European Commission
DG Environment

Recovery of obsolete vessels not used in the fishing trade

Final report

December 2011
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DG Environment

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Abbreviations and Glossary

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<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>ABS</td>
<td>Acrylonitrile Butadiene Styrene</td>
</tr>
<tr>
<td>AINA</td>
<td>Association of Inland Navigation Authorities</td>
</tr>
<tr>
<td>APER</td>
<td>Association pour la Plaisance Eco-Responsible (France)</td>
</tr>
<tr>
<td>CFC</td>
<td>ChloroFluoro Carbons</td>
</tr>
<tr>
<td>CSD</td>
<td>Cutter Suction Dredgers</td>
</tr>
<tr>
<td>Defra</td>
<td>Department for Environment Food and Rural Affairs (UK) – Government Ministry</td>
</tr>
<tr>
<td>DG</td>
<td>Directorate General</td>
</tr>
<tr>
<td>DRSO</td>
<td>Disposal and Reserve Ships Organisation (UK, Ministry of Defence)</td>
</tr>
<tr>
<td>DWT</td>
<td>Dead Weight Tonnage - displacement of a loaded ship expressed in tonnes equivalent to carrying capacity</td>
</tr>
<tr>
<td>EBI</td>
<td>European Boating Industry</td>
</tr>
<tr>
<td>EC</td>
<td>European Commission</td>
</tr>
<tr>
<td>ECNI</td>
<td>the European Confederation of Nautical Industries (now EBI)</td>
</tr>
<tr>
<td>ELV</td>
<td>End of Life Vehicles</td>
</tr>
<tr>
<td>EMSA</td>
<td>European Maritime Safety Agency</td>
</tr>
<tr>
<td>ESM</td>
<td>Environmentally Sound Management</td>
</tr>
<tr>
<td>EU</td>
<td>European Union</td>
</tr>
<tr>
<td>EuDA</td>
<td>European Dredging Association</td>
</tr>
<tr>
<td>FEAPDT</td>
<td>Federación Española de Puertos Deportivos y Turísticos (Spanish Federation of Leisure Ports and Marinas)</td>
</tr>
<tr>
<td>FRC</td>
<td>Fibre Reinforced Composite</td>
</tr>
<tr>
<td>FRP</td>
<td>Fibre Reinforced Plastic/Polymers (see GRP)</td>
</tr>
<tr>
<td>GRF</td>
<td>Glass Reinforced Fibre</td>
</tr>
<tr>
<td>GRP</td>
<td>Glass-Reinforced Plastic (in Britain), Fibre-Reinforced Plastic (FRP) (in USA)</td>
</tr>
<tr>
<td>GRT</td>
<td>Gross Register Tonnage - measure of the internal volume of a ship expressed in units of &quot;register tonnes&quot;</td>
</tr>
<tr>
<td>GT</td>
<td>Gross Tonnage - a measure of the internal volume of a ship</td>
</tr>
<tr>
<td>HKC</td>
<td>Hong Kong Convention for the Safe and Environmentally Sound Recycling of Ships, May 2009</td>
</tr>
<tr>
<td>IADC</td>
<td>International Association of Dredging Companies</td>
</tr>
<tr>
<td>ICOMIA</td>
<td>International Council of Marine Industry Associations</td>
</tr>
<tr>
<td>ICPE Regulation</td>
<td>Installations Classées pour la Protection de l’Environnement (France)</td>
</tr>
<tr>
<td>LDT</td>
<td>Light Displacement Tonnage – displacement of an unloaded ship expressed in tonnes</td>
</tr>
<tr>
<td>MIDN</td>
<td>Mission Interministérielle sur le Démantèlement des Navires (France)</td>
</tr>
<tr>
<td>NATO</td>
<td>North Atlantic Treaty Organization</td>
</tr>
<tr>
<td>NGO</td>
<td>Non-governmental organization</td>
</tr>
<tr>
<td>OECD</td>
<td>Organization for Economic Cooperation and Development</td>
</tr>
<tr>
<td>OEWG</td>
<td>Open Ended Working Group (of the Basel Convention on the Control of Transboundary Movements of Hazardous Waste and</td>
</tr>
</tbody>
</table>
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<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCB</td>
<td>Poly-Chlorinated Biphenyl</td>
</tr>
<tr>
<td>PVC</td>
<td>Poly Vinyl Chloride</td>
</tr>
<tr>
<td>PU</td>
<td>Polyurethane</td>
</tr>
<tr>
<td>PWC</td>
<td>Personal Water Craft</td>
</tr>
<tr>
<td>TBT</td>
<td>Tributyl Tin – antifouling agent</td>
</tr>
<tr>
<td>TSHDs</td>
<td>Trailing Suction Hopper Dredgers</td>
</tr>
<tr>
<td>UCINA</td>
<td>Unione Nazionale dei Cantieri e delle Industrie Nautiche e Affini (Italian Marine Industry Association)</td>
</tr>
<tr>
<td>UNCTAD</td>
<td>United Nations Conference on Trade and Development</td>
</tr>
<tr>
<td>VLCC</td>
<td>Very Large Crude Carrier: an oil tanker</td>
</tr>
</tbody>
</table>
Executive summary

This study was conducted by COWI A/S in cooperation with RWEC and Leitat under the study contract European Commission, Directorate-General Environment and Climate Action, Recovery of Obsolete Vessels not used in the Fishing Trade ENV.C.2/ETU/2010/0031.

Background – Aims and Objectives

The European Commission has conducted a number of studies on the dismantling practices of end of life vessels and on the impacts of possible actions to improve the situation. These studies have focused primarily on large seagoing vessels of the commercial fleet with projections of end-of-life-ships and future scrapping volumes. These ships (500 GT and above) are within the scope of the Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships, adopted at a Diplomatic Conference in May 2009 (HKC).

The objective of this study is therefore to provide the Commission with quantitative and qualitative information to provide clarity on the current practices of ship dismantling, focusing on abandoned vessels and ships that will not be covered by the scope of the Hong Kong Convention. The aims of the study are to: update existing information about ship dismantling for ships covered, or not, by the HKC and for abandoned vessels; to provide a picture of the dismantling conditions of ships not covered by the scope of the HKC and abandoned vessels through additional information; identify best practices in ship dismantling and waste management of these ships, documenting them in a user friendly manner; identify possible shortcomings (legal, technical, financial) in dismantling of these ships, proposing options to address the shortcomings; and to quantify the environmental, social and economic impacts of options to overcome possible shortcomings and rank them.

Classification of vessels outside the scope of the Hong Kong Convention

There are three categories of ships exempted from the HKC’s scope: small vessels below 500 GT, ships used only on government non-commercial service, including warships, and ships operating throughout their life only inside domestic waters, but Parties are to ensure through appropriate measures that the exempted ships act in a manner consistent with the Convention in so far as this is ‘reasonable and practicable. The significance of these vessels is that while they constitute some 1% of registered ships by gross tonnage of the world fleet they account for 36% in terms of numbers.
The broad classification of ships used in this report is: Government owned vessels including navy ships; small vessels - below 500 GT but excluding very small types; abandoned vessels of all types; inland vessels of all types. More sub-divisions exist: Navy ships include warships, mine hunters, and support vessels. Smaller commercial vessels comprise small bulkers, general cargo, tugs and specialist types such as search and rescue vessels. Data analysis is hampered somewhat as data is not always available at lower aggregation levels. Moreover data on some types of ship is reported at differing tonnage values to that of the HKC. Often other conventions or reporting databases employ cut-off limits of 100 GT and 300 GT and data has been collected according to these limits.

The terms in this report describing vessel types are intended to be interpreted widely, not to imply exclusion of any vessels that are outside the scope of the HKC except those specifically excluded by the terms of reference i.e. vessels used in the fishing trade. Other terms such as vessel, ship, boat etc. are also employed. They are not intended to make distinctions between categories but are simply a function of natural usage in context. The term 'recreational craft' is also intended to be interpreted widely within the scope of the report, and not to be restricted to the definition in the Recreational Craft Directive. This term is used interchangeably with 'leisure vessels'.

The characteristics of smaller vessels, such as average lifespan, materials of construction including hazardous components, scrapping/recycling activities are not so well documented (similarly for many HK Convention ships). These ships are likely to be engaged in a range of activities from small ferry operations, leisure/recreational and similar uses. ICOMIA (International Council of Marine Industry Associations) has estimated in 2007\(^1\) that some 6.0 million recreational craft existed in the EU with a growth potential of 5-6% per annum. It is believed that for small ships (navy ships excluded and some of the commercial vessels of traditional steel construction) the problem is very much the opposite of the problem for the HKC ships. They are almost all recovered in Europe and unlike larger vessels many do not contain large amounts of recyclable materials. Dismantling therefore attracts a cost - as opposed to being funded by sale of recyclable materials in the case of large ships. Small end-of-life ships are often therefore a liability and not an asset. Recreational vessels are more likely to be retained for longer as they are subject to less use than commercial vessels and are not required to be maintained and crewed to generate profitable income so commercial freight rates will have no bearing on a decision to scrap. In terms of materials used in ships the greater use of composites in smaller and recreational craft, e.g. in hulls, creates a lower end of life scrap value, or negative value tending to render dismantling of such vessels an economic loss rather than generating income. Those smaller commercial ships with steel hulls less than 500 GT, including coastal and inland vessels may have a marginally positive scrap value but their dismantling location will be local (within Europe) further depressing any likely return on value due to higher labour costs.

Legislative basis

A broad range of legislation is applicable to ship dismantling in EU and in the Member States in relation to ship recycling, recycling facilities and waste management. At the global level this includes the HKC itself, the Nairobi International Convention on the Removal of Wrecks, 2007, the Basel Convention on the Control of Transboundary Movements of Hazardous Waste and their Disposal 1989. At the EU level legislation in place covers: definitions of ships and recreational craft; industrial development and industrial activities; limitation and use of certain hazardous substances; waste; radioactive substances and waste and other general EU environmental legislation and maritime legislation. At the national level few EU countries appear to have specific legislation in place on ship dismantling and for management of abandoned vessels. France has legislation in place relating to measures concerning abandoned vessels and engines in territorial and inland waters. Spain and other countries such as Sweden, Denmark and Finland, commonly have legislation allowing port authorities to remove ships that are either abandoned or left where they cause danger to safety, health or the environment. No other types of control have been identified concerning liability in relation to abandonment. No specific legislation for ship recycling has been identified although some countries (Germany and the Netherlands) have regulations banning landfill disposal of reinforced glass fibres.

Previous Studies

In updating information from previous studies this report refers to the: COWI/TREN (2004) study on the implications of an accelerated phase out scheme of single hull tankers in which historical dismantling volumes were analysed; the COWI/DHI (2007) study on Ship dismantling and pre-cleaning of ships providing information and guidance on the issue of ship dismantling especially with respect to the environmental, technical and economic aspects; the COWI (2009) study providing support to the impact assessment of a new legislative proposal on ship dismantling aiming on implementation of the HKC and the BIO Intelligence Service (2010) study to support the EU strategy on ship dismantling by examining the feasibility of establishing a set of criteria for ships likely to go for dismantling and the feasibility of establishing a list of green and safe ship dismantling facilities. The latter study focused on merchant ships of 500 GT and above. Additionally summaries are provided of the Interdepartmental Committee on the Dismantling of Civilian and Military End-of-Life Ships (MIDN) which identified the EU as having a driving role to play on ship dismantling, although the processing of European State-owned ships represented just 40,000 tonnes a year, with leading players being the British and French Navies for European State-owned ships, especially military ships. The MIDN assessment of the total ship dismantling market in Europe was thought to be about 500,000 to 700,000 tonnes over a period of 10 years. Finally the “Mission parlementaire sur le démantèlement des navires” (Cardo 2010) highlights agreements seeking the creation of a French industrial network for the dismantling of vessels that reach their end-of-life status, including recreational boats.
Future Scrapping Volumes

Projections of scrapping volumes are presented as the number and tonnage (LDT) to be scrapped until 2030. The volumes are presented with an appropriate segmentation of vessels according to size and type consistent with the methodology used in the previous studies.

Table 0-1 shows the forecasted total annual recycling volumes rise steadily from 2015 to 2030 from 6.4 to 8.8 million LDT. EU flagged ships account for approximately 22% of the total volume dismantled.

Table 0-1 Historical and future volumes of demolition by owner/flag State and year of scrap (Million LDT)

<table>
<thead>
<tr>
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<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>In total</td>
<td>4.90</td>
<td>1.60</td>
<td>17.90</td>
<td>6.40</td>
<td>6.50</td>
<td>7.25</td>
<td>8.82</td>
</tr>
<tr>
<td>Hereof</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EU flagged</td>
<td>1.04</td>
<td>0.34</td>
<td>2.7</td>
<td>1.5</td>
<td>1.7</td>
<td>1.54</td>
<td>1.88</td>
</tr>
<tr>
<td>Not EU flagged</td>
<td>3.86</td>
<td>1.26</td>
<td>15.1</td>
<td>5.0</td>
<td>4.8</td>
<td>5.72</td>
<td>6.95</td>
</tr>
</tbody>
</table>

Data from commercial databases have been obtained, using IHS Fairplay (European Commission 2011).

Table 0-2 shows that EU flagged ships account for approximately 13% of all small vessels not covered by the HKC (measures by GT). The share varies with the ship type. These data are for small ships registered to the flag of a country and will not necessarily include those sailing or trading only in national waters, most recreational craft and inland waterway vessels etc. Hence the totals will underestimate all ships >500 GT by a considerable margin.

Table 0-2 The world fleet of small vessels not covered by the HKC (500>GT>100) by type - number of ships and total volume in GT

<table>
<thead>
<tr>
<th>Total Number of Ships</th>
<th>Total Volume (GT)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>All</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Bulkers</td>
<td>394</td>
</tr>
<tr>
<td>Containers</td>
<td>17</td>
</tr>
</tbody>
</table>
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<table>
<thead>
<tr>
<th>Ship Type</th>
<th>Total Number of Ships</th>
<th>Total Volume (GT)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>All</td>
<td>EU flagged</td>
</tr>
<tr>
<td>Gas Carriers</td>
<td>45</td>
<td>4</td>
</tr>
<tr>
<td>General Cargo</td>
<td>4,739</td>
<td>198</td>
</tr>
<tr>
<td>Offshore</td>
<td>1,205</td>
<td>99</td>
</tr>
<tr>
<td>Other Tankers</td>
<td>145</td>
<td>23</td>
</tr>
<tr>
<td>Passenger Ships</td>
<td>2,732</td>
<td>641</td>
</tr>
<tr>
<td>Recreational Boats</td>
<td>1,123</td>
<td>441</td>
</tr>
<tr>
<td>Ro-Ro Ships</td>
<td>1,458</td>
<td>191</td>
</tr>
<tr>
<td>Service Ships</td>
<td>1,806</td>
<td>343</td>
</tr>
<tr>
<td>Specialised Cargo Ships</td>
<td>1,091</td>
<td>39</td>
</tr>
<tr>
<td>Tankers (oil,chemical)</td>
<td>2,465</td>
<td>145</td>
</tr>
<tr>
<td>Tugs</td>
<td>12,856</td>
<td>1,672</td>
</tr>
<tr>
<td>Navy Ships</td>
<td>68</td>
<td>39</td>
</tr>
<tr>
<td>Grand Total</td>
<td>30,144</td>
<td>3,845</td>
</tr>
</tbody>
</table>

Dismantling volumes in 2011 to 2013 are high compared to the average volume per year from 2011 to 2030. This reflects the fact that the average age of small vessels is high. More than 35% are 31 years or older. This means that there is a large backlog of small vessels for scrapping if the assumed expected lifetimes holds true. The approach applied consequently projects that the old vessels will be those most likely to be dismantled first in subsequent years.
The data on recent scrapping shows that the EU accounts for a large share of the scrapping of small vessels - a share that is significantly higher than the share of EU flagged small vessels. This is completely different from the larger HKC vessels, where only very few are recycled in EU, and a very important result for the study, as it shows that EU already takes care of its own vessels of this type.

**EU action**

In general the EU policy on the environment shall contribute, among other things, to promoting measures at international level to deal with regional or worldwide environmental problems, as specified in Article 191(1) of the Treaty on the Functioning of the European Union. Treaty provisions on common transport policy (Articles 90, 91 and 100.2) give the EU a right to take measures to improve the safety of transport at sea, which will include the issue of ship recycling.

EU action is generally based on consideration of both the subsidiary and the proportionality principles. The overall study assessment of present and future recycling of non-Hong Kong Vessels has however not revealed problems of a magnitude that call for EU action. The study has thus not indicated any major transboundary environmental problems no issues of internal market distortions or similar competition issues. The magnitude of any potential problems associated with dismantling of the small leisure vessels does not justify making specific legislation for this particular waste fraction.

Through the study certain Member States have however expressed concerns in relation to the subject and the study has also identified uncertainties in relation to the present and future situation within recycling of certain parts of the non-HKC vessels, which justify an assessment of the feasibility of certain policy options.

**Policy options**

Potential instruments and options, available to regulate the choice of dismantling process and facility, have been discussed with stakeholders during the study. From these discussions and based on the final results of the data collection activities of the study, the following options have been identified for the impact assessment:

1. No policy change (baseline)

2. Development of non-regulatory measures
   - Development of guidance documents
   - Development of a non-mandatory scheme for extended producer responsibility or a "return-system"
   - Establishment of a non-mandatory recycling fund for leisure vessels. (Part of the EPR)
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• Development of a non-mandatory certification scheme for dismantling facilities

3. Development of regulatory measures

• Creation of European registration and deregistration system and/or control system that mirrors HKC

• Development of mandatory scheme for extended producer responsibility or "return-system"

• Development of new legislation in order to implement elements of the HKC for navy vessels and government owned vessels.

Baseline

The baseline option is the business as usual with no policy change at EU level directed at the non-HKC vessels envisaged. Changes to the current recycling practices can of course occur over time resulting from general technological developments within e.g. waste management or caused by regulatory changes within other areas indirectly impacting on the recycling of non-HKC vessels. Examples of such regulatory changes with a potential indirect impact on the recycling of non-HKC vessels could include an EU ban of landfilling of composite materials or the transposition of the HKC into EU law.

In summary, the EU fleet of small vessels not covered by the HKC numbers a total of 6-7 million vessels of which the leisure vessels account for the majority. Although data is not readily available to inform this study on a detailed level, projected future volumes of dismantling of small vessels seem to be rather stable, and within the limit of existing waste management capacities. The number of abandoned vessels (included in the dismantling numbers of the individual vessels types) is also on a moderate level, with data indicating a worst case scenario of some 10,000 primarily leisure vessels abandoned per year in the EU. Baseline projections of future ship recycling volumes are shown in the following Figure 0-1.
The available data from the study does not indicate that the recovery of non-HKC vessels pose a significant problem from an environmental perspective. Thus, given the drivers behind dismantling of smaller vessels, there is at this moment an economic, albeit modest, incentive to dismantle commercial ships with metal hulls, including also the inland vessels. The same incentive applies to the dismantling of government owned vessels, although the general presence of relatively higher volumes of hazardous substances within navy vessels poses a special challenge for dismantling of this kind of vessels.

The calculated materials generation of selected materials fractions (tonnes/year) from recycling of non-HKC are calculated and presented in Table 0-3.

Table 0-3  Materials generation (selected fractions) from recycling of non-HKC vessels (tonnes/year) based on projected future recycling volumes of the various vessel types. For leisure vessels detailed data from Sweden on average distribution between various leisure vessels types and average sizes are used for the entire EU fleet

<table>
<thead>
<tr>
<th></th>
<th>2015</th>
<th>2020</th>
<th>2025</th>
<th>2030</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metal</td>
<td>44.942</td>
<td>42.072</td>
<td>42.831</td>
<td>44.434</td>
</tr>
<tr>
<td>Non-ferrous metals</td>
<td>1.358</td>
<td>1.326</td>
<td>1.334</td>
<td>1.352</td>
</tr>
<tr>
<td>Machinery</td>
<td>14.774</td>
<td>15.401</td>
<td>15.254</td>
<td>14.981</td>
</tr>
<tr>
<td>Resale equipment</td>
<td>280</td>
<td>280</td>
<td>280</td>
<td>280</td>
</tr>
</tbody>
</table>
Assessment of impacts of policy options

The proposed policy options have been analysed to the extent possible from the level of detail of the available data on fleets and recycling practices etc., which limits the analyses to more general and in most cases qualitative analyses of feasibility and impacts.

Overall, the environmental impact from the recovery of non-Hong Kong vessels is expected to be very limited, and specific to local conditions.

The results of the assessment of policy options are summarised in Table 0-4.

### Table 0-4 Summary of options

<table>
<thead>
<tr>
<th></th>
<th>Feasibility</th>
<th>Economic</th>
<th>Environmental</th>
<th>Social</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guidelines on</td>
<td>Feasible</td>
<td>Limited costs but should at</td>
<td>Limited</td>
<td>Limited</td>
</tr>
<tr>
<td>best practice</td>
<td></td>
<td>best be supplemented with a</td>
<td>impacts</td>
<td>impacts</td>
</tr>
<tr>
<td>Non-</td>
<td>Not very</td>
<td>Limited impacts</td>
<td>Limited</td>
<td>Limited</td>
</tr>
<tr>
<td></td>
<td>feasible</td>
<td></td>
<td>impacts</td>
<td>impacts</td>
</tr>
</tbody>
</table>
Recovery of obsolete vessels not used in the fishing trade

<table>
<thead>
<tr>
<th>Feasibility</th>
<th>Impacts</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Economic</td>
</tr>
<tr>
<td>mandatory EPR</td>
<td>ble - long life-time means limited or no effects</td>
</tr>
<tr>
<td>Recycling funds</td>
<td>Feasible Could cover dismantling costs and lead to better dismantling practice</td>
</tr>
<tr>
<td>Registration system</td>
<td>Not very feasible - would be costly to establish and operate</td>
</tr>
<tr>
<td>Mandatory EPR</td>
<td>Not very feasible - long life-time means limited or no effects</td>
</tr>
<tr>
<td>Implement elements of the HKC for small and government owned vessels</td>
<td>In principle feasible</td>
</tr>
</tbody>
</table>

It is our assessment in general that recovery of these vessels within the EU is best managed at national level in order for Member States to address in an efficient way the specificities of the (few) observed discrepancies related to the scrapping of smaller vessels, including in particular the leisure vessels.
1 Introduction

1.1 Objectives

This is the report for the study "Recovery of obsolete vessels not used in the fishing trade" performed by COWI A/S in cooperation with RWEC and Leitat under the study contract European Commission, Directorate-General Environment and Climate Action, Recovery of Obsolete Vessels not used in the Fishing Trade ENV.C.2/ETU/2010/0031.

The overall objective of the study is to provide the Commission with quantitative and qualitative information to provide a clear and reliable picture of the current practices of ship dismantling. The focus is particularly on abandoned vessels and ships that will not be covered by the scope of the Hong Kong Convention (HKC).

The aim of the study is to:

- Update existing information about ship dismantling for ships covered, or not covered, by the HKC and for abandoned vessels
- Complete the picture of the dismantling conditions of ships not covered by the HKC and abandoned vessels by collecting additional information
- Identify best practices in terms of ship dismantling and waste management of these ships and document them in a user friendly manner
- Identify possible shortcomings (legal, technical, financial) in terms of dismantling of these ships and propose options to address these shortcomings
- Quantify the environmental, social and economical impacts of options to overcome possible shortcomings and rank them.

1.2 Scope

The fleet covered by this study can best be described by the exclusions, namely those vessels covered by the provisions of the HKC and those that are used in the fishing trade.

This leaves the following categories to be studied:
Recovery of obsolete vessels not used in the fishing trade

- Government owned vessels including navy ships
- Small vessels - below 500 GT but excluding very small types
- Abandoned vessels of all types
- Inland vessels of all types.

With regard to the small vessels the following exclusions were specifically made in the questionnaires sent to the respondents:

- Fishing vessels
- Wrecks (any vessel covered by the Wreck Removal Convention)
- Personal watercrafts (jet skis)
- Kite surfing equipment
- Very small craft, e.g. less than 4m
- Rubber dinghies (with/without outboard motors).

However, for other data collection purposes no exclusions are made in relation to the length of the vessels or the materials used. Information on personal watercraft, kite-surfing equipment and boards has not specifically been obtained.

1.3 Process and methodology

To achieve the objective a number of tasks have been carried out. First of all existing information provided by previous studies has been reviewed and updated with regard to fleet volumes, age distribution and dismantling volumes in the EU based on information from commercial databases about large seagoing and other vessels.

Additional data to cover small vessels not included in the commercial databases, recreational vessels and abandoned vessels have been collected through questionnaires, stakeholder workshops, national workshops and bilateral discussions. Information on current dismantling practices has also been addressed in the questionnaires and during the workshops, and in addition field visits have been arranged to four recycling facilities in different countries.

Based on an evaluation of the collected data and input from the stakeholders the need for policy options to be introduced at the EU level is discussed and relevant options reflecting the identified issues and concerns are selected for impact assessment.
1.4 Guide to the report

This report is structured as follows:

The Executive summary presents a condensed overview of the background, the objectives, the activities and the results of the study.

Following this brief introduction to the report chapter 2 explains the background and context of the study and provides an overview of the fleet typology referred to in the study.

Chapter 3 presents the legislation with relevance for ship recycling with a focus on EU legislation and national legislation ship recycling and abandoned vessels.

Chapter 4 includes an update of existing European Commission information about the future dismantling volumes of vessels, both vessels included and vessels not included under the HKC. The update includes an assessment of data gaps in these previous studies, which have been updated and complemented by new/additional data from the commercial ship databases.

Chapter 5 includes a description of the extensive data collection activities conducted to complete the picture of current and future recycling of vessels not covered by the HKC and include:

• Review of existing information
• Identification of and contact to relevant stakeholders
• Information gathering via questionnaires and bilateral consultations
• One day stakeholder workshop in Brussels
• Seven national stakeholder workshops at four locations
• Six site visits to recycling facilities, two of which were also part of a workshop (Portsmouth, UK and Szczecin, PL).

Chapter 6 provides the results of the data collection activities described in chapter 5 with regard to fleet characteristics of ships not covered by the HKC.

Chapter 7 includes a description of current and potential future recycling practices of vessels not covered by the HKC. It combines the data in chapter 4, 5, and 6 to provide an assessment of the impact of the current recycling practices and of upgraded practices for vessels in the EU not covered by the HKC.

Chapter 8 identifies potential gaps and necessary policy options to address any shortcomings in the current and/or future recycling of vessels not covered by the HKC and assesses the policy options proposed to remedy any shortcomings identified.
2 Project background and context

2.1 Recycling of ships

When ships reach the end of their operating life they need to be dismantled. Certain current dismantling practices, notably for large seagoing vessels are not considered to be suitable from a social and environmental perspective.

