Specification). A PAS will be reviewed at least every three years to decide either to confirm the PAS for another three years, revise the PAS, process the PAS further to become either a technical specification or an International Standard, or to withdraw the PAS.

ISO/PAS 30000 specifies requirements for a management system to enable a ship recycling facility to develop and implement procedures, policies and objectives in order to be able to undertake safe and environmentally sound ship recycling operations. ISO 30000 applies to the recycling of all types and sizes of ships, in both international and domestic trade.

The standard has been developed in coordination with the IMO Convention and Guideline development and the standard is supposed to support and supplement the guidelines from the International Labour Organisation, the Basel Convention and the IMO Ship Recycling Convention. The standard is compatible with ISO 9001 (quality management systems) and ISO 14001.

The ISO 30000 is to a great extent similar to ISO 14001. The difference in general is a focus on the ship recycling industry and it comprises both the environmental and the health and safety issues.

The standard applies to the entire process from accepting a ship for recycling by the facility until recycling of materials and final disposal of the waste. This will include assessing the hazards onboard the ship, identifying and complying with any legal requirements for ships to be recycled, carrying out the recycling process in a safe and environmentally sound manner including storage and processing of materials and wastes from the ship, conducting the required training and carry out documentation controls for the entire process.

The ISO 30000 is defined for a ship recycling facility. The definition of a recycling facility is a defined area, site, yard or facility used for recycling of ships, including the organisation that manages it.

In the following the most significant differences to ISO 14001 are highlighted.

Policy

The requirements in the ISO/PAS 30000 are a bit more comprehensive with regards to the commitment of ensuring safe and environmentally sound recycling. The policy should:

- a) Ensure proper standards of safety throughout the operation of the facility
- b) Ensure environmentally sound recycling of ships and include a commitment to prevention of pollution.

No similar requirements are found in ISO 14001.

Planning

The planning section in ISO 30000 includes more specific requirements regarding the recycling aspects. The ones not included in ISO 14001 are mentioned below. The facility shall establish, implement and maintain procedures:

- a) to identify what hazardous materials, and other hazardous items the facility is able to recycle and the hazardous materials and other items the facility plans to be able to recycle
- b) to assess the ships planned to be recycled relative to the presence of these materials in association with the acceptance and import of such ships and the ability of the facility to recycle these materials
- c) to prepare and plan the recycling of ships, and have a system to enable planning and preparation to be done for each individual ship the facility intends to recycle.

The facility is thus required to identify the materials the facility is able to recycle and to accept ships for recycling on this basis.

Regarding the legal, statutory and other requirements, the ISO 30000 highlights that the legal requirements include: international requirements, national legislation and local requirements and it adds a requirement about communication of the legal requirements to employees, suppliers, contractors and other relevant parties.

With regards to setting objectives, targets and programs no significant differences are found.

Implementation and operation

In the section on Structure, Resources, Roles, Responsibility and Authority more emphasis is placed on ensuring that the responsibility and organisational structure is communicated to the relevant parties.

The responsibility of the management representative has been extended also to include:

- a) ensuring that the management system is effective in delivering safe and environmentally friendly ship recycling

- b) ensuring any required controls, certificates, consents, permissions and notifications are properly controlled and documented
- c) ensuring that the improvement goals are met in a timely manner or report to top management any discrepancies or possible delays.

In addition, it is emphasized that the responsibility for the performance regarding environment, occupational health and safety ultimately lies with the top management.

Competence training and awareness

The ISO 30000 highlights that the facility shall ensure that persons performing recycling duties as contracting, processing, dismantling, disposal, reuse etc. have the appropriate education and training and that the facility must keep records of this.

A considerable focus is directed towards awareness needs and training, and it is specified that training procedures shall take into account the different levels of responsibility, ability and literacy.

Regarding the section in ISO 30000 on Operational Control it is the most specific and do differ a great deal from the similar chapter in ISO 14001 taking into account the focus areas of the ship recycling industry. In the following the most significant requirements are listed:

- a) The facility shall identify the operations necessary to achieve:
 - proper planning and preparation, which shall include identification of hazards and materials onboard the ship and confirm that the facility can handle the types and volumes
 - safe and environmentally sound recycling, including procedures, equipment, organisations and resources for minimizing the risk of accidents or pollution
 - proper control of contractors and external organisations used for transport, recycling, reuse or disposal of wastes and materials.
- b) The facility shall establish, implement and maintain procedures for controlling exposure to hazardous materials and any other recycling aspects that may cause specific health hazards. These controls are to be systematic and shall include the following elements:
 - agreed reference levels for exposure to hazardous materials and other hazardous items
 - general assessment of exposure risk in the facility and risk assessment methodology
 - control procedures for the measurement, reduction, minimization and/or elimination of exposure risk.

- c) Procedures for operational control shall allow the basic workers rights, without prejudice or detriment to themselves:
- to inform the top management or their representatives or the competent authority about any hazards or risk to safety, health or environment
 - to appeal to the competent authority if they consider measures taken are inadequate or considered not to comply with relevant legislation
 - to remove themselves from danger when they have reasonable justification to believe that there is an imminent and serious risk to their safety and health, and to allow such concerns to be immediately communicated to management representatives
 - access to adequate medical treatment and compensation for occupational injuries and diseases
 - to refrain from operating equipment or machinery or entering into areas where they have not been properly trained or are not properly supervised by qualified staff.

With regards to the emergency preparedness and response section the ISO 30000 adds requirements for monitoring external information, e.g. weather forecast and for informing relevant stakeholders. Equally important, the organisation is required to establish and maintain a survey of possible and actual injuries in order to identify required immediate first aid, health facilities, training and appropriate medical care provisions.

The last sections of the standard include requirements regarding monitoring, evaluation, corrective and preventive actions, audit and management review. These sections more or less correspond to the similar chapters in ISO 14001.

ISO/PAS 30003

ISO/PAS 30003 specifies the minimum requirements for the bodies involved in the audit and certification of ship recycling facilities. The requirements include:

- Principles for certification bodies such as impartiality, competence, responsibility and openness
- Requirements regarding organisation, management, resources, competence of personnel and management, information, the audit process and management systems for the certification body.

The standard refers back to the ISO 19011 regarding the personal attributes, knowledge, skills and education of the auditor. The requirements of the ISO/PAS 30003 surprisingly do not include explicit requirements regarding knowledge and skills in environmental or occupational health and safety aspects for ship recycling facilities.

2.1.2 OHSAS 18000 series

The OHSAS 18000 series of standards includes two parts:

- OHSAS 18001: Occupational Health and Safety Management System Specifications
- OHSAS 18002: Occupational Health and Safety Management Systems Guidelines for the implementation of OHSAS 18001.

OHSAS 18001 grew out of the international success of, among others, the ISO 14000 series of standards and the need for managing safety in the work environment⁵. This standard was created from the British Standard for Occupational Health and Safety Management Systems BS 8800:1996.

Description

Similar to ISO 14001 and 9001, OHSAS is also a "generic management system standard" and follows the Plan Do Check Act methodology.

The standard is compatible to the above mentioned standards and is to a great extent similar to ISO 14001 except that the focus is on occupational health and safety (OH&S).

The OHSAS 18001 system applies to any organisation that wishes to:

- establish an OH&S management system to eliminate or minimize risk to employees and other interested parties who may be exposed to OH&S risks associated with their activities
- implement, maintain and continually improve an OH&S management system
- assure conformance with their stated OH&S policy
- demonstrate such conformance internally and externally
- seek certification/registration of the company's OH&S management system by an external organisation, or
- make a self-determination and declaration of conformance with the OHSAS specification.

2.2 European Scheme

2.2.1 Eco-Management and Audit Scheme (EMAS)

The EU Eco-Management and Audit Scheme (EMAS) is a management tool for companies and other organisations to assist them in evaluating, report and improve their environmental performance. The scheme has been available for participation by companies since 1995 (Council Regulation (EEC) No 1836/93 of 29 June 1993) and was originally restricted to companies in industrial sectors.

⁵ The ILO also has a standard entitled ILO-OSH 2001. The ILO Guidelines on occupational safety and health management systems (ILO-OSH 2001) were adopted at a tripartite Meeting of experts in April 2001. The ILO Governing Body has approved publication of the Guidelines.

Since 2001 EMAS has been open to all economic sectors including public and private services (Regulation (EC) No 761/2001 of the European Parliament and of the Council of 19 March 2001). At this point EMAS recognized ISO 14001 as equivalent to the environmental management system required by EMAS.

The mentioned revisions to EMAS made it easier for organisations already certified to ISO 14001 to attain EMAS registration. For these organisations there will be some minor modifications to be made relating to the core elements of ISO 14001 plus some additional steps specific to EMAS.

Additional steps for EMAS registration:

- 1 *Initial Environmental Review* - The EMAS regulation requires that an initial environmental review be performed to identify an organisation's environmental aspects. However, when an organisation already has an EMS certified to ISO 14001 it does not need to conduct a formal environmental review when moving on to EMAS implementation, as long as the environmental aspects (including both direct and indirect environmental impacts) set out in EMAS are fully considered in the certified environmental management system (EMS).
- 2 *Environmental Statement* - The organisation shall prepare an environmental statement, based on the outcome of the EMS performance audit. The environmental statement must openly report the environmental performance of the organisation.
- 3 *Verifying the Environmental Statement and environmental performance* - In order to attain EMAS registration, the Environmental Statement must be independently validated. This process will check that the statement meets the requirements of EMAS and is publicly available.

From the above description it is obvious that the EMAS requires more transparency of the registered organisation than ISO 14001. EMAS requires that the policy, program, environmental management system and details of the organisations' performance are made publicly available as part of the environmental statement. With Commission Recommendation of July 2003 (C(2003) 2253) the European Commission has recommended the use of a series of environmental performance indicators for the purpose of producing the EMSA required environmental statement.

EMAS specifies that organisations must attempt to "reduce environmental impacts to levels not exceeding these corresponding to economically viable application of best available technology". Therefore, it is easier from outside to control the actual performance of an EMAS organisation compared to one certified according to ISO 14001.

Participation under the EMAS scheme is voluntary. Until recently it was not possible for organisations in other countries outside the European Union and the European Economic Area (EEA) — Iceland, Liechtenstein, and Norway to be registered under the EMAS scheme. However, according to a new Commis-

sion proposal (SEC (2008) 2121) it is proposed to allow registration outside EU and to reinforce requirements for legal compliance and documentation of performance improvements. It is expected that the revised EMAS regulation will be adopted in 2009 and will enter into force at the beginning of 2010.

2.3 UN Conventions and guidelines

2.3.1 International Maritime Organisation (IMO) Conventions and guidelines

Existing IMO guidelines A.962

IMO's present Guidelines on Ship Recycling were adopted by Resolution A.962 in 2003 and are recommendatory. The guidelines include recommendations for the activities undertaken by the ship owner prior to the recycling, such as design and construction issues for new building, the development of green passport for new and existing vessels, and points at the ship owner's preparative efforts to reduce the risks to workers in the ship recycling facilities. This include pre-cleaning and labelling for hazardous materials, gas free for hot work and enclosed space certifications, and minimisation of cargo and storage residuals.

The base document was the Industry Code of Practice on Ship Recycling from the International Chamber of Shipping and for this reason there is little guidance to the recycling facilities except that it should be operating 'consistent with national legislation and relevant international conventions' - the latter being specified as the ILO and Basel Convention guidelines.

The primary impact of the existing IMO Guideline appears to be the green passport concept, which today is frequently included for new buildings. There are only few existing vessels that carry an inventory, but with the prospect of an international convent requiring an Inventory of Hazardous Materials onboard compliance with A.962 or the coming rules ship owners appear to be moving on the existing vessels marked also.

Draft IMO Convention on Safe and Environmentally Sound Recycling of Ships

At its 53rd session in July 2005, the Marine Environment Protection Committee (MEPC) under IMO agreed that the IMO should develop a new instrument on recycling of ships with a view to providing legally binding and globally applicable ship recycling regulations for international shipping and for recycling facilities.

MEPC 53 also agreed that the new IMO instrument on ship recycling should include regulations for the design, construction, operation and preparation of ships so as to facilitate safe and environmentally sound recycling, without compromising the safety and operational efficiency of ships; the operation of ship recycling facilities in a safe and environmentally sound manner; and the establishment of an appropriate enforcement mechanism for ship recycling (certification/reporting requirements).

The text of the International Convention for the Safe and Environmentally Sound Recycling of Ships and its guidelines are being drafted at the moment. The aim is to adopt the Convention in 2009.

The Convention takes a life cycle perspective of ships from design to recycling, with a view to avoiding hazardous materials in new ships and removing them from existing ships during their period of operation. It sets requirements for the ship owners and for the ship recycling facilities, including authorisation of the facilities as well as a reporting system.

The draft Convention (as of September 2008) includes an annex of regulations divided in four chapters. Chapter 1 contains general provisions. Chapter 2 contains requirements for ships, divided into three parts (Part A on design, construction, operation and maintenance of ships; Part B on preparation for ship recycling; and Part C on surveys and certification). Chapter 3 contains requirements for recycling facilities, while Chapter 4 contains reporting requirements. Presently there are two appendices, the first one being particularly important as it contains the list of hazardous materials which are controlled by the Convention, while the second appendix provides standard formats for relevant certificates and other documents.

A number of provisions are still to be agreed upon. One of these is Regulation 16*bis* which is left as a placeholder for 'Implementation'. This regulation is still on the floor in IMO and it was previously discussed to include voluntary systems such as business-to-business certifications as part of an implementation mechanism. Also, recently a detailing of the voluntary audit scheme of Parties was proposed⁶, or to address reporting of disposal of hazardous materials that could not be disposed in a manner required by the Convention⁷.

The draft guidelines on ship recycling

The draft Convention is accompanied by a number of guidelines and the following nine are currently foreseen:

General

- Guidelines for communication of information.

Guidelines for ships

- Guidelines for development of Inventory of hazardous materials.
- Guidelines for submission of a proposal to control hazardous materials.
- Guidelines for surveys and certification.
- Guidelines for inspection of ships.
- Guidelines for establishing gas-free-for-hot-work conditions.

Guidelines for ship recycling facilities

- Guidelines for authorization of ship recycling facilities.
- Guidelines for safe and environmentally sound ship recycling.
- Guidelines for development of a Ship Recycling Plan.

⁶ Submission to MEPC 58/3/11 by France

⁷ Submission to MEPC 58/3/12 by Bangladesh

The “Guidelines for Safe and Environmentally Sound Ship Recycling” addresses the ship recycling facilities – therefore often referred to as the Facility Guideline – and it is currently under development by a working group chaired by Japan. The draft guideline details the procedures to be implemented in the recycling facilities⁸ and it integrates safety, worker’s health and environmental issues in the ship recycling context. This is the IMO guideline typically referred to in the present text.

Whereas the Convention text itself does not address the methods of ship recycling, the draft guideline operates with four: dry dock, pier breaking, landing and beaching, the latter three referred to as ‘wet methods’. The guideline recommends a number of actions to be taken to fulfil the Convention’s ‘safe and environmentally sound management’ criteria. The draft guideline is comprehensive but generally attempts to summarise generic recommendations regarding worker’s safety and the environment and to leave the details to the presumed national legislation. With respect to the wet methods, in particular beaching, issues such as double containment, oil and oily water spill containment, secure mooring, and emergency response access remain unaddressed.

According to the work plan of the Intersessional working group it is the intention to submit the draft guidelines to MEPC 58 in October 2008 after trying to incorporate comments from as many stakeholders as possible⁹. It is the expectation that MEPC should aim at adopting the draft Facility Guidelines at MEPC 59 in July 2009.

The guidelines accompanying the Convention are technically not mandatory documents, but do carry substantial weight as they represent the IMO endorsed interpretation of the Convention itself.

One of the issues of particular importance for the present study is the requirement of the ship recycling facilities to be authorised. The mandatory authorisation is to be given after inspection by the Party or a responsible organisation to facilities managed in compliance with the national implementation of the Convention and its Guidelines.

The possibilities for the facilities, the ship owners and other stakeholders to assess and follow the performance of the ship recycling yard are prepared for in Regulation 19 of the draft Convention which states that a facility must have¹⁰:

- A system for (regular) monitoring of the performance of the ship recycling operations.

The issue of monitoring of the facilities is therefore addressed in the guideline item 2.4 based on a submission from the US regarding the Recycling Facility

⁸ Draft guidelines for safe and environmentally sound ship recycling. MEPC 56/3/4 and MEPC 56/3/5.

⁹ This deadline may have to be extended as a new proposal is not in the submissions to MEPC 58

¹⁰ Report to MEPC 57/3/WP.7

Management Plan. This aims 'to control, monitor and manage all activities required to the ship recycling operation and to ensure the compliance with the Convention'. The Guideline further states that the 'facility should review and monitor the requirements to achieve its target' although the development and anchoring of targets are not described.

Using existing management instruments such as ISO 14001, ISO 30000 or similar may provide a framework for such monitoring recommended in the IMO guideline.

2.3.2 International Labour Organisation (ILO) - Guidelines

At the 279th session of the ILO's Governing Body in November 2000, an agreement was endorsed stating that as a first step ILO should draw up a compendium of best practices adapted to local conditions leading to the preparation of a comprehensive code on occupational safety and health in ship breaking. In February 2001, ILO published the Issues Paper "Worker safety in the ship breaking industries" (ILO, 2001).

Based on this paper and other material, ILO released their Draft guidelines on safety and health in ship breaking, prior to a tripartite meeting of experts with selected Government, Employer and Worker delegates from Bangladesh, China, India, Pakistan and Turkey. The guidelines were endorsed at the tripartite meeting in October 2003 (ILO, 2003) and adopted by the General Body at its meeting in March 2004.

The guidelines are directed towards ship breakers and competent authorities aiming to assist in the implementation of the relevant provisions of ILO standards, codes of practice and guidelines on occupational safety and health and working conditions.

The objectives of the guidelines are to contribute to the protection of ship breaking workers from workplace hazards and to the elimination of work-related injuries, ill health, diseases, incidents and deaths. Further, they are to assist and facilitate the improved management of occupational safety and health issues in or about the workplace.

The ILO guidelines contain practical recommendations for national policies and principles on occupational safety and health and working conditions of persons employed in ship recycling facilities.

It also highlights the specific duties and responsibilities of employers, workers and contractors, and government authorities, in protecting ship recycling workers from work-related injuries and diseases, ill health, and incidents.

The guidelines are not legally binding, nor are they intended to replace national laws, regulations or accepted standards. The guidelines should be used as guidance to those engaged in framing national systems, procedures and enterprise regulations, where they do not exist. The practical use of the guidelines will

largely depend on local circumstances, the availability of financial resources, scale of operations and technical possibilities.

The guidelines are divided into two parts. Part I: National Framework and Part II: Safe Ship breaking operations.

Part I contains six chapters: 1: General provisions, 2: Industry characteristics, 3: General responsibility, duties and rights and legal framework, 4: OHS management, 5: Reporting, recording and notification of work-related injuries and diseases, ill health and incidents and 6: Occupational health services.

The primary task for the first part is to give general guidelines on how to establish effective national laws and regulations ensuring the safety and health of workers working in the ship recycling industry. It gives, among others, guidelines for formulating policy on OHS, nominating a competent authority; establish control mechanisms, ensuring enforcement of national OHS laws and regulations and specification of employment conditions. It gives guidelines for the general provisions for a national legal framework, describes the right and duties for workers and the responsibility of employers.

OHS management is seen as the way to ensure a systematic way of improving the OHS standard at a facility and chapter 4 gives guidelines to an occupational safety and health management system. Chapter 5 gives general guidelines for a system for reporting, recording and notifications of work related injuries. Chapter 6 describes the guidelines for the availability of health care service.

Part II of the document goes more into detail with the actual ship recycling operation. Part II includes the following chapters: 7: Operational planning, 8: General preventive and protective measures, 9: Management of hazardous substances, 10: Measures against physical hazards, 11: Measures against biological hazards, 12: Ergonomic and psychosocial hazards, 13: Safety requirements for tools, machines and equipment, 14: Competence and training, 15: Personal protective equipment and protective clothing, 16: Contingency and emergency preparedness, 17: Special protection and 18: Welfare.

The guideline is very comprehensive and reflects to a great extent the current requirements in most of the European countries regarding occupational health and safety. The guideline is thus a suitable tool, which shows the way for governments, competent bodies and employers and employees in the ship recycling industry.

2.3.3 The Basel Convention - Technical guidelines

The Conference of the Parties to the Basel Convention on the control of transboundary movement of hazardous wastes and their disposal (The Basel Convention) decided at their fifth meeting (COP 5) in December 1999 to address the subject of ship dismantling. The background for taking up this subject was recognition of the need for improving the current ship dismantling procedures and further, to manage the increasing volume of vessels to be disposed.

Following COP 5, the Technical Working Group (TWG) of the Basel Convention was instructed to initiate work of the development of Technical Guidelines for the Environmentally Sound Management for Full and Partial Dismantling of Ships. TWG was further instructed to include a list of hazardous wastes and substances under the Basel Convention applicable to ship dismantling. The TWG published their draft guidelines in April 2002 (TWG, 2002). The Guidelines were adopted on COP 6 in December 2002.

The guidelines focus on management of hazardous materials during the ship dismantling process and are aiming at providing guidance to countries, which have or wish to establish facilities for ship dismantling.

The guidelines provide information and recommendations on procedures, processes and practices that must be implemented to attain Environmentally Sound Management (ESM) at such facilities. Further, the guidelines provide advice on monitoring and verification on environmental performance. In the context of the Basel Convention ESM means "taking all practicable steps to ensure that hazardous wastes or other wastes are managed in a manner which will protect human health and the environment against the adverse effects which may result from such wastes".

The TWG guidelines are applicable to both existing and new dismantling facilities. The guidelines draw up a concept for a model ship recycling facility, to which existing facilities are to comply after going through a planned process of implementing the principles of ESM. Through this process, eventual gaps between the current practices at the facility and the model facility are identified and closed. The guidelines divide the necessary facility upgrading modifications into three groups depending on the size and complexity of the modification. The simplest modifications should be completed within one year, the more complex within five years and the largest and most complex within ten years. The modifications are subject to variations between facilities. New facilities are expected to comply with the model facility.

The guidelines describe the principles of ESM of ship dismantling and the current dismantling practises in the large breaking countries. Included in the first section of the guideline is a description of potential contaminants onboard a vessel for scrap and precautions to prevent release of these during recycling. Finally, the guidelines include a description of how to achieve ESM, including a description of how to perform the gap analysis for existing facilities aiming at ESM. The latter includes a generic checklist showing a path for upgrading of existing ship scrapping facilities.

A number of critical requirements in relation to allowing upgrade of existing scrapping facilities are included in the guidelines. These requirements include, among others, establishment of a number of physical facilities, i.e. a separate area for paint removal, a storm water discharge facility and a wastewater treatment facility. The most critical requirement is, however, the need for establishment of impermeable floors at the entire demolition area.

2.4 National legislation

2.4.1 Recycling in general

Recycling is in general regarded as a beneficial activity when it comes to addressing the sustainability of an industrial sector. This does however not imply that recycling is without its own pollution problems and the environmental management of the sector has been in the authorities' focus for some time.