The European Commission has conducted a number of studies on the dismantling practices of end-of-life-vessels and on the impacts of possible actions to improve the situation. These studies have focused primarily on large seagoing vessels of the commercial fleet. This includes also projections of end-of-life-ships and future scrapping volumes. This category of ships (500 GT and above) is covered by the scope of the Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships which was adopted at a diplomatic conference in May 2009 under the auspices of the International Maritime Organization.

In order to improve the situation, the European Commission adopted a Green Paper in May 2007 and a communication proposing an EU strategy on better ship dismantling in November 2008. The strategy also envisages the need for measures beyond those of the HKC.

The main scope of this study concerns the fleet below 500 GT, navy ships and other government vessels as well as abandoned vessels. Graphs 1 and 2 of Figure 2-1 show an overview of the distribution of the world fleet, both in total numbers and in gross tonnage (based on The World Merchant Fleet in 2009 – Statistics from Equasis).

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Recovery of obsolete vessels not used in the fishing trade

**Figure 2-1** Overview of world fleet by size and tonnage (small: GT<500; medium: 500≤GT<25.000; large: 25.000≤GT<60.000; very large: GT≥60.000)

Equasis defines these categories as:

1. Small ships <500 GT
2. Medium ships 500 GT to 24.999 GT
3. Large ships 25.000 GT to 59.999 GT
4. Very large ships ≥60.000 GT

Many of the small ships do generally not trade internationally, and are therefore not covered by the international conventions or port state control.

The fleet below 500 GT might seem less important than other fleets above 500 GT and above when viewed in terms of gross tonnage; but in terms of the total number of vessels (27,084 vessels - 36%) their significance is much greater.

### 2.2 The Hong Kong Convention

In accordance with Article 2(b) of the Convention on the International Maritime Organization, the Council of the Organization, at its ninety-seventh session in November 2006, approved the request of the Marine Environment Protection Committee of the Organization at its fifty-fifth session in October 2006, that a diplomatic conference be convened to consider the adoption of an International Convention for the Safe and Environmentally Sound Recycling of Ships. The Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships was adopted at a diplomatic conference held in Hong Kong, China, from 11 to 15 May 2009. The Convention is aimed at ensuring that ships, when being recycled after reaching the end of their opera-
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tional lives do not pose any unnecessary risk to human health and safety or to the environment.

Regulations in the new convention cover: 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, incorporating certification and reporting requirements.

**Key definitions in the Hong Kong Convention:**

- **“Ship”** means a vessel of any type whatsoever operating or having operated in the marine environment and includes submersibles, floating craft, floating platforms, self elevating platforms, Floating Storage Units (FSUs), and Floating Production Storage and Offloading Units (FPSOs), including a vessel stripped of equipment or being towed.

- **“Gross tonnage”** means the gross tonnage (GT) calculated in accordance with the tonnage measurement regulations contained in Annex I to the International Convention on Tonnage Measurement of Ships, 1969, or any successor convention.

- **“Hazardous Material”** means any material or substance which is liable to create hazards to human health and/or the environment.

- **“Ship Recycling”** means the activity of complete or partial dismantling of a ship at a Ship Recycling Facility in order to recover components and materials for reprocessing and re-use, whilst taking care of hazardous and other materials, and includes associated operations such as storage and treatment of components and materials on site, but not their further processing or disposal in separate facilities.

- **“Ship Recycling Facility”** means a defined area that is a site, yard or facility used for the recycling of ships.

- **“Recycling Company”** means the owner of the Ship Recycling Facility or any other organization or person who has assumed the responsibility for operation of the Ship Recycling activity from the owner of the Ship Recycling Facility and who on assuming such responsibility has agreed to take over all duties and responsibilities imposed by this Convention.

Ships sent for recycling will be required to carry an inventory of hazardous materials, which will be specific to each ship. An appendix to the Convention provides a list of hazardous materials the installation or use of which is prohibited or restricted in shipyards, ship repair yards, and ships of Parties to the Convention. Ships are required to undergo an initial survey to verify the inventory of hazardous materials, additional surveys during the life of the ship, and a final survey prior to recycling.

Ship recycling yards will be required to provide a "ship recycling plan", to specify the manner in which each ship will be recycled, depending on its particulars and its inventory. Parties will be required to take effective measures to ensure that ship recycling facilities under their jurisdiction comply with the Convention.
A series of guidelines are being developed to assist in the Convention's implementation.

The convention exempts three categories of ships from its scope: small vessels below 500 GT, ships used only for government non-commercial service, including warships (which have a relatively high contamination with asbestos and other hazardous materials), and ships operating only inside domestic waters throughout their life.

It requires the Parties to ensure through appropriate measures that the exempted ships act in a manner consistent with the Convention in so far as this is 'reasonable and practicable'.

2.3 Fleet typology and terminology for vessels not covered by the Hong Kong Convention

2.3.1 Typology

The HKC distinguishes those vessels that will be subject to its provisions from those that will not by establishing a) size limits and b) function classifications. A minimum Gross Tonnage (GT) below which the provisions do not apply is set, as well as excluding others by functional terms: warships and others operating on government non-commercial service and those operating throughout their life only in waters subject to the sovereignty or jurisdiction of the state whose flag the ship is entitled to fly.

Those ships not subject to the HKC themselves warrant classification in order to consider them according to their specific characteristics. For the purpose of analysing the available data the broad classification of these ships that will be used here is as follows:

- Government owned vessels including navy ships
- Small vessels - below 500 GT but excluding very small types
- Abandoned vessels of all types
- Inland vessels of all types.

This report identifies many more types of ships within these categories demonstrating the complexity and variety contained within these categories. Where possible this has been done to a limited extent to illustrate this variety and where appropriate for the purpose of defining different approaches to recycling different categories of vessel. Navy ships can be further sub classified in terms of the type of warship, mine hunters, and of support vessels for example. There are many different sorts of smaller commercial vessels too, from small bulkers, to general cargo to tugs and specialist types such as search and rescue vessels. However further disaggregation is not generally helpful as data is not always
available at lower aggregation levels. Again data for some sub-categories are indicated to the extent possible.

Data on some types of ships is reported at differing tonnage values to that of the HKC. Often other conventions or reporting databases employ cut-off limits of 100 GT and 300 GT and data has been collected according to these limits. This is indicated where it occurs in the text. Some other classification systems, mainly for non-commercial vessels, are also based on the length and engine power rating of the vessel and this is also indicated as appropriate. Another distinction, not clearly made in any formal classification system, is the material of construction which itself has a bearing on the appropriate treatment at end of life, this is of particular interest for recreational boating.

2.3.2 Terminology

From time to time in this report other distinctions can be made, particularly for recreational boats i.e. all those vessels of any size used for non-commercial service. Various categories of these exist and some are classified according to the Recreational Craft Directive (94/25/EC as amended), those referred to as: ‘recreational craft’: any boat of any type intended for sports and leisure purposes of hull length from 2.5 m to 24 m…” which have to conform to safety standards and so on.

In order to be inclusive of all vessels potentially being part of the subject of this study the terms used in this document to describe vessel types are intended to be interpreted widely. They are not meant to imply exclusion of any vessels that are outside the scope of the HKC or falling outside the definition of the recreational Craft Directive except those specifically excluded by the terms of reference for this study, i.e. vessels used in the fishing trade.

Finally, throughout this document other terms such as vessel, ship, boat etc. are also employed. They are not intended to make distinctions between categories but are simply a function of natural usage in context.

2.4 Existing information on vessels not covered by the Hong Kong Convention

While some information is available for ships not within the scope of the HKC such as navy ships and other government vessels, information and data about small ships (below 500 GT) and abandoned vessels have not been collected and thus not evaluated in the previous EC studies. Some information was collected via studies conducted by the Commission about navy ships and other government vessels although this needs to be updated. Moreover some navies have been developing their own inventories of hazardous materials for these ships. It would be important to collect and analyse the available inventories.

Specifically about small and abandoned vessels

The types of vessels about which information is generally scarce are small vessels. These are believed to be mainly dismantled in Europe at the end of their operating lives. Information on abandoned vessels is also scarce.
Recovery of obsolete vessels not used in the fishing trade

The characteristics of small vessels, such as average lifespan, materials of construction including hazardous components and scrapping/recycling activities are not well documented (for many HKC ships this is still under development). These ships are likely to be engaged in a range of activities from small ferry operations, leisure/recreational and similar uses, so information about them may need to be acquired from multiple sources. Some information already exists. One source, for example ICOMIA (International Council of Marine Industry Associations), examining the end of life boats problem, estimated in 2007 that some 6.0 million recreational craft existed in the EU with a growth potential of 5-6% per annum.

It is believed that for small ships (navy ships excluded and also some of the commercial vessels of traditional steel construction) the problem is the total opposite of the problem for the HKC ships. They are almost all recovered in Europe and unlike larger vessels many do not contain large amounts of recyclable materials. Dismantling therefore adds a cost - as opposed to being funded by sale of recyclable materials in the case of large ships. This means that small end-of-life ships are often a liability rather than an asset, which is also an important element in relation to the problem with abandoned ships. The economic drivers for scrapping are therefore also very different to those of the HKC vessels.

For the HKC vessels, the economics of ship dismantling is primarily driven by market factors such as freight rates, the price of steel scrap and the costs of maintaining an ageing fleet. These factors are taken into account when deciding when to scrap a ship. The choice of the dismantling location is world-wide influenced in particular by the metal price that a facility can offer to the ship owner or to the intermediary “cashbuyer”. This price in turn depends on the demand for recycled steel in the area concerned and on the costs of the recycling operations.

In contrast to larger vessels, for small ships, other factors may come into play depending on the type and use of a particular vessel. Recreational vessels are more likely to be retained for longer periods of time as they are subject to less use than commercial vessels. They are not required to be maintained and crewed to generate profitable income, so commercial freight rates will have no bearing on a decision to scrap. In terms of materials used in ships the greater use of composites in small and recreational craft, e.g. in hulls, creates a lower end-of-life scrap value, or a negative value, which tends to render dismantling of such vessels an economic loss rather than generating an income. Small commercial ships with steel hulls less than 500 GT, including coastal and inland vessels, may have a marginally positive scrap value but their dismantling location will be local (within Europe), which further reduces any likely return on value due to higher labour costs. Other types of vessels with specialist uses such as research vessels and rescue vessels are also more complicated to dismantle compared to e.g. a tanker or container ship, adding to costs.

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Drivers are therefore more likely to be related to other factors, such as a need to upgrade, or loss of sea- (or water-) worthiness.

Recycling of large vessels, i.e. navy ships and inland vessels is conducted at facilities in Belgium, the UK, Denmark and Poland. These facilities were identified in previous EU Commission studies on seagoing vessels. For small vessels, such as recreational craft, different facilities and dismantling practices are often employed. In Spain for instance, end-of-life vehicle treatment facilities are licensed to manage the wastes from boat scrapping activities, carrying it out onsite or at ports facilities.
3 Legislation with relevance for ship dismantling

A broad range of legislation is applicable to ship dismantling in EU and in the Member States in relation to ship recycling, recycling facilities and waste management.

3.1 International conventions

Hong Kong Convention
The Hong Kong International Convention which is the international instrument for the Safe and Environmentally Sound Recycling of Ships is described in section 2.2. Although it applies to ships of 500 GT and above it also includes a statement, that each Party shall ensure, by the adoption of appropriate measures, that such ships act in a manner consistent with this Convention, so far as is reasonable and practicable. The Convention which will become effective two years after the moment it has been ratified by 15 countries.

Basel Convention
The requirements of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal are transposed into European law by the EU Waste Shipments Regulation (Regulation (EC) No 1013/2006 Of The European Parliament And Of The Council of 14 June 2006 on shipments of waste). The Waste Shipments Regulation aims to ensure that waste is properly handled from the time it is shipped to the time it is disposed of or recovered at destination. It also bans the export of hazardous waste or waste for disposal to certain countries.

Nairobi Convention
The Nairobi International Convention on the Removal of Wrecks, 2007, was adopted in Kenya in 2007 and will provide the legal basis for States to remove, or have removed, shipwrecks that may have the potential for adverse effects on the safety of lives, goods and property at sea, as well as the marine environment. The Convention includes an optional clause enabling States to apply certain provisions to their territory, including their territorial sea. The convention will come into force 12 months after 10 states have ratified the convention.

3.2 EU legislation

A list of EU legislation pertaining to ships not covered by the HKC is presented in Appendix A. The list includes legislation relevant for ship dismantling facilities, ship recycling activities and waste management, and also key maritime legislation.
The key legislation pertaining to end-of-life ships and abandoned vessels include the Waste Shipments Regulation and the general waste regulation governed by the waste framework Directive. Once the decision is taken that the ship is obsolete it is considered waste and falls under the waste legislation regime.

For ship dismantling facilities the general environmental legislation for industrial activities apply and environmental legislation is also relevant for abandoned vessels that are sunk or left without control and continue a risk to the environment in general or a Natura 2000 area.

3.3 National legislation

Based on information from questionnaire responses, stakeholder workshops, literature reviews and Internet search few EU countries appear to have specific legislation in place on ship dismantling and for management of abandoned vessels.

France has legislation in place on relating to measures concerning abandoned vessels and engines in territorial and inland waters (Loi n°85-662 du 3 juillet 1985 relative aux mesures concernant dans les eaux territoriales et les eaux, les navires et engins flottants abandonnés, as amended).

Spain and also other countries have legislation in place to allow port authorities to remove ships that are either abandoned or left in a place where they cause danger to safety, health or the environment. This is the case for e.g. Sweden, Spain, Denmark and Finland. In Denmark such ships are typically cut into smaller pieces and sent for incineration, id possible at the expense of an identified owner.

In Spain the Law 33/2010, August 5th that modifies supplementary provision no 18th (PUERTOS. Modificación de la Ley 48/2003, de régimen económico y de prestación de servicios de los puertos de interés general. LEY 33/2010, de 5 de agosto que modifica la disposición adicional decimo octava) defined when a boat is abandoned and allows the port authorities to take custody of the boat. In addition some regions have more detailed legislation in place.

No other types of control have been identified concerning liability in relation to abandonment. No specific legislation pertaining to recycling of ships has been identified. With regard to waste management relevant for recreational craft of composite materials, some countries have regulations in place that ban disposal of reinforced glass fibres on landfills. This is the situation in Germany and in the Netherlands. Germany has introduced a landfill disposal ban on glass fiber reinforced plastics (GRP) in June 2005, due to their high (30%) organics content such as polymer and wood.
4 Update of existing European Commission information on recycling of vessels

4.1 Methodology and approach

In recent years the European Commission has conducted and commissioned a number of studies in the relation to ship dismantling\(^4\). Some of these studies (COWI/TREN (2004), COWI/DHI (2007) and COWI (2009)) include historical decommissioning volumes of end-of-life ships and projections for the future volumes. The studies have focused primarily on large seagoing vessels of the commercial fleet. This category of ships (500 GT and above) is covered by the scope of the HKC.

The existing information about the future scrapping volumes in the above-mentioned studies was used as a starting point for the analysis. Based on an assessment of data gaps and uncertainties, the existing information was updated and complemented by new/more data from the commercial ship databases.

The projections of scrapping volumes are presented as the number and tonnage (LDT) to be scrapped until 2030. The volumes are presented with an appropriate segmentation of vessels according to size and type, consistent with the methodology used in the previous studies.

The focus is on detailing the information and data for the vessels not covered by the HKC (as these are the focus of the study). Updates of information on vessels covered by the HKC are included to complete the future "full recycling picture for European vessels".

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4.2 Historical and future ship dismantling volumes

Based on the data and information available on ships and ship dismantling volumes in general, it is difficult to distinguish between vessels covered by the HKC and vessels not covered by the convention due to different ranges and criteria having been used in previous studies. Further, it is not always easy to single out specific vessel categories such as government owned vessels.

Nevertheless in the attempt to provide a picture of the ship dismantling volumes a distinction between vessels covered by the HKC and vessels not covered by the HKC has been made. For the vessels not covered by the HKC, to the extent possible a distinction between the following categories has been made:

- Government owned vessels including navy ships
- Small vessels below 500 GT but excluding very small types
- Abandoned vessels (both HKC and non-HKC)
- Inland vessels.

The readily available data and information do not conform to the above categorisation. For example, the COWI/TREN (2004) study addressed only large ships of above approximately 1,000 GT and does therefore not include all HKC vessels. Further, the COWI/DHI (2007) study presented an update of the projected volumes from the COWI/TREN (2004) study, but included more data and information on fishing vessels and warships (government vessels).

From this background the readily available data do not enable an exact separation of vessels covered by the HKC and vessels not covered by the HKC. This should be taken into consideration in the subsequent parts of this report.

4.3 Data and information from previous studies

In this section the relevant data and information on historical and future ship dismantling volumes from previous studies are briefly summarised.

4.3.1 COWI/TREN (2004)

In the COWI/TREN (2004) study on the implications of an accelerated phase out scheme of single hull tankers historical dismantling volumes were analysed and presented. Further, projections of the expected future volumes (number of vessels and LDT) were presented. The study differentiated between the volumes for single hull oil tankers (focus of the study) and "other shipping segments". The study focused only on vessels of 2,000 DWT and above (equiva-
lent to approximately 1,000-1,500 GT). Thus, the study mainly addressed ships covered by the HKC\textsuperscript{5}.

The analysis was based directly on data from Clarkson Research (Clarkson's fleet database, October 2003 and Clarkson's demolition database (2002)). Clarkson's data include a wide range of information on ships and scrapping data. Further, segmentation into eight ship types was used, and for each of these segments the historical dismantling volumes were calculated, split by break up location and year.

The historical scrapping volumes were calculated to be approximately 450 vessels and 5 million LDT per year on average in the period from 1994-2003. India, Bangladesh, Pakistan, and China accounted for more than 90% of the total volume of ships scrapped (by LDT) during the period.

The global volume of scrapping is related to the overall size of the world fleet. The increase in the size of the world fleet over time has led to a general increase in the supply of ships to the ship scrapping industry. However, there have been large variations in ships scrapped between years. These variations are determined by the developments in the key drivers of supply and demand together with the age profile of the world fleet.

In the report it was found that approximately 32% of the vessels scrapped operated under an EU flag\textsuperscript{6} at the time of scrapping. At the same time, the share of vessels scrapped at European yards made up less than 0.5% of the decommissioning volume.

To project the future volumes for scrap for all types of vessels the average historical lifetime for all ship types (and sizes) was estimated on the basis of the vessels scrapped during 1994-2003. For the projection, it was assumed that the calculated average lifetimes of the various vessels types are constant during the forecast period\textsuperscript{7}.

A summary of the average lifetime expectancy is shown in Table 4-1.

\textsuperscript{5} The historical and projected volumes include government owned vessels. It is not possible to single out the fraction, but it accounts for only a very small proportion of total volumes.
\textsuperscript{6} Including new Member States not part of the EU at the time.
\textsuperscript{7} For tankers a more sophisticated approach was used. A decommissioning frequency function (Weibull) was estimated and applied.
Recovery of obsolete vessels not used in the fishing trade

### Table 4-1 Average historical lifetimes by type of vessel

<table>
<thead>
<tr>
<th>Main vessel type</th>
<th>Historical average lifetime (years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oil tanker</td>
<td>26.1</td>
</tr>
<tr>
<td>Other tanker</td>
<td>26.1</td>
</tr>
<tr>
<td>Bulk carrier</td>
<td>25.7</td>
</tr>
<tr>
<td>Container</td>
<td>25.4</td>
</tr>
<tr>
<td>Gas</td>
<td>29.3</td>
</tr>
<tr>
<td>Passenger/ro-ro/vehicle</td>
<td>27.1</td>
</tr>
<tr>
<td>Other cargo vessel</td>
<td>25.9</td>
</tr>
<tr>
<td>Non-cargo vessel</td>
<td>27.7</td>
</tr>
</tbody>
</table>


It is not possible to make a distinction between HKC and non-HKC ship based on the available data behind the table however few of them were HKC ships.

As shown, the main vessel types have an average lifetime expectancy of 25-29 years. Analysis further shows that the average lifetime has been relatively constant over time (in a 10 year period). As this is the case, it is fair to assume that the lifetime expectancies above are still valid even though they were estimated some years back.

On the basis of the age distribution of the world fleet and the expected average lifetimes the total expected volume of scrapping over time was estimated. It was found that vessels equivalent to 5-7 million LDT per year are expected to be scrapped in the period from 2011-2018.

#### 4.3.2 COWI/DHI (2007)

The COWI/DHI (2007) study on ship dismantling and pre-cleaning of ships provided information and guidance on the issue of ship dismantling especially with respect to the environmental, technical and economic aspects. The study included an updated status and projections for European end-of-life ships. Special attention was given to EU government vessels and fishing vessels.

A European safe ship recycling policy is challenged by potential reflagging of vessels to avoid regulation. This problem is less pronounced in the government owned fleets and the special attention to this segment should be seen in this light.
The number and tonnage (LDT) to be scrapped until 2020 was estimated in the study using the same approach as in the COWI/TREN (2004) study (same segmentation and delineation). However, it also included data and information on fishing vessels (500 GT and above) and warships (150 LDT and above). Thus, the study addressed both ships covered by the HKC and some ships not covered by the convention.

The historical scrapping volumes were re-calculated focusing on the years 2004-2006. In general the picture from the COWI/TREN (2004) was confirmed but the study found a significant drop in scrapping volume in the period from 2004-2006, due to the booming world economy and high freight rates. Thus, the study indicated considerable variations in the scrapping activity level over the years due to the fluctuation in the world economy.

The study also emphasises that the applied projection models do not include forecasts of freight rates and projected scrapping based on historical phase out patterns. Consequently, years with high freight rates leading to continued trading of vessels previously considered at their end-of-life will not be predicted, and likewise a sudden drop in freight rates with subsequent massive scrapping will not be predicted.

The projections of the future volumes of scrapping were made by flag state and country of ownership differentiating between EU countries and non-EU countries. Thus, the projections were made for four categories:

- EU flag/EU owned
- EU flag/Non-EU owned
- Non-EU-flag/EU owned
- Non-EU-flag/Non-EU owned

As the actual level of scrapping was lower than expected from 2004 to 2006 it was stressed that a back log of scrapping of approximately 15 million LDT was created in that period.

The backlog was expected to be scrapped from 2007-2010. From 2010 to 2020 the expected future volumes of scrapping more or less followed the same expectations as found in the COWI/TREN (2004) study of around 5-7 million LDT per year, with a rising trend from 2017 and onwards. In addition, the potential future volume of vessels to be scrapped from the merchant fleet flying an EU Member State flag was estimated to range from 1.3 to 1.7 million LDT/year from 2011 to 2020. The estimates hold true only under the assumption of no reflagging before end-of-life.

In Table 4-2 the the projected future scrapping volumes estimated by flag state (EU/non EU) and country of ownership (EU/non EU) are presented.

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8 Data from Clarkson database was supplemented by data from Shippax 'Statistics and Outlook 06' from Jane's Fighting Ships, Yearbook 2006-2007.
Table 4-2  Future volumes of demolition by owner/flag state and year of scrap - Vessel type 1-10 (Million LDT)

<table>
<thead>
<tr>
<th>Phase-out year</th>
<th>EU flag/ EU owned</th>
<th>EU flag/ Non-EU owned</th>
<th>Non-EU-flag/ EU owned</th>
<th>Non-EU-flag/Non-EU owned</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>1.3</td>
<td>0.2</td>
<td>1.5</td>
<td>4.1</td>
<td>7.2</td>
</tr>
<tr>
<td>2012</td>
<td>1.2</td>
<td>0.2</td>
<td>1.3</td>
<td>3.4</td>
<td>6.1</td>
</tr>
<tr>
<td>2013</td>
<td>1.1</td>
<td>0.2</td>
<td>1.3</td>
<td>3.3</td>
<td>5.8</td>
</tr>
<tr>
<td>2014</td>
<td>1.1</td>
<td>0.2</td>
<td>1.1</td>
<td>3.2</td>
<td>5.6</td>
</tr>
<tr>
<td>2015</td>
<td>1.2</td>
<td>0.3</td>
<td>1.3</td>
<td>3.7</td>
<td>6.4</td>
</tr>
<tr>
<td>2016</td>
<td>1.1</td>
<td>0.2</td>
<td>1.0</td>
<td>2.9</td>
<td>5.2</td>
</tr>
<tr>
<td>2017</td>
<td>1.1</td>
<td>0.2</td>
<td>1.0</td>
<td>2.9</td>
<td>5.2</td>
</tr>
<tr>
<td>2018</td>
<td>1.2</td>
<td>0.2</td>
<td>1.1</td>
<td>3.2</td>
<td>5.6</td>
</tr>
<tr>
<td>2019</td>
<td>1.3</td>
<td>0.2</td>
<td>1.1</td>
<td>3.4</td>
<td>6.0</td>
</tr>
<tr>
<td>2020</td>
<td>1.5</td>
<td>0.2</td>
<td>1.2</td>
<td>3.6</td>
<td>6.5</td>
</tr>
<tr>
<td>Avg. per year</td>
<td>1.2</td>
<td>0.2</td>
<td>1.2</td>
<td>3.4</td>
<td>6.0</td>
</tr>
</tbody>
</table>

As actual volumes are sensitive to the developments in the freight market, these numbers should only be seen as indicative for the level of scrapping.

**Warships**

Special emphasis was given to warships in the study. Warships account for the vast majority of government vessels even though other agencies than the ministries of defence own vessels. Data was obtained from Jane's Fighting Ships, Yearbook 2006-2007. The data also includes a range of vessels used for non-military operations.
It is found that the total fleet of warships in EU represents 1.6 million LDT. In general, the fleet is rather old although large differences in the age profiles across Member States were found.

The table below shows the fleet of warships in terms of LDT and the number of ships.

<table>
<thead>
<tr>
<th>Country</th>
<th>No. of ships</th>
<th>1,000 LDT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt;25 years</td>
<td>+25 years</td>
</tr>
<tr>
<td></td>
<td>&lt;25 years</td>
<td>25+ years</td>
</tr>
<tr>
<td>Grand Total</td>
<td>688</td>
<td>321</td>
</tr>
<tr>
<td></td>
<td>1,211</td>
<td>396</td>
</tr>
</tbody>
</table>

The projection of the future levels of scrapping of warships was done more pragmatically due to the huge variations in the age of warships that are scrapped and due to the fact that scrapping heavily depends on political factors.