As an example several countries operate specific approval schemes for the metal recycling sector, e.g. the Dutch and the Danish environmental management schemes for car recycling are based on approval of the individual scrap company's site and certification of their environmental management system.

Currently, several EU member states are scrutinizing the recycling of electronic equipment and in particular the links to an increasing export of electronic equipment for reuse in countries outside of the EU/OECD. The notion is that the equipment often has little or sometimes no life time left and may represent a *de facto* export of electronic waste to developing countries.

In Japan the materials and waste flows of the recycling sector has been analysed and guidance for improved management developed for several subsectors¹¹.

2.4.2 Recycling of ships

Recycling of ships is often governed by a great number of regulations due to the specific characteristics of the industry, including the fact that the activities take place on the border between land and sea where judicial boundaries often meet or overlap.

Several EU member states are developing management schemes specifically for a national ship recycling industry. Both the UK management strategy for ship recyclers and the efforts of the French government to recycle navy vessels locally under safe and environmentally sound conditions represent efforts to clarify and harmonise national regulation and regional/local responsibilities in this matter.

In the major ship recycling nations Bangladesh, India, Pakistan, China and Turkey the activity is seen as industrial, but not always is the legislative framework established or the law implemented. However, the recent years renewed focus on this industry with its many challenges regarding safety, worker's health, environmental problems and not the least very large foreign currency exchanges involved has generally caused governments to tighten control on ship recycling.

¹¹ Handbook on Resource Recycling Legislation and 3R Trends in 2003, Ministry of Economy, Trade and Industry, Japan

A few examples of the way national and local authorities regulate the industry are given in the following.

Turkey

The Turkish government has issued a number of regulations pertaining to ship breaking (table modified from Nezer et al. 2007). The central and local authorities have a permit and licensing programme specific for ship recycling industry. Recently, the authorities took steps to renew the permits only under more stringent measures.

Planning tool	Promoter	Implementation	Short description
Ship breaking Regulation	Maritime Under secretariat	The Ship breaking Zone Regulation have been promulgated by the Ministry of Transportation since 1970 with revisions in 1986, 1992 and the last revision was made in 2004 with the name "Ship breaking Regulation"	The controlling functions are performed in accordance with: <ul style="list-style-type: none"> • Regulation for Preventing Collision at Sea • Laws and regulations of the Ministry of Environment and Forestry • Regulation for fire fighting • Regulation for Occupational Safety and Health.
Labour Health and Work Safety Regulation	Ministry of Labour and Social Security	In force since 1974	
Hazardous Chemicals Regulation	Ministry of Environment	In force since 1993	
Control of Hazardous Wastes Regulation	Ministry of Environment	In force since 1995	This regulation has forbidden the import of all kinds of hazardous wastes. Starting from 2001, the entrance of all ships carrying asbestos and PCB to Turkish Ports was outlawed.
Basel Convention	Turkish government	In force since 1994	Ships containing substances such as asbestos or PCB's were accepted as hazardous wastes in 2004. Therefore, parties to the treaty shall not be able to send the ships to the countries of destination without the consent of the port state.

China

In China ship recycling is specifically regulated by the State Environmental Protection Administration under Marine Environment Management by 'Regulations of the People's Republic of China on the Environment Protection from the

Ship breaking' issued 18-05-1988¹². An industry standard 'Green ship recycling general regulation' was issued 1 June 2005¹³, and a 'Technical guideline for Pollution Prevention related to Ship breaking' should be available to all Chinese breakers through the industry organisation.

The Chinese authorities and the Chinese National Ship breaking Association have also carried out several awareness raising activities on the environmental and worker's safety management.

India

The beaching plots in Alang and their activities in the coastal marine zone are governed by a number of Indian laws. Several times courts have intervened in the management of Alang, but the recent ruling by the Indian Supreme Court in September 2007 appears to have been more effective than the previous ones in changing the industry. It required the authorities involved in regulating ship breaking to strengthen the policing of applicable rules, and the Court specifically mentioned a number of issues to be dealt with e.g.¹⁴:

- Renewed authorisation of recycling facilities
- Recycling Facility Management Plan and Ship recycling plan
- Company policy for adequate worker safety and the protection of human health and environment
- Certificates for gas free for hot work
- Hazardous materials management plans, incl. disposal facilities, and tracking of all hazardous waste during Preparation phase, Dismantling phase and Waste stream management.

The Supreme Court Ruling in 2007 aims at developing the framework for ship recycling foreseen in the draft IMO Ship Recycling Convention, including authorisation and certifications. However, the regulatory foundation for upgrading activities in Alang has been underway over the last decade. In 2000 the Gujarat Maritime Board thus issued Regulations for safety and welfare of workers as during cutting operation in ship-breaking yards and the environmental measures to be taken during ship breaking activities¹⁵ and the Guidelines for ship breaking activities by Gujarat Pollution Control Board aim at minimizing the pollution impact of ship breaking activities by fixing responsibility for several authorities of state government and the ship breaking association. Also, in 2003, specifically to target ships for recycling, the Indian Government issued an amendment to the Hazardous Wastes (Management and Handling) Rules,

¹² http://www.sepa.gov.cn/law/fg/xzhg/198805/t19880518_85214.htm

¹³ Code WB/T 1022-2005

¹⁴ Supreme Court Judgement Order. Indian Research Foundation for Science vs. Union of India and Anr 06/09/2007

¹⁵ Gujarat Maritime Board (prevention of fire and accidents for safety of workers and protection of environment during ship breaking activities) Regulation, 2000

1989¹⁶, adding to the List of Hazardous Wastes: ‘Cleaning, emptying and maintenance of petroleum oil storage tanks including ships’ and identifying:

- Oil-containing cargo residue, washing water and sludge
- Chemical-containing cargo residue and sludge
- Sludge and filters contaminated with oil, and
- Ballast water containing oil from ships.

While the effectiveness of the previous regulations may be questioned, the recent ruling appears to have had a greater impact. Contrary to the delegation from this EMSA study, delegations from IMO, IACS and ISRA have been able to visit yards in Alang recently, but technical assessment of the improvements have yet to be published.

2.5 Requirements for waste handling and disposal

2.5.1 EC Hazardous waste definition

Under European Community legislation hazardous waste is defined as “wastes featuring on a list to be drawn up in accordance with procedures laid down in Directive 75/442/EEC on the basis of Annexes I and II of Directive 91/689/EEC”. These wastes must have one or more of the properties listed in Annex III of the same Directive.

The most recent version of that list of hazardous waste is included in Commission Decision 2000/532/EC as last amended by Council Decision 2001/573/EC.

Ships often contain hazardous materials, which can endanger the environment if they are not managed in an environmentally sound way. These hazardous materials are listed as hazardous entries in the EU waste list included in Commission Decision 2000/532/EC as amended.

Annex V of the Waste Shipment Regulation is relevant when determining if a shipment of waste is subject to the ban in Article 16 of the Waste Shipment Regulation. Article 16 of the Regulation bans waste listed in Annex V if destined for recovery in countries where the OECD decision does not apply.

Table 2-1 below lists substances, which are likely to be found in relatively large amounts in ships for scrapping, and which are hazardous according to the above mentioned regulation. The substances in the table are based on the list of hazardous materials most often found in vessels prepared by the ICS as part of their 2001 ship recycling guidelines (ICS 2001). The table includes information of the hazardous properties of the compounds and if such exist, concentration limits for the hazardous compound. Further information on the Basel Conven-

¹⁶ The Gazette of India Extraordinary Part-II-Section-3-Sub-section (ii) Published by Authority No. 471 New Delhi, Friday, May 23, 2003

tion classification is included. For a number of substances concentration limits do not exist, e.g. substances dangerous to the environment.

It is the responsibility of the waste generator to classify his waste.

Table 2-1 Hazardous compounds to be identified at ships, classification of properties and their concentration limits in waste to be classified as hazardous (EC DG-ENV, 2007)

Substance	Classification of hazardous properties according to EU Hazardous Waste Classification	Description of concentration limits for hazardous waste	Basel Convention Hazard Class, Annex III	Basel Convention, Annex VIII
Halons	Depends on the type of halons: Carbontetrachloride: T, Carc3; Methylchloride: Fx	Yes if conc. > 3 %	H2	
Refrigerants such as R22/R12		Regulated acc. to 2037/2000	H2	
Fuel oil, diesel oil and gas oil	Carc. 3	Yes if conc.>1 %	H3	
Radioactive materials	Radioactive	Dependent on the type of radioactive material	H7	
Waste lead acid batteries	C (R35)	Yes if con. > 1 %	H8	A1160
Asbestos	Carc1	Yes if con. > 0.1 %	H11	A2050
PCB and PCT containing substances	Dangerous to the environment	Yes, if con. > 0.005 %	H11	A3180
Tin based anti-fouling coatings	Toxic and dangerous to the environment	T: if conc.> 3%	H12	A4030
Lubricating oils	Dependent on the type of oil but mainly Carc 2	Yes if con. >0.1 %	H12	A3020, A4060
Hydraulic Oils	Dependent on the type of oil but may be dangerous to the environment	No concentration limits	H12	A3020, A4060
Oil residues (sludge), oil water mixtures, waste oils, oil cont. waste	Dependent on the type of oil but may be dangerous to the environment	No concentration limits	H 12	
Polyvinyl Chloride	None	Not hazardous waste	H13	

2.5.2 General obligations stemming from Basel, Rotterdam and Stockholm Conventions

Hazardous substances are addressed in several international agreements. As an example, PCBs fall under the scope of three of the most important internationally legally binding instruments on chemicals and wastes:

- The Basel convention on the control of Transboundary Movement of Hazardous Waste and their Disposal
- The Rotterdam Convention on the Prior Informed consent Procedures for Certain Hazardous Chemicals and Pesticides in International Trade
- The Stockholm Convention on Persistent Organic Pollutants.

The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal is the one other global agreement, besides the Stockholm Convention, directly relevant to the application of best available techniques and best environmental practices to the control of chemicals listed in Annex C of the Stockholm Convention.

The Convention places obligations on countries that are Parties to, inter alia:

- Minimize generation of hazardous waste; ensure that adequate disposal facilities are available; and
- Ensure environmentally sound management of wastes.

Paragraph 2 of Article 6 of the Stockholm Convention, which addresses measures to reduce or eliminate releases from stockpiles and wastes, contains the following provisions: “The Conference of the Parties shall cooperate closely with the appropriate bodies of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal to, inter alia:

- Establish levels of destruction and irreversible transformation necessary to ensure that the characteristics of persistent organic pollutants are not exhibited
- Determine what they consider to be the methods that constitute environmentally sound disposal referred to above, and
- Work to establish, as appropriate, the concentration levels of the chemicals listed in Annexes A, B and C in order to define the low persistent organic pollutant content referred to in paragraph 1 (d) (ii).”¹⁷

¹⁷ Article 6, paragraph 1 (d) (ii) of the Stockholm Convention states that each party shall: “(d) Take appropriate measures so that such wastes, including products and articles upon becoming wastes, are ... (ii) Disposed of in such a way that the persistent organic pollutant content is destroyed or irreversibly transformed so that they do not exhibit the characteristics of persistent organic pollutants or otherwise disposed of in an environmentally sound manner when destruction or irreversible transformation does not represent the environmentally preferable option or the persistent organic pollutant content is low, taking into account international rules, standards, and guidelines, including those that may be developed pursuant to paragraph 2, and relevant global and regional regimes governing the management of hazardous wastes.”

2.5.3 Substance specific requirements

The Conference of the Parties to the Basel Convention, at its eighth meeting in December 2006 adopted updated general technical guidelines for the environmentally sound management of wastes consisting of, containing or contaminated with persistent organic pollutants and updated guidelines for the environmentally sound management of wastes consisting of, containing or contaminated with polychlorinated biphenyls, polychlorinated terphenyls or polybrominated biphenyls.

The general technical guidelines developed under the Basel Convention address matters related to all three of the outstanding definitional issues raised in paragraph 2 of Article 6 of the Stockholm Convention. In addition the eighth meeting of the Conference of the Parties to the Basel Convention also adopted the following three new specific technical guidelines:

- Technical guidelines for the environmentally sound management of wastes consisting of, containing or contaminated with the pesticides aldrin, chlordane, dieldrin, endrin, heptachlor, hexachlorobenzene, mirex or toxaphene or with hexachlorobenzene as an industrial chemical
- Technical guidelines for the environmentally sound management of wastes consisting of, containing or contaminated with 1, 1,1 trichloro-2,2 bis (chlorophenyl) ethane (DDT), and
- Technical guidelines for the environmentally sound management of wastes containing or contaminated with unintentionally produced polychlorinated dibenzo-pdioxins (PCDDs), polychlorinated dibenzofurans (PCDFs), and hexachlorobenzene or polychlorinated biphenyls (PCBs).

The "Technical guidelines for the environmentally sound management of the full and partial dismantling of ships", Basel Convention, 2002 includes a description of how to handle all the different kind of hazardous waste. Some of these are included below.

Asbestos

Asbestos is listed in Annex VIII (List A) of the Basel Convention. Thus asbestos should not be re-used or re-cycled. The potential health impacts associated with the use of asbestos are of such a severe nature that maximum precautions are necessary.

All asbestos containing materials (ACM) must be removed from a ship being scrapped before any activity that would disturb the materials is carried out. Properly labelled leak-tight containers with lids are required for the transport of asbestos from the extraction site to the disposal area. Typically, asbestos is disposed of in landfill (burying it in the ground).

PCB and Br- and Cl-compounds (e.g. ODS and flame retardants)

The Basel convention recommends disposing of PCB according to criteria set forth in Article 6 of the Stockholm Convention. The Stockholm Convention has recommended several techniques as Best Available Techniques, including in-

incineration¹⁸. For a detailed analysis of what represents best available techniques for waste incineration, reference should be made to the European Commission BAT Reference (BREF) Document on waste incineration (EC, 2006).

Therefore, the default requirement regarding disposal of PCBs is that PCB and other halogenated compounds (such as ozone depleting substances, ODS) must be destroyed according to BAT in such a way that no other persistent organic pollutants, e.g. dioxins, are generated e.g. by incineration. Under the Stockholm Convention, however, long term storage may be environmentally preferable under certain conditions.

Tributyl tin (TBT)

Tributyl tin (TBT) is an organometallic substance previously used in anti-fouling paints. Paint removal wastes (including contaminated or residues of solvents and sludges, solvent-contaminated rags, abrasive residues and paint chips) that are defined as hazardous waste, either by appearing on a defined hazardous waste list or by having hazardous waste characteristics (ignitable, corrosive, reactive or toxic), must be managed according to the national hazardous waste regulations.

According to the Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade Chemical Review Committee Third meeting Rome, 20–23 March 2007 on "Draft decision guidance document for tributyltin compounds" it is mentioned that EU and Canada do not recommend any special waste disposal technology. However in the text it is said: "In all cases, (TBT) waste should be disposed of in accordance with the provisions of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, any guidelines there under and any other relevant regional agreements". Further is stated: "It should be noted that the recommended disposal and destruction methods are often not available in, or suitable for, all countries, e.g., high temperature incinerators may not be available. Consideration should be given to the use of alternative destruction technologies".

The requirements regarding disposal of TBT do not point to a particular method, but can be interpreted as a "soft" recommendation of high temperature incineration.

Metals and inorganic substances

The metals and inorganics included on the IMO draft Convention's list of hazardous substances include mercury, lead, cadmium and chromium and their compounds. These also comprise a substantial part of the Basel Convention annexes and are the subject of various international agreements such as the UNECE. The EU has directives specifically addressing mercury, lead and cadmium. The disposal practises recommended for inorganics including most heavy metals are landfilling in special disposal sites.

¹⁸ Revised Draft Guidelines on Best Available Techniques and Provisional Guidance on Best Environmental Practices Relevant to Article 5 and Annex C of the Stockholm Convention on Persistent Organic Pollutants, 2006.

2.5.4 OECD Guidance

OECD has submitted a "Guidance Manual on Environmentally Sound Management of Waste", 2007. In that manual OECD defines that all materials that fall under the Environmental Sound Management (ESM) Recommendation are those defined as "waste" in the OECD context (i.e. all materials, substances and objects destined for the disposal or recovery operations). The OECD ESM rules are similar to the approach of the Basel Convention and the EU-IPPC and BAT rules, but do not include special guidelines on how to deal with the wastes.

2.6 Gaps and benefits of existing standards and schemes

The above descriptions of existing management standards, schemes, requirements and practices have revealed a number of gaps and benefits, which are important to keep in mind when evaluating a certified facility and which do form valuable input to the design of the framework European IMS system.

The ISO 14001 standard and to a lesser extent the OHSAS 18001 standard are already being used in the ship scrapping business with recycling yards being certified according to the standards. Thus focus in the following sections is on these two standards together with the IMO draft Convention and the new ISO 30000 series.

The main conclusions from the gap-analysis have been depicted in a table showing the differences and overlaps between the different systems, see Appendix C.

System scope and coverage

First of all, it is important to bear in mind the coverage of the different management standards. EMAS and ISO 14001 are environmental management standards whereas OHSAS 18001 is an occupational health and safety standard. Accreditation/certification towards EMAS/ISO 14001 does therefore not include requirements on proper management of the working environment for workers at the site and vice versa for OHSAS 18001.

Any improved system should address this and both the IMO guidelines and the new ISO 30000 **integrate environment, health and safety.**

Another very important issue is the fact that both ISO 14001 and OHSAS 18001 allow for an organisation to certify only part of its activities. Because of this, a firm can choose to bring only a part of its enterprise and business activities under the regime of the standard, thereby leaving processes that are more difficult to manage and improve from an environmental or health perspective outside the scope of its certificates. Such proceedings can lead to serious misunderstandings about the value of the environmental management system. Therefore it is not enough to check if an organisation is certified according to these standards. It is also necessary to check the actual certificate to see which part of the organisation is covered, and possibly to check the documents behind to fully understand the scope of the certification. This information is, however,

typically available only at the company's discretion as the standards (except EMAS) do not require the certificate, policy etc. to be publically available. Any new system should ensure stakeholder **access to the information** on the system.

The ISO 30000 system comprises the facility as a defined area, site or yard. The management system has to cover all the facility's recycling aspects and all activities that it can control or influence. The latter also include the identified significant aspects with regards to transport, storing, processing, re-using, recycling, trading or disposing of wastes or materials from the facility. The ISO 30000 is more specific than ISO 14001 on what parts to be included in the system, but the general intention seems to be the same.

Procedural vs. performance

All standards are procedural as opposed to performance standards. Therefore, certification against one of the standards by itself does not guarantee a high level of performance. Being a procedural standard means that the standards' requirements are referring to the organisation's management system (procedures etc.) and not the level of performance. The minimum requirement of an ISO 14001 certified organisation is legal compliance to environmental regulations and continuous improvement. The speed and scope of the improvements is however up to the organisation itself. Any improved management system should ensure a certain minimum **performance** of the facilities.

EMAS requires that the policy, programme, environmental management system and details of the organisation's performance are made publicly available as part of the environmental statement. Further the statement has to be verified by an external third part certified auditor. Therefore it is always possible to control the environmental performance of an EMAS registered company.

As ISO 14001 and OHSAS 18001, the ISO 30000 standard can be seen as a procedural standard and it does only set a few specific standards for performance within operational control. The minimum level is, as for ISO 14001 and OHSAS 18001, compliance with the valid legal requirements.

System (legal) basis

The above mentioned requirement of the standards about the regulatory compliance is another important issue when evaluating their applicability towards ensuring sound environmental management within ship scrapping businesses.

Many of the large ship scrapping businesses are located in parts of the world where the HSE legislation and regulatory framework are not fully developed, which means that HSE regulatory compliance of a certified company in for instance Asia can easily allow for HSE performance, which would be unacceptable according to European legislative requirements.

Sector specific systems and requirements to certifying body

Except for the new ISO 30000 series all the existing standards are generic and are thus not designed specifically to ship scrapping industries. Therefore the focus of these standards is not automatically on topics relevant for this industry

with regards to health, safety and environment. This fact put requirements on sector specific knowledge and expertise on the entity that develops and certifies the management systems as to ensure that all relevant issues are covered.

With regards to a third party certification of the management systems it is crucial that certification is regarded as reliable and credible in order to maintain confidence in the system. The certification should thus be provided in a professional and technically impeccable way.

Two ISO documents specify the guidelines of how to carry out audit and by whom; ISO/PAS 30003 and ISO 19011. ISO/PAS 30000 specifies requirements whereas ISO 19011 specifies guidelines. The ISO/PAS 30003 is focused on the requirements regarding the certifying body with regards to the structure of the organisation, the resources, information and the audit process. ISO 19011 is more focused on the audit process and the competence of the auditors. The ISO/PAS 30003 do not contain very specific requirements for the environmental competencies of the auditor and no explicit requirements for the health and safety competencies of the auditor are found in the 30003 standard.

Relevant HSE competencies of the auditor certifying the IMS are very important to ensure the quality and adequacy of the IMS.

2.7 Conclusion

Generally, the conclusion is that a management system certified towards one of the existing standards is valuable, as it sets the framework for an organisation's environmental or health and safety work, but it does not guarantee a certain level of performance except from local legal compliance. With regards to the ship recycling facilities, ISO 30000 will ensure a more focused management system and a higher performance level with regards to health, safety and environment than any of the other standards mentioned.

The IMO Convention and its associated Guideline will undoubtedly, once in force, provide a new shape to ship recycling both the activities performed on-board on behalf of the ship owners and to the actual dismantling, reuse and disposal carried out at the recycling yards. When the Parties' authorisation processes for yards are implementing the full Convention and the applicable national legislations on safety, health and environment are fully adhered to, work and environmental conditions in the yards will have been improved.

International conventions do have a history of sometimes relatively slow implementation into national legislations and it could be a concern also for this Convention. A scenario could be that Parties do not yet have the necessary legislation in place, but may be placed under significant local pressure to authorise ship recycling facilities in order to ensure their commercial viability.

In summary, an improved system for ensuring appropriate conditions regarding safety, health and environment practises in ship recycling facilities must address:

- Integrated safety, health and environment procedures
- Pre-dismantling activities, dismantling, transport, storing, processing, re-using, recycling, trading or disposing of wastes or materials from the facility
- Monitoring of key performance indicators related to the above
- Transparency through publicly available policies and reporting of indicators
- How and by which third party auditing should be performed.

The new IMO guidelines and ISO standard¹⁹ do not cover all these aspects in full and in addition to these coming management systems are proposed in the following.

¹⁹ A summary of the most significant differences between IMO and ISO can be seen in Appendix to the ISO PAS 30000.

3 Industry initiatives, experiences and expectations

Besides the existing international standards and guidelines as described in the previous chapter a number of industry initiatives towards improved HSE performance have been taken. The experiences from these initiatives are described in the following chapter together with the expectations from the industry to a European IMS.

3.1 International Ship Recycling Association

One of the recent developments in the green ship recycling area was the formation in 2007 of the International Ship Recycling Association (ISRA), which promotes better ship recycling:

According to ISRA they: ‘will strive to promote the exchange of knowledge, experience, ideas, new developments and training programmes, as well as to help create a worldwide ship dismantling industry operating to a high environmentally-sound and technical level. To this end, members must agree to have their yards certified to the latest standards’.