It was assumed that warships which today are 25 years or older would be scrapped during the next 14 years (2007-2020). Sales of navy vessels were ignored, but were assumed to balance out with other government owned vessels that will be scrapped in the period. On this basis, an annual scrapping of warships of approximately 28,000 LDT per year is expected.

There are no EU records of the destination of warships, but usually the vessels are scrapped nationally. Historically however, many European navy vessels have been sold for continued use in friendly nation’s navies, but for obsolete vessels it is not uncommon to sell for the scrap value to Asian ship breakers.

4.3.3 COWI (2009)

The COWI (2009) study provided support to the impact assessment of a new legislative proposal on ship dismantling aiming for implementation of the HKC. The study included an assessment of the expected future volume of scrapping of European Vessels. The projections were based on extrapolation of data from COWI/DHI (2007). This was supplemented with information from EMSA on the most recent scrapping volumes. The study also included information on ship dismantling destinations.

The report stressed that scrap volumes are difficult to project exactly because they depend heavily on freight rates and other key drivers. The projections in the COWI/DHI (2007) study are used until 2020. Volumes from 2020 to 2030 were pragmatically estimated by applying the expected yearly growth in sea freight volumes as the yearly growth rate in demolition volumes.

The table below shows the historical and future volumes of demolition by owner/flag state.
**Table 4-4**  
*Historical and future volumes of demolition by owner/flag state and year of scrap (million LDT)*

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>In total</td>
<td>4.90</td>
<td>1.60</td>
<td>17.90</td>
<td>6.40</td>
<td>6.50</td>
<td>7.25</td>
<td>8.82</td>
</tr>
<tr>
<td>Hereof</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EU flagged</td>
<td>1.04</td>
<td>0.34</td>
<td>2.7</td>
<td>1.5</td>
<td>1.7</td>
<td>1.54</td>
<td>1.88</td>
</tr>
<tr>
<td>Not EU flagged</td>
<td>3.86</td>
<td>1.26</td>
<td>15.1</td>
<td>5.0</td>
<td>4.8</td>
<td>5.72</td>
<td>6.95</td>
</tr>
</tbody>
</table>

The table shows that forecast total annual recycling volumes will rise steadily from 2015 to 2030 from 6.4 to 8.8 million LDT. EU flagged ships account for approximately 22% of the total volume dismantled.

**Ship dismantling destinations**

Dismantling of European vessels has moved from taking place locally in the European region, notably Spain and Italy, and Japan during the 1960’s and 1970’s to Asian countries such as Taiwan and Korea in the 1980’s. As the economy grew in Korea and Taiwan, labour costs increased making ship scrapping less attractive in these countries. Consequently, they were replaced by new countries with lower labour costs, notably the South-East Asian countries China, India, Bangladesh and Pakistan. These countries have since completely dominated the business.

The study presented data from EMSA on the 10 largest ship recycling nations based on measures by the volume (GT) scrapped in 2008-2009.

**Table 4-5**  
*The 10 largest ship recycling nations based on recycling volumes GT*

<table>
<thead>
<tr>
<th>Recycling country</th>
<th>Sum of Vessel, GT</th>
<th>Of total GT, %</th>
<th>Cumulative, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bangladesh</td>
<td>9,049,068</td>
<td>32.5</td>
<td>32.5</td>
</tr>
<tr>
<td>India</td>
<td>8,133,311</td>
<td>29.2</td>
<td>61.8</td>
</tr>
<tr>
<td>People's Republic of China</td>
<td>5,985,053</td>
<td>21.5</td>
<td>83.3</td>
</tr>
<tr>
<td>Pakistan</td>
<td>2,158,197</td>
<td>7.8</td>
<td>91.0</td>
</tr>
<tr>
<td>Turkey</td>
<td>748,782</td>
<td>2.7</td>
<td>93.7</td>
</tr>
<tr>
<td>United States of America</td>
<td>414,532</td>
<td>1.5</td>
<td>95.2</td>
</tr>
</tbody>
</table>
Recovery of obsolete vessels not used in the fishing trade

<table>
<thead>
<tr>
<th>Recycling country</th>
<th>Sum of Vessel, GT</th>
<th>Of total GT, %</th>
<th>Cumulative, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indonesia</td>
<td>217,496</td>
<td>0.8</td>
<td>96.0</td>
</tr>
<tr>
<td>Republic of Korea</td>
<td>194,264</td>
<td>0.7</td>
<td>96.7</td>
</tr>
<tr>
<td>Portugal</td>
<td>87,490</td>
<td>0.3</td>
<td>97.0</td>
</tr>
<tr>
<td>South Africa</td>
<td>71,465</td>
<td>0.3</td>
<td>97.3</td>
</tr>
</tbody>
</table>

The table shows that Bangladesh, India, China and Pakistan account for more than 90% of the dismantling market.

Bangladesh, India and Pakistan apply the beaching method and account for more than 70% of the volume. China (more than 20%) uses the afloat method, while the remaining less than 10% is dismantled in OECD countries including EU, where landing, afloat and slipway (docking) methods are applied.

4.3.4 BIO Intelligence Service (2010)

The BIO Intelligence Service (2010) study aims to support the EU strategy on ship dismantling by examining the feasibility of establishing a set of criteria for ships likely to be dismantled and the feasibility of establishing a list of green and safe ship-dismantling facilities. The study focused on merchant ships of 500 GT and above, which means that only ships covered by the HKC are addressed in the study.

The study includes information on future ship dismantling volumes. However, the study only provides robust information on expected scrapping volumes for large and very large ships of 25,000 GT and above. These are estimated on the basis of data from the Equasis world fleet report from 2007. The number of ships to be dismantled up to year 2030 has been projected using a simple model based on the average age of ships. It is projected that on average approximately 500 large and very large ships (25,000 GT and above) will be dismantled every year. This is found to correspond to approximately 35 million GT of ships each year. 9

No aggregated data concerning the volume of EU ships to be dismantled in the period was presented in the study. However, it is found that 19% of all ships dismantled in 2008 were EU flagged. Further, it is found that 11% of the ships in the world fleet are EU flagged, however making up 21% of the deadweight tonnage.

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9 It has been estimated that 1,000 to 3,000 ships per year (500 GT and above) are expected to be scrapped each year between 2010 and 2030.
4.3.5 MIDN (2007)

The Interdepartmental Committee on the Dismantling of Civilian and Military End-of-Life Ships (MIDN) identified the EU as having a driving role to play on ship dismantling although the processing of European State-owned ships represented just 40,000 tonnes per year. The leading players are the British and French Navies for European State-owned ships, especially military ships.

Because of the major scattering of the State services employing ships and because of the differences in the organization among States, it was not possible to make a detailed and precise list of the civil State ships to be dismantled in the years to come.

For small military ships, or military ships in poor condition, each of the States will face similar problems to the French Navy (including destination restrictions) and will have to seek essentially local solutions. However, it is unlikely that their dismantling should justify the setting up of specific sustainable industries.

For the French military fleet to be dismantled over the next ten years (at 2007) it amounted to about 80,000 tonnes, with a few dozen ships over 1,000 tonnes (20 to 40 depending upon second-hand sales, target shootings or other uses) and 100 to 200 small hulls and floating devices – some of them containing asbestos.

Among the other European navies, only the British Royal Navy faces a similar problem to that of the French Navy, with about thirty ships and a total mass of about 90,000 tonnes to be dismantled in the ten forthcoming years. On the whole, the remaining European navies were estimated to represent 120,000 tonnes and about a hundred ships over the same period of time.

For all European military navies it was estimated that, including the French – about 150 ships over 1,000 tonnes and a total mass of 300,000 tonnes were to be dismantled during the ten forthcoming years.

The overall volume of European State-owned ships to be dismantled in Europe or in OECD member States was estimated to amount to 400,000 tonnes over the next ten years.

For the civil state fleets considering existing fleets and their average age, it was estimated that European civil State ships to be dismantled in the ten forthcoming years should not exceed 100,000 tonnes.

In terms of quantities the total market of ship dismantling in Europe was thought to be about 500,000 to 700,000 tonnes over a period of 10 years, to be compared with the 60 to 100 million tonnes merchant vessels to be demolished worldwide over the same period of time.

Seventeen Annexes to the report provide further information including economics, dismantling countries, preliminary decontamination, dismantling processes and waste treatment.
4.3.6 Pierre Cardo (2010)

The work done under the “Mission parlementaire sur le démantèlement des navires” mentions four of the agreements (Agreements number 9, 10, 58.h and 115.c) found in “Le livre bleu des engagements du Grenelle de la Mer”. These agreements seek the creation of a French industrial network for the dismantling of vessels that reach their end-of-life status (agreement 9), including recreational boats (agreement number 58.h), creating as well the necessary training networks (agreement 115.c). This industrial approach is drawn up taking into consideration the possibilities of strengthening the European and international legislation concerning this matter (agreement 10).

4.4 Key findings and conclusions

Recreational vessels

- The dismantling of recreational vessel poses very specific problem in relation to other fleets, making this fleet different from others in dismantling matters.

- Dismantling fibreglass boats is not profitable operation for the owner (high price including transport). Both an “eco” approach and research concerning composite material recovery must be stimulated.

- Proposals such as a fund, a yearly contribution/tax or an eco-tax are mentioned.

- Owners have a special bond with their boat, even when the boat has reached its end-of-life status.

- The number of recreational boats that reach their end-of-life status per year is said to be 20,000. It is thought that there is a great amount of stock to be dismantled in private properties (in houses, yards, and wintering facilities, among others).

- Equipment recovery for second-hand resale is very important in composite boats/vessels. Navigation equipment, engines and accessories represent the only source of income since other materials are not recovered. It is also possible to recycle some ferrous and non-ferrous metals (cables, electronic waste). Nevertheless, it is important to mention that these activities are usually carried out before sending the boat/vessel to a dismantling site; this contributes to give a negative value to dismantling activities.

- Currently, co-combustion in cement industries is the only operational example of valorization at an industrial level concerning recreational boats/vessels. It is important to mention that, for logistic reasons, cement industries only accept volumes from 5000 to 10000t per year this represents a large amount of boats.
Recovery of obsolete vessels not used in the fishing trade

- A decontamination phase is found necessary even though recreational boats/vessels generally have very little by way of hazardous materials. The absence of asbestos must be ensured and batteries must be correctly managed. Special attention must also be given to toxic wastes and oil.

**Merchant vessels**

- To support the idea of the creation of a European fund. For the time being, this fund would only benefit those vessels dismantled in a European site.

**Navy vessels**

- The financing of the dismantling of navy vessels is currently ensured by the Ministry of Defence, something that is proposed should continue.

**Abandoned and seized vessels**

- The cost of abandoned vessels is a burden and a real problem for those in charge of the port facilities. Port facilities face very complex legal situations in this area.
- An example of a complex legal situation is the “Winner”, a vessel that remains in the port of Brest since 2002. The estimated cost of the “Winner’s” treatment is Euro 1,167,219.99.
- The following proposals are made:
  1. the “European fund for merchant vessels” to ensure the financing of the dismantling of abandoned merchant vessels;
  2. port authorities should be compensated/indemnified by the State concerning the costs derived from the management of abandoned merchant vessels;
  3. the need to create an “organism” in charge of giving technical, legal and financing support to port authorities in relation to abandoned vessels;

- The immobilization of a vessel may happen for many reasons, among which we can find: illegal activities, navigation accident, voluntary pollution, creditors seizing, a vessel represents a danger for maritime traffic or for the environment, port inspections.

**4.4.1 Other relevant information**

- **Research and development**

  The main needs concerning research activities are found in the recovery of composite materials

  All the different sources of composite material (vessels, caravans, other production discards, among others) need to be amalgamated
Recovery of obsolete vessels not used in the fishing trade

- Creation of a Professional qualification Certification
- Urgent ratification of the HKC (taking into consideration that all vessels excluded in the HKC are asked to “ensure, by the adoption of appropriate measure, that such ships act in a manner consistent with this Convention, so far as is reasonable and practicable”)
- Metal vessels: Ferrous and non-ferrous metals are sent to metalworking facilities in Europe, mainly Spain and Italy, and Asia as well. Other materials such as wood are used for energy recovery or for making pallets. Other non-recovered wastes are sent to incineration or landfill.

Eleven Annexes to the report provide further information including stakeholders, context for different vessel typology, legal and research issues.

4.5 New data from commercial ship databases

Data from commercial databases were obtained, the main source being IHS Fairplay (European Commission 2011).

The data covers both large vessels covered by the HKC (500 GT and above), and vessels not covered by the convention (500>GT>100). The data reflect the status as of end of year 2009.

The table below shows the world fleet of small vessels not covered by the HKC (500>GT>100) by type in terms of the number of ships and total volume in gross tonnage.

<table>
<thead>
<tr>
<th>Table 4-6 The world fleet of small vessels not covered by the HKC (500&gt;GT&gt;100) by type - number of ships and total volume in GT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total number of ships</td>
</tr>
<tr>
<td>------------------------</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Bulkers</td>
</tr>
<tr>
<td>Containers</td>
</tr>
<tr>
<td>Gas carriers</td>
</tr>
<tr>
<td>General cargo</td>
</tr>
<tr>
<td>Offshore</td>
</tr>
<tr>
<td>Other tankers</td>
</tr>
<tr>
<td>Passenger ships</td>
</tr>
</tbody>
</table>
Recovery of obsolete vessels not used in the fishing trade

<table>
<thead>
<tr>
<th></th>
<th>Total number of ships</th>
<th>Total volume (GT)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Recreational boats</strong></td>
<td>1,123</td>
<td>323,406</td>
</tr>
<tr>
<td></td>
<td>441</td>
<td>111,741</td>
</tr>
<tr>
<td><strong>Ro-Ro ships</strong></td>
<td>1,458</td>
<td>447,623</td>
</tr>
<tr>
<td></td>
<td>191</td>
<td>60,255</td>
</tr>
<tr>
<td><strong>Service ships</strong></td>
<td>1,806</td>
<td>421,907</td>
</tr>
<tr>
<td></td>
<td>343</td>
<td>78,816</td>
</tr>
<tr>
<td><strong>Specialised cargo ships</strong></td>
<td>1,091</td>
<td>291,966</td>
</tr>
<tr>
<td></td>
<td>39</td>
<td>7,660</td>
</tr>
<tr>
<td><strong>Tankers (oil,chemical)</strong></td>
<td>2,465</td>
<td>799,385</td>
</tr>
<tr>
<td></td>
<td>145</td>
<td>47,397</td>
</tr>
<tr>
<td><strong>Tugs</strong></td>
<td>12,856</td>
<td>3,018,250</td>
</tr>
<tr>
<td></td>
<td>1,672</td>
<td>422,204</td>
</tr>
<tr>
<td><strong>Navy ships</strong></td>
<td>68</td>
<td>16,103</td>
</tr>
<tr>
<td></td>
<td>39</td>
<td>8,627</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>30,144</td>
<td>8,149,404</td>
</tr>
<tr>
<td></td>
<td>3,845</td>
<td>981,294</td>
</tr>
</tbody>
</table>

The table shows that EU-flagged ships account of approximately 13% of all small vessels not covered by the HKC (measures by GT). The share varies with the ship type. It is highest for navy ships, recreational boats and passenger ships and lowest for containers, bulkers and specialised cargo ships and tankers (oil, chemical). It should be noted that this data is for small ships registered to the flag of a country, and do not necessarily include those sailing or trading only in national waters, most recreational craft and inland waterway vessels etc. Hence the totals will underestimate all ships >500 GT by a considerable margin. Further information on these is given in chapter 6.

The table below shows the world fleet of large vessels covered by the HKC (500 GT and above) by type in terms of the number of ships and total volume in gross tonnage.

**Table 4.7** The world fleet of large vessels covered by the HKC (500 GT and above) by type - number of ships and total volume in GT

<table>
<thead>
<tr>
<th></th>
<th>Total number of ships</th>
<th>Total volume (GT)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>All</td>
<td>EU-flagged</td>
</tr>
<tr>
<td><strong>Bulkers</strong></td>
<td>8,571</td>
<td>778</td>
</tr>
<tr>
<td><strong>Containers</strong></td>
<td>4,882</td>
<td>954</td>
</tr>
<tr>
<td><strong>Gas carriers</strong></td>
<td>1,524</td>
<td>178</td>
</tr>
<tr>
<td><strong>General cargo</strong></td>
<td>12,172</td>
<td>1,245</td>
</tr>
</tbody>
</table>
Recovery of obsolete vessels not used in the fishing trade

<table>
<thead>
<tr>
<th></th>
<th>Total number of ships</th>
<th>Total volume (GT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offshore</td>
<td>4,575</td>
<td>34,637,567</td>
</tr>
<tr>
<td></td>
<td>511</td>
<td>2,299,465</td>
</tr>
<tr>
<td>Other tankers</td>
<td>248</td>
<td>791,068</td>
</tr>
<tr>
<td></td>
<td>30</td>
<td>79,449</td>
</tr>
<tr>
<td>Passenger ships</td>
<td>959</td>
<td>17,326,379</td>
</tr>
<tr>
<td></td>
<td>178</td>
<td>3,481,945</td>
</tr>
<tr>
<td>Recreational boats</td>
<td>438</td>
<td>629,142</td>
</tr>
<tr>
<td></td>
<td>93</td>
<td>95,008</td>
</tr>
<tr>
<td>Ro-Ro ships</td>
<td>3,890</td>
<td>59,706,547</td>
</tr>
<tr>
<td></td>
<td>1021</td>
<td>17,756,592</td>
</tr>
<tr>
<td>Service ships</td>
<td>1,098</td>
<td>3,595,384</td>
</tr>
<tr>
<td></td>
<td>228</td>
<td>674,967</td>
</tr>
<tr>
<td>Specialised cargo ships</td>
<td>2,285</td>
<td>14,858,202</td>
</tr>
<tr>
<td></td>
<td>120</td>
<td>991,710</td>
</tr>
<tr>
<td>Tankers (oil, chemical)</td>
<td>12742</td>
<td>298,188,122</td>
</tr>
<tr>
<td></td>
<td>1,651</td>
<td>55,962,046</td>
</tr>
<tr>
<td>Tugs</td>
<td>766</td>
<td>766,137</td>
</tr>
<tr>
<td></td>
<td>107</td>
<td>141,469</td>
</tr>
<tr>
<td>Navy¹⁰ ships*</td>
<td>160</td>
<td>4,133,251</td>
</tr>
<tr>
<td></td>
<td>34</td>
<td>414,845</td>
</tr>
<tr>
<td>Total</td>
<td>54,310</td>
<td>993,404,439</td>
</tr>
<tr>
<td></td>
<td>7,128</td>
<td>165,507,822</td>
</tr>
</tbody>
</table>

*: Not covered by the HKC

The table shows EU-flagged ships account of approximately 17% of all large vessels covered by the HKC (measures by GT). The highest is for Ro-Ro ships, containers and passenger ships. The lowest share is for offshore, specialised cargo ships and other tankers.

Projection approach

The projections of future dismantling volumes are made based on a simple assessment of the age profile of the vessel and the lifetime expectancy. The projections were made following this procedure:

a) The age profile of the existing fleet for each vessel type is estimated.

b) A decomposition frequency function, which shows the share of vessels scrapped at a certain age, was estimated. A decommissioning frequency function from the COWI/DHI (2007) study was used. The frequency function was established based on historical scrapings of all ship types.

c) The conditional decommissioning frequency function was estimated on the basis of the decommissioning frequency function. The conditional decommissioning function expresses the probability that a vessel is scrapped in the

¹⁰ The Hong Kong Convention excludes naval vessels from its scope in its Article 3.2 “This Convention shall not apply to any warships, naval auxiliary or other ships owned or operated by a Party and used, for the time being, only on government non-commercial service.”
following year conditional on being in operation at the beginning of the year.

d) Combining the estimated age profile and the conditional decommissioning frequency function for a vessel, estimates of the future dismantling volumes were obtained.

e) By adding the dismantling volumes for all type, the aggregate estimates of future volumes of scrapping were reached.

It should be noted that by applying the approach described above of estimating the future decommissioning volumes by year (e.g. when ships are scrapped), the projections will only reflect the overall trend in volumes. Moreover, the projections will not reflect e.g. actual variations in the scrapping market business cycle that comes from fluctuating freight rates and future political initiatives. However, using the estimated age profile and the fitted conditional decommissioning frequency function to estimate the future decommissioning volumes the trend in the medium and long term is reflected.

Average lifetimes

On the basis of data on the vessels scrapped during 2008-2009, the average lifetime for all ship types were calculated. The average lifetimes are presented in the table below.

<table>
<thead>
<tr>
<th>Ship type</th>
<th>Average lifetime (years)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>All vessels</td>
</tr>
<tr>
<td>Bulkers</td>
<td>31.1</td>
</tr>
<tr>
<td>Containers</td>
<td>27.3</td>
</tr>
<tr>
<td>Gas carriers</td>
<td>30.3</td>
</tr>
<tr>
<td>General cargo</td>
<td>34.0</td>
</tr>
<tr>
<td>Navy ships</td>
<td>47.2</td>
</tr>
<tr>
<td>Offshore</td>
<td>35.4</td>
</tr>
</tbody>
</table>
Recovery of obsolete vessels not used in the fishing trade

<table>
<thead>
<tr>
<th>Ship type</th>
<th>Average lifetime (years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Other tankers</td>
<td>35.0 33.7 42.0</td>
</tr>
<tr>
<td>Passenger ships (cruise ships, ferries)</td>
<td>38.1 47.6 30.9</td>
</tr>
<tr>
<td>Recreational boats</td>
<td>30.0 30.0 30.0</td>
</tr>
<tr>
<td>Ro-Ro ships</td>
<td>32.2 31.7 43.1</td>
</tr>
<tr>
<td>Service ships</td>
<td>34.3 35.5 33.5</td>
</tr>
<tr>
<td>Specialised cargo ships</td>
<td>30.9 30.8 33.1</td>
</tr>
<tr>
<td>Tankers (oil, chemical)</td>
<td>28.6 28.6 30.0</td>
</tr>
<tr>
<td>Tugs</td>
<td>44.5 49.0 44.2</td>
</tr>
<tr>
<td>(blank)*</td>
<td>31.7 32.5 31.1</td>
</tr>
<tr>
<td>Total</td>
<td>31.6 31.3 33.3</td>
</tr>
</tbody>
</table>

*: Vessel type not specified in database

The table shows that the calculated average lifetime for vessels scrapped in 2008 and 2009 varies between 27 and 47 years according to type. The lifetimes for large vessels are high compared to the historical lifetimes estimated in COWI/TREN (2004) - comparing the lifetimes for large vessels only. The increased lifetimes may be due to freight rates being high in 2007 and 2008, along with high trade volumes making it attractive to keep as many ships as possible in operation. This means that mostly the oldest and obsolete vessels were sent for scrapping in these two years.

On the other hand, the average lifetimes for small vessels seem relatively low as small vessels, according to information from stakeholders etc., tend to have a longer lifetime than larger vessels.

Nevertheless, in the projections of the future dismantling volumes, the above calculated average lifetimes for 2008 and 2009 were applied. The calculated average lifetimes of the various vessels types are assumed to be constant during the forecast period.
To assess the sensitivity of the assumed average lifetimes to the results for the small vessels in focus, a sensitivity analysis have been carried out applying average lifetimes that are 50 % higher than the lifetimes presented in the table above. The results of the sensitivity analysis are presented in Appendix B.

The ship volumes are expressed in GT in the original source. A conversion factor was applied to calculate the ship volumes in LDT. Converting GT into LDT is not straightforward as it depends upon the types of ships involved.

Conversion factors for the various ship types have been estimated and provided by the European Commission (DG Environment). They have been estimated by linking ship data from IHS fairplay with data from a shipbroker (Cotzias\textsuperscript{11}). The conversion factors are presented in the table below.

\textit{Table 4.9} \hspace{1cm} \textit{Ship volume conversion factors - GT/LDT}

<table>
<thead>
<tr>
<th>Shiptype EU category</th>
<th>Average GT/LDT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulkers</td>
<td>2.56</td>
</tr>
<tr>
<td>Containers</td>
<td>2.21</td>
</tr>
<tr>
<td>Gas carriers</td>
<td>1.93</td>
</tr>
<tr>
<td>General cargo</td>
<td>1.97</td>
</tr>
<tr>
<td>Navy ships</td>
<td>2.56</td>
</tr>
<tr>
<td>Offshore</td>
<td>2.96</td>
</tr>
<tr>
<td>Other tankers</td>
<td>1.71</td>
</tr>
<tr>
<td>Passenger ships (cruise ships, ferries)</td>
<td>1.23</td>
</tr>
<tr>
<td>Recreational boats</td>
<td>1.23\textsuperscript{*}</td>
</tr>
<tr>
<td>Ro-Ro ships</td>
<td>3.20</td>
</tr>
<tr>
<td>Service ships</td>
<td>1.60</td>
</tr>
<tr>
<td>Specialised cargo ships</td>
<td>2.67</td>
</tr>
</tbody>
</table>

\textsuperscript{11} http://www.cotzias.gr/reports/COTZIAS_2011_01_JAN.pdf
Recovery of obsolete vessels not used in the fishing trade

<table>
<thead>
<tr>
<th>Shiptype EU category</th>
<th>Average GT/LDT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tankers (oil, chemical)</td>
<td>2.85**</td>
</tr>
<tr>
<td>Tugs</td>
<td>1.60***</td>
</tr>
</tbody>
</table>

Source: Data provided by European Commission (DG Environment)
* Estimate not available. Set equal to estimate for passenger ships
** Own estimate based on data from COWI, 2004.
*** Estimate not available. Set equal to estimate for service ships.

Table 4-10 shows the projected future volumes of dismantling of vessels not covered by the HKC by year and in terms of number of ships and total volume in GT and LDT as the total of all ship types.