The members are two yards in China, six in Turkey, a Dutch and a US facility, together with the Ship Breakers Association of Turkey²⁰.

The criteria for members of ISRA are since 31st March 2008 available on ISRA home page and comprise the main Standards for Members²¹ and an Annex with the Additional Requirements for ISRA A members²². ISRA has not established requirements for other types of memberships.

²⁰ Chine Jiang Xiajiang Changjiang Shiprepair Yard; Zhongxin Ship Recycling & Steel Co. (both from China); OGe Gemi Sokum, Cemas Celik, Leyal Ship Recycling, Adem Simsek & Simsekler Group, Demtas and Dortel Ship Recycling Limited & Co. (all from Turkey); Sparrows Point Shipyard (USA); and Scheepsloperij Nederland BV (the Netherlands).

²¹ ISRA STANDARDS FOR A MEMBERS <http://www.isra-dis.com/documents/ISRA%20STANDARDS%20April%2016th%202008.pdf>

²² ISRA ADDITIONAL REQUIREMENTS FOR ISRA A MEMBERS. <http://www.isra-dis.com/documents/ISRA%20additional%20requirements%20April%2016th%202008.pdf>

It is worth noticing that clause A.4. requires A members to be certified according to the Association's standards, which in clause A.2. and A.3. include reference to the requirements in IMO, ILO and Basel Convention Guidelines (on ship recycling). The Association's rules insist on the availability and use of:

- secure mooring conditions
- protective barriers surrounding the vessel
- controlled removal of dismantled parts
- proper collection and disposal of hazardous waste
- access to the vessel by emergency vehicles
- fire prevention and emergency response
- personal protective equipment
- training of personnel.

The ISRA does not point to any particular certification mechanism. .

3.2 Shipping Industry Associations

The industry code of practise published by International Chamber of Shipping (ICS) in 2001 encouraged the shipping and recycling industry to take notice of the available guidelines and as special recommendations develop the inventories of potentially hazardous materials and provide gas free for hot works certificates. Already here, the industry wishes to '....encourage those administrations with responsibilities for recycling yards to consider introducing a "Certificate of Approval" for yards meeting acceptable worker safety and environmental control standards...?'

ICS also chairs the Inter-Industry Working Group on ship recycling which is co-ordinating the industry's position on the development of the draft Convention, and the measures that may need to be taken by industry on a voluntary basis in the period before the Convention comes into force. ICS and International Shipping Federation (ISF) state in their recent Annual Review 2007 that it is considered to be of assistance to the industry if a system of approval of ship recycling yards could be made available to the industry, for example as an action of the European Union.

In July 2007, the Working Group on Ship Recycling (International Chamber of Shipping, BIMCO, International Association of Classification Societies, Intercargo, Intertanko, International Parcel Tankers Association, Oil Companies International Marine Forum) launched an initiative to promote the safe and environmentally sound recycling of end-of-life ships called "Interim Measures"

which outlines five principles for ship owners to follow when selling ships at the end of their working life²³:

- **Yard Selection**
When selling ships for recycling, owners are encouraged to select only those yards which have stated they are willing to undertake operations compatible with the measures recommended in the Interim Measures document
- **Inventory of Hazardous Materials**
Owners are encouraged to complete part 1 of the Inventory of Hazardous Materials for all ships in their fleet and to complete parts 2 and 3 during sales and prior to delivery to the ship recycling facility
- **Gas Freeing**
As a precaution against explosions during the recycling process owners should ensure that Gas-Free-For-Hot-Work provisions are included in their contract of sale and, to the extent possible, that the recycling facility to which they are selling the ship conducts gas-freeing in its operations
- **Ship Recycling Plan**
Owners are encouraged to provide the ship recycling facility with as much information as possible, in particular an inventory of hazardous materials, to facilitate the development of the ship recycling plan
- **Reporting to Flag State**
As soon as possible after the delivery of the ship to the recycling yard, owners are encouraged to inform their Flag Administration that they have taken steps in accordance with these recommendations and to request appropriate acknowledgement.

According to ICS/ISF Annual Review 2008 more detailed guidance material to support these Interim Measures will be developed for publication in due course.

3.3 Sustainability certifications

Mechanisms to demonstrate sustainability or eco-labelling systems exist on national, regional and global basis for services and products, but presently none are aimed at ship recycling. It should be noted that “eco-labels” or “green labels” in the common meaning are not necessarily only concerned with nature and ecology, but often include social and safety aspects.

Well known European eco-labels backed by (inter-)governmental organisations include the EU Flower, the Nordic Swan and the German Blue Angel, but a wider range of EU member states and regions have developed such labels²⁴. The labels are typically aimed at allowing an informed choice within a group of

²³ Interim measures for ship owners intending to sell ships for recycling (2007) Developed by the industry working group on ship recycling.

Accessed on <http://www.marisec.org/recycling/>

²⁴ See http://ec.europa.eu/environment/ecolabel/other/int_ecolabel_en.htm

consumer products, but the mechanisms also include green procurement and business to business services. Eco-labels are available in many other countries including Australia, Brazil, Canada, India, Japan, Korea, New Zealand, Singapore and USA.

Early eco-labels often emerged from the activist NGOs, but in recent years authorities and business associations have developed green labels in collaboration with the NGOs. Some typical examples of private consumer eco-labels are FSC (Forest Stewardship Council), MSC (Marine Stewardship Council) and Fair-trade, but schemes borne out of requirements from the business community also exist. For instance the Oil Companies International Marine Forum (OCIMF) operates a best practice guide for its members under the name Tanker Management and Self Assessment (TMSA) and this includes key performance indicators on management, safety and environment.

Some systems are organised as "clubs" with certain membership criteria allowing companies to join that pledges to fulfil the criteria such as Global Compact, while others as organisations bestow their label to particular products or services such as the aforementioned European labels.

3.4 Green Award

An example of a non-governmental certificate from the shipping industry is the Green Award. The Green Award Foundation is an independent foundation originally established in 1994 in the Netherlands to improve the environmental management and performance of tankers and bulk carriers. The certificate is awarded after a survey to the individual vessel and the idea was, and is, that the Green Award helps ship owners and vessels to distinguish themselves in the market. In the Green Award organisation's own words: 'Experience shows that customers and service providers value this opportunity to work with Green Award vessels. This can lead to a strong starting point in negotiations with insurers, but also to a position as preferred supplier for shippers who value a high quality image.'

The cost of the Green Award is carried by the ship owners and in addition to the presumably improved market position they enjoy a range of benefits, e.g. premium incentives based on port dues, pilot tariffs and reception facilities fees. The EMAS, ISO and OHSAS certification systems are not eco-labels as such although many companies combine these management systems with performance indicators related to the company policy and thereby in reality develop their own eco-label.

3.5 Practical experience from HSE implementation in China and Bangladesh

The most extensive experiences from introducing HSE procedures at Asian ship recycling facilities stem from the private initiative of the shipping company P&O Nedlloyd (now part of Maersk Line) in China and the International

Labour Organisation, ILO SAFEREC project in Bangladesh. Experiences from these two initiatives are referred below.

Further, it is recognized that the Gujarat Maritime Board, which is the managing authority of the shipbreaking on Alang Beach, has initiated a number of upgrading activities over the last five years. This includes training facilities for workers and the support to ISO 14001 and OSHA 18001 certifications of more than 20 recycling yards in Alang. Also, the Gujarat Pollution Control Board has provided access to a Treatment, Storage and Disposal Facility (TSDF) for hazardous waste from the ship breaking activities.

The upgrade of the Turkish facilities in Aliaga should also be mentioned. Here the Turkish Shipbreaker's Association has provided collection and storage facilities for hazardous waste, and local authorities have intensified the monitoring of safety, health and environmental issues in the yards.

3.5.1 P&O Nedlloyd recycling project in China

During the first two years of this millennium P&O Nedlloyd (P&ONL) recycled 19 vessels at two Chinese facilities, Changjiang Ship breaking Yard in Jiangyin, and Shanghai Xinhua Iron and Steel Co. Chongming Island, Shanghai. During that time – until May 2003 – a system was developed based on the practical experience gained and adapted on a training-on-the-job system.

The basic set-up for the project as perceived by the P&ONL management was to persuade the recycling yards and the Chinese authorities to adapt their working practices to avoid the inherent health, safety and environmental problems associated with the deconstruction of the vessels.

The first two vessels functioned as a pilot project and were recycled at the Jiangyin facility. During this pilot period, a number of employees were subjected to a short practical training course, set up by the shipping line together with the recycling yard. Safety equipment, a mobile decontamination unit and supervision by P&ONL was supplied and an elementary training course developed.

During the subsequent recycling of further 17 vessels, a superintendent from the shipping line together with a local Chinese employee from the Shanghai office were stationed at the recycling yards to oversee the recycling works.

Initially the recycling operations to be carried out were reviewed with the ship yard management and, during the course of time, a modus operandi developed. This meant that, for each vessel due to be delivered for recycling, the crew on board was asked to try to deliver the vessel with the least possible equipment, fuel, spare parts and food stores on board at the time of delivery of course without hampering the safe and international maritime requirements.

Prior to delivery of the vessel, P&ONL had every vessel surveyed by an expert on asbestos, a full radiation survey was carried out and the crew was instructed

to do the maximum possible to deliver the vessel with most tanks and spaces not needed for safe operation clean and gas-free.

During this period of recycling ships both the personnel of the recycling yards, the local on-the-ground P&ONL staff and the P&ONL management in Europe developed a manual to be used for future recycling of vessels due to be taken out of service. The resulting manual, Ship Recycling Standard Operating Procedures, is an internal document which is not available for external use without prior permission from the current owner of P&ONL, i.e. Maersk.

The manual was developed in a stage-by-stage manner, taking into account the steps that needed to be undertaken for changes in methods employed to be accepted. One major issue was apparent fairly soon after inception of the delivery of the first vessels: that changes would have to be undertaken in small steps in order to be able to be accepted by the employees.

P&ONL introduced an effective system of having the yards comply with the regulations they wished to be followed during the recycling of their vessels. By returning a small percentage of the purchase price in stages, it was possible to enforce the procedures the company should adhere to during the deconstruction process.

In summing up the practical experiences from the P&ONL China project, it shows that:

- Introducing a ship recycling plan would be a good way forward, but the experience so far teaches us that the yards are not yet in a position where this can be put into practice. In order to succeed, the “green passport” which a ship should have prior to being delivered to a recycling yard, is necessary document
- Most yards have some kind of recycling procedure, but one that can hardly be influenced by input from “outside” without some kind of incentive being used
- The stage of having an integrated management system in place is still far from possible. This stage may be feasible once the ship recycling plan and recycling procedures are fully accepted and in use in most yards.

Information received after the project seems to indicate that there are now more acceptances for introducing improvements at more Chinese yards.

3.5.2 ILO Bangladesh Project

In comparison to the Chinese yards the Bangladeshi facilities as experienced through the ILO SAFEREC (Safe and Environmentally Friendly Ship Recycling) project suggests that the Bangladeshi business community is not yet ready to take responsible part in the upgrade process for ship recycling procedures.

The project was a result of a workshop held in March 2001 at Chittagong, which was arranged by the Bangladesh ILO office and had present representatives of the major stakeholders within ship recycling in Bangladesh, including various Bangladeshi governmental departments, the Bangladesh Shipbreakers Association (BSBA), UNDP, various NGO's as well as local legal entities and representatives of workers' associations.

The project was planned as a three year project and commenced in February 2006. The project was aimed at:

- Ensuring proper and safe occupational working conditions
- Improving workers' health and welfare
- Raising awareness about and limiting as far as possible the environmental impact of the recycling activities, and
- Developing National Ship Recycling Guidelines.

Early in 2006 the project was able to begin the actual training of workers. Five senior staff members from each yard were designated and received safety training so as to form a training cell. All yards participated in this issue. Following this a schedule was drawn-up, whereby a number of workers per yard were allocated to attend a one-day OHS training course.

During November 2006 running of the project was handed over to the local staff, who continued the training sessions until December 2007 when the project ended. The achievements at the end of the project included:

- A clear picture of the working and living conditions of those employed in ship recycling in Bangladesh
- A practical training course specifically intended for illiterate workers (developed and frequently held)
- More than 6,500 employees followed the basic safety training course, and
- Although not quantifiable, yard owners reported a significant drop in the accident rate at the yards where workers had followed the OSH training.

For a series of reasons some of the project objectives were unfortunately not met:

- No National Guidelines were developed
- Less than 25% of the employees followed a basic OSH course (there are approx. 25,000 to 30,000 employees working at the yards)
- Working practices were not substantially improved
- The environmental aspect of the project was almost a non-issue, and
- The attempt to have records of incidents kept at the yards was not accepted.

Some of the learnings from the project were that it is very important to get the local ship breaking association involved from the start to get them to take ownership of the project. Further, the regulatory set-up in Bangladesh made it difficult with several different ministries involved and not one ministry or department had the overall authority. That made it difficult to make and enforce tough decisions.

3.6 Expectations from the recycling industry

As an input to the basis for a European IMS for ship recycling facilities, a survey has been performed amongst authorities, organisations and companies within the recycling industry to study the attitudes and expectations within the industry to such future IMS.

3.6.1 Procedure

The survey was performed by use of a web-based questionnaire using the internet survey tool TricTrac. It included a total of 73 authorities/organisations/companies distributed along the five groups:

- 1 Maritime authorities
- 2 Environmental authorities
- 3 Ship-owners
- 4 Ship-recyclers, and
- 5 NGO's towards ship recycling.

The questionnaire was split into six topics:

- 1 Existing conditions and legislation
- 2 Scope of certification system
- 3 Responsibilities of ship-owners and recyclers
- 4 Procedure and performance standards
- 5 Certification and indicators, and
- 6 Public information on performance.

Topic 1 was answered only by environmental and maritime authorities. Topics 2-6 were answered by all. The questionnaire included room for the respondents to elaborate to their responses.

The questionnaire was sent to the respondents via e-mail including a dedicated link to the Internet questionnaire and an introductory text. Following contacts to some of the respondents, the questionnaire was faxed/e-mailed in a scanned version to the respondents, who in some cases returned the filled-in questionnaire in a hard copy version. These hard-copy answers were then entered in the electronic questionnaire database.

After the stipulated time-frame for completion of the questionnaire, reminder e-mails or faxes were sent twice to respondents from which responses had not been received.

Details on the survey, including the list of invited respondents and the questionnaire text can be found in Appendix A.

3.6.2 Results

Of the invited 73 respondents 16 responded, which corresponds to a response rate 21%. This is a fairly low rate but is to be expected from this kind of approach. Table 3-1 below includes the total number of invited respondents within the five groups and the response rate within each group.

Table 3-1 Total number of invited respondents within each group and the obtained response rate

Respondent group	Total invited number	Response rate, %
Maritime authorities	17	18
Environmental authorities	27	15
Ship-owners	18	39
Ship-recyclers	9	22
NGO's	2	0

With 16 respondents, it has not been possible to provide statistically sound inferences from the data. However, more qualitative inferences on trends and tendencies can be established.

Below is presented the results of the survey for each of the six topics. The detailed results are shown in Appendix A.

Existing conditions and legislation

Six nations responded to this survey part, which reveals information about present conditions and legislation in these countries. This part was included in the survey for “setting the scene” and is not relevant as input for the proposed European IMS. Please refer to Appendix A for the results of the answers.

Scope of certification system

Most respondents agree to the statement “All ship recycling facilities should reach the same level of compliance by entry into force of the IMO Ship Recycling Convention (SRC)”. The only respondents that do not agree are 3 out of 7 ship-owners associations. In several instances, these associations elaborated on their responses. Some of these elaborations are shown below:

- "Some yards are dedicated to military vessels or non commercial vessels and can accordingly not be treated equally."

- "The aim of the Convention is not that all facilities reach the same level of compliance under the new regime. The minimum standards set up by the Convention will apply to the facilities, taking into account that different facilities may have different capacities in terms of the vessels they are able to recycle.

However, we do not agree with the example quoted in Q 16. Handling hazardous materials is a core element of ship recycling and it is difficult to envisage that a recycling yard would not handle asbestos. Limitation of approval should relate to the physical capacities of the facilities (not all the installations of a facilities may be approved; or the facility may not be able to handle ships of a certain size).

This being said, limited approval is a pragmatic solution, which will also make ratification and implementation much easier than if the Convention would envisage a "one size fits all" approach."

Most respondents agree to the statement "Ship recycling facilities can opt for limited approval if they do not have all needed facilities in place (e.g. no asbestos containing ships if procedures and equipment are inadequate)". The respondents that disagree (and which were not quoted above) provided the following elaborations:

- "In order to create a level playing field among ship recyclers, at least a minimum level of compliance should be set."
- "If the new legislation will accept certain loopholes, the industry will take advantage of this and we will end up with Asian practices. New legislation should be equal worldwide so a level playing field is created!"

Five respondents have no strong opinion on the statement: "On the same grounds limits in certification should be possible and available for enquiries above". Just two respondents disagree. The elaborations of these two respondents have already been quoted above.

Responsibilities of ship-owners and recyclers

All but one respondent agree to the statement "The Green Passport (GP) or Inventory of Hazardous Materials (IHM) should be updated regularly under the same owner and updated upon sale?". The one respondent that does not agree (ship-owners association) has provided no elaboration of the motives for disagreeing.

More than a third of the respondents have no strong opinion on the statement: "The GP/IHM should be approved by a third party before the development of the Ship Recycling Plan (SRP)" above. Four respondents disagree, amongst them three ship-owners associations and one ship recycler. The respondents that disagree have provided the following elaborations on the answers:

- SRP should be submitted for approval to a Party competent authority but no need for availability to the public (to gain time and stop unnecessary speculations) (Ship recycler).
- It must be noted that it is practically impossible to provide Annex II and III of the Inventory for the SRP: they refer to (more limited) operational wastes

linked among other to the final voyage and the SRP take place before the final voyage. This is why a control is made by the flag State (based on the final survey) (Shipowner).

More than a third of the respondents have no strong opinion on the statement: "The SRP's should be submitted for approval to a Party competent authority and be available to the public" above. Two respondents disagree. These respondents have provided the following elaborations to their responses:

- "It is not approval as such that is required, but the opportunity for the CA to inspect the SRP in due time, and check that it is consistent with the capabilities and permit of the Ship Recycling facility." (Env. Authority)

Although most respondents agreed to the statements in this section, some nonetheless saw a need to elaborate on their affirmative answers. These responses can be seen in Appendix A.

Procedure and performance standards

Almost a third of the respondents (5) disagree with the statement: "The IMO Convention and Guidelines are sufficient to ensure the practical implementation of the Convention".

The ISO 30000 procedural standard on Ship Recycling, presently under development, or other international standards will assist ship recycling nations in the implementation of the SRC Recycling Plan (SRP)". Remarkably, most respondents have no strong opinion on this statement

Most respondents disagree to the statement: "National standards of ship recycling nations are sufficient to ensure an implementation of the SRC". Only one respondent (an environmental authority) agrees. The respondents that disagree made no further elaborations.

One of the respondents that were generally in agreement with the statements in this section provided the following elaboration:

- "For the ISO 3000, there is a need to avoid that this forum works on its own, without consultation with stakeholders. The risk would otherwise be that a paperwork procedure would be set up rather than an improvement procedure.
For national standards, there is a crucial need to have a realistic approach, to foreseen a transitional period (to meet the western standards) and make the best of it." (Shipowner).

Certification and indicators

The first statement in this section: "Certification is a way to achieve market recognition of the efforts made to improve management of occupational health, safety and environment in ship recycling" was met with unanimous agreement.

There is also close to unanimous agreement to the statement: "Certification is a way to track the performance of the ship recycling facility regarding management of occupational health, safety and environment". Only one respondent disagrees.

Again, there is close to unanimous agreement to the statement: "The performance of the ship recycling facility from year to year should be measurable". Only one respondent disagrees and provides the following elaboration:

- "The performance of the ship recycling facility should possibly be monitored one or several times during the accreditation period of 5 years (for instance)". (Ship owner)

Agreement to the statement: "The performance of the ship recycling facility from year to year should be benchmarked against indicators on occupational health, safety and environment" is close to unanimous. There is also almost unanimous agreement to the statement: "The performance of the ship recycling facilities should allow the seller of a vessel to benchmark facilities against indicators on occupational health, safety and environment".

Although the agreement on the statements in this section is close to unanimous, several respondents have provided elaborations. Examples of these are:

- "It should be emphasized that certification is not a goal in its self. So a certified ship recycling facility must be audited in a certain time frame. This can be once a year or once every second year. Benchmark is not necessary." (Env. Authority)
- "We agree with the above statements, provided that certification is made by the recycling facilities' competent authorities, and in accordance with the Convention's provisions.
Dissemination of information relating to recycling facilities' performance will assist ship owners selling end of life ships in taking the appropriate decision.
On the other hand, we would be reluctant if a certification scheme was developed at regional level, whereby ship owners would be required to use facilities certified under that scheme. Any other certification scheme can only play an indicative role." (ship owner)
- "Vessel owners should take the performances of facilities on health, safety and environment into account when selling their ships". (Recycler)
- "The certification of recycling facilities by their competent authorities in accordance with the Convention, and the dissemination of relevant information in the public domain will assist ship-owners selling end of life ships in fulfilling their obligations" (ship owner).

Public information on performance

To the statement: "Indicators of performance on occupational health, safety and environment issues should be submitted to the Party's competent authorities" the agreement is unanimous. Only two respondents have no strong opinion on the issue.

The agreement to the same statement, but with the addition that the indicators should be made public is close to unanimous. A single respondent disagrees. This respondent has provided the following elaboration:

- " as previously indicated technical information need some skill to be understood. This info should be submitted to the competent authority, but not to the public. Media prove not to be a suitable source of information ("Good news is no news")" (ship owners).

Two of the respondents that agree to the statements in this section have provided elaborations to their answers:

- "Public opinion is a very effective control over the ship recycler's performances" (Recycler)
- "As with the comments on certification, it is felt that the provision of information pertaining to the performance standards of facilities will assist in applying the Convention and allowing stakeholders to fulfil their obligations under its terms." (ship owner).

3.7 Conclusion

The ship recycling industry initiatives come from different industry actors including ship owners, ship recycling yards and international organisations. The experiences from these evolve around the same HSE issues and show that the following four key issues are crucial in upgrading to sustainable recycling practises:

- Adequate safety procedures regarding e.g. gas-free conditions, confined spaces, hot work areas, barriers to dangerous areas, lighting of work and access areas
- Training and equipment to allow identification, removal, transport and storage of hazardous materials, particularly asbestos, but also PCBs, ozone depleting substances, heavy metals and other hazardous materials
- Increased mechanisation to avoid heavy manual lifts and manual transport and handling of dangerous, large or heavy objects
- Access to appropriate disposal facilities for hazardous materials, i.e. facilities operating to internationally recognised sound environmental management practises and standards.

4 Design of an integrated management system

Today, the standards of ship breaking facilities vary considerably across the Globe. There are many similarities between the different facilities in the member states of the European Union and also compared to the sites in the US and Canada, and a well documented gap when compared to the beaching facilities in Asia. Some facilities in Turkey and in China have improved their performance level, but others in these countries have not.

In India initiatives have been undertaken during the last decade for improving the HSE performance of the ship recycling facilities at Alang, including certification of several of the Alang based ship recycling facilities according to the HSE standards, ISO 14001 and OHSAS 18001. The direct improvements within HSE performance resulting from these initiatives are yet to be published. Unfortunately, the Indian authorities denied granting the authors of this EMSA study the necessary permits²⁵ to visit the Alang ship recycling facilities with the purpose of studying the HSE initiatives at the site.

The proposed integrated management system (IMS) is described in the following sections. The proposal is based on the analysis of the existing information on certification systems and practises together with the initiatives, experiences and expectations to an IMS from the shipping industry, as analysed in the previous two chapters.

4.1 Usefulness of a simple quality identification system

The goal of a quality identification system in ship recycling is to provide for the informed choice when the process of selecting a recycling yard is set in motion in a shipping company, broker or cash buyer. Although aimed at environmental and eco-labels, and not an integrated system, the aim of the ISO standard 14020 may very well be much in line with the needs of the shipping and recycling industry:

²⁵ No Objection Certificate (NOC) could not be obtained from the Ministry of External Affairs, India

“Through communication of verifiable and accurate information, that is not misleading, on environmental aspects of products and services, to encourage the demand for and supply of those products and services that cause less stress on the environment, thereby stimulating the potential for market-driven continuous environmental improvement”

The coming IMO Convention will in its existing draft form establish two quality levels for ship recycling facilities:

- Compliant, and
- Non-compliant.

In a perfect world this will obviously simplify the selection process by ship owners. However, the compliant group under the current draft Convention will include authorised types of facilities spanning those operating on beaches to those using sophisticated dry docks. At present, the IMO Convention and its Guidelines do not impose specific requirements for authorised facilities on e.g. disposal facilities or address quantitative performance standards, but refer to the national legislation of the Party. Although the IMO Convention will undoubtedly lead to improved conditions in the future compliant facilities different interpretations in national legislation may still allow considerable differences in the realisation levels of the Convention and its Guidelines.

Obviously in the future when the Convention enters into force, the ship recycling facilities already compliant will remain compliant and likewise some sub-standard facilities of today will presumably continue operation in the domestic or non-party market (upper and lower arrows in Figure 4-1). However, it is expected that the existing commercial ship recycling facilities will upgrade to levels in compliance with the IMO Convention (visualised by the large arrow in Figure 4-1). Concern has been expressed in the MEPC from several EU member states that Parties to the Convention, in compliance with their own national regulation, may authorise facilities e.g. using disposal mechanisms which would be inadequate according to the European implementation of the Stockholm and Basel Conventions (identified by the dashed arrow and box in Figure 4-1). The consequence is that additional scrutiny will be needed for ship owners to establish compliance with their company’s recycling policy as part of their Corporate Social Responsibility policy. Flag state authorities may also struggle to establish the level of compliance with their own national or regional regulation or with internationally accepted practises.

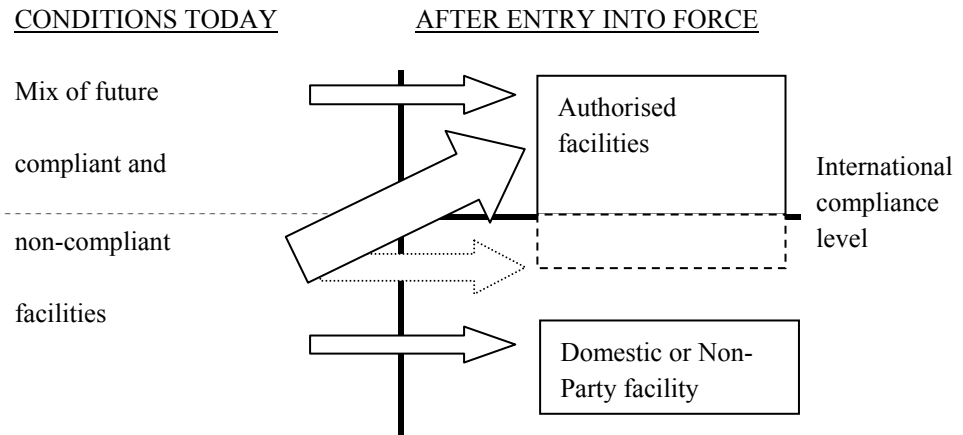


Figure 4-1 Upgrade of ship recycling facilities as the IMO Convention enters into force. Some authorised facilities may not comply with international standards on disposal

A mechanism to address this inadequacy is proposed as a simple system for identification of ship recycling facilities that complies not only with the IMO Convention, but also with the specific requirements of the European Community. It is important to note that the IMO Convention is at the core of this system and that IMS certification will only require marginal additional effort for a facility already pursuing appropriate authorisation under IMO or certification from ISO/PAS 30000. It is built on a tiered approach allowing the recognition of improvements in different ship recycling methodologies.

The proposed system is a voluntary business-to-business system similar to the ISO standards allowing facilities to decide on their market profile. It will bring in certain European requirements related to hazardous waste handling and disposal, occupational health and workplace safety and in particular a requirement on performance monitoring and publication of progress.

The envisaged system operates with three levels A, AA and AAA where an A level indicates implementation of IMO minimum levels – in the current draft Convention and guidelines this includes beaching – and two more compliant levels: the top level (AAA) is indicative of the full standard with double containment in dry dock facilities and full incineration or disposal of hazardous waste; and the medium level (AA) comprising the existing pier and slipway breaking such as carried out in Europe and in China, and represent the ultimate upgrading possibility for beaching and landing facilities. It is believed to be of value in particular to the better qualified entrants that more than one level exists and also for the end users, i.e. the ship owners, it may be important to be able to differentiate the yards and still maintain a large pool of compliant facilities.

Table 4-1 Conceptual tri-levelled compliance system

Compliance levels	Overall indicators
Premium or AAA	High safety levels, extensive use of state-of-the-art disposal and elimination, double containment in cutting zones. This would typically be a dry dock facility.
Medium or AA	High safety levels, proper disposal and incineration facilities, ship's hull used as containment, double containment for breaking keel. This may include pier breaking, slipways and redesigned beaching and landing.
Minimum or A	Adequate levels on worker's safety, no incineration of hazardous waste, bunds and containment in primary cutting zone for keel not impermeable. Hot work and confined space certificates available. This may include improved beaching and landing facilities.
Non compliant	Non compliant facilities e.g. lacking disposal facilities, environmental management or without proper safety equipment

Globally, the facilities currently in non-compliance with the future Convention are by and large considered to be the beaching facilities operating in India, Pakistan and Bangladesh. It should not, however, be ignored that around the world a number of non-compliant yards amongst landing, slipway and pier breaking facilities will also be in need of costly and comprehensive upgrading.

However, a simple quality identification system for ship recycling facilities as described above and detailed further in the following sections will allow ship recycling to become more transparent at very short notice. A certification mechanism may already be available prior to the single hull tanker phase out due in 2010. It may also assist in the upgrade process during the interim period for the IMO Convention to the benefit of sustainable ship recycling.

4.2 Requirements for a European integrated management system for ship recycling facilities

Two international systems aimed specifically at ship recycling facilities are under development, the Guidelines for Safe and Environmentally Sound Ship Recycling as part of the IMO draft ship recycling Convention and the ISO 30000 management standard.

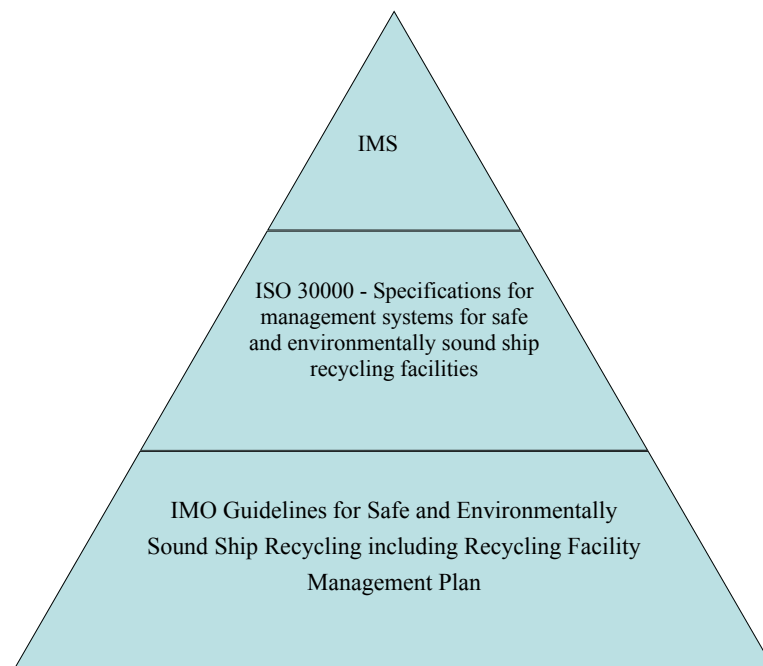
The ship recycling facilities guidelines under the draft IMO Convention, currently under the development of a working group chaired by Japan, includes a draft version of the Recycling Facility Management Plan (RFMP). In the present draft version the RFMP is chapter 2 of the Facility guidelines and is less comprehensive in its formal requirements than the ISO 30000.

The ISO 30000 is the most developed with a full standard text being available in a PAS version (ISO, 2008). ISO 30000 has been developed in coordination with the IMO Convention and Guideline process and the standard support and

supplement the guidelines from the International Labour Organisation, the Basel Convention and the IMO Ship recycling Convention.

The ISO 30000 guideline includes a comparison of the standard with the draft IMO Convention on Safe and Environmentally Sound Ship Recycling, which indicates that the ISO 30000 covers most of the draft IMO Convention with a few exemptions in general related to named requirements and documents that are not specifically mentioned in the ISO 30000.

It should be emphasised that a tri-levelled EU acknowledgement IMS for sustainable ship recycling is not a repetition of IMO or ISO systems. It is assumed that ship recycling facilities ready to be authorised by their national authorities have already implemented at least their IMO based integrated management system derived from the Guidelines for Safe and Environmentally Sound Ship Recycling. Such facilities should need only to address a limited number of additional issues in order to be certifiable. If these facilities already use the ISO 30000 as a vehicle for their integrated management system, in the same way many shipping companies use ISO 14001 for part of the ISM code, the additional work is limited and primarily concerned with monitoring of the indicators described in the following chapter.



4.2.1 Overall system contents

The proposed European IMS includes a manual and procedures compliant with the ISO 30000 or the draft IMO Convention and a few additional specific requirements, which are described further in the following sections.

In short form the proposed European IMS includes:

- Manual and procedures compliant with the ISO 30000 or the draft IMO Convention Guideline (when fully developed)
- Requirement to include certain international conventions and regulations as the regulatory base for the system
- Requirement to measure and publicise HSE performance as a minimum for 10 specified performance indicators for which continuous improvements must be documented and a minimum benchmark passed
- Requirement to perform a dedicated risk assessment for each ship to be dismantled
- Requirement to explicitly handle specific HSE issues within the IMS.

The proposed table of contents for the IMS, which is equivalent to the ISO 30000, is listed in the Figure 4-2 below. The additional requirements are detailed in the following sections.

1. Requirements
2. Ship recycling policy
3. Planning
 - a. Recycling aspects
 - b. Legal, statutory and other requirements
 - c. Ship recycling management objectives, targets and programmes
4. Implementation and operation
 - a. Structure, resources, roles, responsibility and authority
 - b. Competence, training and awareness
 - c. Communication
 - d. Documentation
 - e. Control of documents
 - f. Operational control
 - g. Emergency preparedness and response
5. Checking
 - a. Monitoring and measurement
 - b. Evaluation of compliance
 - c. Nonconformity, corrective action and preventive action
 - d. Control of records
 - e. Audit
6. Management review and continual improvement

Figure 4-2 Proposed table of contents for European integrated management standard for ship recycling facilities (based on ISO 30000)

The general system operational philosophy of the European IMS is the traditional “plan-do-check-act” cyclic approach, which should ensure continuous improvements in the performance within the areas, covered by the system: environment, health and safety. The cyclic operational approach of the proposed system is illustrated in Figure 4-3 below. The organisation shall commit itself to the continued improvement of its HSE performance.

The few additional requirements of the European IMS compared to the ISO 30000 are described in the following sections.

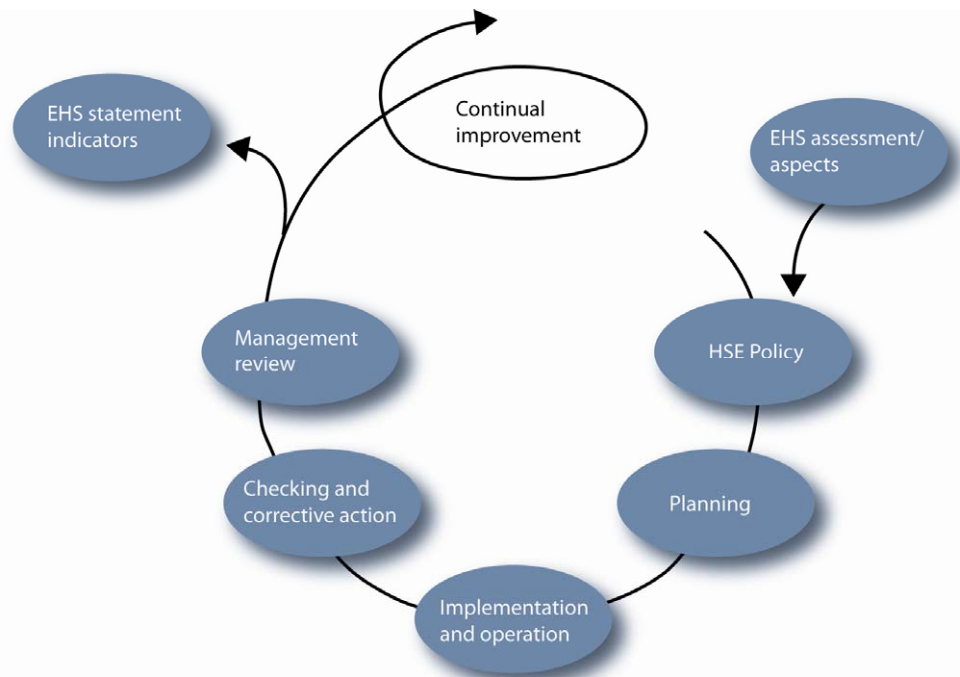


Figure 4-3 Proposed cyclic approach for the European IMS system

4.2.2 International requirement base for IMS

Ships flying the colours of an EU member state must comply with community directives and the national laws also when they are destined for recycling, and a key directive in the area of ship recycling has proven to be the Waste Shipment Regulation, which is the implementation of the Basel Convention laying down strict rules for transboundary movement of waste²⁶.

Irrespective of the legal regime that the recycling facility is operating within it has to implement into the IMS and adhere to the following international legislation/requirements:

- The IMO Ship Recycling Convention including associated guidelines
- Basel Convention
- Stockholm Convention
- ILO Conventions and Recommendations²⁷.

These requirements should be included in the applicable legal requirements and other requirements to which the facility is subject, whether due to international legislation, national legislation or local requirements, or to which it subscribes, related to its recycling aspects. This requirement should be irrespective if the country of the ship recycling facility has ratified these international regulations, guidelines and conventions or not.

²⁶ Details are given in COWI/DHI (2007) Ship Dismantling and Pre-cleaning of Ships

²⁷ ILO standards relevant for the ship recycling industry is given in IMO document: MEPC-ISRWG 3/INF.2

This commitment shall also be explicitly expressed in the facilities' IMS policy.

4.2.3 Performance

One of the conclusions from a previous study on ship recycling was that performance indicators based on documentation of best practise/best available technology were needed to evaluate the capacity of ship recycling facilities with respect to safe and environmentally sound ship recycling (DG ENV 2007).

Further, as concluded in the analyses in the previous chapters, it is of outmost importance that the performance of the ship recycling facility with respect to safe and environmentally sound ship recycling is publicly available.

The recycling facility shall continuously measure their performance within HSE. This shall as a minimum be done for a set of HSE indicators, which are considered to be of key importance to the system and are thus treated in detail in a separate chapter, Chapter 6.

The recycling facility shall be able to demonstrate that the management system and the audit procedures address the actual performance of the recycling facility with respect to the key HSE aspects, including the indicators as proposed in the following chapter.

The performance of the organisation against its objectives and targets and the indicators shall be evaluated as part of the management review process. The performance shall be published at least once a year in a publicly available HSE statement. The requirement for continuous improvements within the facility's HSE performance includes the indicators.

The performance indicators and actual procedures could be made available through a publication from a central organisation or agency engaged in shipping and/or industry issues. It is strongly emphasised that the national authorization of ship recycling facilities by a Party to the Convention is not affected in any way by the proposed voluntary system for certification.

4.2.4 Individual risk assessments

The ship recycling plan developed prior to start of recycling of ships shall be based on a ship-specific risk assessment performed for the actual ship to be decommissioned and can thus not be based on a generic risk assessment covering the activities at the facility within a certain period. The aim of this assessment is to identify hazards and risks to environment, safety and health from the recycling of the ship.

In case of significant changes to the planning of the recycling work of the ship the risk assessment shall be reviewed and necessary changes to the ship recycling plan incorporated.

The risk assessment shall be based on a specific procedure and the results of this should be documented. An example of a risk assessment tool, which could be applied, is presented in Annex V of the ILO Guideline (ILO, 2004).

4.2.5 Relevant HSE issues to be explicitly covered in the IMS

The IMO Convention Guideline lists a number of occupational health risks that must be appropriately addressed according to the national legislation, in order to be compliant with the Convention. Referring to the discussion in Section 4.2.2 this requirement does not guarantee full and acceptable HSE coverage of the IMS in countries with not very developed national HSE legislation. The ISO 30000 standard on the other hand being a procedural standard mentions in general terms the HSE issues to be addressed in a management system for a compliant facility and includes a reference to the ILO guidance. Both the Convention Guideline and the ISO 30000 do then not explicitly guarantee full coverage of HSE issues in the system.

The proposed European IMS therefore includes a requirement for the explicitly and proper coverage within the IMS of all HSE issues of significance for the specific yard as detailed below.

The list of HSE issues is a proposal for a list of HSE issues the management as a minimum needs to consider when developing the integrated management system. Whether the issues are relevant for the specific facility, and thus will be covered by the IMS will depend on the geographical location, the kind of ships the facility recycles, the technological level of the facility etc.

Within health and safety the following headlines list (based on ILO (2004)) of issues should as a minimum be included in the IMS with the detailed hazards within each of the headlines as specified in Table 4-2:

- Frequent causes of accidents
- Hazardous substances and wastes
- Physical hazards
- Mechanical hazards
- Biological hazards
- Ergonomic and psychosocial hazards, and
- General concerns, incl. training, work organisation, housing and sanitation, accident prevention and emergency, first aid, rescue and medical facilities.

With regards to environmental hazards the IMS should explicitly include procedures for handling and disposal of all hazardous substances listed in the draft IMO Convention and its Guideline on Inventory of Hazardous Materials.

Table 4-2 Common hazards that are likely to cause work related injuries and death, ill-health, diseases and incidents, ILO guideline Safety and health in ship breaking, guidelines for Asian countries and Turkey, 2004

Frequent causes of accidents:	
Fire and explosions, explosives, flammable objects	Falls from height inside ship structures or the ground
Falling objects	Moving objects
Trapping and compression	Wet surface
Snapping of cables, ropes, chains, slings	Sharp objects
Heavy objects	Oxygen deficiency in confined spaces
Access in progressively dismantled vessel	Lack of PPE, housekeeping practices, safety signs
Electricity	Shackles, hooks, chains
Poor illumination	Cranes, winches, hoisting and hauling equipment
Hazardous substances and wastes	
Asbestos fibres, dust	PCB's and polyvinyl chloride
Heavy and toxic metals	Welding fumes
Organometallic substances	Volatile organic solvents
Lack of hazard communication	Inhalation in confined and enclosed spaces
Batteries, fire fighting liquids	Compressed gas
Physical hazards	
Noise	Vibration
Extreme temperatures	Radiation
Mechanical hazards	
Trucks and transport vehicles	Failure of machinery and equipment
Scaffolding, fixed and portable ladders	Poor maintenance of machinery and equipment
Sharp edged and other tools	Lack of safety guards in machines
Power driven hand tools, saws, grinders and abrasive cutting wheels	Structural failure in the ship

Frequent causes of accidents:	
Biological hazards	
Toxic marine organisms	Animal bites
Risk of communicable diseases transmitted by pests, vermin, rodents, insects and other animals that may infect the ship	Vectors of infectious diseases
Ergonomic and psychosocial hazards	
Repetitive strain, awkward positions, repetitive work, excessive workload	Mental stress, anti social behaviour, alcohol and drug abuse, violence
Long working hours, shift work, night work and temporary employment	Poverty, low wage, under age workers, lack of education, and social environment
General concerns	
Lack of safety and health training	Inadequate accident prevention and inspection
Poor work organisation	Inadequate emergency, first aid and rescue facilities
Inadequate housing and sanitation	Lack of medical facilities and social protection

Details on HSE issues within ship recycling

As a supplement to the above requirements for certain HSE issues, to be explicitly covered in the IMS, are in the sections below given details and experiences on the HSE issues of concern within ship recycling facilities.

The majority of the ship scrapping is undertaken in developing countries where worker safety is suffering from inadequacies in several respects. These deficiencies are obvious at all steps of the process and include non- or insufficient planning, training, personal protection equipment, facilities, etc.

Environmental concerns of ship recycling are first and foremost related to the harmful substances involved and the lack of containment allowing toxic compounds to enter the environment. The nature of some of the major scrapping sites in Asia allows tidal wash-out of these compounds and hence, immediate effects may be avoided in the coastal waters.

Basic standards for workers' health at some of the world's major scrapping sites are not adhered to. The nature of the ship recycling work causes immediate wear-and-tear related risks, which are most often not adequately addressed, but also the long-term exposure to harmful substances is likely to have severe effects on life expectancy. However, in most facilities long-term monitoring of workers' health is non-existent.

Some of the key health, safety and environmental concern within the ship recycling yards are focused around:

- Exposure of hazardous materials to environment and people (workers and residents) during recycling operations
- Safe disposal of the hazardous materials
- Accidents and incidents primarily due to falling heavy objects, falls from heights, explosions and fire.

Further, the following issues are also very important in terms of the wellbeing of the ship recycling workers especially at Asian recycling facilities and international organisations like ILO put a lot of focus to these. The issues are however related to social issues and have not been included in the proposed IMS:

- Poor housing and sanitary conditions for workers.
- High frequency of a range of diseases related to the above.

In Table 2-1 different types of hazardous chemicals were shown which are of concern in ship recycling and therefore must be identified in ships. In the Table the classification with respect to adverse properties were given together with the concentration limit for classification as hazardous waste for waste containing the substance. The recycling activities during which workers are most likely to be exposed are shown in Table 4-3 (ILO, 2001).