**Table 4-10** Projected future dismantling volumes of vessels not covered by the HKC (500>GT>100) by flag state and year of scrap - number of ships and total volume in GT and LDT

<table>
<thead>
<tr>
<th>Year</th>
<th>Total number of Ships</th>
<th>Total volume (GT)</th>
<th>Total volume (LDT)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>All</td>
<td>EU-flagged</td>
<td>All</td>
</tr>
<tr>
<td>2011</td>
<td>2,115</td>
<td>325</td>
<td>534,502</td>
</tr>
<tr>
<td>2012</td>
<td>1,556</td>
<td>236</td>
<td>393,537</td>
</tr>
<tr>
<td>2013</td>
<td>1,170</td>
<td>174</td>
<td>297,236</td>
</tr>
<tr>
<td>2014</td>
<td>910</td>
<td>130</td>
<td>233,390</td>
</tr>
<tr>
<td>2015</td>
<td>744</td>
<td>101</td>
<td>193,768</td>
</tr>
<tr>
<td>2016</td>
<td>657</td>
<td>84</td>
<td>174,210</td>
</tr>
<tr>
<td>2017</td>
<td>614</td>
<td>74</td>
<td>164,875</td>
</tr>
<tr>
<td>2018</td>
<td>585</td>
<td>66</td>
<td>158,821</td>
</tr>
<tr>
<td>2019</td>
<td>569</td>
<td>61</td>
<td>155,725</td>
</tr>
<tr>
<td>2020</td>
<td>564</td>
<td>58</td>
<td>154,721</td>
</tr>
</tbody>
</table>
Recovery of obsolete vessels not used in the fishing trade

<table>
<thead>
<tr>
<th></th>
<th>Total number of Ships</th>
<th>Total volume (GT)</th>
<th>Total volume (LDT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2021</td>
<td>566</td>
<td>57</td>
<td>154,727</td>
</tr>
<tr>
<td>2022</td>
<td>569</td>
<td>57</td>
<td>155,232</td>
</tr>
<tr>
<td>2023</td>
<td>575</td>
<td>58</td>
<td>156,526</td>
</tr>
<tr>
<td>2024</td>
<td>584</td>
<td>60</td>
<td>158,289</td>
</tr>
<tr>
<td>2025</td>
<td>598</td>
<td>62</td>
<td>161,049</td>
</tr>
<tr>
<td>2026</td>
<td>605</td>
<td>64</td>
<td>162,518</td>
</tr>
<tr>
<td>2027</td>
<td>606</td>
<td>66</td>
<td>162,125</td>
</tr>
<tr>
<td>2028</td>
<td>602</td>
<td>67</td>
<td>160,886</td>
</tr>
<tr>
<td>2029</td>
<td>595</td>
<td>69</td>
<td>159,719</td>
</tr>
<tr>
<td>2030</td>
<td>595</td>
<td>70</td>
<td>161,343</td>
</tr>
<tr>
<td>Grand Total</td>
<td>15,378</td>
<td>1,939</td>
<td>4,053,199</td>
</tr>
<tr>
<td>Average per year</td>
<td>769</td>
<td>97</td>
<td>202,660</td>
</tr>
</tbody>
</table>

As presented in the table, the dismantling volumes from 2011 to 2013 are high compared to the average volume per year from 2011 to 2030. This reflects the fact that the average age of small vessels is high. More than 35% are 31 years or older. This means that there is a large backlog of small vessels for scrapping if the assumed expected lifetimes holds true. The approach applied consequently projects that the old vessels will be those most likely to be dismantled first in subsequent years.

However, it should be stressed that if the expected lifetimes do not hold true for the small vessels, there might not be a backlog. In this case, the expected annual volume of dismantling of small vessels may be closer to the estimated average volume of 202,660 GT (or 769 ships) per year.

The table above also shows that the EU share of the expected future dismantling volumes is in line with the estimated share of ships flying EU flags.
Appendix B presents the results of a sensitivity analysis average lifetimes have been increased by 50% compared to the average lifetimes used in the calculation above.

Not surprisingly, when the average lifetimes of small vessels are increased the projected future volume of dismantling in the period from 2011 to 2030 is significantly reduced. The average number of ships dismantled per year in the period is projected to 526 which is a reduction of 242 compared to the base case where average lifetimes are not increased by 50%.

The sensitivity analysis also shows that the backlog is significantly reduced when average lifetimes are increased. However, the projection shows that quite a few vessels will still be scrapped in the coming years. Moreover, from 2011 to 2014 the expected number of small vessels that will be scrapped is significantly higher than the average expected number of small vessels scrapped per year in the entire period from 2011 to 2030 (an average of 769 vessels per year in the period 2011-2014 compared to 527 vessels per year from 2011 to 2030). Again, this result should be seen in view of the fact that a number of small vessels are old. Further, it should be noted that the available data do not include details of the age of ships above the age of 32 years. Vessels above this age are registered in one category only. In the projections the vessels in this category are distributed in age intervals from 32 to 60 years with a share decreasing according to age.

Table 4-11 shows the projected future volumes of dismantling of vessels covered by the HKC by year of scrap in terms of the number of ships and total volume in GT as the total of all ship types.

<table>
<thead>
<tr>
<th>Year</th>
<th>Total number of Ships</th>
<th>Total volume (GT)</th>
<th>Total volume (LDT)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>All</td>
<td>EU-flagged</td>
<td>All</td>
</tr>
<tr>
<td>2011</td>
<td>2,431</td>
<td>178</td>
<td>7,938,678</td>
</tr>
<tr>
<td>2012</td>
<td>1,950</td>
<td>142</td>
<td>6,287,779</td>
</tr>
<tr>
<td>2013</td>
<td>1,654</td>
<td>122</td>
<td>5,590,344</td>
</tr>
<tr>
<td>2014</td>
<td>1,467</td>
<td>110</td>
<td>5,173,980</td>
</tr>
<tr>
<td>2015</td>
<td>1,351</td>
<td>104</td>
<td>4,989,235</td>
</tr>
</tbody>
</table>
Recovery of obsolete vessels not used in the fishing trade

<table>
<thead>
<tr>
<th>Year</th>
<th>Total number of Ships</th>
<th>Total volume (GT)</th>
<th>Total volume (LDT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>1,288</td>
<td>5,218,422</td>
<td>1,344,790</td>
</tr>
<tr>
<td>2017</td>
<td>1,267</td>
<td>5,943,900</td>
<td>1,528,850</td>
</tr>
<tr>
<td>2018</td>
<td>1,256</td>
<td>6,945,706</td>
<td>1,781,537</td>
</tr>
<tr>
<td>2019</td>
<td>1,240</td>
<td>7,993,635</td>
<td>2,056,008</td>
</tr>
<tr>
<td>2020</td>
<td>1,219</td>
<td>9,000,219</td>
<td>2,343,543</td>
</tr>
<tr>
<td>2021</td>
<td>1,202</td>
<td>0,299,251</td>
<td>2,732,669</td>
</tr>
<tr>
<td>2022</td>
<td>1,195</td>
<td>1,824,769</td>
<td>3,252,267</td>
</tr>
<tr>
<td>2023</td>
<td>1,185</td>
<td>3,387,619</td>
<td>3,829,827</td>
</tr>
<tr>
<td>2024</td>
<td>1,178</td>
<td>4,931,132</td>
<td>4,397,840</td>
</tr>
<tr>
<td>2025</td>
<td>1,184</td>
<td>6,438,295</td>
<td>4,930,315</td>
</tr>
<tr>
<td>2026</td>
<td>1,209</td>
<td>8,398,763</td>
<td>5,549,659</td>
</tr>
<tr>
<td>2027</td>
<td>1,261</td>
<td>1,071,106</td>
<td>6,264,257</td>
</tr>
<tr>
<td>2028</td>
<td>1,331</td>
<td>4,247,921</td>
<td>7,013,298</td>
</tr>
<tr>
<td>2029</td>
<td>1,410</td>
<td>7,492,569</td>
<td>7,722,202</td>
</tr>
<tr>
<td>2030</td>
<td>1,482</td>
<td>0,509,932</td>
<td>8,304,554</td>
</tr>
<tr>
<td>Grand Total</td>
<td>27,761</td>
<td>453,683,256</td>
<td>69,014,966</td>
</tr>
<tr>
<td>Average per year</td>
<td>1,388</td>
<td>22,684,163</td>
<td>3,450,748</td>
</tr>
</tbody>
</table>

The table above shows that on average 1,388 vessels accounting for 22.7 million GT will be dismantled per year in the period from 2011 to 2030. The EU
flagged ships only account for approximately 14% of the expected average volume in the period even though they account for 17% of the world fleet of large vessels. This is due to the fact that the EU flagged vessels are much younger than the average of all vessels. The vast majority of EU flagged vessels are less than 15 years old.

Overall, the average age of large vessels is much lower than the average age of small vessels—especially the largest vessels. Consequently, the backlog volume of large vessels for scrapping is not as high as for small vessels.

The table also shows that the total dismantling volume will increase steadily from 2020 to 2030. This reflects the fact that more than approximately 80% of the vessels (measured in GT) are under 20 years old. A large proportion of these vessels are expected to be dismantled 10 to 20 years from today.

Dismantling in 2008 and 2009

Table 4-12 and Table 4-13 display data on dismantling of the world fleet in 2008 and 2009.

Table 4-12  Dismantling volumes in 2008 and 2009 by size - number of ships and total volume in GT

<table>
<thead>
<tr>
<th>Dismantling year</th>
<th>Large</th>
<th>Small</th>
<th>Total</th>
<th>Large</th>
<th>Small</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2008</td>
<td>565</td>
<td>194</td>
<td>759</td>
<td>8,643,016</td>
<td>50,845</td>
<td>8,693,861</td>
</tr>
<tr>
<td>2009</td>
<td>1,153</td>
<td>144</td>
<td>1,297</td>
<td>23,816,928</td>
<td>37,365</td>
<td>23,854,293</td>
</tr>
<tr>
<td>Grand Total</td>
<td>1,718</td>
<td>338</td>
<td>2,056</td>
<td>32,459,944</td>
<td>88,210</td>
<td>32,548,154</td>
</tr>
</tbody>
</table>

Note: Large ships are ships of 500 GT and above. Small ships are ships of 500 GT and below (ships down to 100 GT).

Table 4-12 shows that relatively few large vessels were scrapped in 2008. This should be seen in the light of high freight rates in 2007 and most of 2008. The dismantling volume increased by almost 75% in 2009 reflecting the dramatic drop in freight rates following the worldwide financial crisis that began at the end of 2008.
Recovery of obsolete vessels not used in the fishing trade

Table 4-13  **Dismantling volumes in 2008 and 2009 by vessel type - number of ships and total volume in GT**

<table>
<thead>
<tr>
<th>Vessel type</th>
<th>Total number of ships</th>
<th>Gross tonnage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Large</td>
<td>Small</td>
</tr>
<tr>
<td>Bulkers</td>
<td>314</td>
<td>1</td>
</tr>
<tr>
<td>Containers</td>
<td>253</td>
<td>0</td>
</tr>
<tr>
<td>Gas carriers</td>
<td>54</td>
<td>0</td>
</tr>
<tr>
<td>General cargo</td>
<td>396</td>
<td>41</td>
</tr>
<tr>
<td>Navy ships</td>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>Offshore</td>
<td>17</td>
<td>7</td>
</tr>
<tr>
<td>Other tankers</td>
<td>11</td>
<td>2</td>
</tr>
<tr>
<td>Passenger ships</td>
<td>16</td>
<td>21</td>
</tr>
<tr>
<td>Ro-Ro ships</td>
<td>180</td>
<td>7</td>
</tr>
<tr>
<td>Service ships</td>
<td>6</td>
<td>10</td>
</tr>
<tr>
<td>Specialised cargo ships</td>
<td>76</td>
<td>5</td>
</tr>
<tr>
<td>Tankers (oil,chemical)</td>
<td>253</td>
<td>3</td>
</tr>
<tr>
<td>Tugs</td>
<td>2</td>
<td>38</td>
</tr>
<tr>
<td>(blank)</td>
<td>130</td>
<td>203</td>
</tr>
<tr>
<td>Grand Total</td>
<td>1,718</td>
<td>338</td>
</tr>
</tbody>
</table>

Note: Large ships are ships of 500 GT and above. Small ships are ships of 500 GT and below (ships down to 100 GT).
Table 4-13 shows that bulkers, tankers and containers account for the largest share of the dismantling volumes of large ships. For small ships the largest share is for general cargo ships and tugs.

Table 4-14 shows the dismantling volumes by dismantling location in 2008 and 2009.

Table 4-14 Dismantling volumes in 2008 and 2009 by dismantling location - number of ships and total volume in GT

<table>
<thead>
<tr>
<th>Dismantling location</th>
<th>Total number of ships</th>
<th>Gross tonnage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Large</td>
<td>Small</td>
</tr>
<tr>
<td>Bangladesh</td>
<td>347</td>
<td>1</td>
</tr>
<tr>
<td>India</td>
<td>571</td>
<td>2</td>
</tr>
<tr>
<td>China</td>
<td>319</td>
<td>0</td>
</tr>
<tr>
<td>Pakistan</td>
<td>117</td>
<td>4</td>
</tr>
<tr>
<td>Turkey</td>
<td>156</td>
<td>15</td>
</tr>
<tr>
<td>Other OECD</td>
<td>79</td>
<td>45</td>
</tr>
<tr>
<td>Unknown</td>
<td>48</td>
<td>102</td>
</tr>
<tr>
<td>EU</td>
<td>55</td>
<td>145</td>
</tr>
<tr>
<td>Other</td>
<td>26</td>
<td>24</td>
</tr>
<tr>
<td>Grand Total</td>
<td>1,718</td>
<td>338</td>
</tr>
</tbody>
</table>

Note: Large ships are ships of 500 GT and above. Small ships are ships of 500 GT and below (ships down to 100 GT).

Bangladesh, India, China and Pakistan accounted for more than 95 % of the total volume of large ships scrapped (GT) in 2008 and 2009. However, the same countries only accounted for less than 5 % of the total volume of small ships scrapped (GT). EU countries accounted for approximately 44 % of the scrapping of small vessels in 2008 and 2009. This share is significantly higher than the share of EU flagged small vessels (13%). Denmark and Belgium are by far the two largest countries for dismantling of small ships in the EU and in the world as a whole.
Table 4-15 shows the dismantling volumes in 2008 and 2009 by the ship flag state before scrapping.

Table 4-15 Dismantling volumes in 2008 and 2009 by the ship flag state before scrapping - number of ships and total volume in GT

<table>
<thead>
<tr>
<th>Flag state</th>
<th>Total number of ships</th>
<th>Gross tonnage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Large</td>
<td>Small</td>
</tr>
<tr>
<td>EU</td>
<td>152</td>
<td>171</td>
</tr>
<tr>
<td>Other OECD</td>
<td>229</td>
<td>82</td>
</tr>
<tr>
<td>Other</td>
<td>1,303</td>
<td>72</td>
</tr>
<tr>
<td>Unknown</td>
<td>34</td>
<td>13</td>
</tr>
<tr>
<td>Grand Total</td>
<td>1,718</td>
<td>338</td>
</tr>
</tbody>
</table>

Note: Large ships are ships of 500 GT and above. Small ships are ships of 500 GT and below (ships down to 100 GT).

The table above shows that EU flagged ships only account for approximately 8% of the volume of large ships scrapped. This is partly due to the fact that the EU fleet mainly consists of young vessels. When the vessels are 10-15 years old they tend to be sold to owners and operators outside the EU and are re-flagged.

4.6 Conclusion

The projections of future volumes of dismantling of vessels were carried out on the basis of data from IHS Fairplay on the world fleet of ships covered by the HKC (≥500 GT) and the larger of the ships not covered by HKC (500>GT>100). The projections do not include ships below 100 GT. Although the projections are believed to provide reasonable estimates of the overall future dismantling volumes, the data are however subject to some uncertainty such as developments in the world economy. Therefore the projections for specific years are uncertain as sudden changes, such as economic downturn or upturn will also be influencing shipowners’ decisions to scrap.

The IHS Fairplay data also includes data on recent ship dismantling. On this basis, dismantling in 2008 and 2009 in terms of the number of ships and total volumes in GT were calculated. The dismantling volumes were differentiated based on ship size and location. The calculations provide good information on dismantling in recent years. They also show how volumes can vary drastically from one year to another (75% increase in recycling in 2009 compared to...
Recovery of obsolete vessels not used in the fishing trade

2008), which are believed to be a result of a significant change in the major driver for recycling of commercial vessels namely the freight rates which again depend on a number of factors - among others the world's economic situation. The data on recent scrapping shows that the EU accounts for a large share of the scrapping of small vessels - a share that is significantly higher than the share of the EU-flagged small vessels. This is completely different than for the large HKC vessels, of which only very few are recycled in EU, and a very important result for the study as it shows that the EU countries are in fact already "taking care" of most of their own vessels.
5 Recycling of vessels not covered by the Hong Kong Convention

The data collection activities have included stakeholder workshops, a questionnaire with four different sections sent out to 200 respondents, field visits to recycling facilities and bilateral consultations with different stakeholders.

5.1 Stakeholder Workshops

The workshop schedule included an initial one-day stakeholder workshop targeting more cross-cutting critical issues and policy options in relations to dismantling practices of ships not covered by the HKC and abandoned vessels. In addition seven national workshops were conducted in five different locations to obtain more detailed information about national practices, input for suggesting policy options and information which useful for the impact assessment.

Table 5-1 shows time and place as well as the specific focus of the project stakeholder workshops in 2011.
Table 5.1  Workshop Schedule

<table>
<thead>
<tr>
<th>Date</th>
<th>Country</th>
<th>City</th>
<th>Focus</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 April 2011</td>
<td>Belgium</td>
<td>Brussels</td>
<td>Critical issues and expectations for future EU policy</td>
</tr>
<tr>
<td>13 April 2011</td>
<td>UK</td>
<td>Portsmouth</td>
<td>Navy and government owned vessels</td>
</tr>
<tr>
<td>28 April 2011</td>
<td>Spain</td>
<td>Madrid</td>
<td>Small vessels</td>
</tr>
<tr>
<td>29 April 2011</td>
<td>Spain</td>
<td>Madrid</td>
<td>Abandoned vessels</td>
</tr>
<tr>
<td>3 May 2011</td>
<td>UK</td>
<td>London</td>
<td>Small vessels</td>
</tr>
<tr>
<td>23 May 2011</td>
<td>Poland</td>
<td>Szczecin</td>
<td>Small and abandoned vessels</td>
</tr>
<tr>
<td>24 May 2011</td>
<td>Poland</td>
<td>Szczecin</td>
<td>Government owned and inland vessels</td>
</tr>
<tr>
<td>25 May 2011</td>
<td>Greece</td>
<td>Athens</td>
<td>Small, abandoned and inland vessels</td>
</tr>
<tr>
<td>21 June 2011</td>
<td>Belgium</td>
<td>Brussels</td>
<td>Cancelled due to lack of registrations</td>
</tr>
</tbody>
</table>

A short description of each of the workshops with selected key findings and observations are presented in the following sections. Reports of all workshops can be found in the appendices.

5.1.1  Stakeholder Workshop in Brussels April 8th 2011

As part of the initial data collection activities a one day workshop in Brussels was conducted with the purpose of presenting the study to a broad group of stakeholders and to open up a dialogue with the stakeholders on the main critical issues concerning dismantling practices of ships not covered by the HKC. Stakeholder expectations for future policy at EU level were also discussed. The attendees were from several EU member states; independent consultants, ministries, industry associations, EU DGs, NGOs and the project consultants (see workshop agenda and attendees in appendix C).

The workshop agenda focused on a presentation and discussion of the study itself, the preliminary results of the data collection and specific challenges for environmentally sound dismantling of these vessels; critical issues and expectations for future policy at EU level.
5.1.1.1 Selected Key Findings and Observations

The leisure boat industry has estimated that the recreational crafts fleet is currently approximately 6 million and that most recreational crafts are less than 18 metres in length. The national boating associations make estimations of the size of the national fleet for recreational crafts. This may be a valuable data source for the study. Additional information may be obtained from insurers but recreational crafts are not always insured, so insurance registers might not be a particularly useful data source for estimating future volumes.

- There may be a large discrepancy between the actual numbers of boats that are "ready" for dismantling and the number of boats that people actually wish to dismantle. Owners can have many different reasons behind their decision to either dismantle or not, perhaps purely for sentimental reasons. Boats may be kept elsewhere than on the water in harbours and marinas and not attract the attention of the authorities. Often they can be transported and stored on land in gardens and garages.

- A comment was made that the boats being built today may present greater challenges in dismantling at end of life due to advances in construction technology and materials producing vessels of greater strength but consequently harder to break apart.

- Bio based materials and eco-building techniques are beginning to appear on the market. Eco-guide software for boat manufacturers is currently being developed in France to help producers think about the life cycle of the boats.

- The largest problem for the recreational and smaller boat owners may be the costs of dismantling including the costs for transport of the vessel to the dismantling facility.

- It was mentioned that obsolete EU fishing boats are dumped in West African countries - Mauritania is an example (fishing boats are however not included in this study).

- The represented recycling industry found that there is sufficient legislation of the ship recycling area today.

The results of this Stakeholder workshop demonstrated the diversity and complexity of the topic of ship recycling as it applies to non-HKC vessels. The low level of responses to the questionnaire (see section 5.2) was also put into perspective as it appears that information on these types of vessel is not well collated in Europe. It has also become clear that practices with respect to boat registration vary widely between EU Member States, with no consistent approach as to whether it should be voluntary or obligatory or on size categorization. France is a good example for registration covering craft above 2.5 m.

Some information is available for recreational boating, but in general it is a largely poorly reported area on ship recycling, however some associations have
been actively anticipating future recycling needs and this could prove helpful. In other areas relating to inland and coastal vessels and government owned, including navy, vessels the data is patchy. Data collection is therefore likely to have to rely on estimates. The destinations of small boats for recycling are not well characterised across Europe. Some further understanding of the treatment of composites (i.e. non-ferrous material comprising glass fibre and resins in a variety of formulations) is required to better assess the economic costs of recycling recreational craft in particular but not exclusively. These will impact on options analysis later in the project. A slightly low attendance at the meeting also meant that representation on all the issues was limited while a number of useful contacts were made.

5.1.2 National Stakeholder Workshops in EU Member States
A series of national stakeholder workshops were conducted with the focus on completing the information already collected and needed for the subsequent impact analyses and impact assessments. The stakeholder workshops covered the situation in relation to dismantling of ships not covered by the HKC in a representative number of EU member states based on size of the problem current practices and geography (see workshop agenda and attendees in appendix D).

5.1.3 Spanish Workshop 1 and 2 in Madrid
Two workshops on recycling of small vessels and abandoned vessels were conducted in Madrid on April 28th and 29th 2011. The focus of the workshops was to obtain an overview of the current situation in Spain in relation to scrapping and recycling practices of small vessels and of the legal basis and legislation in Spain concerning small and abandoned vessels. The attendees represented stakeholders from; ministries, public agencies, dismantling companies and industry associations, ports and the project consultants (see workshop agenda and attendees in appendix D1).

As a general comment, many attendees queried why fishing vessels were not part of the study, as they considered that even though fishing vessels receive grants for abandoning their professional activity, experiences with these types of vessels could be of help to this project.

5.1.3.1 Selected Key Findings and Observations
• Fibreglass boats/vessels create a specific problem since they represent a negative economic value when they reach their end-of-life status.

• Concerning boat/shipbuilding, ecodesign was brought forward as a key aspect to be considered, as it could help not only for dismantling activities but also for repair and maintenance activities

• The use of existing waste management facilities could be an option for dismantling small vessels, especially for recreational craft.
Recovery of obsolete vessels not used in the fishing trade

• In relation to ensuring appropriate recycling of small vessels a few ideas were discussed, but not analysed in full detail. Some of the suggestions seen as possibilities by the stakeholders included:

- Establishment of a fund in order to "take care" of the recycling costs;

- Establishment of a “return system”, including that boat/vessel could be returned for dismantling to where it was bought once it has reached its end-of-life. This option is however, not considered very feasible since a boat that has reached its end-of-life status may not be located geographically near to where it was bought. In this case transportation costs would be very high.

• In relation to abandonment of small recreational vessels, it was estimated that in recreational ports in Spain approximately 2 or 3 vessels are abandoned per port per year. This number was further believed increasing (in Spain there are 358 recreational ports and marinas).

• When a boat/vessel is abandoned it deteriorates very rapidly. It only generates expenses. If legal procedures were speeded up, the boat/vessel would have more value because it wouldn’t be so deteriorated/damaged once the process is over. Another important aspect to be considered is that the more time a boat/vessel is abandoned the higher the risk for environmental impact.

5.1.4 United Kingdom Workshop (1) in Portsmouth

The first of two separate workshops in the UK was conducted in Portsmouth on 13 April 2011. The focus of the workshop was recycling of government owned vessels in UK with specific focus on navy vessels. The workshop was conducted at the Offices of the Disposal and Reserve Ships Organisation at the HM Naval Base in Portsmouth. The attendees represented stakeholders from; ministries, public agencies and industry associations, DG ENV and the project consultants (see workshop agenda and attendees in appendix D2).

5.1.4.1 Selected Key Findings and Observations

• The UK Ministry of Defence operates a flexible but controlled system for disposal of naval vessels. Preparation for recycling is an established process involving cooperation with the ship’s company in the transition from active service to disposal, within defined custody arrangements.

• A ship that is sold as a working ship would not be waste or escape environmental legislation – particularly for waste shipment. It would need to be passed as seaworthy to be sailed. It is no different from the sale of a second hand commercial ship. The UK ship recycling strategy does take account of later actions when a ship is sold to another country by putting conditions in the contract that the final recycling should be carried out in accordance with environmentally sound management (ESM) standards.
• The whole process ensures conformity with the UK’s own Ship Recycling Strategy including environmental compliance requirements.

• This may be considered as a basis for a model approach to disposal of Government owned vessels, whose principles can be employed directly and procedures are capable of modification based on the size and type of vessels to be dealt with.

5.1.5 United Kingdom Workshop (2) in London

The second UK workshop was conducted in London on 3 May 2011 at the offices of the Department for Environment Food and Rural Affairs. The focus of the workshop was the UK perspective on obsolete non-HKC vessels. Specific issues on the agenda were small vessels, recreational craft, abandoned vessels and recovery practices of non-government and government owned (non-navy) vessels. The attendees represented stakeholders from; ministries, public agencies, dismantling companies and industry associations, DG ENV and the project consultants (see workshop agenda and attendees in appendix D).

5.1.5.1 Selected Key Findings and Observations

• It was suggested that the project need to revise the methodology used to calculate the future recycling volumes for small vessels between 100-500 GT. The methodology used may not be suitable because the underlying assumptions, with respect to vessel ages etc, for this group may be different and need to be reassessed. (This was later done and is reflected in Chapter 4, section 4.1 and the sensitivity analysis in Appendix B.)

• It was not recognized by the workshop attendees that car dismantling enterprises usually have the necessary facilities for dismantling of small vessels.

• It was suggested by the representative from British Marine Federation that many small leisure boats are sold eastwards. Used but not obsolete leisure boats from the western part of Europe are sold to the eastern part of Europe for use here. (n.b. This was not confirmed for Poland during the Polish workshop.)

• It was a general opinion of the stakeholders that the lifetime expectancy of leisure boats is longer than so far indicated in the project. Around 30 years was seen as being a very low estimate.