Table 4-3 Main exposure to hazardous substances during the scrapping process (ILO, 2001)

Dismantling activity	Workers' exposure	Environmental exposure	Safety exposure
Asbestos removal and disposal	Exposure to asbestos fibres, especially through inhalation, may cause asbestosis or cancer.	Exposure of people working and living in the neighbourhood, and migration of asbestos fibres to bodies of water.	
PCB removal and disposal	Exposure through inhalation, ingestion, or absorption through the skin may cause adverse health effects.	PCBs are toxic and persistent in the environment. The most carcinogenic PCBs tend to bioaccumulate.	Toxic furans and dioxins are produced when PCBs are heated, e.g. in fire related incidents.
Bilge and ballast water removal	Toxic organics, i.e. solvents or PCBs, may cause serious health effects. Discharge of toxic organics may cause release of poisonous gases.	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.	Flammable vapours or gases may evolve from residues in tanks or compartments.
Oil and fuel removal	Oils and fuels may exhibit toxic characteristics. Main exposure routes are inhalation and consumption of contaminated fish and water.	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.	Refined petroleum products represent a fire hazard.
Paint removal and disposal	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.	Waters (incl. blasting residues and paint chips) may have negative effect on the environment through contamination of soil and surface waters.	Paints and coatings may be flammable.
Metal cutting and metal disposal	Torch cutting generates fumes, smoke and particulates (incl. manganese, nickel, chromium, iron, asbestos and lead) that may have toxic effects.	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.	Pockets of flammable substances represent a fire and explosion hazard when cutting metal.
Removal and disposal of miscellaneous ship machinery	Workers handling ship machinery components may be exposed to contaminants, such as asbestos, PCBs, oil and fuels.	Ship machinery components may be contaminated with hazardous materials, such as asbestos, PCBs, oil and fuels. Improper storage may also lead to lead contamination.	Oils, fuels, etc. may represent a fire and explosion hazard when being disassembled.

Safety

The working environment at ship recycling facilities is influenced by large and heavy unsafe structures and the introduction of several simultaneous operations within a small area involving many individuals. This working environment results in accidents at every stage of the breaking process.

In general very little reporting of incidents/accidents and injuries/deaths can be found. The Gujarat Maritime Board (GMB) in India has revealed figures related to accidents and casualties for the years 1997-99, see below table.

Table 4-4 Incidents at Alang ship recycling facilities in India, reported by Gujarat Maritime Board (ILO, 2001)

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 (26)	33 (38)	43 (48)

Greenpeace estimates that around 1,000 – 1,200 workers have died over the last three decades at Alang, India (Greenpeace/FIDH, 2005). The statistics presented by GMB also include causes of incidents (Table 4-5). Table 4-6 includes the self-reported dangers within ship recycling as reported by ship recycling yard workers in Chittagong, Bangladesh during the ILO SAFEREC project (ILO, 2005).

Table 4-5 Causes and frequencies of the incidents at Alang as reported by Gujarat Maritime Board (ILO, 2001)

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

Table 4-6 *Dangers within ship recycling as reported by employees at Chittagong recycling yards (ILO, 2005)*

Particulars	No. of supervisors	% of supervisors	Number of workers	% of workers
At cutting place	1	2		
Explosion	17	28	24	28
Fire	32	53	47	55
Gas	2	4		
Falling heavy objects	22	36	25	30
Falling from ship	2	3		
If Workers work carefully no danger	2	3		
Wire breakage	19	32	1	1
People falling	1	2		
Cutting injury	1	2		
Suffocation			7	8
At least one response	56	93	78	92
No response	4	7	7	8
Total respondents	60	100	85	100

Health

In general it is difficult to find public data or reports on ship recycling workers' health, which suggests that systematic monitoring of health among workers engaged in ship scrapping in these regions is not very common.

Some studies and reports are however addressing the poor working conditions of the workers at the ship recycling facilities. In an ILAS Newsletter (ILAS, 2003) is cited Dr Rupa Abdi, an independent researcher and writer, who was working as a consultant at the Centre for Social Studies, Gujarat State: "The labourers in Alang live in poor housing and sanitary conditions and little attention is paid to their health and safety concerns. According to the physicians in and around Alang, who treat numerous Alang patients, the combination of hazardous working conditions, congested and unhygienic living conditions, poor quality drinking water, availability of illicit country liquor, and rampant homosexuality and prostitution have given rise to a number of skin, gastrointestinal, and liver diseases besides tuberculosis, leprosy, malaria, malnutrition, cancer, HIV-AIDS, and other sexually transmitted diseases (STD). According to the local Bhavnagar Blood Bank office at Alang, besides 38 confirmed cases of AIDS, about 50-55 new cases of other STD are being reported every week among the labourers".

A very active NGO in Bangladesh Young Power in Social Action, YPSA (YPSA, 2006) refer a study showing:

- 88% of the ship recycling workers suffered from some form of accidental injury from foot injury to larger accidents
- 87% suffered from muscle pain
- 72% have problems with eyesight
- 52% have breathing difficulty
- 81% of labourers have gastric problems
- 56% suffered from skin diseases, and
- 28% have other infections.

Only few studies exist of possible long-term health effects amongst ship recycling workers. One such study is performed by Yi-kuen Liu et al. (2003) in Taiwan, which was previously a destination for end-of-life ships. The study is a 13-year retrospective follow-up study on the mortality among former ship breaking workers.

The results of the Taiwan study showed that compared to the reference population²⁸, ship breaking workers had a significantly higher all cause mortality of 11% and a significantly higher mortality from external causes of injury and poisoning of 75%. On the other hand the ship breaking workers did not have significantly different mortality rates from infectious and parasitic diseases, neoplasm, circulatory diseases, respiratory diseases and diseases in the digestive system compared to the reference population.

The 20-39 years old ship breaking workers of the Taiwanese study had a significantly higher mortality from nasopharynx cancer, pleura mesothelioma, traffic accidents, chemical poisoning and submersion compared to the reference population of same age, and in all age groups ship breaking workers had a significantly higher mortality from accidental falls and industrial accidents compared to the reference population. Compared with supervisors/others²⁹, odd-jobbers had a significantly higher mortality from external causes of injury and poisoning, especially from traffic accidents, and lifters had a significantly higher all causes mortality and a higher mortality from diseases in the digestive system and accidental falls compared with supervisors/others.

Environment

As mentioned above the environmental concerns of ship recycling are primarily related to the harmful substances in the ships and the lack of containment of these during the dismantling processes, storage and transport, which allows the toxic compounds to enter the environment.

The relevant hazardous compounds are well defined as for instance in the IMO inventory of potentially hazardous materials on board ships:

²⁸ Reference population: The populations of Kaohsiung County, Kaohsiung City and Pingtung County because the ship breaking workers primarily came from these areas.

²⁹ Supervisors/others posed as reference group because they had the lowest mortality.

- Asbestos (not a prime environmental concern)
- Additive in paints, including lead, tin, cadmium, organotins (TBTs), arsenic, zinc, chromium, strontium, others
- Materials containing PCBs, PCTs, PBBs at levels of 50 mg/kg or more
- Ozone depleting substances: refrigerants (R12/R22) and halon
- Oil and oil contaminated waste
- Mercury, and
- Other hazardous substances.

From one of the few real life studies, Table 4-7 shows an estimate of the amount of these compounds in a 37,500 LDT VLCC (Norwegian Ministry of Environment, 1999).

Table 4-7 Materials of potential environmental concern on board a 37,500 LDT VLCC ready for scrapping (Norwegian Ministry of Environment, 1999)

Component	Material	Amount
Anodes	Lead	0,4 kg ¹
	Cadmium	120 kg ¹
Electrical equipment	Batteries (Pb, H ₂ SO ₄)	232 kg (140 kg, 44 litres)
Coatings and paints	Antifouling (TBT)	24,000 kg ² (1,200 kg)
Refrigerants	R22/F12 ³	900 kg
Heat insulation	Asbestos	6,000 - 8,000 kg
Electrical installations	PVC cable insulation	10,000 kg
	Light tube capacitors (PCB)	24 kg ⁴ (14 g)
	Light tubes (Hg)	100 kg ⁵ (15 g)
Oil residue	Heavy fuel oil	333 m ³
	Hydraulic oil	18 m ³
	Lubrication oil	20 m ³
	Oil sludge	1,820 m ³

- 1: trace elements that cannot be separated from the main part of metal. Assuming 50% of the anodes have disappeared due to corrosion
- 2: estimated TBT-content of 5%
- 3: CFC-gases
- 4: estimated weight of 50 g/capacitor
- 5: estimated weight of 100 g/tube.

Several studies of the contamination level at and outside ship recycling facilities have been conducted. In Bangladesh at Chittagong DNV in 2000 (DNV, 2000) collected marine water and sediment samples in the intertidal zone outside some of the ship recycling plots. These samples were analysed for pollution parameters. Further soil, surface water and air samples from inside one of

the ship recycling plots were collected and analysed. The conclusions of the study are shown in the table below.

Table 4-8 Conclusions of analyses of environmental samples taken at or outside ship recycling facilities at Chittagong, Bangladesh in 2000 (DNV, 2000)

Sample analysis	Conclusions
Sediments	Analysed samples do not have concentrations that are alarming. However, this is probably caused by tidal water characteristics. A monitoring programme of sediment sampling should have been made. Reference studies from the same area show significant levels of various pollutants.
Sea water	Analysed samples have not revealed alarmingly high concentrations in the seawater. However, this is most likely due to the sampling sequence and its unfortunate synchronisation versus the tidal frequency (sample on incoming tide). Previous work provides documentation revealing high levels of toxic compounds in the area.
Surface water samples	The DNV analysed samples do show high concentrations of oil in water samples from the breaking area.
Soil	Soil analyses have established significant levels of contaminants such as heavy metals, PCB and TBT.
Air	The analysed air-samples do show a content of heavy metals and organic compounds, while for asbestos there is not detected any in the air sample. The relative small content of heavy metals and organic compounds may be explained with the wind conditions during the sampling. For asbestos the negative result may be explained by the fact that the crushed substance the day of air sampling was not asbestos.

4.3 Certification, audits and accreditation

To establish a management system some companies use solely internal staff and resources while others engage consultants to work with company staff and bring the management system up to a level that may be certified or authorised in the vocabulary of the IMO Convention. The implementation of the IMO management system, the ISO 30000 or the European IMS will not be any different. The certification and audits of such systems are placed with authorities or responsible organisations, e.g. the classification societies, bureau of standards and similar entities adhering to a standardised and approved set of qualification criteria for their auditors, vetting inspectors, surveyors or whatever title they may bear.

It is crucial that certification of a management system is reliable and credible to maintain confidence in the system. The certification should be provided in a professional and technically impeccable way. It is therefore proposed that the

existing commercial organisations mentioned above also engage in certifying and auditing the European IMS.

Procedures for regularly accreditation of the certifying organisation must be in place for a European IMS. An accreditation must be defined by a specific set of requirement to the certifying body and auditor similar to those found in ISO 19011 in combination with the ones in ISO 30003 and supplemented by specific detailed requirements to the health and safety knowledge and expertise of the certifying body and auditor.

Relevant requirements to the auditor include:

- Profound knowledge of the IMS, the IMO and ISO systems and examination as qualified auditor
- Experience about the technical and commercial issues regarding the recycling facilities
- Knowledge about the relevant legislation, local as international
- Knowledge about the specific environmental and occupational health and safety issues with relevance for the recycling facilities
- Impartiality.

Accreditation in today's certification systems are typically carried out through national services. In this case it is expected that only facilities in relatively few countries will apply for certification and that only few certifying bodies will be active in this area. Thus, accreditation of the certifying body could be centralised and placed with the entity issuing the IMS procedure or another organisation appointed by the EC. The issuing entity will in this way be able to ensure a high quality level of the certification and keep control of the certifying body.

5 Performance

As described in previous chapters it is a necessity to increase the transparency of the industry and allow for a real and well-informed choice of the ship owners in his choice of ship recycling facility. It has in several instances proved very difficult to get to know the actual performance level of ship recycling facilities certified to some of the existing standards. Therefore it is a necessity that the European IMS ensures that the performance of the ship recycling facilities with respect to safe and environmentally sound ship recycling is publicly available.

Within the proposed IMS the HSE performance shall as a minimum be measured for a set of HSE indicators, which should be continuously updated and available on request.

5.1 Indicators

5.1.1 Introduction

Indicators are succinct measures describing as much about a system as possible in as few points as possible. Indicators thus simplify a complex reality. They focus on certain aspects which are relevant, measurable and on which data are available or obtainable.

Indicators help us understand a system, compare it and improve it. Communication is the main function of indicators: they should enable or promote information exchange regarding the issue they address. Our body temperature is an example of an indicator we regularly use. It provides critical information on our physical condition.

Indicators are as varied as the types of systems they monitor. However, there are certain characteristics that effective indicators have in common. The European Environment Agency (EEA) has established the following 11 generic criteria for the selection of their core set of indicators (not exclusive to environmental issues)³⁰:

- 1 Be policy relevant
- 2 Monitor progress towards the quantified targets

³⁰ <http://themes.eea.europa.eu/IMS/About/CSI-criteria.pdf>

- 3 Be based on ready available and routinely collected data
- 4 Be consistent in space coverage
- 5 Time coverage
- 6 Primarily be national in scale and representative for countries
- 7 Be understandable and simple
- 8 Be conceptually and methodologically well founded and representative
- 9 EEA priorities in management plan
- 10 Be timely
- 11 Well documented and of known quality.

It is important to notice that the criteria address a quantifiable target for the indicators, which means that the good indicator should be quantifiable. An indicator is not the same thing as an indication, which is generally not quantifiable, but just a vague clue.

The requirement for reliability for the indicators is not the same as a requirement for precision of the indicator. An indicator does not necessarily need to be precise; it just needs to give a reliable picture of the system it is measuring.

Accessibility of data is a necessity, but access to existing data should not be limiting for the development of indicators. Rather frequently is thus seen that the most applicable indicators are those for which there are no existing formal system for collection of data.

5.1.2 Indicators within ship recycling

Although some facilities have improved over the last years, the ship recycling industry has been and still is a rather closed industry in terms of communication on their health, safety and environmental performance. This fact - the lack of data - constitutes a challenge for development and implementation of successful indicators within the industry, because it is difficult to establish a baseline. It does not only constitute a technical challenge in terms of establishment of indicators and benchmarks, but it is also a mental challenge as the industry will have to accept more openness on its HSE performances.

To facilitate the needed “mindset change” within the industry it is considered important to focus on the development of indicators that address the successfulness of the integrated management system in terms of reduction of negative impacts and increases in positive.

As the indicators to be developed should be able to monitor performance at individual yards, the indicators should be as universal as possible within the industry/area of measurement. Further “normalisation” of indicators should be considered, as to reduce the impacts of differences in sizes, activity level etc. at recycling facilities.

The purpose is to develop a set of indicators that can demonstrate the performance and improvements of ship recycling facilities, which will be certified under the new integrated management system.

The previous chapter provided examples of the activities and substances that are considered most likely to give adverse HSE effects during ship recycling. The following list provides examples of some key issues which may be part of the assessment of a given facility.

Table 5-1 Key issues for assessing the standard of a given facility

Procedures	Techniques and equipment
Development and implementation of safety, health and environment management system	Personal Protection Equipment
Development of plans according to the Convention	First aid and rescue equipment
Ship Recycling Plan	Techniques and equipment for asbestos removal and storage
Recycling Facility Management Plan	Techniques and equipment for removal and storage of non-asbestos hazardous materials
Emergency preparedness and response plan	Test systems for hazardous material
Training of staff	Handling of non-hazardous waste
Work place safety	Lifting and transport machinery
Emergency preparedness and response arrangements	Surface area cover, roofing and drainage system
First aid and rescue	Treatment of water
Identification and labelling of hazardous materials	Handling and treatment of composite waste
Removal of hazardous materials and their handling methods	Disposal facilities
Special training on asbestos containing materials ACM	
Transport and storage of hazardous materials	
Disposal of hazardous materials	
Removal, collection and disposal of other waste	
Conditions for subcontractors	

This is obviously a comprehensive and complex assessment, but the safety, worker’s health and environmental challenges faced by the facilities on the upgrade road can be grouped under a few headings.

As concluded in Chapter 3 the experiences from the HSE upgrade projects around the Globe have identified the following four key issues as crucial in upgrading to sustainable recycling practises:

- Adequate safety procedures regarding e.g. gas-free conditions, confined spaces, hot work areas, barriers to dangerous areas, lighting of work and access areas

- Training and equipment to allow identification, removal, transport and storage of hazardous materials, particularly asbestos, but also PCBs, ozone depleting substances and heavy metals
- Increased mechanisation to avoid heavy manual lifts and manual transport and handling of dangerous, large or heavy objects, and
- Access to appropriate disposal facilities for hazardous materials, i.e. facilities operating to internationally recognised sound environmental management practises and standards.

Indicators on these key elements in safe and environmentally sound ship recycling are developed in the following sections, in particular 5.4.

5.2 Available relevant indicator systems

Having identified the key issues for indicators within ship recycling, the use of indicators in other industrial and political-administrative sectors is reviewed. This work can form inspiration and a basis for development of indicators within ship recycling facilities. As an example a significant body of work for development of environmental, health and safety performance indicators have been carried out within the oil and gas production industry.

A long list has been produced of existing indicators, which could possibly be applied within the ship recycling facilities. This list is placed in Appendix B and formed one input to the final selection of the 10 HSE indicators as described later in the chapter.

Some of this existing work on development of HSE indicators within related industries/sectors is described in the following sections.

5.2.1 European Environmental Agency, Core Environmental Indicators

The European Environmental Agency (EEA) has established 37 core environmental indicators. The core set of indicators (CSI) was established in February 2004 from a long-list of first 400 indicators established in July 2002 with the purpose of being relevant to policy objectives and distributed across DPSIR. This list was reduced to 250 indicators in May 2003 and then to the existing 37 indicators.

The purpose of the EEA CSI is to: i) provide a manageable and stable basis for indicator reporting by the EEA on the web and in its indicator-based reports, ii) prioritise improvements in the quality and geographical coverage of data flows, especially priority data flows of the European environment information and observation network (Eionet) and iii) streamline EEA/Eionet contributions to other European and global indicator initiatives, e.g. structural indicators and sustainable development indicators.

5.2.2 European Commission, EMAS

As mentioned in Chapter 2 the European Commission in 2003 (EC, 2003) issued a recommendation (2003/532/EC) for the use of environmental performance indicators to ‘increase clarity, transparency and comparability’ of the information provided (environmental statement) by the EMAS registered organisations.

The recommendation includes a number of environmental performance indicators split in three different categories of indicators:

- 1) Operational Performance Indicators (OPIs)
- 2) Management Performance Indicators (MPIs)
- 3) Environmental Condition Indicators (EPIs).

Within each of the three categories of indicators several sub-categories of indicators are presented each containing a number of examples of specific indicators with corresponding examples of measurement units.

5.2.3 World Health Organisation (WHO)

The World Health Organisation Statistical Information System (WHOSIS) is an interactive database bringing together core health statistics for the 193 WHO member states. WHOSIS comprises more than 70 indicators, which can be accessed by way of a quick search, by major categories, or through user-defined tables. The data are also published annually in the World Health Statistics Report released in May.

WHOSIS includes five major categories for the 70 indicators:

- 1) mortality and burden of disease
- 2) Health service coverage
- 3) Risk factors
- 4) Health system resources, and
- 5) Inequities.

5.2.4 European Agency for Safety and Health at Work

The European Agency for Safety and Health at Work was set up in 1996 and is a tripartite organisation working with governments, employers and workers representatives. The Agency’s mission is to make Europe's workplaces safer, healthier and more productive.

The European Agency for Safety and Health at Work (EU-OSHA) was established by Council Regulation No 2062/94 of 18 July 1994. As a single reference point for OSH information EU-OSHA collect and publish new scientific research and statistics on OHS risks from around the world.

The Agency's statistical reports cover areas such as accidents at work, demographic trends and work-related diseases. The Agency maintains close co-operation with the European Foundation for the Improvement of Living and Working Conditions and Eurostat, the EU's statistical office, in order to build up a clear picture of occupational safety and health in the EU.

5.2.5 International Association of Oil & Gas Producers (OGP)

The International Association of Oil & Gas Producers (OGP) was formed in 1974 and includes most of the world's major publicly-traded, private and state-owned oil & gas companies, oil & gas associations and upstream service companies. OGP members produce more than half the world's oil and about one third of its gas. An essential part of OGP's mission is to help its members achieve continuous improvements in safety, health and environmental performance.

OGP have established committees within health, safety and environment. These committees are publishing the industry's performance within the different areas based on reporting from the member companies/organisations. Some of the performance reporting is in the form of key performance indicators. The publishing of safety data has the longest history and was initiated in 1985.

5.2.6 Other work/sources

Several other organisations and institutions have developed indicators within HSE and are maintaining databases for performance within these areas to allow for benchmarking of organisations/companies.

Several of these organisations and institutions have tools to allow the individual companies and users of the tool in general to compare their performance benchmark with others.

Examples of such available benchmarking tools are presented below.

Corporate Health & Safety Performance Index (CHaSPI)

Health and Safety Executive (HSE), the British Occupational Health Inspectorate, has developed Corporate Health & Safety Performance Index (CHaSPI), which is a web-based benchmarking tool within occupational health and safety suitable for organisations with more than 250 employees.

CHaSPI aims to help in the assessment of how well organisations manage their risks and responsibilities towards their workers, the public and other stakeholders (internal and external).

In CHaSPI's own words from the homepage, the system is designed to assist external stakeholders in assessing how well an organisation is managing its risks and responsibilities towards workers and the public. Internally, it can be used as an indicator of performance, and over time, improvement in occupational health and safety management (<http://www.chaspi.info>-

exchange.com/userguide.asp?id=195683). Examples of indicators within CHaSPI include injuries, serious incidents and sickness absence.

With CHaSPI the organisations can answer questions within five areas: occupational health management, health, work related incidents, work related injuries and sickness/absence. As output the organisation gets its own score within the five areas and a combined score for its occupational health and safety performance. These scores can then be compared to each of the other organisations using the ChaSPI tool and to the mean and extreme scores of all organisations.

CHaSPI is still sponsored by HSE and is presented as their tool. The administration of the tool has however been outsourced to a private consulting company.

Together with the Association of British Insurers, the British Insurance Brokers Association and the Federation of Small Businesses, HSE has developed a similar tool for organisations with less than 250 employees.

Engineering Employers' Federation (EEF) Occupational Health and Safety Performance Tool

Engineering Employers' Federation (EEF), The British manufacturers' organisation, has developed a web-based tool for occupational health and safety benchmarking (www.eef.org.uk/eef/ohskpi). The tool is available for the organisation's members to use for benchmarking of their occupational health and safety performance with other member companies.

The tool is only available for the member companies. The running cost of the tool is sponsored via the EEF member fee, and no direct costs apply for using the tool.

The companies are answering on-line questions regarding their occupational health and safety work. The tool then returns a report of the company's performance benchmarked against other companies' performance in an anonymous form.

Several similar benchmarking tools, other than the ones mentioned above, do exist, including:

- Occupational Health & Safety Benchmarking Association (OHSBA), which is a service from The Benchmarking Network Inc. (www.hrba.org/ohsba.html)
- Contour EHS benchmarking tool developed by CBI (www.cbi.org.uk/ndbs/content.nsf/802737aed3e3420580256706005390ae/7e053286a04880fe8025706700380571?OpenDocument).