• The volumes of composites materials are too low for it to be of commercial value and interest. Recovery of this material may be more economically viable if composite boat dismantlers could cooperate with other industries.

As a general observation a government official pointed out that the greatest impact on the environment in the lifecycle of vessels is probably accounted for in the use-phase of a vessel and therefore this should be put in perspective when the impacts from the disposal phase are assessed.
5.1.6 Polish Workshop 1 and 2 in Szczecin

Polish workshops were conducted in Szczecin on 23 and 24 May 2011 at the Campanile Hotel. The focus was on small and abandoned vessels on the first day and on inland and government owned vessels on the second day. The objective was to discuss the situation in Poland and identify potential problems at the national level related to the recovery of obsolete vessels not covered by HKC. Furthermore, aims were to obtain information on the potential dismantling volumes based on statistical data, to present the data referring to the situation in other European countries, to discuss best practices for dismantling of vessels, and to identify the instruments to make recycling profitable and environmentally friendly business (see workshop agenda and attendees in Appendix D4).

5.1.6.1 Selected Key Findings and Observations

• Ships are registered with different agencies and verification of data on fleet below 500 GT in Poland was considered difficult. The Statistical Office in Szczecin, Maritime Statistics Centre may be able to collect a more complete set of data about small ships from the different agencies;

• It was a general opinion by the stakeholders that there is a lack of EU legislation specifically referring to small vessels;

• It was recognized by the workshop attendees that car dismantling enterprises could be used for dismantling of small vessels. However, these units are specialised for cars dismantling and it would be technically and economically less efficient to use them for ships dismantling, due to e.g. location and equipment dimensioned for smaller items;

• It was suggested that the categories chosen for defining the scope of problem in Poland may not be the optimal categories to focus on in the data collection process. According to participants categorising would be more relevant based on material used for vessel construction (steel, wood or composite material), as these decide the economics associated with the recycling process;

• It was concluded that abandoned vessels do not constitute a problem in Poland at this point of time since the vessels are either recycled or reused for some other purpose;

• It was mentioned that the focus should also be kept on PCBs and asbestos for the study since these materials are also present in small vessels.

5.1.7 Greek Workshop in Athens

The Greek workshop was conducted in Athens on 25 May 2011 at the Ministry of Environment, Energy & Climate Change. The focus of the workshop was on small and abandoned vessels. The aim of the workshop was to obtain an overview of the current Greek situation concerning small vessels below 500 GT (including recreational craft and commercial vessels e.g. small ferries etc) and of
the legal basis and legislation in Greece concerning abandoned vessels (see workshop agenda and attendees in Appendix D5).

5.1.7.1 Selected Key Findings and Observations

• There is only one permitted ship recycling facility in Greece. It deals with some 50 vessels per year, mostly small steel-hulled ships and is subject to an environmental permit. Recreational craft were not dismantled at this facility. Other ships were exported to Turkey in accordance with the provisions of Regulation (EC) 1013/2006 on shipments of waste. It was stated that ships with valid legal navigation certificates are not regarded as waste, although an explanation of how this approach was compliant with the shipments regulation was not provided.

• Greece is considering introducing a system to control recycling small vessels equivalent to that for end of life vehicles. A working group is examining additional requirements for recycling small vessels and a consultation paper is expected to be produced.

• Most of the control of abandoned vessels lies with the local authorities. Each port authority keeps its own data on the registered vessels and copies are sent to the Ministry of Civil Protection. The absence of an electronic database appeared to make it difficult for the central government to generate a quick overview of the total number of registered vessels at any given time.

• Any vessel larger than 2m in length must be registered with the corresponding port authorities.

• The bureaucracy related to permissions to dismantle vessels in Greece was perceived by some as being an obstacle for the industry that wishes to operate nationally. This was recognized by the Greek authorities who are working a simplification of the process.

5.1.7.2 Conclusion of workshop results

The series of national workshops have assisted in filling some but not all the gaps in information about non-HKC vessels numbers and recycling practices across Europe and may be used as basis for estimates.

• The total numbers of vessels known to be operating/in use are not fully described, some data from snapshot surveys has been useful, further more accurate information would be obtained with more widespread use of registration – and de-registration for smaller vessels;

• Further clarity has been obtained on registration practices, which vary between the countries where workshops were held and others, those with such schemes often employ a lower cut off limit of 2-2.5 metres (refer to Table 6-1);
• A wide variety in known approaches to recycling has been revealed, some countries having only one or two facilities, others using car (ELV) dismantling facilities others not doing so. It is not clear if all such facilities possess environmental permits for waste operations across Europe;

• Definitive information on average age at recycling of the different types of vessels below 500 GT is generally lacking among the workshop participants. Some data is available for navy vessels. It is clear anecdotally that many recreational craft are often kept and used beyond 50 years of age and some commentators would find an average age of 40 years plus not atypical for these craft, in contrast to a norm of around 30 years for larger commercial vessels covered by the HKC;

• There is little definitive data on all dismantling locations of small vessels and a number of comments indicate a belief that older vessels gradually migrate towards Eastern Europe through sales, some may be using fishing vessel recycling sites which were however not examined directly as part of this study:
  
  - Explanations for the discrepancies may be by informal dismantling in some areas, owners retaining or storing their craft, onward sale outside EU, composite vessels not yet in general having been consigned for dismantling as their operational/useful lives may exceed 60 years even, use of ELV or fishing trawler facilities and some informal abandonment, although no data found supports that this latter constitutes a major “sink” for end of life vessels. No reliable estimates for these figures are available;

  - Naval vessels appear to be catered for through available EU and OECD facilities and examples of good practice in preparing ships to the extent possible as well as developing inventories of hazardous materials for recycling in accordance with EU environmental legislation are available.

• The dismantling of recreational and other craft made of composites is still at an early stage of investigation generally. Other projects and studies and the workshops support the view that dismantling and recycling has a cost for these craft. This is partly due to the lack of a market for waste composite and the nature of boat construction making dismantling harder to do;

• There is active work ongoing on the re-use of composites with involvement of other EU projects and academia which may assist in developing new markets and sufficient critical mass to allow an economically viable composite recycling sector to develop.

5.2 Questionnaires

As a part of the information collection and consultations of the stakeholders, information was gathered via Internet-based questionnaires, which were sent
out to 200 stakeholders who were expected to hold valuable information on one or several of the focus areas.

Based on the review of all existing information, a questionnaire was proposed to the Commission to close any existing information/data gaps for subsequent analysis. Subsequently four questionnaires were developed focusing on the main vessels types and the current recycling facilities/practices:

1. Small vessels below 500 GT
2. Government owned vessels including naval vessels
3. Abandoned vessels
4. Recycling facilities/practices for the above mentioned vessel types

Only very few stakeholders answered the questionnaire. The responses are shown in the following section. The questions are shown in Appendix E.

Examples of relevant stakeholders for this questionnaire were: vessel owners associations, vessel registration bodies and classification societies. In total 11 respondents entered some form of national data.

5.2.1 Answers to questionnaire on small vessels below 500 GT

Three stakeholders gave information about number and/or weight of obsolete vessels in their countries.

- The Netherlands reported that other types of vessels than the categories in the questionnaire constitute the largest volume of obsolete vessels in the country with 18,486 GT most of them being above 24 m. Dredgers, cable layers and other special purpose vessels make up the second largest group of obsolete vessels type with 10,288 GT and Research and monitoring vessels the third largest with 3,845 GT.

- Italy provided information on obsolete motorboats and yachts. The estimation is that the total weight is 1,000,000 LDT with most vessels being less than 15 m.

- The UK reported that there are three obsolete vessels that are of other types than the categories in the questionnaire with a total weight of approximately 2,400 LDT, all above 24m.

Two stakeholders gave information about future/expected tonnage or number of obsolete vessels which will be sent for recovery.

- Italy estimated that 25,000 obsolete motorboats and yachts will be sent for recovery each year.
• The UK estimated that 10 vessels of other types than the ones mentioned in the questionnaire will be sent for recovery in 2011.

Seven stakeholders provided information about registers.

• Italy and Germany reported that obsolete vessels are not recorded in these countries.

• France noted that obsolete vessels are not recorded in an official register but there is a report on ship dismantling available on the Internet\textsuperscript{12}.

• The Netherlands and Belgium reported that they do record obsolete vessels.

Three stakeholders gave information about the main (average) material of the hull of vessels. The hull of passenger ferries, freight vessels, general cargo vessels, dredgers, cable layers and other special purpose vessels, research and monitoring vessels, tugs and off-shore workboats, motorboats and yachts, diving platforms and other vessels are reported as being made of steel. Other vessels are reported as also sometimes being made from wood.

From Italy it was stated that materials found on board the various types of obsolete motorboats and yachts can be: fuels, oils, batteries (lead-acid), PCBs, heavy metals, paint additives, fire fighting equipment and flares.

The Italian stakeholder provided information on the approximate average quantities of materials of motorboats and yachts. 0-20 tonnes was the estimation for each of the types of materials: steel, non-ferrous metals, wood, fibre-glass and composites.

Two stakeholders made indications of how old obsolete vessels are when they are sent for recovery.

• In Italy about half of the motorboats and yachts were estimated to be older than 50 years and a third is between 35-39 years. The rest are younger.

• The Netherlands estimated that the vast majority of Research and monitoring vessels are between 20-24 years. Most Tugs and off-shore workboats are between 20-24 years. Half of Dredgers, cable layers and other special purpose vessels are estimated to be more than 30-34 years old, a third between 30-34 years and 20% more than 40 years. All passenger ferries are guessed to be older than 40 years.

Four stakeholders gave indication of the most common location for recovering of obsolete vessels.

\textsuperscript{12} Interdepartmental Committee on the Dismantling of Civilian and Military End-of-Life Ships (MIDN), Premier Ministre, March 2007
In the Netherlands it is believed that all vessels are recovered at a boat or ship-breaking yard.

In Italy it is estimated that the most common location for recovery of obsolete motorboats and yachts are at boat yards and boat dealers.

In Germany it is estimated that motorboats and yachts are dismantled at boat or ship-breaking yards but it is also mentioned that in general yachts are rarely being dismantled because of their long-life span. Even very old boats will rather be restored than dismantled.

One stakeholder estimated that most vessels in Europe are dismantled at boat or ship-breaking yards.

Two stakeholders gave an indication of the typical destination of on-board equipment removed as a result of dismantling of obsolete vessels.

In Germany motorboats and yachts are either re-used by the owner, sold on through merchants, dismantled for recovery of materials or components or disposed of (discarded as waste).

In Italy the indication is that most equipment from motorboats and yachts are disposed of (discarded as waste).

On EU level it is estimated that the most common process is to sell the equipment on through merchants.

One stakeholder has indicated where the residues from obsolete vessels end up.

The Italian stakeholder indicates that 60% of the residues from obsolete motorboats and yachts end up at landfills and approximately 40% are send for recovery.

The Italian stakeholder does not see any drivers that determine the decision to dismantle. In the future a possibility would be an application of the Extended Producer Responsibility (EPR).

The German stakeholder points out that unrepairable damages are the most important factor.

The international stakeholder sees trade factors e.g. freight rate as an important factor.

One stakeholder has estimated that the average dismantling cost per tonne is 1,000 EUR.

Two stakeholders have given indications of the percentage of obsolete vessels sent to various destinations to be dismantled / recovered / broken.
In Italy 20% are believed to be dismantled in the nearest harbour/port. 70% are recovered in the country of its origin and about 10% in other EU states.

In the Netherlands it is estimated that approximately 30% are dismantled in the nearest harbour/port. 60% are dismantled in the country of its origin and 10% in other EU states.

5.2.2 Answers to questionnaire on abandoned vessels
Examples of relevant stakeholders for this questionnaire included harbours, coastal and inland waterway authorities of EU Member States, IGOs and NGOs. Two respondents entered national data.

- A French stakeholder stated that abandoned vessels are not recorded in an official register in France but information is in a report on ship dismantling available on the Internet.

- A Swedish stakeholder informed that abandoned vessels are not recorded in an official register in Sweden. Normally no attempts are made to trace the owner of an abandoned vessel and when they are, they are normally not successful. Most abandoned vessels (90%) are left to break up naturally. The authorities do not recover any abandoned vessels. The approximate recovery costs per vessel are estimated at 700 EUR.

5.2.3 Answers to questionnaire on government owned vessels including naval vessels
Examples of relevant stakeholders for this questionnaire are navies of EU Member States, EU state owned ferry companies, national ministries and maritime authorities. Three respondents entered national data in this questionnaire.

Two stakeholders entered historical information about number and/or weight of obsolete government owned vessels.

- In the UK there were 3 vessels above 24 m. with a total weight of 7,200 LDT in 2010.

- In the Netherlands: there were 7 vessels with a length under 15 m, 46 vessels from 15 to 24 m and 25 above 24 m with a total volume of 15,785 GT in 2010.

Two stakeholders gave indications of future expected tonnage or number of obsolete government owned vessels which will be sent for recovery.

- France estimates 200,000 LDT.

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13 Rapport 2007 – Mission Interministérielle portant sur le démantèlement des navires civils et militaires en fin de vie (MIDN)
Recovery of obsolete vessels not used in the fishing trade

• UK estimates 7,200 LDT including three vessels above 24 m expected in 2011.

Three stakeholders have given information about official registers in their country.

• In France there is a report on civilian and military ships dismantling available on the Internet

• In the UK government owned vessels are not recorded in an official register

• In the Netherlands obsolete government owned vessels are recorded in the official basic registration system which is available on the Internet.

A UK stakeholder gave information on materials found on board of obsolete government owned vessels. This was mostly reported as being fuels (2,000 litres) and oils (2,000 litres).

The UK stakeholder also stated that obsolescence and beyond economical repair of government owned vessels are factors that determine the decision to dismantle.

Furthermore, UK government owned vessels are reported as being sent up to 2000km (i.e. to Turkey) away for dismantling.

Two stakeholders gave estimates of the percentage of obsolete government owned vessels sent to various destinations to be dismantled, recovered or broken up.

• UK estimated that half of the government owned vessels are dismantled in the country of their origin. 20 % in another EU state and another 20 % outside EU but in the OECD 10 % are thought to be dismantled in the nearest harbour or port.

• The UK stakeholder estimated that there are usually no costs connected to the dismantling of government owned vessels.

• Italy estimated that 70 % of the vessels are dismantled in the country of their origin. 20 % in the nearest harbour or port and 10 % in other EU states.

5.2.4 Answers to questionnaire on recycling facilities/practices
Examples of relevant stakeholders for this questionnaire are regulatory authorities and agencies of EU member states and vessel recycling facilities. Two French respondents entered national data in this questionnaire
One French stakeholder informed that 40 dismantling or recovery sites are known to be operating in France. The facilities are geographically located all around the French sea cost. 40 permits are currently issued for dismantling operations. 100 tonnes are treated per year in these facilities. Most of the materials from dismantling go to land-fills while approximately 30 % go to incineration. The number of informal dismantling or recovery sites is estimated to be about 40. Approximately half of end-of-life vessels are believed to be treated at these sites.

By the phrase 'good practice for vessel recovery' one French stakeholder understands the French ICPE regulation: 27 12. The other French stakeholder suggests that it is intended to respect EU and international rules for conservation of the environment and for occupational health and safety and for environmentally sound management of waste.

### 5.2.5 Comments to results

Since the questionnaires offered the possibility to enter free text, the answers are not uniform and are reflecting the focus and understanding of the individual respondent. However, the main results can be summarised as illustrated in Table 5-2.

**Table 5-2 Results obtained from questionnaires**

<table>
<thead>
<tr>
<th>Questionnaire</th>
<th>Selected answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small vessels below 500 GT</td>
<td>IT: 25,000 obsolete motorboats and yachts expected to be sent for recovery each year in the future.</td>
</tr>
<tr>
<td></td>
<td>NL/BE: Official registration of obsolete vessels.</td>
</tr>
<tr>
<td></td>
<td>Estimated life-time of boats (IT and NL):</td>
</tr>
<tr>
<td></td>
<td>Motorboats and yachts: &gt; 50 years (a third 35-39 years). The rest are younger.</td>
</tr>
<tr>
<td></td>
<td>Research and monitoring vessels: 20-24 years.</td>
</tr>
<tr>
<td></td>
<td>Tugs and off-shore workboats: 20-24 years.</td>
</tr>
<tr>
<td></td>
<td>Dredgers, cable layers and other special purpose vessels: 30-34 years old (20 % &gt; 40 years).</td>
</tr>
<tr>
<td></td>
<td>Passenger ferries: &gt; 40 years.</td>
</tr>
<tr>
<td></td>
<td>Dismantling locations: Ship-breaking yards and boat dealers</td>
</tr>
<tr>
<td></td>
<td>60-70 % of obsolete vessels recovered in the country, 20-30% in nearest harbour, 10% in other EU country.</td>
</tr>
<tr>
<td></td>
<td>IT: 60 % of waste from obsolete motorboats and yachts is landfilled and 40 % sent for recovery.</td>
</tr>
<tr>
<td></td>
<td>Average dismantling cost: EUR 1000.</td>
</tr>
<tr>
<td>Abandoned vessels</td>
<td>No official registers reported.</td>
</tr>
<tr>
<td></td>
<td>SE: 90% are left to break up naturally.</td>
</tr>
</tbody>
</table>
Recovery of obsolete vessels not used in the fishing trade

<table>
<thead>
<tr>
<th>Government owned and navy vessels</th>
<th>SE: Recovery cost per small vessel estimated at EUR 700</th>
</tr>
</thead>
<tbody>
<tr>
<td>Future expected volumes to be sent for recovery: UK: 7200 LDT in 2011 F: 200,000 LDT (period not clear) Historical numbers from UK and NL. Dismantling location (estimated): 50 % in country of origin, 20 % in other EU country, 20 % in non-EU but OECD country, 10 % in nearest port/habour. Usually no related costs.</td>
<td></td>
</tr>
</tbody>
</table>

| Recycling facilities / practices | F: 40 dismantling sites with permits located at the coast with 100 tons treated/year. F: Most material go to landfill, approximately 30% to incineration. No common understanding of good practice for vessel recovery. |

5.3 Field visits

Field visits were arranged to recycling facilities in Spain, UK, Belgium and Denmark. As part of the Polish workshop, a visit was arranged to a scrapyard that was also engaged in ship dismantling of ships up to 100 m length.

The field visits included site inspections to collect information on the recycling procedures and the potential environmental impacts associated with the ship dismantling practices. Further, interviews with owners, employees and local authorities were carried out to collect information on social and economic impacts of the dismantling practices.

The purpose was to identify and document the environmental, social and economic impact of the current and best available practices for recycling of vessels not covered by the HKC.

An overview of the conducted field visits is shown in Table 5-3.

<table>
<thead>
<tr>
<th>Table 5-3 Overview of field visits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date</td>
</tr>
<tr>
<td>15 April 2011</td>
</tr>
</tbody>
</table>
Recovery of obsolete vessels not used in the fishing trade

<table>
<thead>
<tr>
<th>Date</th>
<th>Country</th>
<th>Location/Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 April 2011</td>
<td>Spain</td>
<td>Desguaces LEMA, Galicia</td>
</tr>
<tr>
<td>13 April 2011</td>
<td>UK</td>
<td>Portsmouth Naval Base, Disposal and Reserve ships Organisation (Visit during workshop)</td>
</tr>
<tr>
<td>22 June 2011</td>
<td>Belgium</td>
<td>Van Heyghen Recycling, Ghent</td>
</tr>
<tr>
<td>23 May 2011</td>
<td>Poland</td>
<td>Almex Spółka z o.o, Szczecin (Visit during workshop)</td>
</tr>
<tr>
<td>30 June 2011</td>
<td>Denmark</td>
<td>Fornaes, Grenaa</td>
</tr>
</tbody>
</table>

Another site visit in UK was proposed but no suitable site became available to be visited within the period that was in the process of dismantling a ship.

A short description of each of the sites is presented in the following. Detailed information about the plants, their activities and processes can be found in the field visit reports in Appendix F.

5.3.1.1 Spain

The recycling facility, Desguaces Petrallo, has been in business since 1994. Their every-day activity is dismantling of fishing vessels. Apart from fishing vessels, they have also dismantled other types of vessels such as small merchant vessels (around 50m) or recreational boats (fibreglass catamarans). This latter is however not the main activity and is only carried out from time to time. Dismantling is carried out in a dry dock and involves a lot of manual work. Fibreglass is disposed of to landfill or taken to waste management companies.

Desguaces LEMA is a company specialized in industrial dismantling, hazardous and non-hazardous waste management and metal valuation. They are authorised for waste management by the Galician Government (See Appendix F1).

Environmental impacts from the operation at the two sites were identified to primarily include waste generation of both hazardous and non-hazardous waste and atmospheric emissions from transport and manoeuvring and cutting operations. Occasional spills/drops of material into the sea during the recycling processes were identified at one of the sites, Desguaces LEMA. Health impacts of the operations at the two sites included handling of hazardous materials and general hazardous working with large and heavy equipment and machinery. Possible lack of use of proper PPE by the workers was observed during the site visit at Desguaces LEMA.

UK

Selected areas of the Portsmouth Naval Base were visited including the harbour mooring for three ships prepared and ready for tow to a recycling facility. The aircraft carrier Ark Royal was visited at its berth where it was being prepared
for disposal by the ship’s crew and DRSO (Disposal Reserve Ship Organisation) staff, UK Ministry of Defence. DRSO plays a vital part in the disposal process which includes, e.g. clearing the ships inventory, development of a “green passport”, highlighting the hazardous materials on board including an asbestos survey etc and commissioning removal of such materials where possible. The ultimate objective is that the condition of the ship is known and documented when selling for recycling (cold sale) (See Appendix D2).

This visit demonstrated a methodical approach to ship preparation for recycling as an intermediate step for ships for tow, emphasising the necessary processes prior to dismantling at a yard that take place in between decommissioning from use but before recycling. This includes de-storing, fuel removal and de-equipment of armaments, the recording of materials left on board and hazardous materials, need for temporary power for lighting pumps etc, through preparation for tow to final destination and storage at mooring and safe anchorage.

Environmental impacts from the operation at the site were identified to be very limited as only preparatory works for recycling were performed at the site. Potential impacts were limited generation of mainly non-hazardous waste and atmospheric emissions from transport and manoeuvring operations. Health impacts at the site were reduced to general hazards related to working with large and heavy equipment and machinery. Use of proper PPE by the workers was recorded during the site visit.

Belgium
Van Heyghen Recycling in Ghent is part of Group Galloo and established in 1939 and located on 10 HA open land on the seaport of Ghent. They dismantle ships up to 265m long by 37m wide, but also trawlers, wooden boats and glass-fibre boats. Dismantling is carried out in a slipway using mobile shearsers. Van Heyghen is believed to be the largest facility for ship recycling in Europe with a throughput of some 40 vessels of varying sizes per annum amounting to approximately 25,000 tonnes annually. Capacity to treat up to 50,000 tonnes exists. About 75 % of the received vessels are non-Hong Kong vessels corresponding to approximately 20 % by tonnage. Specialist contractors are used for removal of hazardous waste like asbestos (See Appendix F2).

Over the years the site has been upgraded progressively and now is largely covered by a strong concrete working surface with drainage to a wastewater catchment and treatment area. Clearly delineated storage areas for recyclable materials and waste (some in constructed bays others as heaps) are separate from quayside and slipway dismantling areas. The use of temporary controlled protected asbestos removal zones was evident. Site control starts at the gate with weighbridge control office and traffic barriers. Inspections are made by the authorities. Effective and efficient operation relies on the use of large mechanical plant for dismantling the ships and moving material on site, using a small labour force.

In summary this visit demonstrated some of the essential features of a modern ship recycling facility and the need for continual improvement. While other systems may be employed with other environmental protection practices this
facility shows the required attributes of site infrastructure, management control and monitoring needed to ensure a facility capable of being compliant with regulatory permits.

**Poland**

A shorter visit was paid to Almex Spółka z o.o as part of the workshop held in Szczecin. Almex was established in 1999 and is primarily involved in buying and processing of steel scrap. Steel hulled ships are dismantled as part of their business primarily to obtain steel for improvement of the quality of the other different steel scrap fractions. Almex Spółka z o.o is located directly at the waterfront and dismantles ships up to 100 m length and 6 m wide. Dismantling occurs at the wharf. Work was carried out in line with Polish legislation and inspections by the different involved authorities were common (See Appendix D4.)

This site visit demonstrated a well-organised and what appeared to be a compliant facility primarily organised for the purpose of processing scrap but with capacity for a certain amount of steel ship dismantling. Work was not ongoing on the day of the visit due to an unexpected electricity cut.

**Denmark**

Fornaes Recycling ApS was founded in 1993 and has, since then, scrapped well over 1000 ships and vessels. The majority have been fishing vessels of various sizes, but also freighters, supply vessels, ferries and a navy vessel have been dismantled. Most of the vessels being scrapped at Fornaes come from Scandinavia, UK, Germany and The Netherlands. The site is very simple as many operations are subcontracted to specialist companies. This also includes the reprocessing of metals and other recyclable materials, which is performed by another company.

Fornaes ApS normally processes between 30 - 40 ships per year of varying sizes. The highest number processed was 100 ships in one year when the layup of fishing vessels were at its highest. Mostly smaller to medium sized vessels are treated and mostly metal vessels but some wooden and composite boats are also accepted. Fornaes has recycled a number of wooden boats and also have experience with recycling of glass fibre hulled boat. The hull materials of these boats, painted wood and glass fibre were disposed of as hazardous waste at a cost of around 1,000 DKK/tonne (approx. EUR 130/tonne) (See Appendix F3).

This site visit demonstrated a compliant facility which is relatively simple in terms of infrastructure and organisation, even though it is amongst the largest ship recycling facilities in EU. This "simplicity" is a result of the facility's business concept which is based on sub-contracting specialist assignments such as asbestos removal, waste management etc. and reuse of the majority of functional units (not including hulls) from the recycled vessels. This contrasts with the focusing on recycling for materials recovery, which is the business model for most other EU ship recycling facilities. The site visit again demonstrated the durability of individual vessel parts and that a market for such parts from small vessels exists within EU, which is also the case for HKC vessels, e.g. at the large ship recycling destinations in Asia.
The site visit further demonstrated that existing recycling methods for recycling of metal-based ships can be applied directly to non-metal based ships, but at the same time confirmed that the economics shifts, from a net positive to a net negative, for the ship owner when going from recycling of metal-ships to non-metal ships.

Environmental impacts from the operation at Fornaes were identified to primarily include waste generation of both hazardous and non-hazardous waste and atmospherics emissions from transport and manoeuvring and cutting operations. Health impacts of the operations were identified to include handling of hazardous materials and general hazardous working with large and heavy equipment and machinery. These hazardous were minimised by the use of professional specialist waste management companies for the decontamination operations and use proper PPE by the workers at site, which was recorded during the site visit.

5.3.1.2 Conclusion
The field visits have provided a good overview of the ship recycling industry in EU. The field visits have covered the range of recycling facilities in EU ranging from the most modern and largest commercial EU facility, over medium sized facilities to small recycling companies mainly involved in recycling of other waste type fractions such as cars, but recycling small ships when available.

The field visits have provided a good overview of current and best available practices including environmental and health impacts in EU for recycling of the various vessels not covered by the HKC. The field visits have underlined the importance of the vessel hull material and the associated economics in determining the current recycling method. Hereunder the site visits have demonstrated the relative limited experience in EU with recycling of glass-fibre boats compared to e.g. metal-based boats.
6 Fleet characteristics - ships not covered by the Hong Kong Convention

The information gaps on the number and other characteristics of ships not covered by the HKC (small, government owned and inland vessels) and abandoned ships have been identified on the basis of analysis of the information from existing studies and the additional data from commercial databases.

Additional data and information on these ships have been collected through Member States, regional and local authorities, and other relevant stakeholders. The information collected about the number of ships not covered by the HKC and of abandoned vessels is both qualitative and quantitative and is presented below. In order to obtain coherent future dismantling volumes for boats in Europe, it is necessary to establish an overview of the number of the given vessels within EU.

6.1 Ships not covered by the Hong Kong Convention: small vessels

When considering small vessels (<500 GT) it is important to underline that these can be divided into two clear categories: merchant and recreational fleet. The merchant fleet can be measured in GTs, while recreational fleet is measured by length and power.

On the other hand, even though merchant vessels and recreational craft have common problems concerning dismantling and treatments (recycling, recovery, among others) at end-of-life, it is also important to highlight the areas in which important differences are found, e.g.:

- Different materials (e.g. metal vs. fibreglass)
- Different economic values. Metal vessels have a positive economic value when they reach their end-of-life status, while non-metal boats, which are often recreational boats, do not.

Identified information on the number of small vessels is described below in separate sections. Merchant vessels were however also the subject of the information presented in Chapter 4 and only limited additional information is presented below. The pertinent issue of registration of small boats is addressed as a preface to the information.
6.2 Registrations for small boats in Europe

The registration system provides an existing system for control of the status and ownerships of boats potentially also when they reach their end of life. Therefore it is important to study the existing registration schemes within EU.

Those EU countries that have boat registrations systems in Europe have been identified through consultations of relevant stakeholders and discussions at the workshops. This shows that out of 27 countries in Europe:

- Most countries have a form of mandatory boat registration.
- Many countries register all craft from 2.5m in length up
- Several countries operate exclusions from registration requirements the low end (craft below a certain length or a certain engine power).

The length limit as condition for boat registration varies greatly:

- Exemption for L < 2 m: Greece
- Exemption for L < 2.5m: Cyprus, France
- Exemption for L < 5-5.5m: Finland, Hungary, Slovenia
- Exemption for L < 7m: Luxembourg, Romania
- Exemption for L < 8m: Spain
- Exemption for L < 10m: Italy
- Exemption for L < 12m: Latvia, Estonia
- Exemption for L < 15m: Germany.

The engine power as condition for boat registration varies from P=7.35kW in Luxembourg to P=15kW in Finland.

Denmark uses the Gross Register Ton as criteria (registration > 20 GRT), while The Netherlands refer to the speed (registration > 20km/h).

The key elements of the existing boat registration schemes in EU are presented in Table 6-1 and are focusing on boat registration for sea-going craft (rather than PWC – personal watercraft) and inland waterways ships.
Table 6-1  Overview of boat registration systems in Europe. P: power, L: length

<table>
<thead>
<tr>
<th>Country</th>
<th>Regulation for boat registration</th>
<th>Regulation for PWC registration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td>No information</td>
<td>No information</td>
</tr>
</tbody>
</table>
| Belgium         | Compulsory for all craft from 2.5m < L < 24m.  
For inland waterways: Unique craft registration (“immatriculation”) must be affixed on the craft.  
For coastal waters: The owner must request a commercial charter boat) or non-commercial (private use) flag letter (“Vlaggenbrief” or “lettre de pavillon”). | Mandatory registration.  
Craft registration (“immatriculation”) must be affixed on the PWC. |
| Bulgaria        | Compulsory registration of all craft from L = 2.5m up 4 registers:  
1. Register books of small vessels (craft < 40 GT, river boats L< 20m).  
2. Register books of large vessels (craft > 40 GT, river boats L> 20m).  
3. Register books of vessels, hired under bareboat charter.  
4. Register books of vessels under construction, over 12 m in length. | No registration.  
Project of introducing compulsory PWC registration. |
| Cyprus          | Compulsory for all craft from 2.5m < L < 24m.  
2 possibilities: Register of Cyprus Ships (all waters) or Register of Small Vessels (only territorial waters) | Mandatory registration. |
| Czech Republic  | Compulsory for all craft from 2.5m < L < 24m.  
Sea-going craft up to L = 24m: registration in Maritime office of Ministry of Transport and Inland waterways.  
Craft with P > 4kW or sail area over 12m²: registration in State Navigation Administration (“Státní plavební správa”).  
Craft exempted from registration:  
- Craft < 1,000kg with P < 4kW and sail area < 12m². | No registration. |
| Denmark         | Voluntarily registration system for vessels between 5 and 20 Gross Register Tons1 (GRT).  
Vessels > 20 GRT must be registered in Danish Ship Register.  
Fee for this voluntary registration is approx. 900 EUR | No registration |
| Estonia         | Compulsory registration for craft L > 12m.  
Managed by Estonian Road Administration Bureau | Compulsory registration |
<table>
<thead>
<tr>
<th>Country</th>
<th>Regulation for boat registration</th>
<th>Regulation for PWC registration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finland</td>
<td>Compulsory registration for all craft with L from 5.5m up and/or engine P = 15kW</td>
<td>Compulsory registration for PWC if engine P = 15kW or L = 5.5m</td>
</tr>
<tr>
<td>France</td>
<td>Compulsory registration for all sea-going craft L &gt; 2.5m.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sea going craft:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Craft L &lt; 7m: Registration document (“Carte mer”)</td>
<td></td>
</tr>
<tr>
<td>France</td>
<td>- Craft L &gt; 7m AND craft L &lt; 7m but P &gt; 150kW (22 fiscal HP): French Flag Act (“Acte de francisation”) and annual tax.</td>
<td>Compulsory registration</td>
</tr>
<tr>
<td></td>
<td>Inland waters: Compulsory registration for craft with P &gt; 4.5kW and/or L &gt; 5m</td>
<td></td>
</tr>
<tr>
<td>Germany</td>
<td>Sea navigation: compulsory registration for craft L &gt; 15m (Register of Sea-Going Vessels).</td>
<td>No registration</td>
</tr>
<tr>
<td></td>
<td>Inland navigation: compulsory registration (Register of Inland Waterway Vessels) for craft displacement &gt; 10 tons. Compulsory licence plate of inland waterway craft &lt; 20 m (with some exceptions) issued by official authority or user association – to be cancelled from 2012 onwards.</td>
<td></td>
</tr>
<tr>
<td>Greece</td>
<td>Compulsory registration for all craft exceeding 2m length.</td>
<td>Compulsory registration</td>
</tr>
<tr>
<td>Hungary</td>
<td>Compulsory registration for:</td>
<td>No information</td>
</tr>
<tr>
<td></td>
<td>- Sailing boats with L &gt; 5m and sail area &gt; 10m².</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Motorboats with L &gt; 5m and P &gt; 4 kW.</td>
<td></td>
</tr>
<tr>
<td>Ireland</td>
<td>Voluntary registration on Small Craft Register.</td>
<td>Voluntary registration on Small Craft Register.</td>
</tr>
<tr>
<td></td>
<td>Compulsory registration on inland waterways for P &gt; 7.45kW</td>
<td></td>
</tr>
<tr>
<td>Italy</td>
<td>Voluntary registration for craft up to L = 10m (“natante”).</td>
<td>No information</td>
</tr>
<tr>
<td></td>
<td>Compulsory registration for craft L &gt; 10m (“imbarcazione”).</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Compulsory registration for craft L &gt; 24m in Italian International Register.</td>
<td></td>
</tr>
<tr>
<td>Latvia</td>
<td>Compulsory registration for sailing &amp; motor boats, incl. Motor boats &gt; 12m length.</td>
<td>No information available</td>
</tr>
<tr>
<td></td>
<td>Registration in the Latvian Ship Register.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Managed by the Maritime Administration of Latvia (“Latvijas Juras Administracija”), also responsible for RCD implementation.</td>
<td></td>
</tr>
<tr>
<td>Country</td>
<td>Regulation for boat registration</td>
<td>Regulation for PWC registration</td>
</tr>
<tr>
<td>-----------</td>
<td>--------------------------------------------------------------------------------------------------</td>
<td>---------------------------------</td>
</tr>
<tr>
<td>Lithuania</td>
<td>Compulsory registration for all craft $2.5m &lt; L &lt; 24m$.</td>
<td>Compulsory registration for PWC if engine $P = 15kW$ or $L = 5.5m$.</td>
</tr>
<tr>
<td></td>
<td>Inland waters and sea navigation up to 12 miles from coastline: managed by State Inland Waterways Navigation Inspectorate.</td>
<td></td>
</tr>
<tr>
<td>Luxembourg</td>
<td>Voluntary identification for non-habitable small craft, $L &lt; 7m$ and $P &lt; 7.35kW$ (&quot;menue embarcation de plaisance&quot;).</td>
<td>Compulsory registration</td>
</tr>
<tr>
<td></td>
<td>Compulsory registration for inland waterways habitable craft, $L &gt; 7m$ and $P &gt; 7.35kW$ (&quot;bateau de plaisance&quot;).</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Compulsory registration for sea-going habitable craft, $L &gt; 7m$ and $P &gt; 7.35kW$ (&quot;navire de plaisance&quot;).</td>
<td></td>
</tr>
<tr>
<td>Malta</td>
<td>Compulsory registration for all craft.</td>
<td>No information</td>
</tr>
<tr>
<td>Netherlands</td>
<td>Compulsory registration for craft with speed &gt; 20km/h.</td>
<td>No information</td>
</tr>
<tr>
<td></td>
<td>On-going discussions to extend the compulsory registration</td>
<td></td>
</tr>
<tr>
<td>Poland</td>
<td>Compulsory registration for all craft.</td>
<td>Compulsory registration</td>
</tr>
<tr>
<td>Portugal</td>
<td>Compulsory registration for all craft with $2.5m &lt; L &lt; 24m$.</td>
<td>Compulsory registration</td>
</tr>
<tr>
<td>Romania</td>
<td>Compulsory registration for all craft $L &gt; 7m$ or $P &gt; 15kW$.</td>
<td>No information</td>
</tr>
<tr>
<td>Slovakia</td>
<td>Compulsory registration for all craft with $2.5 &lt; L &lt; 24m$ with State Navigation Administration (&quot;Státna plavebna správa&quot;)</td>
<td>Compulsory registration</td>
</tr>
<tr>
<td>Slovenia</td>
<td>Compulsory registration for all craft $L &gt; 5m$ or $P &gt; 3.7kW$.</td>
<td>Compulsory registration if $P &gt; 3.7kW$.</td>
</tr>
<tr>
<td></td>
<td>Compulsory registration for commercial use of craft $L &lt; 5m$ and $P &lt; 3.7kW$.</td>
<td></td>
</tr>
<tr>
<td>Spain</td>
<td>Compulsory registration for all craft $2.5m &lt; L &lt; 24m$.</td>
<td>No information</td>
</tr>
<tr>
<td></td>
<td>Expected change end of 2010 where a notification will be required for craft $2.5m &lt; L &lt; 8m$ (simpler than registration).</td>
<td></td>
</tr>
</tbody>
</table>
### Table 6.1

<table>
<thead>
<tr>
<th>Country</th>
<th>Regulation for boat registration</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sweden</strong></td>
<td>No boat registration. Proposal to enforce mandatory liability insurance for craft L &gt;7m or faster than 7 knots.</td>
</tr>
<tr>
<td><strong>United Kingdom</strong></td>
<td>No national compulsory registration scheme for sea-going craft. Craft leaving UK territorial waters must be flagged and therefore registered by UK Ship Register either Part I Full Registration or Part III Small Ships Register (SSR). Inland waterways: Mostly covered by compulsory licensing of craft, this is a form of local registration.</td>
</tr>
</tbody>
</table>

It has been discussed during some of the workshops whether the registration schemes in the different countries provide a realistic opportunity to assist in assessing likely future demand for recycling facilities provided the right information is made available. It has also been discussed if they could serve as instruments to assist in preventing abandonment of ships, if the information contained is updated every time the ships change owner.

However, in the present form where registers throughout Europe are based on different classification criteria, where data are not complete and where the information on ownership and status when ships are dismantled or no longer in operation is also not updated, the schemes would require significant development to serve such purposes. With no legal power behind the registration requirement and no other incentives attached to the scheme, it is also not very likely that registration will be carried out for all boat types within a short timeframe. Some stakeholders also expressed some concerns in relation to registration of small recreational boats.

### 6.3 Merchant fleet

The data presented in Chapter 4 focused on the merchant fleet. The analysis made was based on information provided by the European Commission concerning number and volume of small vessels. The results of this analysis together with data collected from the public database *The World Merchant Fleet in 2009 – Statistics from Equasis* are presented in Table 6-2 below.
Recovery of obsolete vessels not used in the fishing trade

Table 6-2  Comparison of results of the analyses of commercial data provided by the EU DG ENV to the information available in Equasis

<table>
<thead>
<tr>
<th></th>
<th>Number of ships</th>
<th>Volume (GTs)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Year 2009</td>
<td>Year 2009</td>
</tr>
<tr>
<td>Information provided by the EC</td>
<td>Statistics from Equasis</td>
<td>Information provided by the EC</td>
</tr>
<tr>
<td>All</td>
<td>EU flagged</td>
<td>All</td>
</tr>
<tr>
<td>Bulkers</td>
<td>394</td>
<td>10</td>
</tr>
<tr>
<td>Containers</td>
<td>17</td>
<td>0</td>
</tr>
<tr>
<td>Gas carriers</td>
<td>45</td>
<td>4</td>
</tr>
<tr>
<td>General Cargo</td>
<td>4,739</td>
<td>198</td>
</tr>
<tr>
<td>Offshore</td>
<td>1,205</td>
<td>99</td>
</tr>
<tr>
<td>Other tankers</td>
<td>145</td>
<td>23</td>
</tr>
<tr>
<td>Passenger ships</td>
<td>2,732</td>
<td>641</td>
</tr>
<tr>
<td>Ro-Ro ships</td>
<td>1,458</td>
<td>191</td>
</tr>
<tr>
<td>Service ships</td>
<td>1,806</td>
<td>343</td>
</tr>
<tr>
<td>Specialized Cargo ships</td>
<td>1,091</td>
<td>39</td>
</tr>
<tr>
<td>Tankers (oil, chemical)</td>
<td>2,465</td>
<td>145</td>
</tr>
<tr>
<td>Tugs</td>
<td>12,856</td>
<td>1,672</td>
</tr>
</tbody>
</table>

As can be seen from Table 6-2 there is in general relatively good correlation between the two data sets. Some large differences are however seen between the two data sets, e.g. for Ro-Ro ships and Specialized cargo ships. These differences can easily be the result of differences between how the ship categories are defined.

Some additional information on the merchant fleets compared to the results of the analyses presented in the study Chapter 4, form a valid basis for further analyses.

Average lifetimes

First, the average age of broken-up ships of GT > 300 (only some of these ships included in this study) and over can be found in Figure 6-1 from *Review of Maritime Transport 2010 – United Nations Conference on Trade and Development UNCTAD*. 
Recovery of obsolete vessels not used in the fishing trade

Figure 6-1 Average age of broken-up ships

Second, and according to the Rapport 2007 – Mission Interministérielle portant sur le démantèlement des navires civils et militaires en fin de vie (MIDN), the average lifetime of ships sent for dismantling has passed from 25 to 30 years in the last years and the average lifetime in 2007 was around 35 years. This report mentions the average lifetime for oil tankers in 29 years, 30 years for cargo ships and 34 years for ferries.

6.3.1.1 Ships by age

Other important data to consider is the distribution of “ships by age”. In Table 6-3 data on age distribution of small vessels are presented from the commercial database IHS Fairplay made available by the Commission (European Commission 2011). From these data can be seen a relatively large fraction of older ships in small vessels, with around 50 % (both based on numbers and GT) being more than 23 years old. For the EU flagged fleet this is even slightly more pronounced than for the entire world fleet.

Table 6-3 The world fleet of small vessels not covered by the HKC (500 GT and below) by age categories - number of ships and total volume in GT

<table>
<thead>
<tr>
<th>Age categories</th>
<th>Total Number of Ships</th>
<th>Total volume (GT)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>All</td>
<td>EU flagged</td>
</tr>
<tr>
<td>0 - 9 years</td>
<td>6,948</td>
<td>764</td>
</tr>
</tbody>
</table>
Recovery of obsolete vessels not used in the fishing trade

<table>
<thead>
<tr>
<th></th>
<th>Total Number of Ships</th>
<th>Total volume (GT)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>All</td>
<td>EU flagged</td>
</tr>
<tr>
<td>10 - 14 years</td>
<td>2.738</td>
<td>329</td>
</tr>
<tr>
<td>15 - 19 years</td>
<td>3.517</td>
<td>294</td>
</tr>
<tr>
<td>20 - 22 years</td>
<td>1.778</td>
<td>203</td>
</tr>
<tr>
<td>23 - 25 years</td>
<td>1.523</td>
<td>181</td>
</tr>
<tr>
<td>26 - 28 years</td>
<td>1.474</td>
<td>172</td>
</tr>
<tr>
<td>29 - 30 years</td>
<td>1.396</td>
<td>173</td>
</tr>
<tr>
<td>31+ years</td>
<td>10.770</td>
<td>1.729</td>
</tr>
<tr>
<td>Total number of ships</td>
<td>30.144</td>
<td>3.845</td>
</tr>
</tbody>
</table>

6.4 Recreational fleet

The term 'recreational craft' is intended to be interpreted widely within the scope of the study, and not to be restricted to the definition in the Recreational Craft Directive as mentioned in section 2.3.2. However, data collection activities have not specifically targeted personal watercrafts like jet skis, kitesurfing equipment or surfboards.

6.4.1 Average lifetimes

Concerning the average lifetimes for recreational fleet, several information sources have been consulted, although definitive results were not forthcoming some useful indications have been obtained.

The European Boating Industry (EBI), states that the average lifetime for recreational fleet is 30 years, even though in some occasions it may go up until 40 years, depending on the state/condition of the boat. This average was also confirmed by the experts who attended the Spanish workshop in Madrid (see Appendix D1). According to these experts it is also important to separate sailboats from motorboats since people tend to pay special attention to the care and maintenance of sailboats. On the other hand motorboats suffer more than sailboats and no special attention is paid in these boats. This is the reason why some experts say that certain sailboats may last until 40 years or more and cer-
tainly boats of such ages are still bought and resold for further use. As regards inflatable and semi rigid fleets the average lifetime of these boats goes down to 15 years; some experts consider the average lifetime of these boats is between 10 to 15 years.

In Figure 6-2 the general average lifetime is shown as confirmed by EBI, by UCINA - the Italian Marine Industry Association (Unione Nazionale dei Cantieri e delle Industrie Nautiche e Affini), by APER - the French Association for Eco-responsible Recreational Boating (Association pour la Plaisance eco-responsible) and by the Spanish Federation of Leisure Ports and Marinas (Federación Española de Puertos Deportivos y Turísticos), including the information confirmed in the Spanish workshop on inflatable and semirigid boats.

Figure 6-2  Average lifetimes - Recreational fleet

6.4.2 Boat numbers

Contrary to merchant fleets, data on recreational vessels by age is not readily available. This information is however a key element when calculating future dismantling volumes.

Available information on the number of boats within each of the EU countries has therefore been collected from different sources and is presented in Table 6-4.

Table 6-4  Number of recreational boats within EU countries

<table>
<thead>
<tr>
<th>Country</th>
<th>Recreational boats, No.</th>
<th>Specifications</th>
<th>Information source</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td>No information</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Recovery of obsolete vessels not used in the fishing trade

<table>
<thead>
<tr>
<th>Country</th>
<th>Recreational boats, No.</th>
<th>Specifications</th>
<th>Information source</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belgium</td>
<td>35.000</td>
<td>10% were owned by foreign nationals.</td>
<td>Employment trends in all sectors related to the sea or using sea resources - Belgium by the European Commission - DG Fisheries and Maritime Affairs.</td>
<td>2003</td>
</tr>
<tr>
<td>Bulgaria</td>
<td></td>
<td>No information</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cyprus</td>
<td></td>
<td>No information</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Czech Republic</td>
<td>15.439</td>
<td>40% (6150) are inflatable boats. 27% (4242) are other rigid boats including outboard motorboats. 16% (2472) inboard/stendrive motorboats. 16% sailboats. In total: 13,555 (88%) from 2.5m up to 7.5m 1679 (11%) from 7.5m up to 12m 200 (1.2%) from 12m up to 24m 5 (0.03%) above 24m</td>
<td>ICOMIA</td>
<td>2009</td>
</tr>
<tr>
<td>Denmark</td>
<td>55.000</td>
<td>57% are sailboats. 39% are inboard /sterdrive motorboats. 3.5% are other rigid boats including outboard motorboats. 20.300 (36%) from 2.5m up to 7.5m. 28.900 (52.5%) from 7.5 up to 12m. 5.800 (10.5%) from 12m up to 24m and above.</td>
<td>ICOMIA</td>
<td>2009</td>
</tr>
<tr>
<td>Estonia</td>
<td></td>
<td>No information</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Finland</td>
<td>737.000</td>
<td>90% (663.300) of the 737.000 boat population is &lt;6m. Mainly of wooden construction.</td>
<td>FINNBOAT - Finnish Marine Industries Federation</td>
<td>2007</td>
</tr>
<tr>
<td>France</td>
<td>924.000</td>
<td>72% of the 923.506 boat population is &lt;6m 75% (700.000) motorboats 25% (224.000) sailboats 58% (540.000) less than 5m 42% (384.000) above 5m</td>
<td>Ministère de l'Écologie, du développement durable, des transports et du logement &amp; Mission parlementaire - Démantèlement des navires (Le Grenelle de la Mer)</td>
<td>2011</td>
</tr>
</tbody>
</table>
## Recovery of obsolete vessels not used in the fishing trade

<table>
<thead>
<tr>
<th>Country</th>
<th>Recreational boats, No.</th>
<th>Specifications</th>
<th>Information source</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Germany</td>
<td>500,000</td>
<td>39% sailboats. 38% inboard/sterndrive motorboats 23% other rigid boats including outboard motorboats. 241,000 (48%) from 2.5m up to 7.5m. 259,000 (51%) from 7.5 up to 12m.</td>
<td>ICOMIA</td>
<td>2009</td>
</tr>
<tr>
<td>Greece</td>
<td>147,670</td>
<td>77% (114,397) other rigid boats including outboard motorboats. 11% (16,143) are inflatable boats. 9% (13,330) are inboard/sterndrive motorboats. 2.5% (3,800) are sailboats. 129,280 (87.5%) from 2.5m up to 7.5m. 16,030 (11%) from 7.5m up to 12m. 2,130 (1%) from 120 up to 24m. 230 (0.1%) above 24m.</td>
<td>ICOMIA</td>
<td>2009</td>
</tr>
<tr>
<td>Hungary</td>
<td>No information</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ireland</td>
<td>27,000</td>
<td>No specification provided.</td>
<td>ICOMIA</td>
<td>2009</td>
</tr>
<tr>
<td>Italy</td>
<td>449,552</td>
<td>Circulation fleet estimation 450,000 (just engine-propelled boats considered, including timber&amp;rubber craft also) &lt;18m. 22% (57,800) registered craft up to 10m. 5% (20,892) registered craft from 10 to 12m 4% (16,930) registered craft from 12 to 18m 60% (353,900) craft not registered but possessing engine certificate.</td>
<td>UCINA</td>
<td>2011</td>
</tr>
<tr>
<td>Latvia</td>
<td>No information</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lithuania</td>
<td>No information</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Luxembourg</td>
<td>No information</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Malta</td>
<td>No information</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Recovery of obsolete vessels not used in the fishing trade

<table>
<thead>
<tr>
<th>Country</th>
<th>Recreational boats, No.</th>
<th>Specifications</th>
<th>Information source</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Netherlands</td>
<td>523,000</td>
<td>38% (198,740) sailboats. 28% (146,440) inboard/sterndrive motorboats. 33% (172,590) other rigid boats including outboard motorboats.</td>
<td>ICOMIA</td>
<td>2009</td>
</tr>
<tr>
<td>Poland</td>
<td>72,000</td>
<td>95% (68,400) sailboats.</td>
<td>ICOMIA</td>
<td>2009</td>
</tr>
<tr>
<td>Portugal</td>
<td></td>
<td>No information</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Romania</td>
<td></td>
<td>No information</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slovakia</td>
<td></td>
<td>No information</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slovenia</td>
<td></td>
<td>No information</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spain</td>
<td>128,796</td>
<td>95% (122,213) motorboats. 5% (6,583) sailboats. 90% (115,916) up to 7.5m.</td>
<td>Ministerio de Fomento - Marina Mercante</td>
<td>2010</td>
</tr>
<tr>
<td>Sweden</td>
<td>943,000</td>
<td>60% (565,800) of the fleet is &lt;5 metres 30% (282,900) of the fleet is 6-10 metres</td>
<td>Swedish Environmental Protection Agency</td>
<td>2011</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>541,560</td>
<td>39% (212,305) sailboats. 17.5% (94,805) inboard/sterndrive motorboats. 29% (155,850) other rigid outboard motorboats. 14% (78,600) inflatable boats. 429,880 (79%) from 2.5 up to 7.5m. 92,815 (17%) from 7.5 up to 12m. 18,660 (3%) from 12m up to 24m. 205 (0.03%) above 24m.</td>
<td>ICOMIA</td>
<td>2009</td>
</tr>
<tr>
<td>EU Total</td>
<td>6,000,000</td>
<td>Recreational crafts</td>
<td>ICOMIA</td>
<td>2007</td>
</tr>
</tbody>
</table>

As it can be seen from the table, some information was available for 15 out of the 27 countries. The individual country numbers appear to be reasonably consistent with the assessment reported by ICOMIA for a total EU fleet of 6 million recreational boats and may form a basis for impact assessments.
6.5 Government owned vessels

Navy and other Government owned vessels embrace varieties of specialist and non-specialist vessels as may be found in merchant applications. Fleet sizes tend to be smaller in comparison with commercial ships and recreational craft because of their particular purpose.