5.3 Indicator analysis

5.3.1 The DPSIR Model

A number of organisations have developed models for indicator systems, including definitions and specifications of criteria for indicators at different levels. One of the most complete is the DPSIR model developed by the EEA.

DPSIR stands for Drivers, Pressures, State, Impact and Responses. According to this systems analysis view, social and economic developments exert Pressure on human health and environment and as a consequence the State of the pressurised system changes. Finally, this leads to Impacts on human health or environment, which in return may elicit a societal Response that feeds back on the Driving forces or on the State or Impacts directly, through adaptation or corrective action. The DPSIR model is illustrated in Figure 5-1.

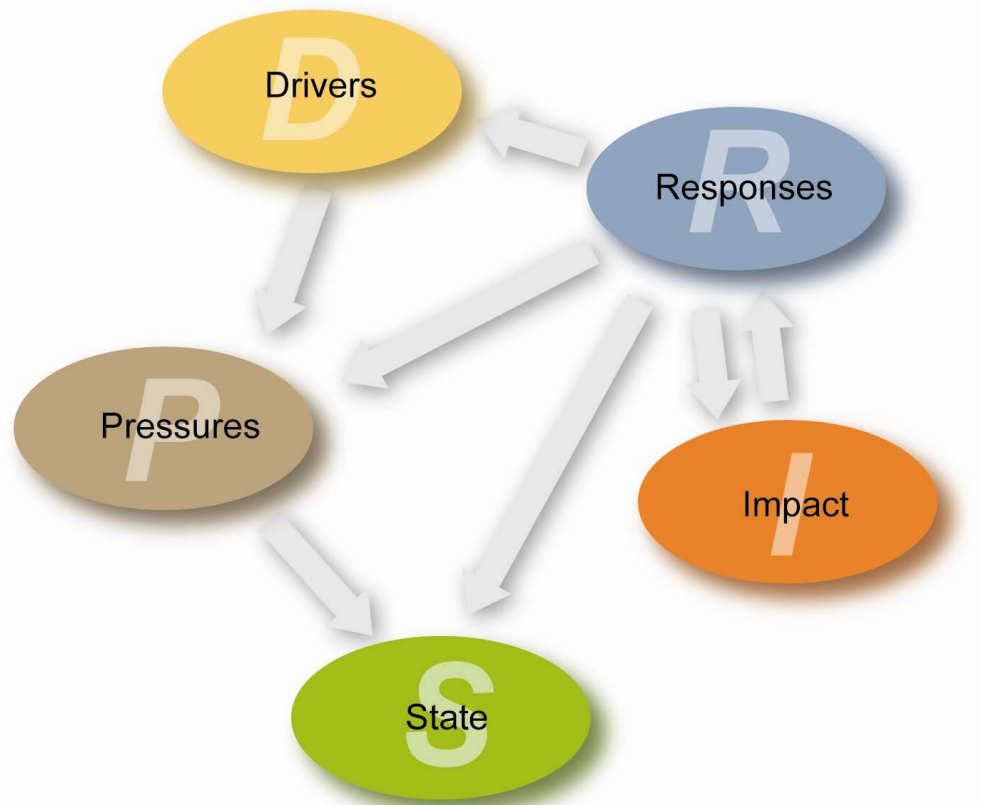


Figure 5-1 Drivers, Pressures, State, Impact and Responses – the DPSIR framework

The DPSIR framework is very useful for describing the relationships between the origins and consequences of environmental, health and safety problems, but in order to understand their dynamics it is also useful to focus on the links between the DPSIR elements.

The DPSIR framework is used here to analyse and systemise the findings of environmental, health and safety issues within the ship recycling industry for development of appropriate HSE indicators.

Driving forces include economic developments in Asian countries with booming construction sectors and an increased requirement for steel. Further, drivers for the ship recycling industry includes the economy of the transport/shipping sector especially the freight market and the environmental regulation of phasing out single hulled oil tankers. Studies have shown that the world steel prices are a driving force, but a less important one (European Commission Directorate-General Energy and Transport, 2004).

The driving forces exert pressure on the health and the environment in the form of emissions of hazardous substances to the environment (air, water and soil) including human exposure, physical and biological agents, waste generation (the use of land) and a dangerous working environment for workers at the ship recycling facilities.

State indicators give a description of the quantity and quality of physical, biological and chemical phenomena, e.g. concentrations of chemical compounds in sediments, water and biota around the ship recycling facility. State conditions also include the health conditions of recycling facility workers.

Due to the pressures on the environment/human health the state of these change, which then impacts the functions of the systems, such as human and ecosystem health, availability of resources and biodiversity. Impact indicators are used to describe changes in these conditions.

In the DPSIR framework impacts are only those parameters that directly reflect changes in the environment or human health. Although effects of human change in the environment occur in a sequence: air pollution may cause changes in the radiation balance (primary effect but still a state indicator), which may in turn cause an increase in temperature (secondary effect, also a state indicator), which may provoke a rise of sea level (tertiary effect, but still a state of the environment), it is only the last step: loss of terrestrial biodiversity, that should be called the impact indicator (European Commission, 2005). Impact indicators within ship recycling facilities include loss of habitats within and around the facility and loss of human health and lives.

Response indicators refer to responses by groups and individuals in society, as well as government attempts to prevent, compensate, improve or adapt to changes in the state of the environment. Examples of response indicators are the waste management at the facilities, use of personal protective equipment and mechanisation of work processes.

5.3.2 Ship recycling yards

Below is shown the DPSIR framework filled in individually for each of the three areas: environment, health and safety. The three figures are based on the above analyses of the key HSE issues.

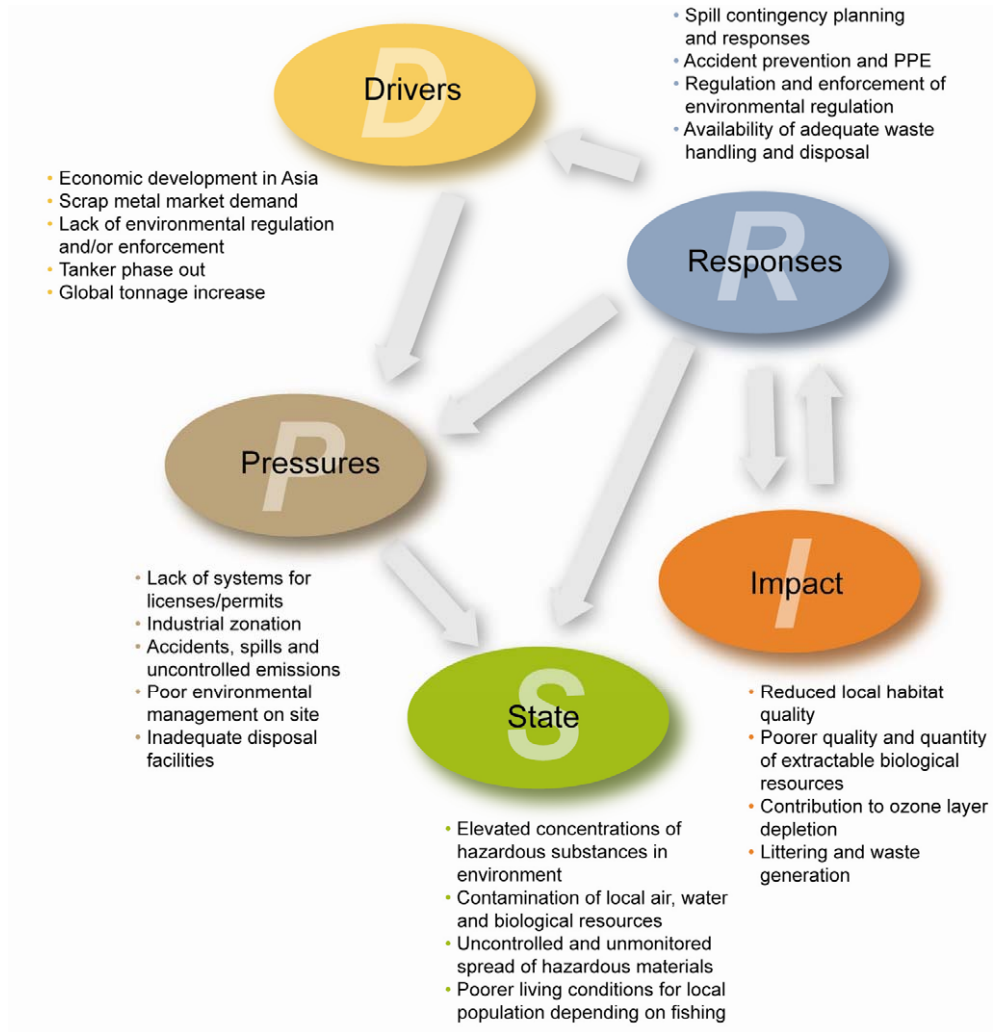


Figure 5-2 DPSIR framework for environmental issues within ship recycling yards

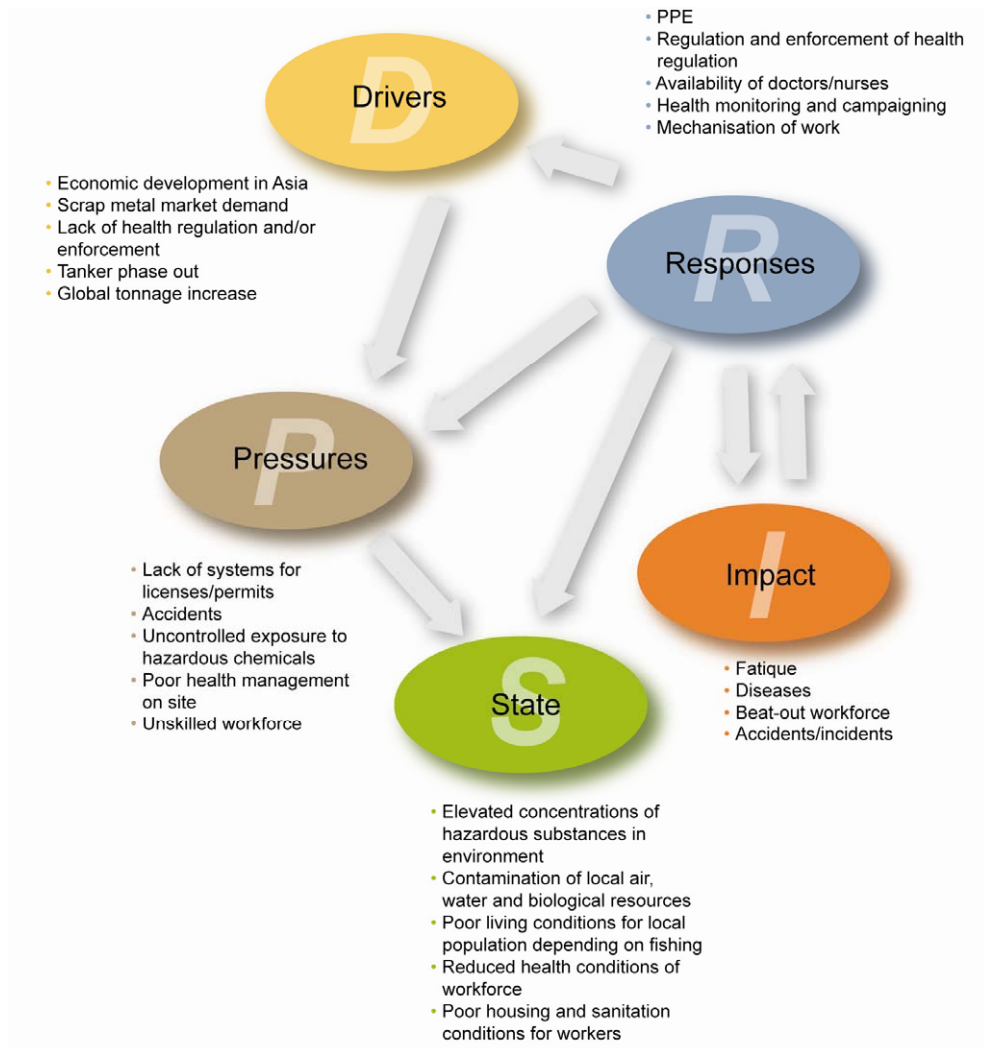


Figure 5-3 DPSIR framework for health issues within ship recycling yards

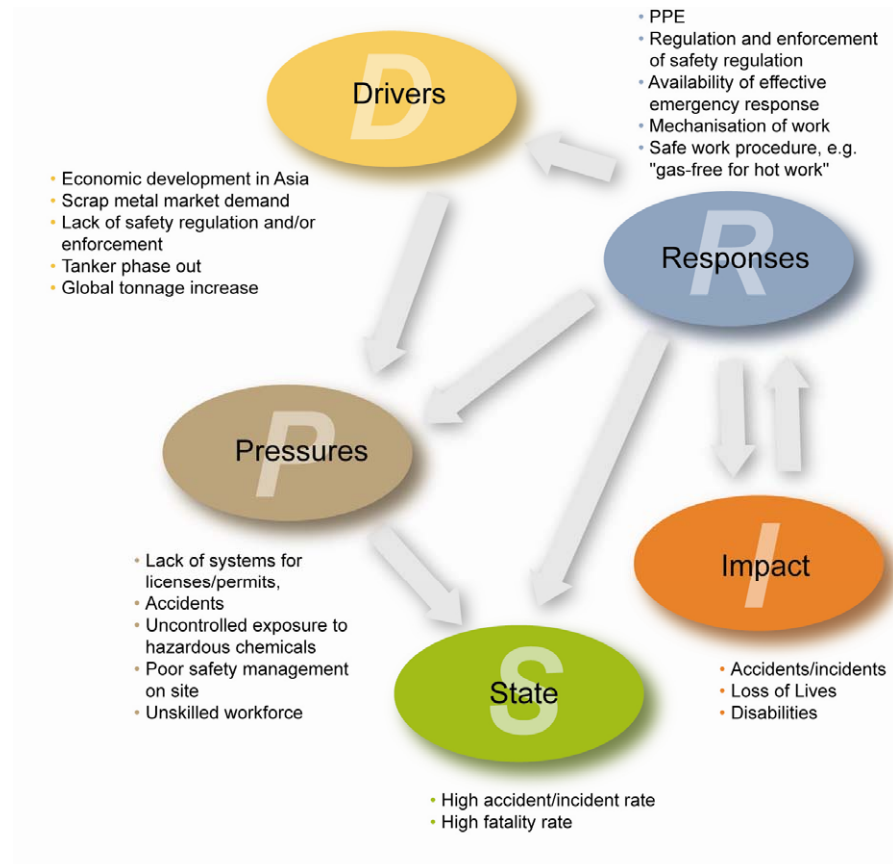


Figure 5-4 DPSIR framework for safety issues within ship recycling yards

5.4 Proposed 10 indicators

The above DPSIR analyses and the EC Recommendation 2003/532/EC on selection and use of environmental performance indicators have given valuable input to the identification of a limited number (10) of suitable indicators for the HSE performance of ship recycling facilities.

In selection of indicators it has been prioritised to have indicators representing several of the “DPSIR-levels” and each of the three categories of indicators according to the EC Recommendation. The significance of the HSE impacts of ship recycling facilities and the complexity of these facilities do that management performance indicators (MPI) and operational performance indicators (OPI) have been prioritised from environmental condition indicators (ECI) in the EC indicator category terms.

Final important input and parameters in the indicator selection has been the existing work on indicators within other sectors/industries and an evaluation of the availability (existing and future) of appropriate input data.

Table 5-2 includes the proposed 10 indicators and a description of how the indicators are established.

Table 5-3 includes for each of the indicators reference to the HSE issue of concern and the DPSIR-level and EC indicator category.

Table 5-2 Description of how to establish the proposed indicators for health, safety and environmental performance at ship recycling facilities

Indicator	Measurement unit(s) for indicator
Training and awareness	Number of training hours per employee per employee category per year
Illnesses	Number of work related sick days per employee and year
Emergency preparedness	The number of hours of emergency training per employee per year and number of full scale yard drills
Lifting operations	The number of uncontrolled falls of objects during ship recycling operations within the last 12 operational months The maximum individual manual lifting load (both lifts in motion and stationary lifts) in kg
Accident rate	Number of accidents involving personal injuries normalised to per 100,000 man-years worked
Fatality rate	Fatal accidents occurred normalised to per 100,000 man-years worked
Pollution prevention from spills	The percentage of the area of each cutting zone equipped with impermeable surfaces and controlled drainage
Concentration of hazardous materials in soil, air, sediment and marine water within the facility	The concentration of relevant hazardous compounds in soil, air, sediment and marine waters within the facility as measured in environmental samples sampled during recycling operations
Environmental performance of waste disposal contractors	The percentage of the hazardous waste generated at the facility disposed according to international waste disposal requirements or similar national regulation
Emission of hazardous material to the environment	Demonstration of agreement between amounts of hazardous materials as recorded in final certificate, the completion report and the records of disposal

Details and specific comments on the proposed indicators are found in the following sections.

Training and awareness

The indicator must be based on training records to be available at the facility.

The specific training and awareness raising training must be split on the different employee categories based on the individual risk assessment of the work processes at the facility. Awareness training is required for all employees whereas additional specific training are needed for “at risk people”, who are those identified as being at risk of exposure to a hazard for which specific training/education is considered appropriate.

The indicator is calculated as the total number of training hours within the specific employee category within the last 12 months divided by the number of employees within that employee category.

The quality of the training is off course an important factor, which should be constantly evaluated and assessed and which should be assessed as part of the certification audits. In general the indicator should be as high as possible.

Illnesses

A system operated by a trained medical officer should record occupational health consequences and illnesses. This system should form basis for the indicator.

Protocols and treatment records from the site trained medical officer will form valuable input to this indicator.

The illness rate is calculated by comparing the total number of working days where employees have been ill as a result of a work related illness against planned working days, within the last 12 months.

The numerical value of the indicator should be as low as possible and at best zero.

Accident and fatality rate

The accident rate is calculated as the number of accidents involving personal injuries within the last 12 months normalised to 100,000 men (multiply number of accidents with 100,000 and dividing by total number of workers).

The fatality rate is calculated as the number of fatalities within the last 12 months normalised to 100,000 men by multiplying the number of fatalities within the last 12 months with 100,000 and (multiply number of fatalities with 100,000 and dividing by total number of workers).

The numerical values of the indicators should be as low as possible and at best zero.

Emergency preparedness

The indicator must be based on training records to be available at the facility.

The number of hours of emergency preparedness training must be split on the general employee and employees with specific duties within the facility's emergency preparedness.

The indicator is calculated as the total number of training hours within employees with and without specific emergency preparedness duties respectively within the last 12 months divided by the number of employees within that employee category.

The quality of training and drills are of course an important factor, which should be constantly evaluated and assessed and which should be assessed as part of the certification audits. However, in general the indicator should be as high as possible.

Lifting operations

Lifting operations during ship dismantling are critical operations in relation to the health and safety for the workers within the facility. Large falling objects pose a serious safety risk at the facilities and heavy manual lifts can seriously impact the health of the workers.

Uncontrolled falls include dropped or falling objects in areas, which has not been carefully planned and with the fall-area safely barricaded to prevent people entering.

The indicator is found by summing up the number of uncontrolled falls of objects within the last 12 months of active ship recycling operations at the facility (the relevant period will be longer than 12 months in case of non-continuous ship recycling activities at the facility).

Manual lifts include all manual lifting operations by workers on site during normal work procedures. In case large heavy objects are lifted by more than one worker the individual load is found by dividing the total weight of the object by the number of workers lifting it.

The indicator should be as low as possible both for the number of uncontrolled falls and for the maximum experienced manual lifting load.

Pollution prevention from spills

This indicator is calculated as number of m² with pavement and controlled drainage divided by the total surface area in m² multiplied by 100. The indicator is calculated for each of the cutting zones: primary and secondary. Controlled drainage includes drainage to pollution controlling devices as holding tanks, oil skimmers etc.

The indicator should be as high as possible and at best 100%.

Concentration of hazardous materials in soil, air, sediment and surface water within the facility

Selection of relevant hazardous materials to be included in this indicator will vary between facilities depending on their capabilities to handle specific hazardous materials.

The relevant number of sampling sites and the location of these will also be site specific. The nature of the environment where the facility is located will have to

be taken into consideration, e.g. the highly dynamic marine environments of the beaching facilities will very much impact the concentrations of hazardous materials found in these environments as described in the previous chapter.

The list of relevant hazardous materials together with the number and location of the sampling sites will have to be frequently evaluated within the facility and should be assessed as part of the certification audits at the facility.

The concentrations of hazardous materials found in the environmental compartments should be as low as possible. The physical and chemical properties of the relevant compounds are very important to keep in mind when evaluating the trend in the indicator within a facility, e.g. the persistency and mobility of the compound in the specific environmental compartment.

Environmental performance of waste disposal contractors

The indicator is calculated as the amount of the hazardous waste generated at the facility disposed according to international waste disposal requirements or similar national regulation compared to the total amount of hazardous waste generated at the facility multiplied by 100 to get it as percentage.

The waste contractor can be the ship recycling facility if they are disposing/storing some of the hazardous materials themselves.

The indicator should be as high as possible and at best 100%.

Emission of hazardous material to the environment

As the possible emission points for hazardous materials during ship recycling in most cases are numerous it is not possible to directly measure the emissions from the facility during ship recycling operations. Instead the emission of hazardous materials to the environment is calculated as the difference between the input of hazardous materials to the facility – the amount of hazardous materials onboard the vessels – and the controlled output of hazardous materials from the facility – the controlled disposal of hazardous materials. That difference makes up the emissions (losses) of hazardous materials within the facility.

The input of hazardous materials to the facility is based on the inventory of hazardous materials, which have to be handed over to the ship recycling facility at delivery of the vessel to the facility. The output is based on the records for the disposal of the hazardous materials.

As described for the above indicator, the list of relevant hazardous materials to be included in this indicator will vary between facilities depending on their capabilities to handle the specific hazardous materials.

The relevant hazardous compounds will have to be evaluated frequently within the facility and should be assessed as part of the certification audits at the facility.

The indicator should be as low as possible and at best zero.

Table 5-3 Relevant HSE issue, DPSIR-level and EC indicator category for each of the proposed indicators

Area	Issue	Indicator	DPSIR*	EC Category**
Health	The high accident and incident rate involving personal injuries	Training and awareness	R	MPI
Health	The unhealthy working conditions with heavy manual lifts etc. Uncontrolled human exposure to hazardous chemicals The high accident and incident rate involving personal injuries	Illnesses	I	MPI
Health/safety	Lack of adequate emergency response	Emergency preparedness	R	MPI
Safety/health	The safety dangers from uncontrolled falling objects and the health impacts associated with heavy manual lifts	Lifting operations	R	OPI
Safety	The high accident and incident rate involving personal injuries	Accident rate	I	MPI
Safety	The high accident and incident rate involving personal injuries	Fatality rate	I	MPI
Environment	The uncontrolled emission of hazardous chemicals and substances within the facility leading to environmental and human exposure	Pollution prevention from spills	R	OPI
Environment	The uncontrolled emission of hazardous chemicals and substances within the facility	Concentration of hazardous materials in soil, air, sediment and marine water within the facility	S	ECI
Environment	The uncontrolled emission of hazardous chemicals and substances outside the facility	Environmental performance of waste disposal contractors	R	OPI
Environment	The uncontrolled emission of hazardous chemicals and substances within the facility	Emission of hazardous material to the environment	S	OPI

*: DPSIR level: D: Driver; P: Pressure; S: State; I: Impacts; R: Response

** : EC category: OPI: Operational Performance Indicator; MPI: Management Performance Indicator; ECI: Environmental Conditions Indicator

5.5 Indicator benchmarks/European label

The main purposes of the proposed indicators as described above are to be able to benchmark different facilities in terms of their HSE performance and to allow for an evaluation of the development over time of the HSE performance within one facility.