A number of government agencies operate vessels, e.g. Ministry of Defence, Fisheries Inspectorate, the Coast Guards, Ministry of Environment, and Research Organisations etc. In fact, in the UK Defra (2007) found 20 agencies owning government vessels in addition to the Ministry of Defence.

The study has shown that information on government owned vessels in the EU is not readily available. The questionnaire attempted to gather this information but it was not generally forthcoming in the replies. Additional analysis of other sources has provided some insight into the distribution of these types of vessels and available information is presented above.

In both naval and other Government uses there is a wide range of type and size in use. They may comprise the following general purpose types:

- Cable layers
- Dredgers
- Diving platforms
- Freight vessels
- General cargo
- Lifeboats
- Motorboats
- Passenger Ferries
- Research and monitoring vessels
- Tugs and offshore workboats
- Yachts
- Search and rescue vessels
- Navy vessels

These will be dealt with in two broad categories, Government owned non-navy vessels and navy vessels.

6.5.1 Non-Navy vessels

These ships are used to conduct a wide variety of tasks from commercial transport to coastguard and other duties. The variety of Government owned vessels employed will depend on the differing mix of service provision and public sector management of waterways and coastal zones in countries concerned. They may range from public transport services and coastal and inland waterway maintenance systems - marine coastal, rivers, canals and lakes. The extent and type of coastline and national waters will also have a bearing. Information on some of these vessels types available at a European level is provided in the following sections.
6.5.1.1 Dredgers

Dredging is a significant industry in Europe which operates worldwide. In the private dredging industry some 750 EU flagged vessels are reported to be available. Not all of these operate in European waters as the European Dredging Association (EuDA) estimates that their members have an 80% share of the worldwide open dredging market (EuDA 2009). The main types of equipment are: trailing suction hopper dredgers (TSHD), cutter suction dredgers (CSD) and backhoe/grab/dipper dredgers. The EuDA has stated that “The vast majority of the dredgers of the EuDA members are >500GT and are covered by the HKC, the provisions of which are followed strictly by the EuDA members for the disposal of their vessels. Accompanying these vessels and supporting them in the projects, are a fleet of smaller auxiliary equipment (<500GT) which are normally disposed of in the same environmentally responsible way as the bigger vessels are.” (EuDA, 2011). Worldwide for 2008, 1,206 vessels have been identified of which 264 backhoes, 433 CSDs and 509 TSHDs (International Association of Dredging Companies (IADC).

Overall therefore as much of this work is in the hands of the private sector the number of EU government owned dredgers is believed to be considerably less than commercial operated dredgers. The maximum number of EU government owned dredgers is estimated to be less than 100.

6.5.1.2 Research Vessels

These are small highly specialized vessels. Their work has been coordinated across Europe over the last two years to optimize their use and research time under the EU-funded FP& programme project “Eurofleets” (Eurofleets, 2009). The project identified a total of some 5 ocean going Research vessels of 65 – 120 m length and 13 Regional research vessels of 31 to 82 m length.

According to "Eurofleets" the total number of EU government owned research vessels amounts to 18.

6.5.1.3 Search and rescue boats

The approximate quantity of Government (or often voluntary service) vessels used for search and rescue at sea has been calculated from available data and estimated as shown below. It can be seen that this does not contribute a significant amount to overall tonnage of vessels arising for recycling. It would amount to some 808 tonnes per annum in the EU, as calculated from this data in the following paragraph. An estimate of the numbers of lifeboats/rescue vessels in the EU and their weight has been made and an average life expectancy factor taken to assess the number arising for decommissioning each year. Table 6-5 shows the number of vessels and Table 6-6 shows the approximate weights based on the UK distribution, for which information is available.
Recovery of obsolete vessels not used in the fishing trade

Table 6.5  Maritime Rescue Vessels in Selected EU Member States

<table>
<thead>
<tr>
<th>EU Coastal</th>
<th>Institution</th>
<th>Data Obtained</th>
<th>Number</th>
<th>Size Limit</th>
<th>Total Weight Tonnes</th>
<th>Data Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finland</td>
<td>Finnish Lifeboat Institution</td>
<td>website <a href="http://www.meripelastus.fi/en/main.html">http://www.meripelastus.fi/en/main.html</a></td>
<td>146</td>
<td>6m-14m</td>
<td>1737</td>
<td>2011</td>
</tr>
<tr>
<td>France</td>
<td>Société Nationale de Sauvetage en Mer (SNSM)</td>
<td>SNSM Website <a href="http://www.snsm.org/">http://www.snsm.org/</a></td>
<td>219 (stations)</td>
<td>~5-17.6m</td>
<td>2606</td>
<td>2011</td>
</tr>
<tr>
<td>Germany</td>
<td>Deutsche Gesellschaft zur Rettung Schiffbrüchiger DGzRS</td>
<td>Website <a href="http://www.dgzrs.de/">http://www.dgzrs.de/</a></td>
<td>61</td>
<td>20-46m</td>
<td>726</td>
<td>2011</td>
</tr>
<tr>
<td>Netherlands</td>
<td>Royal Netherlands Sea Rescue Institution</td>
<td>KNRM website <a href="http://www.knrm.nl/">http://www.knrm.nl/</a></td>
<td>70</td>
<td>5-19</td>
<td>833</td>
<td>2011</td>
</tr>
<tr>
<td>Spain</td>
<td>Sociedad de Salvamento y Seguridad Maritima</td>
<td>Leitat</td>
<td>114</td>
<td></td>
<td>No information available</td>
<td>2011</td>
</tr>
<tr>
<td>UK - Ireland</td>
<td>Royal National Lifeboat Institution RNLI</td>
<td>RNLI website <a href="http://www.rnli.org.uk/what_we_do/lifeboats/current_lifeboats/fleet">http://www.rnli.org.uk/what_we_do/lifeboats/current_lifeboats/fleet</a></td>
<td>285</td>
<td>5m-17m</td>
<td>3395</td>
<td>2011</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>1,078</td>
<td></td>
<td>11,475</td>
<td></td>
</tr>
</tbody>
</table>

Assumptions - the average weight of all rescue/lifeboats is similar to that for the UK.

This covers most of the EU maritime States with significant rescue services and numbers of lifeboats. While the types of rescue vessel are not necessarily the same an approximation of the European fleet recycling needs can be made as
follows. From Table 6.5 in total the 1078 vessels comprise some 11,475 tonnes weight of vessels. The materials of constructions are frequently composites (see UK figures in Table 6.6 below) but may also include steel and aluminium. Assuming that the total European “fleet” of rescue vessels were to be double this figure for EU 27 and with an assumed average age of replacement of 30 years then this would amount to 1078x2/30 or 71.8 vessels of all sizes in this category per annum, arising for dismantling across the EU. Taking into account the figure of 11.9 tonnes per vessel which is the weighted average of a vessel weight as indicated in Table 6-6 on the basis of the UK fleet, then 11.9 x 71.8 or 854 tonnes per annum (including engines, hull and superstructure, where present) of materials would arise for dismantling and recycling.

Table 6-6  Breakdown of UK Lifeboats- numbers and composition

<table>
<thead>
<tr>
<th>Type</th>
<th>No</th>
<th>Weight (tonnes)</th>
<th>Total Weight</th>
<th>Materials (Hull)</th>
<th>Length (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tamar</td>
<td>6</td>
<td>30</td>
<td>180</td>
<td>FRP</td>
<td>16</td>
</tr>
<tr>
<td>Severn</td>
<td>30</td>
<td>41</td>
<td>1230</td>
<td>FRC</td>
<td>17</td>
</tr>
<tr>
<td>Trent</td>
<td>28</td>
<td>27.5</td>
<td>770</td>
<td>FRC</td>
<td>14</td>
</tr>
<tr>
<td>Tyne</td>
<td>26</td>
<td>25</td>
<td>650</td>
<td>Steel</td>
<td>14</td>
</tr>
<tr>
<td>Mersey</td>
<td>29</td>
<td>13</td>
<td>377</td>
<td>Al/FRC</td>
<td>12</td>
</tr>
<tr>
<td>&quot;B&quot; Class</td>
<td>78</td>
<td>1.7</td>
<td>132.6</td>
<td>Polyester GRF</td>
<td>7.38/8.44</td>
</tr>
<tr>
<td>&quot;D&quot; Class</td>
<td>81</td>
<td>0.44</td>
<td>35.32</td>
<td>Hypalon/Polyester</td>
<td>5</td>
</tr>
<tr>
<td>&quot;E&quot; Class</td>
<td>3</td>
<td>3.5</td>
<td>10.5</td>
<td>Al Alloy/Polyurethane</td>
<td>9</td>
</tr>
<tr>
<td>Hovercraft</td>
<td>4</td>
<td>2.4</td>
<td>9.6</td>
<td>Al + composites</td>
<td>8</td>
</tr>
<tr>
<td>Arancia</td>
<td>0</td>
<td>0.165</td>
<td>0</td>
<td>Bonded Hypalon</td>
<td>3.9</td>
</tr>
<tr>
<td>Total</td>
<td>285</td>
<td>372</td>
<td>3395</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average tonnage</td>
<td>11.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

FRP= fibre reinforced plastic
FRC= Fibre reinforced composite
GRC = Glass reinforced Fibre
Al= Aluminium
6.5.2 Navy vessels

Of the government owned vessels the navy ships are the most well defined and easiest identifiable group of ships. Naval vessels, employed specifically for defence purposes with combat capability will comprise any of:

- Aircraft Carriers
- Assault Ships
- Coastal Training Craft
- Destroyers
- Ice Patrol Ships
- Landing Platforms
- Frigates
- Rigid Inflatable Landing Craft
- Submarines
- Mine hunters
- Patrol Craft
- Survey Ships

Alongside these a range of support vessels, auxiliaries – which may be classified as civilian support vessels:

- Tankers
- Stores Ships
- Amphibious Ships
- Repair Ships
- Casualty (Hospital) Ships
- Tugs
- Tenders
- Personnel Ferries
- Salvage and Recovery Vessels, and
- Sundry other craft

These vessels vary in size from as little as a few tonnes for large rigid inflatables to 21 tonnes displacement for a personnel ferry, up to 22,000 tonnes for an aircraft carrier. The materials of construction are usually steel except for the rigid inflatables. Of interest may be the mine countermeasures ships (mine-hunters). Their specialised operational role requires the least amount of ferromagnetic metal to be present hence they typically have hulls of glass reinforced plastic. This is similar to that used for many recreational craft and poses challenges for recycling where the intrinsic value of a vessel without significant reusable steel is depressed. Some compensating value may be provided by a higher proportion of more valuable non-ferrous metals.

In the 2007 COWI/DG ENV study the total fleet of navy vessels in the EU was identified to represent 1.6 million LDT, with a distribution of LDT and the number of ships by country as shown in Table 6-7 (COWI/DG ENV 2007).
Table 6-7  The fleet of warships by country (no. and 1,000 LDT)

<table>
<thead>
<tr>
<th>Country</th>
<th>No. of ships</th>
<th>1,000 LDT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt;25 years</td>
<td>+25 years</td>
</tr>
<tr>
<td>Belgium</td>
<td>9</td>
<td>4</td>
</tr>
<tr>
<td>Bulgaria</td>
<td>6</td>
<td>23</td>
</tr>
<tr>
<td>Denmark</td>
<td>23</td>
<td>15</td>
</tr>
<tr>
<td>Estonia</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>Finland</td>
<td>24</td>
<td>17</td>
</tr>
<tr>
<td>France</td>
<td>122</td>
<td>34</td>
</tr>
<tr>
<td>Germany</td>
<td>95</td>
<td>29</td>
</tr>
<tr>
<td>Greece</td>
<td>34</td>
<td>60</td>
</tr>
<tr>
<td>Ireland</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Italy</td>
<td>96</td>
<td>8</td>
</tr>
<tr>
<td>Latvia</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>Lithuania</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Malta</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Netherlands</td>
<td>36</td>
<td>1</td>
</tr>
<tr>
<td>Poland</td>
<td>23</td>
<td>19</td>
</tr>
<tr>
<td>Portugal</td>
<td>9</td>
<td>16</td>
</tr>
<tr>
<td>Romania</td>
<td>27</td>
<td>7</td>
</tr>
<tr>
<td>Spain</td>
<td>43</td>
<td>35</td>
</tr>
</tbody>
</table>
Recovery of obsolete vessels not used in the fishing trade

<table>
<thead>
<tr>
<th>Country</th>
<th>No. of ships</th>
<th>1,000 LDT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt;25 years</td>
<td>+25 years</td>
</tr>
<tr>
<td>Sweden</td>
<td>35</td>
<td>9</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>99</td>
<td>27</td>
</tr>
<tr>
<td>Grand Total</td>
<td>688</td>
<td>321</td>
</tr>
</tbody>
</table>

Updated information has been identified for the principal units (vessels employed specifically for defence purposes with combat capability) of some of the main EU navies: France, Germany, Greece, Italy, Netherlands, Spain and UK. This information is presented in Table 6-8.

**Table 6-8 Some of the main EU Navies principal units: Numbers and GT of vessels**

<table>
<thead>
<tr>
<th>Country</th>
<th>Ships, No</th>
<th>Gross Tonnage</th>
</tr>
</thead>
<tbody>
<tr>
<td>France</td>
<td>63</td>
<td>123,400</td>
</tr>
<tr>
<td>Germany</td>
<td>53</td>
<td></td>
</tr>
<tr>
<td>Greece</td>
<td>54</td>
<td></td>
</tr>
<tr>
<td>Italy</td>
<td>47</td>
<td>71,900</td>
</tr>
<tr>
<td>Netherlands</td>
<td>22</td>
<td></td>
</tr>
<tr>
<td>Spain</td>
<td>24</td>
<td>69,000</td>
</tr>
<tr>
<td>UK</td>
<td>61</td>
<td>140,700</td>
</tr>
<tr>
<td>Total</td>
<td>324</td>
<td>405,000</td>
</tr>
</tbody>
</table>


The data of Table 6-7 and Table 6-8 can not be directly compared, as the vessel numbers in Table 6-8 only constitute a portion of the vessels in Table 6-7. There is however no indication that the 2011 figures generally have changed significantly since 2007, although some changes have occurred. UK for exam-
ple is currently accelerating its programme of withdrawing ships from service, a number of which may be disposed of by recycling rather than sold on or used for other purposes as described earlier.

As can be seen from Table 6-7, 321 European warships were more than 25 years old corresponding to a total of 396,000 LDT in the 2007 accounts. The figures revealed large differences in the age profiles of the Member States. In general, the fleets were at that time considerably younger in the "old" Member States. Portugal for instance had a relatively old fleet compared to the rest of the "old" EU Member States, with almost 60% of the vessels being more than 25 years old, whereas Romania had a relatively young fleet.

The decommissioning of naval vessels is potentially a matter of national security and exact figures are usually confidential. This is especially so where a navy ship is subject to a planned withdrawal from operational activity yet is still in service and fully crewed. Decisions to remove a ship from service will be made according to a number of factors relating to Government’s policies, operational needs, modernisation programmes, changing roles (e.g. involvement in peace keeping activities, piracy protection etc.). Planned decommissioning programmes may be accelerated or delayed. Predictions of expected replacement dates and actual age at decommissioning therefore may only be based on estimates of past rather than known future plans. However a process is usually in place that follows a general pattern for decommissioning as exemplified by the case of the British Royal Navy see UK national workshop (1) report in Appendix D.

6.5.3 Summary of government owned vessels

From the above information government owned vessels within an EU Member State seem to vary from a few ships to a few hundred ships within each type of vessels. With the number of different vessel types (13) and an overall estimation of the relative size of each of these vessel types an estimate of the maximum number of government owned vessels within a Member State is limited to 1,000 ships mainly of limited size.

To further qualify this estimate a more detailed analysis was performed for Spain where the range of Ministries and government organisations were contacted to provide information on the numbers and types of vessel under "their ownership". The results of this analysis (not including navy vessels) for Spain are given in Table 6-9.
Recovery of obsolete vessels not used in the fishing trade

Table 6-9  Government owned vessels < 500 GT in Spain including Canary Islands

<table>
<thead>
<tr>
<th>Type</th>
<th>Mainland Spain</th>
<th>Canary</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Special</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>School</td>
<td>6</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Oceanographic research</td>
<td>3</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Fisheries research</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tug</td>
<td>73</td>
<td>17</td>
<td>132</td>
</tr>
<tr>
<td>Rescue / antipollution</td>
<td>4</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Unrated</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Surveillance</td>
<td>14</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sub-Total</td>
<td>106</td>
<td>26</td>
<td>132</td>
</tr>
<tr>
<td>Transport</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hovercraft</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conventional cargo</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Refrigerator</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Hidroreactor</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Passage cruise</td>
<td>36</td>
<td>38</td>
<td></td>
</tr>
<tr>
<td>Passage / RORO</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sub-Total</td>
<td>39</td>
<td>46</td>
<td>85</td>
</tr>
<tr>
<td>Ports</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tugs</td>
<td></td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>
The results of the detailed, but likely not complete, analysis showed a total of 333 government owned vessels below 500 GT. Adding the navy vessels, Table 6-7, the total for government owned vessels in Spain is 411. On top of this a limited number of other government owned vessels above 500 GT will most likely exist, but the total number of government owned vessels in Spain is not expected to be higher than 500.

The data collection and case analysis for Spain indicate, as expected, that the volume of government owned vessels within EU is relatively limited. Based on the case of Spain and applying the fraction of Spanish navy vessels of the total EU navy fleet (78/1009) on the total EU government owned fleet, a very rough estimate of the total EU government owned fleet of 6,500 vessels can be obtained.

### 6.6 Inland vessels

Inland waterways, natural (rivers) or man-made (canals) were originally used as navigable transport routes for carriage of goods, now many especially smaller ones, are used for recreational craft. Northern Europe makes extensive use of the network for commercial traffic, supplying nearly 1% of all goods transport in Europe. Altogether there are approximately 42,700 km of inland waterways

<table>
<thead>
<tr>
<th>Type</th>
<th>Mainland Spain</th>
<th>Canary</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maritime and Rescue</td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Maritime and water rescue.</td>
<td></td>
<td></td>
<td>55</td>
</tr>
<tr>
<td>Maritime and water rescue (large)</td>
<td></td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>Multi-use Vessels</td>
<td></td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>Tugs</td>
<td></td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>Collector</td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Motor Boats</td>
<td></td>
<td></td>
<td>40</td>
</tr>
<tr>
<td>Sub-Total</td>
<td></td>
<td></td>
<td>114</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>333</td>
</tr>
</tbody>
</table>
Recovery of obsolete vessels not used in the fishing trade

across Europe about half of which accept vessels of 1,000 tonnes or more (European Union Energy and Transport In Figures 2010, Table 3.5.7).

The principal inland waterways in Europe are in Northwest Europe in Belgium, France, Germany, The Netherlands, Poland, Romania and the UK. France possesses a network of some 100 canals and rivers with probably the longest totalling 8,800 kilometres. Belgium has a high capacity network of some 1,600 km and the Netherlands 6,000 km of which 2200 km is the main commercial network. Poland is 3,650 km of mostly smaller waterways used for recreation. The UK has about 3,000 km of canals and 1,000 km of rivers.

6.6.1 Commercially Operated Vessels - Europe

In terms of freight carriage inland shipping distinguishes six main types of vessels (Dutch Inland Shipping Information Agency (BVB) 2009):

- Dry cargo carriers
- Well barges
- Tank vessels
- Push/tugboats
- Passenger ships and
- RO-RO

The inland waterway shipping fleet is more durable than the maritime fleet and tends to have a lifespan of over 50 years. Just a quarter of the Northwest European fleet is of new vessels less than twenty years old. Altogether this comprises some 14,700 vessels in Western Europe and 2,500 vessels in Eastern Europe, mostly in Poland and Romania, Dutch Inland Shipping Information Agency (BVB), 2009). Altogether this represents some 17,200 ships.

6.6.2 Recreational Inland Waterway Vessels - UK

In the UK there are several different navigation authorities for canals and rivers each registering the boats, of any size, that use their waters. A survey published in 2008 by the Association of Inland Navigation Authorities calculated that about 88,000 boats were registered for use on the inland waterways in 2007 (AINA, 2008). This figure had increased by about 10 % from the survey of 2002. Boat classification is not fully standardised, as statutory national boat registration for recreational use is not necessary in the UK, so a standardised list was prepared to encompass all boat types in the waters that AINA members control. The main types identified were:

- Powered boats
- Unpowered boats
- Trip/restaurant boats
- Hire boats
- Powered day hire boats
- Unpowered day hire boats
The bulk of the registrations were for powered boats. No information on construction materials was given although about 30,000 of these will be steel hulled canal narrow boats (AINA, 2008). No information was given about the fate of these boats or the numbers deregistered each year. The information is presented in Table 6-10.

Table 6-10  Vessels Licensed in UK Inland Waterways (from AINA 2008)

<table>
<thead>
<tr>
<th>Navigation Authority in AINA Membership</th>
<th>Total number of vessels licensed or registered in 2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avon Navigation Trust</td>
<td>1,617</td>
</tr>
<tr>
<td>Basingstoke Canal Authority</td>
<td>148</td>
</tr>
<tr>
<td>Bridgewater Canal Company</td>
<td>750</td>
</tr>
<tr>
<td>Bristol City Council</td>
<td>815</td>
</tr>
<tr>
<td>British Waterways</td>
<td>32,604</td>
</tr>
<tr>
<td>Broads Authority</td>
<td>12,615</td>
</tr>
<tr>
<td>Cardiff Harbour Authority</td>
<td>1,109</td>
</tr>
<tr>
<td>Cheshire West &amp; Chester Council</td>
<td>250</td>
</tr>
<tr>
<td>Chesterfield Canal Partnership</td>
<td>6</td>
</tr>
<tr>
<td>City of York Council</td>
<td>0</td>
</tr>
<tr>
<td>Conservators of the River Cam</td>
<td>1,519</td>
</tr>
<tr>
<td>Devon County Council</td>
<td>54</td>
</tr>
<tr>
<td>Environment Agency</td>
<td>23,426</td>
</tr>
<tr>
<td>Essex Waterways Limited</td>
<td>500</td>
</tr>
<tr>
<td>Exeter City Council</td>
<td>332</td>
</tr>
<tr>
<td>Lake District National Park Authority</td>
<td>5,264</td>
</tr>
</tbody>
</table>
Recovery of obsolete vessels not used in the fishing trade

<table>
<thead>
<tr>
<th>Navigation Authority in AINA Membership</th>
<th>Total number of vessels licensed or registered in 2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loch Lomond National Park Authority</td>
<td>5,704</td>
</tr>
<tr>
<td>Middle Level Commissioners</td>
<td>341</td>
</tr>
<tr>
<td>Neath Canal Navigation Limited</td>
<td>1</td>
</tr>
<tr>
<td>Port of London Authority</td>
<td>Not available</td>
</tr>
<tr>
<td>The National Trust (Wey Navigations)</td>
<td>1,212</td>
</tr>
<tr>
<td>TOTAL</td>
<td>88,267</td>
</tr>
</tbody>
</table>

Based on the case of UK and applying the fraction of UK inland waterways of the total EU inland waterways (4000 km/42,700 km) an approximate value for the total EU inland waterways fleet is 942,000 vessels. Of these a relatively large but unidentified number will be recreational boats included in Table 6.4.

### 6.7 Abandoned vessels

Information on abandoned vessels is not collected systematically across the EU27. Some information is available through reports from different authorities and the EU Commission but a comprehensive status of abandoned vessels for 2011 cannot be determined. The available information is presented below. Stakeholder discussions during workshops and site visits do not indicate that abandoned vessels are currently a major problem within the EU, although of course they may cause local difficulties on a case by case basis.

Metal hulled ships are in general not considered a problem because the value of the vessel as scrap metal means that it is more likely to be scrapped first or it can used to offset the cost of recovery.

Abandoned wooden ships and ships of composite materials typically represent lesser recycling or reuse value, but are also not considered generally to be problematic at the moment.

With regard to the small, recreational ships, many are used for other purposes when they reach their end of life. However, projections regarding the future volume of obsolete composite ships, indicate that dismantling and disposal of these ships need to be addressed as continued landfilling, which is the currently predominant disposal method, is not feasible for a much larger volume.
The definition of "abandoned" with respect to vessels, or at least a determination of when it applies in individual cases merits attention. This is when the term is applied in the sense of a vessel being “orphaned” from its owner who may not be traceable and the vessel is no longer seaworthy or in use and no-one takes responsibility for it, as opposed to abandonment of a distressed vessel due to eg a maritime emergency or casualty (where the abandoned vessel will still have an identifiable owner). Clarification of when abandoned vessels become waste and also a definition of "ownership" in relation to abandoned vessels and in particular those that do not require registration could prove beneficial. Neither term is clearly defined in EU or national legislation.

To overcome the uncertainties and make it easier for boat owners and responsible authorities to manage problems related to abandon vessels and in particular recreational vessels a best practice in the form of a guide for management of abandoned recreational craft would be helpful. Such best management practices have been developed in the United States of America (National Association of State Boating Law Administrators, NASBLA, 2009).

Table 6-11 shows the available data obtained through review of information from previous studies, answers to the questionnaires, stakeholder consultations and personal contacts to selected authorities) on abandoned vessels.