One of the parameters for the selection of the indicators is that they should be as universal as possible to allow for direct comparison of the performance of different facilities. Differences within facility operations, e.g. beaching vs. pier-breaking can influence the performance level of some of the indicators, which one should keep in mind when benchmarking different facilities or facilities located in very different environments against each other. As an example can be mentioned the resulting concentration of hazardous compounds in sediments from a given discharge pattern outside a beaching facility located in a highly dynamic marine environment and a slip-way facility located in a sheltered inlet, which can easily be very different although the emissions were the same.

The above fact, combined with the limited data availability for some of the relevant indicators, makes it difficult to establish direct quantitative performance levels/benchmarks for all the proposed indicators.

In Table 5-4 below is presented the proposed performance benchmarks for each of the three ship recycling quality levels as described earlier in Chapter 4. The levels are obviously built up around increasing the requirements for HSE performance using the indicators where possible to denote a measurable improvement. In some cases it may be the same indicator, but the requirement for qualitative and quantitative information increase from A to AAA, e.g. the disposal records requirement. Some of the benchmarks could possibly be changed later when more data within HSE performance in the industry has been gathered.

A prerequisite for qualifying for the A level is fulfilment of the IMO Convention and Guideline, which forms basis for the IMS. The requirements for the three levels are cumulative and all those of lower level must be fulfilled at upper levels. Two criteria can be exempted for one year while maintaining a level.

The minimum level (A) indicates implementation of the IMO draft Convention and guidelines and will under the current IMO draft include the beaching facilities. If the European Community opts to exclude the beaching method from the approvable methods in this category there will presumably still be some of the facilities in Turkey employing simple versions of the landing method and possibly certain pier breaking facilities.

The AA level is meant to include upgraded and improved versions of the pier breaking and slipway facilities, but may also comprise other methods without access to impermeable surface in the primary cutting zone.

The surface criterion is crucial to the AAA level and it is presently expected that only docking methods will qualify.

Table 5-4 Proposed performance benchmarks for each of the three tiers in the proposed tiered HSE performance label. IMO Convention and Guideline must be fulfilled. The requirements are cumulative and all those of lower level must be fulfilled at upper levels. Two criteria can be exempted for one year while maintaining a level

Indicator	Minimum A	Medium AA	Premium AAA
Training and awareness	All employees have within previous 12 months received HSE awareness training and 'at risk employees' are identified and have received specialised training	HSE awareness training for all employees and specialised training for 'at risk employees' within previous 6 months	HSE awareness training for all employees and specialised training for 'at risk employees' within previous 3 months
Illnesses	The average number of sick days per employee and per year is publicly available. As a minimum a nurse is available for the facility. Asbestos health checks within 1 month after employment and at least annually	A doctor and a clinic are available at the facility or within 3 km or 30 min. Health records for employees are kept	A doctor and a clinic are available at the facility or within 3 km or 30 min. Proactive health campaigns towards the employees are conducted by a doctor
Emergency preparedness	Availability of first aid and emergency response to all working areas during all times of work operations. All employees have received information on emergency procedures and staff with specific emergency response duties are trained	At least one full scale emergency yard drill have been performed within last 24 months	At least one full scale emergency yard drill have been performed within last 12 months
Lifting operations	Dismantled objects must not be allowed uncontrolled falls and no gravity cutting is allowed. The maximum size of cut or uncut objects must be set relevant to the mechanical lifting capacity. No manual lifting operations with an individual load of above 50 kg	No manual lifting operations with an individual load of above 30 kg	No manual lifting operations with an individual load of above 15 kg
Accident rate	Accidents are investigated and corrective and preventive actions implemented. The effectiveness of these is controlled and documented. Five years rolling average reduction targets are met.	Four years rolling average reduction targets are met. The max. rate being 12,000 accidents with more than three days absence per 100,000 men per year (normalised) or national targets whichever is lowest	Incidents and near-misses are also recorded, analysed and corrective and preventive actions implemented. Three years rolling average reduction targets are met. The max. rate being 6,000 acci-

³¹ EU accident rate within some of the most dangerous work sectors: agriculture and construction according to European Agency for Safety and Health at Work

Indicator	Minimum A	Medium AA	Premium AAA
	The max. rate being 18,000 accidents with more than three days absence per 100,000 men per year (normalised) or national targets whichever is lowest		dents with more than three days absence per 100,000 men per year ³¹ (normalised) or national targets whichever is lowest
Fatality rate	The fatality rate and reduction goals for the facility are publicly available. Compensations are paid. Five years rolling average reduction targets are met. The max. rate being 39 fatalities per 100,000 men per year (normalised) or national targets whichever is lowest	Four years rolling average reduction targets are met. The max. rate being 26 fatalities per 100,000 men per year (normalised) or national targets whichever is lowest	Three years rolling average reduction targets are met. The max. rate being 13 fatalities per 100,000 men per year ³² (normalised) or national targets whichever is lowest
Pollution prevention from spills	Hull used as impermeable barrier for non wetted parts with keel moved to area with impermeable flooring and drainage when cutting through final barrier		Double containment within all working areas
Concentration of hazardous materials in soil, air, sediment and marine water within the facility	Relevant reference levels are established. Monitoring frequency at least 1 per year	Monitoring frequency at least 1 per quarter	Monitoring frequency 1 per month or continuous
Environmental performance of waste disposal contractors	All waste treated according to ESM including non-destructive disposal techniques. All contractors must be properly licensed		All waste treated according to ESM incl. destruction and immobilisation
Emission reduction of hazardous materials to the environment	Documented facility compliance between sum of IHM and total disposal records	Documented compliance between IHM and final disposal records on a ship basis	PCHMs are verified. Documented compliance between IHM and final disposal records on a ship basis

³² EU fatality rate within some of the most dangerous work sectors: agriculture and construction according to European Agency for Safety and Health at Work

6 Recommendations on how to introduce the IMS

The IMO Convention and Guidelines on Safe and Environmentally Sound Ship Recycling is expected to be adopted in 2009, but may not enter into force until 2013 or even later depending on the speed of ratifications. In recent years the annual recycled volume has amounted to less than 1% of the merchant vessel fleet, but the current global economic slowdown is expected to hurt freight rates and bring more tonnage to recycling, and so is the upcoming estimated phase out peak in 2010 for single hulled oil tankers. Thus, urgency is warranted in providing acceptable recycling options for the European and the Global shipping industry.

A voluntary business-to-business system, such as the integrated management system (IMS) proposed here, will be instrumental in assisting the IMO implementation process and may even accelerate the improvement of conditions in ship recycling facilities with respect to health, safety and environmental issues. The IMS presented takes into account European Community legislation and includes few additions to the IMO draft Guidelines and the system for certification developed by the International Standardisation Organisation ISO (ISO 30000 series), both of which builds on the IMO draft Convention. The core of the IMS reaching beyond procedural standards is related to the advancement of a limited number of key performance indicators to be monitored in ship recycling facilities. Therefore, any ship recycling facility embarking on an adaptation to the IMO Convention and Guidelines should find it achievable to comply with the system proposed here.

However, globally the ship recycling facilities have very different starting points and to assist a global introduction of a new IMS must seek to:

- rapidly ensure availability of the IMS to the market while the ambition levels, certification systems and budgeting issues are still under consideration in the recycling industry
- provide a qualified accreditation system of the auditing and certifying organisations to ensure legitimacy and immediate market credibility, and
- increase sector capacity and assist ship recycling facilities in upgrading to European certification system and performance goals.

Recommendations for how to address the challenges within the three key issues are detailed in the following sections.

6.1 Availability of IMS

First of all, activities to ensure availability of the IMS to the stakeholder community must be initiated rapidly since the adjustment of the ship recycling sector's HSE performance is already picking up and will gain momentum with the adoption of the IMO Ship Recycling Convention planned for 2009. It is also a timely intervention since a peak for phase out of single hulled tankers should appear in 2010. Guidance and certification systems to increase transparency have been warranted by shipping industry organisations and the present proposal is based on the developed draft guidance documents under the IMO and produces easily recognisable key performance indicators.

Under less time constrained circumstances it could be proposed that a European standardisation organisation, e.g. CEN, should produce and issue the guidance on how to apply the management system in ship recycling facilities. However, the technical procedures of such organisations may be lengthy and in light of the pending peak recycling volume in year 2010 it is recommended that a manual to the IMS and a publication outlining the indicators are rapidly published by an appropriate European entity, preferably no later than mid 2009. This would allow interested ship recycling facilities to become certified according to the IMS in the same process as their upgrade towards IMO Convention level and a possible ISO certification.

6.2 Organisations and actors in implementation

Auditing and certification of the system should be left to the market players already active in this business sector. It should not be necessary to develop any new organisations as it is most feasible that the certifying auditors come from the existing organisations already involved in these activities, e.g. class, standardisation bureaus and consultancies.

There may not be more than 100 ship recycling facilities applying to become certified according to the IMS³³ and fewer organisations involved in audits of these facilities. The existing national accreditation organisations, which control the auditing and certifying organisations, have few and rarely used competencies in this area. To ensure legitimacy and credibility it is proposed to have only one organisation globally responsible for accreditation of the auditing and certifying organisations in the ship recycling sector. The responsibility for accredi-

³³ A gross estimate of the number of ship recycling facilities in the world today is 300-400, many of which are dormant or engaged in recycling of small vessels, and currently maybe only some 50 facilities are active in recycling of the merchant fleet. Although, the recycling volume can be expected to increase the number of recycling facilities may very well remain limited or even consolidation may take place. It is estimated that the number seeking an IMS certification may not be more than 100.

tation may be offered in tender within the technically competent organisations already involved in accreditation, e.g. EMSA.

Presently, the draft IMO Convention does not acknowledge voluntary certification systems. It would obviously increase the implementation effectiveness of the IMS if a Party could require ships flying its flag to be recycled in facilities adhering to a specific management system, i.e. IMS, ISO or the like.

6.3 Capacity development and awareness raising

The implementation strategy should aim at promoting the IMS within the recycling facilities themselves, national authorities and the associated industries: the ship-owners and cash buyers, the steel mills, the subcontractors and the equipment retail businesses. Thus, both a promotion component and a technical capacity development component should be included:

Promotion component:

- It is important to seek commitment from the shipping community to their active request for a voluntary certification and auditing scheme in the recycling yards, e.g. via European Ship Owners Association, ISRA and the like
- This may also include a joint award to green recycler and ship owner for sustainable collaboration, i.e. recycling of a vessel under IMS conditions
- Publically available list of all IMS facilities and vessels recycled under IMS conditions
- Publication of IMS indicators for yards at central internet location
- Subsidise five free IMS certifications in (third) world and five in Europe.

Awareness and capacity component:

- Develop a brief IMS implementation manual (check list type) with focus on indicators to be freely distributed
- Offer a web-tool guiding interested ship recycling facilities through a virtual upgrade process depending on the starting points (the four IMO methods)
- On a short notice, use of existing technical assistance instruments to countries using beaching may be considered for upgrade or if necessary relocation of their ship recycling activities. These may include:
 - Sector specific aid and bilateral assistance
 - Business to business programmes
 - Technology transfer of hardware and software, and
 - Cleaner development mechanism programmes.

- On the longer term, support to the innovative development of safe and environmentally sound solutions for IMS certified facilities via existing technical and research programmes
- On a medium term, the European IPPC Bureau may organise and produce a BAT reference document (BREF) for ship recycling.

The suggestions above are all ‘carrots’ and it is difficult to establish a ‘stick’ directed at the recycling facilities area since the facilities most in need of upgrade and those handling the largest volume of merchant vessels are outside of European jurisdiction. However, facilities in the member states recycling government vessels or vessels under subsidised decommissioning of fishing vessels can be requested to adhere to the IMS. To upgrade should not prove too difficult as European facilities presumably already fulfil most criteria for AA or AAA level.

A possible ‘stick’ would be a requirement from member states that vessels flying their flag must be recycled at facilities enrolled in the European IMS. It would be possible to initiate this in the interim before the IMO convention enters into force.

A key financial mechanism of the recycling industry is the Letters of Credit that are issued by cash buyers to the ship recyclers when a recycling facility purchases a ship for recycling. Today, a credit crunch is eminent and it is increasingly difficult to finance investments, also for ship breakers. It may therefore work also in the short term to establish a European fund to finance such Letters of Credit. To provide an incentive, the funds should allow for a competitive interest rate and be made available either via the cash buyers, banks, directly to the recyclers or via any other appropriate channel. Obviously, a condition to such Letters of Credit supported by European Community funds must be that the ship recycling facility adheres to the IMS.

6.4 Financing

International auditing is costly and experience from other similar certification and auditing schemes shows that a major share of an auditing organisation’s operating budget is to be paid by the customers. In this case the recycling facilities which in turn presumably will pass on the costs to the ship owners.

The financing principle of the upgrade and certification is therefore in line with the polluter pays-principle and it will be seen as a cost deducted from the price paid for the ship to be recycled.

The technical and financial capacity of recycling facilities in developing nations may not allow for their commitment to the European IMS programme. Work must be undertaken in the first place to meet the requirements of the IMS certification at a time when the IMO Convention is not yet in force, and although the certification and auditing in the long run must be sustained through the contribution from its users, it may be necessary during the initial phase partly to

cover the implementation costs of the IMS for recycling facility particularly in developing countries via mechanisms as mentioned above.

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Appendices

Appendix A Survey

Appendix A-1 Survey Questionnaire

[Introduction]

Ship recycling facilities

This Questionnaire is part of an ongoing study for the European Maritime Safety Agency (EMSA) carried out by COWI as contractor.

The study aims to develop a certifiable model for an integrated management system allowing recycling facilities to demonstrate safe and environmental sound recycling of ships. The study forms a part of the EC/EMSA input to the implementation of the future IMO Ship Recycling Convention under development at the moment.

The purpose of the Questionnaire is to map the expectations of stakeholders within the ship recycling industry regarding certification systems for ship recycling facilities.

All answers will be made anonymous before further use.

The estimated time to complete the Questionnaire is 10 minutes.

[respondent info]

Please complete the following forms:

[1 - single]

Contact info

1. Contact info

[HopC el D el E ==> < scope >]

[Facts on existing conditions]

Facts on existing conditions

[2 - single]

What is the number of ship recycling facilities in your country targeting ocean-going vessels?

- 1. 0
- 2. 1-2
- 3. 3-5
- 4. 5-10
- 5. >10
- 6. No information

[3 - single]

Estimated annual total recycled ship **tonnage in your country** (in either DWT or LDT):

- 1. Ton

[4 - single]

If both smaller ships such as inland barges and fishing ships and oceangoing vessels are recycled what is the estimated **percentage** of oceangoing vessels larger than 500 DWT?

1. Percentage

[A - Percent - ÉbPercentages

- 1. 0-25%
- 2. 25-50%
- 3. 50-75%
- 4. 75-100%

[approvals, licensing]

Approvals, licensing and monitoring

The following questions concerns approvals, licensing and monitoring of (ship) recycling industry (*if there are no ship recycling facilities in your country, please respond for other recycling industry, e.g. cars*):

[5 - multiple]

Which ministry or ministries holds responsibility for permits regarding this type of industrial activity and for worker's health, safety and environment at such facilities?

- 1. Ministry of Environment
- 2. Ministry of Industry/Commerce
- 3. Ministry of Health
- 4. Other:

[6 - single]

Is there a specific approval system of (ship) recycling facilities?

- 1. Yes
- 2. No
- 3. No information

[7 - single]

What is the duration/validity of permits or licences?

- 1. 1 year
- 2. 2 years
- 3. 3 years
- 4. 4 years
- 5. > 4 years
- 6. No information / not relevant

[8 - multiple]

How is compliance of permits at the facilities monitored?

- 1. Inspection
- 2. Sampling
- 3. Self control
- 4. Other
- 5. No information / Not relevant

[9 - single]

Please elaborate on your answers:

- 1. elaborate

[scope]

Expectations to the certification system based on IMO Ship Recycling Convention

The following questions concern your expectation to the future certification system based on the IMO ship recycling convention (SRC). For each question please indicate to which extent you agree.

[Facility scope]

Facility scope

[10 - single]

All ship recycling facilities should reach the same level of compliance by entry into force of the IMO Ship Recycling Convention (SRC)

- 1. Strongly disagree
- 2. Disagree
- 3. No strong opinion
- 4. Agree
- 5. Strongly agree

[11 - single]

Ship recycling facilities can opt for limited approval if they do not have all needed facilities in place (e.g. no asbestos containing ships if procedures and equipment are inadequate)

- 1. Strongly disagree
- 2. Disagree
- 3. No strong opinion
- 4. Agree
- 5. Strongly agree

[12 - single]

On the same grounds limits in certification should be possible and available for enquiries

- 1. Strongly disagree
- 2. Disagree
- 3. No strong opinion
- 4. Agree
- 5. Strongly agree

[13 - single]

Please elaborate on your answers:

- 1. elaborate

[responsibilities]

Responsibilities of ship owners and ship recycling facilities

[responsibilities]

[14 - single]

The Green Passport (GP) or Inventory of Hazardous Materials (IHM) should be updated regularly under the same owner and updated upon sale?

- 1. Strongly disagree
- 2. Disagree
- 3. No strong opinion
- 4. Agree
- 5. Strongly agree

[15 - single]

The GP/IHM should be approved by a third party before the development of the Ship Recycling Plan (SRP)

- 1. Strongly disagree
- 2. Disagree

- 3. No strong opinion
- 4. Agree
- 5. Strongly agree

[16 - single]

The SRP's should be submitted for approval to a Party competent authority and be available to the public

- 1. Strongly disagree
- 2. Disagree
- 3. No strong opinion
- 4. Agree
- 5. Strongly agree

[17 - single]

Please elaborate on your answers:

- 1. elaborate

[standards]

Procedure and performance standards

[Standards]

[18 - single]

The IMO Convention and Guidelines are sufficient to ensure the practical implementation of the Convention

- 1. Strongly disagree
- 2. Disagree
- 3. No strong opinion
- 4. Agree
- 5. Strongly agree

[19 - single]

The ISO 30000 procedural standard on Ship Recycling, presently under development, or other international standards will assist ship recycling nations in the implementation of the SRC Recycling Plan (SRP)

- 1. Strongly disagree
- 2. Disagree
- 3. No strong opinion
- 4. Agree
- 5. Strongly agree

[20 - single]

National standards of ship recycling nations are sufficient to ensure an implementation of the SRC

- 1. Strongly disagree
- 2. Disagree
- 3. No strong opinion
- 4. Agree
- 5. Strongly agree

[21 - single]

Please elaborate on your answers:

- 1. elaborate

[Certification and Indicators]

Certification and Indicators

[Certification and Indicators]

[22 - single]

Certification is a way to achieve market recognition of the efforts made to improve management of occupational health, safety and environment in ship recycling

- 1. Strongly disagree
- 2. Disagree
- 3. No strong opinion
- 4. Agree
- 5. Strongly agree

[23 - single]

Certification is a way to track the performance of the ship recycling facility regarding management of occupational health, safety and environment

- 1. Strongly disagree
- 2. Disagree
- 3. No strong opinion
- 4. Agree
- 5. Strongly agree

[24 - single]

The performance of the ship recycling facility from year to year should be measurable

- 1. Strongly disagree
- 2. Disagree
- 3. No strong opinion
- 4. Agree
- 5. Strongly agree

[25 - single]

The performance of the ship recycling facility from year to year should be benchmarked against indicators on occupational health, safety and environment

- 1. Strongly disagree
- 2. Disagree
- 3. No strong opinion
- 4. Agree
- 5. Strongly agree

[26 - single]

The performance of the ship recycling facilities should allow the seller of a vessel to benchmark facilities against indicators on occupational health, safety and environment

- 1. Strongly disagree
- 2. Disagree
- 3. No strong opinion
- 4. Agree
- 5. Strongly agree

[27 - single]

Please elaborate on your answers:

- 1. elaborate

[Public Information]

Public Information on Performance

[Public Information]

[28 - single]

Indicators of performance on occupational health, safety and environment issues should be submitted to Party's competent authorities

- 1. Strongly disagree
- 2. Disagree
- 3. No strong opinion
- 4. Agree
- 5. Strongly agree

[29 - single]

Indicators of performance on occupational health, safety and environment issues should be submitted to Party's competent authorities and made public

- 1. Strongly disagree
- 2. Disagree
- 3. No strong opinion
- 4. Agree
- 5. Strongly agree

[30 - single]

Please elaborate on your answers:

- 1. elaborate

[next]

Click next to end the questionnaire. No further editing will be possible.

Appendix A-2 Invited Survey Respondents

Environmental Authorities

Organisation	Organisation 2	Country
Ministry of Environment and Forest	Bangladesh Secretariat	Bangladesh
Ministry of Environment and Forest		Bangladesh
OVAM - Flemish Public Waste Agency	Stationsstraat MO	Belgium
Department of International Cooperation	SEPA	China
Zhejiang Maritime Safety Administration		China
Soil and Waste Division	Danish Environmental Protection Agency	Denmark
Waste Department	Ministry of the Environment	Estonia
International Affairs Unit	Ministry of the Environment	Finland
Interministerial Committee on Ship	Dismantling	France
Focal Point Basel Convention	Federal Environmental Agency	Germany
Hellenic Chamber of Shipping	Ministry of Commercial Maritime	Greece
Ministry of Environment and Forests		India
Office of Waste Disposal Management	Department of Waste Management and Recycling	Japan
Waste Management Division	Ministry of Environment	Latvia
Waste Management Team	Malta Environment and Planning Authority	Malta
Subsecretaría de Gestión Para la Protección Ambiental	Secretaria de Medio Ambiente y Recursos Naturales	Mexico
Waste Section	Ministry of Environment	Netherlands
Ministry of Environment		Norway
Pakistan Environment Protection Agency	Ministry of Environment	Pakistan
Transboundary Movement of Waste Division	Chief Inspectorate for Environmental	Poland
General Directorate for Waste Management and Hazardous Substances	Ministry of Environment and Water Management	Romania
Ministerio de Medio Ambiente		Spain
Division for Eco-Management and Chemicals	Ministry of Sustainable Development	Sweden
Waste Management Department	Ministry of Environment and Forestry	Turkey
Waste Management Division	Department for Environment, Food and Rural Affairs (DEFRA)	London SW1E 6DE
Pollution Control Division	Vietnam Environment Protection Agency	Viet Nam
International and Transportation Branch	US Environmental Protection Agency	United States of America

Maritime Authorities

Organisation	Country
Federale Overheidsdienst Mobiliteit en Vervoer	Belgium
Ministry of Transport	Bulgaria
Ministry of Economic and Business Affairs	Denmark
Estonian Maritime Administration	Estonia
Ministère de l'Équipement, des Transports, de l'Aménagement du territoire, du Tourisme et de la Mer	France
Ministry of Mercantile Marine	Greece
Ministero delle Infrastrutture e dei Trasporti	Italy
Ministry of Transport of Latvia	Latvia
Lithuanian Maritime Safety Administration	Lithuania
Ministerie van Verkeer en Waterstaat	Netherlands
The Norwegian Maritime Directorate	Norway
Ministry of Maritime Economy	Poland
Ministry of Transport, Construction and Tourism	Romania
Ministerio de Fomento	Spain
Turkish Maritime Administration	Turkey
Marad	USA
Department for Transport	United Kingdom

Ship Owners

Organisation	Country
Royal Belgian Ship owners' Association	Belgium
Danmarks Rederiforening	Denmark
Armateurs de France	France
Union of Greek Ship owners	Greece
Confederazione Italiana Armatori	Italy
Koninklijke Vereniging van Nederlandse Reders	The Netherlands
Asociacion de Navieros Espanoles	Spain
The Chamber of Shipping	The United Kingdom
Estonian Ship owners' Association	Estonia
Lithuanian Ship owners	Lithuania
Zwiazek Armatorów Polskich (Polish Ship owners' Association)	Poland
Bulgarian Ship owners' Associations	Bulgaria
Norwegian Ship owners' Association	Norway
Indian National Ship owners Association	India
National Association of Chinese Ship owners	China
Chamber of Shipping of America	USA
Malta International Shipping Council	Malta
European Ship Owners Association	Belgium
Joint Cyprus Ship owners Association	Cyprus

Ship Recyclers (Association)

Organisation	Country
British Metals Recycling Association	The United Kingdom
Ship Recycling Industries Association India	India
Turkish Ship Breakers Association	Turkey
China national resource recycling association	China
Confederation Belge de la recuperation	Belgium
Federec	France
Netherland: Dutch metal recycling federation	The Netherlands
Scheepsslorerij Nederland BV	The Netherlands
Van Heyghen Recycling	Belgium

NGO

Organisation	Country
Greenpeace	The Netherlands
Basel Action Network	Belgium

Appendix A-3 Survey Results

Existing conditions and legislation

The respondents represent 6 nations; Bulgaria, Denmark, Estonia, Lithuania, Netherlands and UK. The survey reveals information about present conditions and legislation in these countries.

	1	2	3	4	5	6	7
Bulgaria	0			Ministry of Environment Ministry of Health	No information	No information	
Denmark	3-5			Ministry of Environment Ministry of Employment	Yes	> 4 years	Inspection Self control
Estonia	1-2	4,000	5	Ministry of Environment Ministry of Economic Affairs Estonian Maritime Administration Ministry of Social Affairs	No	> 4 years	Inspection sampling self control accountancy
Lithuania	0			Ministry of Environment	No information	No information	
Netherlands	1-2			Transport	No information	No information	
UK	3-5	10,000	10	Ministry of Environment Health and Safety Executive	Yes	> 4 years	Inspection sampling

One respondent chose to elaborate their answer:

"There is only one big ship demolition and building factory in Estonia, who is buying old ships from all over Estonia and also from other Baltic Sea countries. Mostly the old ships are disaggregated and the reusable materials are sold (mostly black metal) abroad.

Old ships that are going to be demolished must be taken off the ship register. The factory must have waste permit from county department of Ministry of the environment and hazardous waste licence, if necessary from Ministry of the environment."

Scope of certification system

The following tables summarize the answers on this topic.

All ship recycling facilities should reach the same level of compliance by entry into force of the IMO Ship Recycling Convention (SRC)

	Total	Strongly disagree	Disagree	Nr. strong opinion	Agree	Strongly agree
A Environmental Authority	4	0	0	0	1	3
B Maritime Authority	3	0	0	1	2	0
C ship owners	7	2	1	0	3	1
D Recycler	2	0	0	0	1	1
E NGO	0	0	0	0	0	0
Total	16	2	1	1	7	5

Ship recycling facilities can opt for limited approval if they do not have all needed facilities in place (e.g. no asbestos containing ships if procedures and equipment are inadequate)

	Total	Strongly disagree	Disagree	No strong opinion	Agree	Strongly agree
A Environmental Authority	4	0	0	1	1	2
B Maritime Authority	3	1	0	1	1	0
C ship owners	7	0	1	1	2	3
D Recycler	2	1	1	0	0	0
E NGO	0	0	0	0	0	0
Total	16	2	2	3	4	5

On the same grounds limits in certification should be possible and available for enquiries

	Total	Strongly disagree	Disagree	No strong opinion	Agree	Strongly agree
A Environmental Authority	4	0	0	3	0	1
B Maritime Authority	3	0	0	1	2	0
C ship owners	7	0	1	1	3	2
D Recycler	2	1	0	0	1	0
E NGO	0	0	0	0	0	0
Total	16	1	1	5	6	3

Below is a selection of the elaborations that respondents made to their answers to the questions above:

- "By limited approval means a full approval stating clearly that the facility is not able to handle specific waste types."

- "Some yards are dedicated to military vessels or non commercial vessels and can accordingly not be treated equally."
- "The aim of the Convention is not that all facilities reach the same level of compliance under the new regime. The minimum standards that will be set up by the convention will apply to the facilities, taking into account that different facilities may have different capacities in terms of the vessels they are able to recycle."

However, we do not agree with the example quoted in Q 16. Handling hazardous materials is a core element of ship recycling and it is difficult to envisage that a recycling yard would not handle asbestos. Limitation of approval should relate to the physical capacities of the facilities (not all the installations of a facilities may be approved; or the facility may not be able to handle ships of a certain size).

This being said, limited approval is a pragmatic solution, which will also make ratification and implementation much easier than if the convention would envisage a "one size fits all" approach."

- "In order to create a level playing field among ship recyclers at least a minimum level of compliance should be set."
- "How can you dismantle ships in a green way if your workforce cannot detect e.g. certain waste products as asbestos. If a company wants to recycle ships, they have to obtain a proper and COMPLETE licence."

If the new legislation will accept certain loopholes, the industry will take advantage of this and we will end up with Asian practices. New legislation should be equal worldwide so a level playing field is created!"

- "It is not a condition of the Convention that all facilities achieve the same level of compliance under the new legal regime, nor has such an outcome been envisaged during its development. What is anticipated is that a minimum standard will be created through the Convention applying to all facilities which will each have distinct capacities and capabilities in terms of the vessels they are able to recycle and the materials they can safely handle."

Responsibilities of ship owners and recyclers

The following tables summarize the answers on this topic

The Green Passport (GP) or Inventory of Hazardous Materials (IHM) should be updated regularly under the same owner and updated upon sale?

	Total	Strongly disagree	Disagree	No strong opinion	Agree	Strongly agree
A Environmental Authority	4	0	0	0	2	2
B Maritime Authority	3	0	0	1	1	1
C ship owners	7	0	1	0	3	3
D Recycler	2	0	0	0	1	1
E NGO	0	0	0	0	0	0
Total	16	0	1	1	7	7

The GP/IHM should be approved by a third party before the development of the Ship Recycling Plan (SRP)

	Total	Strongly disagree	Disagree	No strong opinion	Agree	Strongly agree
A Environmental Authority	4	0	0	2	2	0
B Maritime Authority	3	0	0	1	2	0
C ship owners	7	1	2	2	1	1
D Recycler	2	0	1	1	0	0
E NGO	0	0	0	0	0	0
Total	16	1	3	6	5	1

The SRP's should be submitted for approval to a Party competent authority and be available to the public

	Total	Strongly disagree	Disagree	No strong opinion	Agree	Strongly agree
A Environmental Authority	4	0	1	0	3	0
B Maritime Authority	3	0	0	1	1	1
C ship owners	7	1	0	4	1	1
D Recycler	2	0	0	1	1	0
E NGO	0	0	0	0	0	0
Total	16	1	1	6	6	2

Below is a selection of the elaborations that respondents made to their answers to the questions above:

- "It is not approval as such that is required, but the opportunity for the CA to inspect the SRP in due time, and check that it is consistent with the capabilities and permit of the Ship Recycling facility."

- "It must be noted that it is practically impossible to provide Annex II and III of the Inventory for the SRP: they refer to (more limited) operational wastes linked among other to the final voyage and the SRP take place before the final voyage. This is why a control is made by the flag state (based on the final survey).

The SRP should possibly be submitted to the formal or implicit approval of the authority. We see, however, no reason to make it available to the public: information is highly technical, impossible to understand for not skilled persons, and this is not the case in other sectors. The last part of the proposal could create many arms."

- "Ship owners accept that the convention will place responsibilities upon them, including the update of the IHM, which is a pre-condition to the successful implementation of the convention.
- "Under the convention, the inventory will be certified by the Flag State or a recognized organisation acting on its behalf and we agree with that. Any additional certification would be redundant.

We agree with the first part of the sentence – the ship recycling plan should be approved by the “recycling state”. However, making it available to the general public would present commercial problems both for the shipowner and the recycling yards. Moreover, we fail to see the added value of this proposal."

- "The Inventory of Hazardous Materials will require authorization by the flag State or an RO operating on its behalf and therefore the proposals in the above section largely fit with the terms of the Convention.

Whilst the SRP should be approved by the competent authority of the recycling state, the public availability of such a document may present certain commercial problems for ship owners and recyclers alike, and such obstacles should be recognised if the Convention system is to be fair to stakeholders."

Procedure and performance standards

The following tables summarize the answers on this topic.

The IMO Convention and Guidelines are sufficient to ensure the practical implementation of the Convention

	Total	Strongly disagree	Disagree	No strong opinion	Agree	Strongly agree
A Environmental Authority	4	0	1	0	1	2
B Maritime Authority	3	0	1	2	0	0
C ship owners	7	1	1	0	4	1
D Recycler	2	0	1	0	1	0
E NGO	0	0	0	0	0	0
Total	16	1	4	2	6	3

The ISO 30000 procedural standard on Ship Recycling, presently under development, or other international standards will assist ship recycling nations in the implementation of the SRC Recycling Plan (SRP)

	Total	Strongly disagree	Disagree	No strong opinion	Agree	Strongly agree
A Environmental Authority	4	0	0	2	1	1
B Maritime Authority	3	0	0	2	1	0
C ship owners	7	1	0	4	2	0
D Recycler	2	0	1	0	1	0
E NGO	0	0	0	0	0	0
Total	16	1	1	8	5	1

National standards of ship recycling nations are sufficient to ensure an implementation of the SRC

	Total	Strongly disagree	Disagree	No strong opinion	Agree	Strongly agree
A Environmental Authority	4	1	1	1	1	0
B Maritime Authority	3	0	2	1	0	0
C ship owners	7	1	3	3	0	0
D Recycler	2	2	0	0	0	0
E NGO	0	0	0	0	0	0
Total	16	4	6	5	1	0

Below is a selection of the elaborations that respondents made to their answers to the questions above:

- "For the ISO 3000, there is a need to avoid that this fora works on its own, without consultation with stakeholders. The risk would otherway be that a

paperwork procedure would be set up rather than an improvement procedure.

For national standards, there is a crucial need to have a realistic approach, to foresee a transitional period (to meet the western standards) and make the best of it."

Certification and indicators

The following tables summarize the answers on this topic.

Certification is a way to achieve market recognition of the efforts made to improve management of occupational health, safety and environment in ship recycling

	Total	Strongly disagree	Disagree	No strong opinion	Agree	Strongly agree
A Environmental Authority	4	0	0	3	0	1
B Maritime Authority	3	0	0	0	2	1
C ship owners	7	0	0	0	5	2
D Recycler	2	0	0	0	2	0
E NGO	0	0	0	0	0	0
Total	16	0	0	3	9	4

Certification is a way to track the performance of the ship recycling facility regarding management of occupational health, safety and environment

	Total	Strongly disagree	Disagree	No strong opinion	Agree	Strongly agree
A Environmental Authority	4	0	1	1	1	1
B Maritime Authority	3	0	0	1	2	0
C ship owners	7	0	0	0	5	2
D Recycler	2	0	0	0	2	0
E NGO	0	0	0	0	0	0
Total	16	0	1	2	10	3

The performance of the ship recycling facility from year to year should be measurable

	Total	Strongly disagree	Disagree	No strong opinion	Agree	Strongly agree
A Environmental Authority	4	0	0	0	2	2
B Maritime Authority	3	0	0	1	1	1
C ship owners	7	0	1	1	4	1
D Recycler	2	0	0	1	0	1
E NGO	0	0	0	0	0	0
Total	16	0	1	3	7	5

The performance of the ship recycling facility from year to year should be benchmarked against indicators on occupational health, safety and environment

	Total	Strongly disagree	Disagree	No strong opinion	Agree	Strongly agree
A Environmental Authority	4	0	0	2	1	1
B Maritime Authority	3	0	0	1	1	1
C ship owners	7	0	1	0	5	1
D Recycler	2	0	0	0	1	1
E NGO	0	0	0	0	0	0
Total	16	0	1	3	8	4

The performance of the ship recycling facilities should allow the seller of a vessel to benchmark facilities against indicators on occupational health, safety and environment

	Total	Strongly disagree	Disagree	No strong opinion	Agree	Strongly agree
A Environmental Authority	4	0	0	2	1	1
B Maritime Authority	3	0	0	1	2	0
C ship owners	7	0	0	1	4	2
D Recycler	2	0	0	0	0	2
E NGO	0	0	0	0	0	0
Total	16	0	0	4	7	5

Below is a selection of the elaborations that respondents made to their answers to the questions above:

- "It should be emphasized that certification is not a goal in itself. So a certified ship recycling facility must be audited within a certain time frame. This

can be once a year or every second year. Bench mark is not necessary. (Consultancy bureau getting a leading factor)".

- "We agree with the above statements, provided that certification is made by the recycling facilities' competent authorities, and in accordance with the convention's provisions.

Dissemination of information relating to recycling facilities' performance will assist ship owners selling end of life ships in taking the appropriate decision.

On the other hand, we would be reluctant if a certification scheme was developed at regional level, whereby ship owners would be required to use facilities certified under that scheme. Any other certification scheme can only play an indicative role."

- "Vessel owners should take the performances of facilities on health, safety and environment into account when selling their ships".
- "The certification of recycling facilities by their competent authorities in accordance with the Convention, and the dissemination of relevant information in the public domain will assist ship owners selling end of life ships in fulfilling their obligations"

Public information on performance

The following tables summarize the answers on this topic.

Indicators of performance on occupational health, safety and environment issues should be submitted to Party's competent authorities

	Total	Strongly disagree	Disagree	No strong opinion	Agree	Strongly agree
A Environmental Authority	4	0	0	0	3	1
B Maritime Authority	3	0	0	1	1	1
C ship owners	7	0	0	1	5	1
D Recycler	2	0	0	0	1	1
E NGO	0	0	0	0	0	0
Total	16	0	0	2	10	4

Indicators of performance on occupational health, safety and environment issues should be submitted to Party's competent authorities and made public

	Total	Strongly disagree	Disagree	No strong opinion	Agree	Strongly agree
A Environmental Authority	4	0	0	0	3	1
B Maritime Authority	3	0	0	1	2	0
C ship owners	7	0	1	1	4	1
D Recycler	2	0	0	0	1	1
E NGO	0	0	0	0	0	0
Total	16	0	1	2	10	3

Below is a selection of the elaborations that respondents made to their answers to the questions above:

- "For the last question: as previously indicated, technical information need some skill to be understood. This info should be submitted to the competent authority, but not to the public. Media prove not to be a suitable source of information ("Good news are no news")"
- "Public opinion is a very effective control over the ship recyclers' performances".
- "As with the comments on certification, it is felt that the provision of information pertaining to the performance standards of facilities will assist in applying the Convention and allowing stakeholders to fulfil their obligations under its terms."

Appendix B Long list of existing EHS indicators from literature survey

Table C-1 Long list of identified existing environmental indicators possibly to be used within certified ship recycling facilities

Indicator
Tonnes carbon dioxide emitted per thousand tonnes of production
Tonnes of methane per thousand tonnes of production
Tonnes of NMVOC per thousand tonnes of production
Tonnes of sulphur dioxide (SO ₂) per thousand tonnes of production
Tonnes of nitrogen oxides (NO _x) per thousand tonnes of production
The overall average oil content in water discharged
Tonnes of oil spilt to the environment for every million tonnes of production
Energy consumption (GJ) for every tonne of production
Facility has safe management procedures and use proper removal, transport and storage facilities for hazardous materials on site
Facility's sub-contractors including disposal facilities comply with similar procedures and controls, and that their authorisations, certificates, permit or similar proof of operation compliance is adequate
Monitoring of facility pollution levels is carried out and reported to the authorities or the public

Table C-2 Long list of identified existing health/safety indicators possibly to be used within certified ship recycling facilities

Indicator
Workplace, product and environmental health hazards are identified, their risks assessed and a health plan produced for all current activities, operations and products
The health plan addresses any risks identified, is reviewed regularly and is progressed against internally set targets
The workplace environment meets legal requirements and does not harm health
Industrial hygiene and occupational health expertise is used to assess all chemical, physical, biological, ergonomic and psychological health hazards and advise on the implementation of appropriate controls and work practices to eliminate or minimize exposures
Workplace exposure monitoring is used to confirm ongoing effectiveness of control measures
Material storage, labelling, and safety data sheets are kept current

Employees are trained to understand the health risks, preventive measures and emergency procedures associated with their work
The workplace maintains adequate records for auditing and demonstrating compliance
Provision is made for the management of medical emergencies associated with company operations and activities
There is a medical emergency plan based on competent medical advice and level of risk, and it is in alignment with existing local provisions
The medical emergency plan is integrated into other emergency procedures, communicated effectively, and practised regularly with drills and reviews as appropriate
A process is in place to ensure that lessons learned are acted upon as a result of drills or incidents
Appropriate response times are established for first aid, emergency medical care and evacuation, and adequate resources have been made available to meet these times
All staff are provided with emergency contact numbers for medical assistance on each work site and during travel
Employees have access to occupational health practitioners who can help mitigate the effects of ill-health on their ability to work effectively, including facilitating employee rehabilitation and return to work post-illness or post-injury
A system is in place to provide access to primary, secondary and emergency medical facilities as well as counselling and employee assistance where appropriate
Employees' health status is compatible with the work that they do, and this is confirmed by assessments when necessary
There is a task check-list for different job categories, and health assessments/surveillance are performed by a competent health practitioner who has knowledge of the work to be performed
Pre-employment, pre-placement and periodic health assessments are conducted as dictated by legal requirements and by the health risks associated with specific tasks
Health surveillance is performed where required by legislation or where the work is known to be associated with the development of a recognized health problem for which there is a valid method for testing
Health impact assessment are initiated during the development stage of all new projects and expansions
Health impact assessment baseline data are established on the demography, community health status, air, soil and water quality prior to the start of a new project
Health impact assessors are assigned to work with social and environmental impact assessors in order to outline the range and types of hazard and potential beneficial impacts from new projects/expansion
Health information on all operations and products meets legal requirements and is accurate, secure and readily available

Records are maintained on raw materials, processes, products, work locations and work duties, as well as monitoring and assessment activities such as health risk assessments, workplace and personal exposure monitoring
Significant health incidents or trends are investigated
Personal health records are retained confidentially in line with any legislation on access and data protection
Categories and cases of occupational ill-health are tracked and analysed on a regular basis, and form part of the routine presentation of operating, business and financial metrics to facility management
An effective interface between public health and occupational health is maintained to mitigate major business risks and identify key sources of epidemiological information
Communications are maintained with local governments and health authorities to plan timely response to major outbreaks of infectious diseases
A programme is in place to identify key employee health issues and develop programmes to educate around prevention/harm reduction. Where appropriate these programmes extend beyond the workforce and into the community; examples might include HIV, tuberculosis, smoking, obesity, heart disease, malaria and vaccination programmes
The percentage of health risk assessments (HRAs) completed
The percentage of 'at-risk' people that have completed appropriate job-related health awareness, education and training programmes
Regular medical emergency drills are conducted at all locations to a defined standard
Percentage compliance with defined response times
The percentage of a defined cohort of at-risk employees who have undergone health surveillance appropriate to the hazardous exposure
A description of health impact assessments completed for new projects (vessels)
The percentage of sites at which the health concerns of employees are represented at an appropriate group, e.g. health circle, health and safety committee
The efficient reporting of work related illness
Occupational illness frequency rate (OIFR), expressed per million man hours exposure
Fatal accident rate per million hours worked
Lost time injury (LTI) frequency per million hours worked
Total recordable incident rate per million hours worked
Restricted Work Day Case (RWDC) + LTI frequency per million hours worked
Lost work day cases by cause
Certificates for confined and enclosed spaces, for hot work, emergency training, asbestos removal and for other management of haz-

ardous materials must be available
Procedures for workplace safety, rigging, scaffolding, emergency plan etc. must be available
Availability and use of personal protection equipment must be ensured
Facility must provide occupational health services

Table C-3 Long list of identified existing facility (other/overall) indicators possibly to be used within certified ship recycling facilities

Indicator
Facility must be registered, licensed, permitted, monitored and controlled by relevant authorities. Once IMO Convention enters into force, the facility must also be authorised by Party
Facility must apply equivalent control towards sub-contractors as the facility is subject to
The plans mentioned in IMO Convention: Recycling Facility Management Plan and Ship Recycling Plan must be available

Appendix C Comparison between the standards for environmental management

Standard/ convention/guideline	Issues covered by the standard	Specific for the ship recycling industry	Minimum coverage geographical and organisational	Based on or partly based on national legislation	Focus on performance	Certification / authorization	Information regarding performance public accessible	Includes the history of the ship	Includes waste handling down stream of the facility
ISO 14001	Environment	The standard is generic and valid for all types of organisations	An organisation can be defined as only a part of a company. If more operations a single operating unit may be defined by an organisation	Yes	No	Yes. ISO 19011 could be used as a guideline for CB	No	No	Yes, if they have some kind of control over the impacts.
OHSAS 18000	Occupational health and safety	The standard is generic and valid for all types of organisations	d.o.	Yes	No	Yes	No	No	Yes, if they have some kind of control over the impacts.
EMAS	Environment	The standard is generic and valid for all types of organisations	The smallest organisation is a site. Where a site is defined as: "all land at a distinct geographic location under the management control of an organisation covering activities, products and services. This includes all infrastructure, equipment and materials"	Yes	No	Yes	Yes	No	Yes if significant
ISO 30000	Occupational health and safety and environment	Specific for ship recycling industry	Defined area, site, yard or facility including the organisation that manages it.	Yes	No	Yes, ISO/PAS 30003 could be used as a standard for CB	No	Yes	Yes
IMO guidelines	Occupational health and safety and environment	Specific for ship recycling industry	Cover the areas affected by the ship recycling.	Yes partly		Yes	No	Yes	
ILO guidelines	Occupational health and safety	Specific for ship recycling industry	Cover the areas affected by the ship recycling.	No	Very specific requirements with regards to OHS performance	No	No	Yes	
Basel Convention - Technical guidelines	Environment	Specific for ship recycling industry		No	No	Yes	No	Yes	Yes