<table>
<thead>
<tr>
<th>Country</th>
<th>Number of abandoned vessels</th>
<th>Type of vessels</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estonia</td>
<td>0 reported in 2006</td>
<td>1): 26 cargo ships; 7 tug boats; 7 tankers; 18 passenger ships; 6 fishing boats; 5 barges; 4 floating cranes/reception facility; 2 yachts; 1 livestock carrier; 2 M/S or M/V; 9 N/A</td>
<td>Basel Convention, OEWG-IV/6, Responses to questionnaire, 2006</td>
</tr>
<tr>
<td>Greece</td>
<td>1) 88 reported 1958 - 2005 2) 743 reported up to 2010 (55 recovered, 678 pending)</td>
<td>1) Basel Convention, OEWG-IV/6, Responses to questionnaire, 2006 2) Stakeholder workshop, 25 May, Athens (Greek Ministry of Citizen Protection, Hellenic Coast Guard)</td>
<td></td>
</tr>
<tr>
<td>Italy</td>
<td>64 reported since 1970's</td>
<td>1 cargo ship; 6 tug boats; 2 tanker; 1 small ship; 13 barges; 3 passenger ships; 2 dredgers; 10 fishing boats; 1 wooden boat; 1 recreational; 19 motor ships; 1 sand transportation ship</td>
<td>Basel Convention, OEWG-IV/6, Responses to questionnaire, 2006</td>
</tr>
<tr>
<td>Denmark</td>
<td>30 vessels (&gt; 5 m, including wrecks) reported in 2010 (excluding ports)</td>
<td>2 cargo ships; 4 barges; 2 fishing boats; 9 recreational; 1 sail boat; 1 passenger ship; 1 small boat; 1 motor boat; 1 platform; 1 floating bridge</td>
<td>The Danish Nature Agency 2010</td>
</tr>
</tbody>
</table>
Recovery of obsolete vessels not used in the fishing trade

<table>
<thead>
<tr>
<th>Country</th>
<th>Number of abandoned vessels</th>
<th>Type of vessels</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poland</td>
<td>9 reported 1997 - 2004</td>
<td>1 cargo ship; 1 tanker; 1 steel barge; 2 wooden hulls; 1 plastic boat; 3 fishing cutters</td>
<td>Basel Convention, OEWG-IV/6, Responses to questionnaire, 2006</td>
</tr>
<tr>
<td>Spain</td>
<td>Estimate of 2-3 units per recreational port per year (358 recreational ports and marinas)</td>
<td>Recreational</td>
<td>Stakeholder workshop, 29 April, Madrid (Spanish Federation of Leisure Ports and Marinas)</td>
</tr>
<tr>
<td>Finland</td>
<td>Several cases during the last 10 years. More than 20 cases not yet processed.</td>
<td>No information</td>
<td>National Investigation 2004</td>
</tr>
<tr>
<td>UK</td>
<td>Frequency of dealing with abandoned boats: Harbour Master A: 8/year (crude estimate) Harbour Master B: Not many Harbour master C: 100 wrecks/4 years</td>
<td>Lack of recorded information makes quantification and identification impossible.</td>
<td>Academic thesis on “End of life boat hulls -The current situation and disposal options” (study related to the three main shipping and boating rivers that flow into Southampton Water)</td>
</tr>
</tbody>
</table>

This table shows that information on abandoned vessels is quite limited and may not all be very precise as it is derived from very different sources and based on very different methodologies for data collection. For example for Greece differences exist in the figures reported in the Basel Convention Questionnaire and the information provided by the Greek Ministry of Citizen Protection, Hellenic Coast Guard.

However, the data from Spain and France, which gives the greatest obtained estimate of vessels abandoned every year, may represent a worst-case scenario for recreational craft. This may give some indication of the potential magnitude of abandonment in Europe and detail the potential problem. Spain has 358 recreational ports/marinas with 2-3 abandoned vessels per annum. Denmark possesses some 325 recreational marinas and France has recreational ports in 270 cities of which some have more than one port. Spain, Denmark and France are among the EU countries with long coastline. Assuming that there is an average of 150 recreational marinas in each of the 22 EU Member States with a coastline, a conservative assessment suggests there may be 6,600-9,900 abandoned vessels generated per year. This equals 0.11-0.17 % of the total EU fleet.
Recovery of obsolete vessels not used in the fishing trade

of recreational vessels according to the numbers above Even were the total number of ports in EU coastal states equal that of Spain (358) with the maximum number of vessels per port abandoned set at 3, some 23,628 vessels per annum might become abandoned. This exaggerated estimate would still amount to a little under 0.4% of the total recreational fleet as indicated by the ICOMIA report.

Taking into account the figures obtained by studies made by some Members States such as Greece, it appears that the issue of abandoned boats is real but indeterminate, yet not so great as to arouse general concern among stakeholders.
7 Recycling practices of ships not covered by the Hong Kong Convention and materials output

7.1 Overview

As part of this study a clear understanding of recycling of the vessels not covered by the HKC and abandoned vessels has been obtained. This is both in terms of establishing the present and the best available recycling practices and potential future recycling practices.

The overall conclusion is that in terms of present and future recycling there is a natural distinction defined by the main material component of the vessels, i.e. the hull material. The vessels either comprise metal as their main component or non-metal. The distinction has a bearing on the economics of the recycling operation, which for metal-hull vessels is often cash positive for the vessel owner whereas it is normally cash negative for the owner of a non-metal ship. Non-metal ships almost entirely fall within the small ships category (below 500 GT).

Further, consultations also indicate that it would be beneficial to distinguish between merchant (non-recreational) vessels and non-merchant (recreational) vessels.

The overall picture of the present recycling situation of the non-HKC and abandoned vessels following the study results has been summarised in Table 7-1.
Table 7-1  Overall picture of the present recycling situation of the non-HKC and abandoned vessels

<table>
<thead>
<tr>
<th>Vessel type</th>
<th>Dominant material</th>
<th>Present disposal method/location</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Government owned vessel</td>
<td>Metal</td>
<td>Commercial recycling facility in EU/outside EU (-OECD)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Non-metal</td>
<td>Commercial recycling facility in EU Disposal facility in EU</td>
<td>Estimated, limited data</td>
</tr>
<tr>
<td>In-land vessel</td>
<td>Metal</td>
<td>Commercial recycling facility in EU</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Non-metal</td>
<td>Commercial recycling facility in EU Disposal facility in EU</td>
<td>Estimated, limited data</td>
</tr>
<tr>
<td>Small vessels</td>
<td>Metal</td>
<td>Commercial recycling facilities in EU/outside EU (primarily OECD)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Non-metal</td>
<td>Merchant/non-recreational:</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Commercial recycling facilities in EU/outside EU (larger vessels)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Use for non-vessel purposes</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Recreational/non-merchant:</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Commercial recycling/scrap facilities (larger vessels)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Landfills</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Sinking</td>
<td></td>
</tr>
<tr>
<td>Abandoned vessels</td>
<td>Metal</td>
<td>Recycling/re-use</td>
<td>Estimated, limited data</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Recycling/scrap facilities</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Non-metal</td>
<td>Sinking</td>
<td>Estimated, limited data</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Landfills/dump yard</td>
<td></td>
</tr>
</tbody>
</table>

7.2 Recycling materials outputs including waste generation

The material fractions generated from ship dismantling can either constitute a resource and an asset or a liability and an expense. The main material fraction to be handled is the hull. These may comprise wood, steel, aluminium, fibre reinforced polymers (FRP) and monolithic composites, each with their own characteristics.

Wood is the traditional boat building material that was and is still used for hull and spar construction. It is buoyant, cheap, widely available and easily worked.
As such, it is a popular material for amateur builders, especially for small boats (of e.g. 6-metre length; such as dinghies and sharpies). The hull of a wooden boat usually consists of planking fastened to frames and a keel. Keel and frames are traditionally made of hardwoods such as oak while planking can be oak but is more often softwood such as pine, larch or cedar. Plywood is especially popular for amateur construction. Wood is still widely seen in recycling of recreational boats, fishing vessels etc.

Steel and before that iron was used in sheets or alternatively plates for all-metal hulls or for isolated structural items. It is strong, but heavy, generally about 30% heavier than aluminium. The material rusts unless protected from water, which is usually done by means of a surface coating. Modern steel components are welded or bolted together. Until the mid 1900s, steel sheets were riveted together.

Aluminium is either used in sheet for all-metal hulls or for isolated structural items. Many sailing spars are made of aluminium. It is the lightest material for building boats, but is very expensive and it is usually not used by amateur builders. While it is easy to cut, aluminium is difficult to weld, and also requires heat treatments such as precipitation strengthening for most applications. Corrosion is a concern with aluminium, particularly below the waterline.

Since fibre reinforced polymers (FRP) became available for commercial application in the 1950s, the production of recreational craft constructed from FRP have grown at an impressive rate. Composite materials thus represent the vast majority of recreational boats built in Europe. Wood, aluminium and steel are a small minority of current recreational boat production volumes.

Boats built from sandwich or monolithic composites account for the vast majority of recreational craft produced today. The main advantages are low manufacturing cost, a rather light construction weight, relatively low maintenance in both with regard to cost and time, and the relative ease of modification. The main disadvantages are that the use of composites depends on the availability of oil and the production of resin and fibre reinforcement involves high energy use and atmospheric emissions, among others. In boat construction, the resins used in fibre reinforced plastic (FRP) structures are mainly thermosetting (polyester, epoxy, vinylester etc.). According to the European Boating Industry, more recently, bio-based resins have started to appear but their use is still very limited in the nautical sector. In addition to their environmental advantages at the end of life, bio-based resins reduce the dependency on oil resources.

Other materials are generated from the recycling process. The following sections indicate the relative proportions of these found for the non-HKC vessels.

The configuration of materials onboard these vessels vary with the size, type and function of the vessel. The following groupings are relevant for the boats in question:

- Small merchant vessels, government owned (non-navy) and inland vessels
Recovery of obsolete vessels not used in the fishing trade

- Navy vessels have typically a higher fraction of hazardous substances, including asbestos due to special conditions of the ships operating life.

- Recreational boats, due to its often different hull composition.

### 7.2.1 Small boats - merchant boats, government owned vessels (non-navy vessels) and inland vessels

Responses and information received indicate that material onboard these vessels in general do not differ from the HKC vessels except in quantity. The European Commission has established a generic dataset on the standard materials fractioning of older vessels (EC, 2000). The estimated dataset for standard tankers and bulkers are shown in Table 7-2.

Steel is the dominating material on both types of vessels. Steel make up around 74% of the total weight in tankers and around 63% in bulkers. The reason for this is that bulkers, in general are of simpler construction than tankers.

*Table 7-2 Fractioning of a typical tanker and bulker, % of total weight*

<table>
<thead>
<tr>
<th>Materials</th>
<th>Fraction, % of total weight</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Tanker</td>
</tr>
<tr>
<td>Steel</td>
<td>74</td>
</tr>
<tr>
<td>Copper</td>
<td>0.01</td>
</tr>
<tr>
<td>Zinc</td>
<td>0.03</td>
</tr>
<tr>
<td>Special bronze</td>
<td>0.03</td>
</tr>
<tr>
<td>Machinery</td>
<td>14</td>
</tr>
<tr>
<td>Electrical equipment</td>
<td>2.5</td>
</tr>
<tr>
<td>Joinery</td>
<td>5</td>
</tr>
<tr>
<td>Minerals</td>
<td>0.5</td>
</tr>
<tr>
<td>Plastics</td>
<td>0.5</td>
</tr>
<tr>
<td>Liquids</td>
<td>2</td>
</tr>
</tbody>
</table>
Recovery of obsolete vessels not used in the fishing trade

The Norwegian Ministry of the Environment and the Norwegian Ship owners Association have made an inventory of materials of potential environmental concern in a VLCC of 290,000 DWT (around 37,500 LDT) built in Europe in 1976 (Norwegian Ministry of Environment, 1999). The inventory, which is still one of the only publicly available inventories, is shown in Table 7-3.

Table 7-3  Materials of potential environmental concern on board a 37,500 LDT VLCC ready for scrapping (Norwegian Ministry of Environment, 1999)

<table>
<thead>
<tr>
<th>Component</th>
<th>Material</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anodes</td>
<td>Lead</td>
<td>0.4 kg (^1)</td>
</tr>
<tr>
<td></td>
<td>Cadmium</td>
<td>120 kg (^1)</td>
</tr>
<tr>
<td>Electrical equipment</td>
<td>Batteries (Pb, H(_2)SO(_4))</td>
<td>232 kg (140 kg, 44 litres)</td>
</tr>
<tr>
<td>Coatings and paints</td>
<td>Antifouling (TBT)</td>
<td>24,000 kg (^2) (1,200 kg)</td>
</tr>
<tr>
<td>Refrigerants</td>
<td>R22/F12 (^3)</td>
<td>900 kg</td>
</tr>
<tr>
<td>Heat insulation</td>
<td>Asbestos</td>
<td>6,000 - 8,000 kg</td>
</tr>
<tr>
<td>Electrical installations</td>
<td>PVC cable insulation</td>
<td>10,000 kg</td>
</tr>
<tr>
<td></td>
<td>Light tube capacitors (PCB)</td>
<td>24 kg (^4) (14 g)</td>
</tr>
<tr>
<td></td>
<td>Light tubes (Hg)</td>
<td>100 kg (^5) (15 g)</td>
</tr>
<tr>
<td>Oil residue</td>
<td>Heavy fuel oil</td>
<td>333 m(^3)</td>
</tr>
<tr>
<td></td>
<td>Hydraulic oil</td>
<td>18 m(^3)</td>
</tr>
</tbody>
</table>
Recovery of obsolete vessels not used in the fishing trade

<table>
<thead>
<tr>
<th>Component</th>
<th>Material</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Lubrication oil</td>
<td>20 m³</td>
</tr>
<tr>
<td></td>
<td>Oil sludge</td>
<td>1,820 m³</td>
</tr>
</tbody>
</table>

1: trace elements that can not 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

Inventories of hazardous materials vary between vessels, i.e. types, size, age etc. The above inventory is one of the very few publicly available inventories and has formed the basis for several of the previous EU ship recycling studies. Information from this inventory is applied here where no other information exists.

7.2.2 Navy vessels

Based on recycling of three UK Navy vessels the following representative material fractioning of navy vessels has been derived (UK DRSO, 2011) and is shown in Table 7-4.

Table 7-4  Materials fractioning of navy vessels based on recycling of three UK Navy vessels (UK DRSO, 2011)

<table>
<thead>
<tr>
<th>Material</th>
<th>Amount, % (weight)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metal steel</td>
<td>89</td>
</tr>
<tr>
<td>Non-ferrous steel</td>
<td>5.7</td>
</tr>
<tr>
<td>Waste, plastic/rubber</td>
<td>4.0</td>
</tr>
<tr>
<td>Oils</td>
<td>0.05</td>
</tr>
<tr>
<td>Asbestos</td>
<td>0.5</td>
</tr>
<tr>
<td>Others (resale equipment)</td>
<td>1.4</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
</tr>
</tbody>
</table>
7.2.3 Small boats - recreational boats

The following Table 7-5 shows the composition of materials found in recreational boats. Fibreglass represents 60% of the whole both for motorboats and sailboats (Catalan Nautical Faculty – UPC University). For the non-inflatable boats the numbers are for FRP hulled boats.

Table 7-5 Experienced composition of materials found in recreational crafts

<table>
<thead>
<tr>
<th>MATERIALS (VOLUME %)</th>
<th>MOTOR BOATS</th>
<th>INFLATABLE BOATS</th>
<th>SAILBOATS</th>
<th>OTHER BOATS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fiberglass Reinforced Polyester (FRP)</td>
<td>60</td>
<td>2</td>
<td>60</td>
<td>65</td>
</tr>
<tr>
<td>Ropes</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Wood</td>
<td>5</td>
<td>0</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Metals</td>
<td>5</td>
<td>2</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Glass</td>
<td>0.05</td>
<td>0</td>
<td>0.05</td>
<td>2</td>
</tr>
<tr>
<td>Plastics</td>
<td>0.3</td>
<td>20</td>
<td>0.3</td>
<td>2</td>
</tr>
<tr>
<td>PVC/elastomers</td>
<td>0.5</td>
<td>56</td>
<td>0.5</td>
<td>2</td>
</tr>
<tr>
<td>Electric wires</td>
<td>0.05</td>
<td>1</td>
<td>0.05</td>
<td>1</td>
</tr>
<tr>
<td>Residual waters</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Motors</td>
<td>10</td>
<td>10</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>Electric components</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Appliances</td>
<td>5</td>
<td>0</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>Bathroom fittings</td>
<td>5</td>
<td>0</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>Furnitures</td>
<td>5</td>
<td>2</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Sails</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>Oil</td>
<td>0.05</td>
<td>1</td>
<td>0.05</td>
<td>1</td>
</tr>
<tr>
<td>Refrigerants</td>
<td>0.05</td>
<td>1</td>
<td>0.05</td>
<td>1</td>
</tr>
<tr>
<td>Batteries</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>TOTAL % (MATERIAL/BOAT)</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

As some of the experts mentioned during the Spanish workshop, it is important to mention the evolution concerning the quality of the materials that are used; this has a direct impact on the average lifetime for boats. For fibreglass, for example, the average lifetime has been doubled in the past 50 years.

7.3 Dismantling costs

Cost of boat dismantling is a special issue for the recreational sector, as non-metal boat recycling shifts the recycling economics from a positive to a negative cash flow for the owner.

The dismantling costs identified during the study are presented below for the various non-HKC vessels referred to earlier.

7.3.1 Small boats - merchant boats, government owned vessels (non-navy vessels) and inland vessels

Based on interviews with some of the key ship recyclers in Europe including those that took place during site visits the income for selling such vessels for recycling in Europe was estimated to 100 - 200 EUR/tonne for the mainly steel hulled vessels. The exact payment varies between ships as a result of detailed material composition of the ship including the existence of hazardous materials.
7.3.2 Navy vessels

Some elements of the cost of preparation for dismantling are important with respect to the dismantling of navy vessels. This is due to factors such as age, size and type of vessel and the need to inspect for and remove or identify asbestos and PCB containing materials. Each vessel is unique in this respect. Some costs such as de-stocking are incurred while the vessel is under command. Costs will vary substantially. The costs of preparing the hazardous materials inventory (as a green passport) are known to range from 3,300 EUR to 27,500 EUR. Asbestos surveys may cost around 33,000 EUR for a large vessel.

As an example one UK Royal Navy support vessel, Rame Head (some 70 years old) was prepared for recycling by cleaning-up from an environmental point of view. The cost of this was in the region of 825,000 EUR. An account of the complexities encountered can be seen in the out-turn document produced by the UK Ministry of Defence Disposal Services Authority on the vessel (DSA, 2010).

Cost of dismantling at a recycling facility will otherwise be comparable for other vessels except that during dismantling a naval warship may also incur additional work to deal with the sheer quantity of steel to be removed. Such ships have large numbers of isolatable compartments which add to the complexity of dismantling, although compensated for by the quality of steel recovered. By contrast the cost of dismantling specialist vessels may be considerable. A fibreglass reinforced hulled mine hunter vessel would at present most likely be broken up for landfill and the net sum realisable from sale of non-ferrous metal and equipment may barely cover the cost of disposal perhaps yielding some few hundred thousand EUR at best. Advances in the recovery of composites and polymers, currently at pilot stage for example as indicated during discussions at a workshop on the European DIVEST Project, (Walker, 2011) may in future provide more cost effective solutions.

7.3.3 Small boats - recreational boats

Some EU countries have worked on calculating dismantling costs for recreational craft. These data are provided in Table 7-6.
Recovery of obsolete vessels not used in the fishing trade

Table 7-6  Dismantling costs for recreational crafts

<table>
<thead>
<tr>
<th>COUNTRY</th>
<th>DISMANTLING COSTS</th>
<th>SPECIFIC INFORMATION</th>
<th>INFORMATION SOURCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finland</td>
<td>For boats under 6 metres, the disposal costs are 10€ per metre, plus nominal local transportation costs.</td>
<td>The Finnish system follows the principle that &quot;the polluter pays&quot; but tempers this by ensuring that the polluter doesn't pay too much (avoiding dumping problems because of high marina charges and high disposal costs). The Finnish system is not yet proven for larger craft, such as large sailing boats among others, but Kuusakoski is confident that these too can be handled with no particular difficulties. In their opinion, no new capital expenditure on infrastructure, fixed or mobile, would be necessary. The costs of scrapping these larger crafts would be greater than for the small boats, with a 12m sailing boat working out at about 124€ per metre.</td>
<td>FINNBOAT - Finnish Marine Industries Federation &amp; Kuusakoski</td>
</tr>
<tr>
<td>Finland</td>
<td>7 metre boat has a dismantling cost of approximately 700€. This cost could go up to 900€ when transportation is included.</td>
<td>Nevertheless, for each boat, the above-mentioned association APER - Association pour la Plaisance Eco-Responsible asks for several cost estimations in order for owners to get the best price. Costs for bigger boats are not specified, but the document mentions the cost would go up in an exponential way.</td>
<td>Mission parlementaire – Démantèlement des navires (Le Grenelle de la Mer)</td>
</tr>
<tr>
<td>Italy</td>
<td>The estimations of the decommissioning cost of an end-of-life boat have been evaluated for three different craft sizes, not including transport and handling expenses: - Short outboard craft (5m): ~ 300€ - Medium outboard daycruiser (7.5m); Moulds: ~ 1.500€ - Big cabin cruiser (15m): ~ 15.000€</td>
<td>Such a price difference is generated essentially by the labour costs, deriving from the complexity of the disassembling process, which cannot be managed with standardized large-scale waste handling procedures. That process needs a hand-crafted process made by operators with a strong boatbuilding know-how, in order to preserve the safety of the workers and to obtain the maximum recyclability of each component.</td>
<td>UCINA - Italian Marine Industry Association</td>
</tr>
<tr>
<td>Spain</td>
<td>Yatch (4-7 m): 760€ Sailboat (10-12 metres): 1880€</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>LIFE Boatcycle project</td>
</tr>
</tbody>
</table>

Based on the above average prices of dismantling recreational boats are estimated at:

- Sailing boats: 100 - 150 EUR/m
- Motor boats: 200 - 1,000 EUR/m

The average price for dismantling is the following:

For boats/vessels up to 7 metres: 800EUR
For boats/vessels from 10 to 12 metres: 1500EUR
For 15 metre boats/vessels: 15.000EUR
7.4 Merchant fleet (metal fleet) recycling

7.4.1 Existing facilities
These facilities are the same as for the HKC vessels described in previous EU ship recycling studies, e.g. Appendix C of COWI/DG ENV 2007 study.

A few of these facilities, e.g. Fornaes (Denmark), Van Heygen Recycling (Belgium), Desguaces Petrallo (Spain) and Almex Spółka z o.o. (Poland) were visited as part of this study. The overall processes at these facilities when boats are dismantled with the purpose of recycling the materials are in general the same even though small technological differences and different business cases are seen between the different recycling facilities. Future recycling capacity within EU

A project to assist establishment of additional recycling capacity within the EU is on-going. The EU supported study "Recyship" is described below.

7.4.1.1 Recyship project
Recyship is an ambitious European project framed within the LIFE+ programme in the action line of “Environment Policy and Governance” to be developed during the period 2009-2012. The intention is to address the issue of ship scrapping in matters of occupational safety, health and environmental protection.

A pilot plant will be developed in Aveiro, Portugal, to optimize the processes of ship decontamination in order to encourage such operations on European territory and avoid international shipments of hazardous waste. At the same time it aims to develop an integrated management system of quality, environmental and occupational risk prevention applicable to such facilities in Europe and other countries.

According to the project itself the expected results of the project are:
• Proposal of regulations for proper management of ships out of use
• Inclusion of the needs, problems and expectations of stakeholders
• Definition of potential host environments (based on ability and ecological criteria)
• Streamlined processes for decontamination and dismantling of ships out of use for the environmentally sound management of European ships
• Solving environmental problems of the current scrapping yards
• Feasibility plan for decontamination and dismantling of ships out of use facilities
7.5 Recreational fleet (non-metal) recycling

As mentioned above the experience of recycling of non-metal ships are still relatively limited. The life-times of the ships are very long, therefore only a limited fraction of the EU recreational ships have reached their end of life.

The overall processes within the merchant fleet recycling facilities are presented in Figure 7-1 (Fundació Mar).

Figure 7-1  Overall processes within the merchant fleet recycling facilities in EU

As an example the French Nautical Industries (FIN) some 10 years ago had plans to create six recycling centres at the French coasts with a planned recycling capacity of around 1,500 old sailing boats per year. The project however never materialised partly because it was found that the demand for recycling was not as large as expected.

Examples of current existing recycling practices have been collected as part of the study and are presented below. All of these recycling practices use existing waste management firms either in the form of ship recycling facilities or other experienced waste companies. The reason for that is because of the economics of recycling of recreational boats, which at the moment does not allow for new investment or complex, long term financing arrangements.
Recovery of obsolete vessels not used in the fishing trade

7.5.1 France

APER – Association pour la Plaisance Eco Responsible - is a French association which is organizing the recycling and the deconstruction of old sailing-motor boats in France. After many years of surveys, in April 2009, the French Nautical Industries Federation (FIN) has created this structure in Caen, Normandy.

The APER office at Caen advises amateur sailors on finding solutions for recycling their boats. APER has 25 information points in France, which are the front door for amateur sailors, police, customs, government, French institutions, people, sail experts, insurance companies when boat owners have a problem with old boats.

Today APER has selected six waste firms who can transport, de-pollute, recycle, recover and treat the waste of old boats. All waste firms sign a strict functional specification permitting APER to select the best firms. For each boat, APER asks for several cost estimations to be sure owners can get the best price for the best service. These firms represent 40 locations around France. At present none of the waste management firms recycle the main material of the boats, glass reinforced plastics, rather it is incinerated, e.g. in cement kilns or waste to energy plants or are reusing the material for other purposes.

7.5.2 Finland

The information available in Finland is based on the study “End of life boat disposal in Finland” compiled by Triskel Consultants Ltd for the European Confederation of Nautical Industries (now European Boating Industry - EBI).

The Finnish Marine Industries Federation, Finnboat is the umbrella organisation for Finland's marine industry and trade. They have entered into a partnership with Kuusakoski, a well established recycling company, which allows Finnboat to offers their members a solution for the disposal of unwanted recreational craft.

The operating model agreed was that Finnboat would promote and encourage the responsible recycling of boats at the end of their useful life. Kuusakoski would provide a complete commercial disposal service using its existing infrastructure but at the minimum possible cost to the user. No dedicated facilities have been built and no marine specific infrastructure has been necessary. Boats are treated like any other scrap material with the owner paying for collection and disposal in the same way as they would for any other large unwanted item.
7.5.3 Spain

In Spain, dismantling activities can take place both in car scrap yards or in port facilities.

Casa Nualart, a car scrapping company, is experienced in boat scrapping and has the necessary equipment in order to carry out the different boat scrapping processes requirements in a safe and effective way. Each time a boat is dismantled, a certificate of destruction is issued.

Casa Nualart dismantles boats at their facilities or in some cases they do it directly at port facilities. The decision depends on the type of boat they have to dismantle, on transportation difficulties or on whether there are appropriate facilities for dismantling at the collection point. The best option for Nualart is to dismantle at own facilities but in case they need to dismantle in port facilities, Nualart has mobile equipment for these specific cases (mobile equipment can be viewed in the first picture of figure 7-4).
Casa Nualart facilities are located in Pineda de Mar (Barcelona) and Tordera (Girona). Some images of their activity are shown in Figure 7-4.

Figure 7-4    Images of boat recycling activity at the Casa Nualart facility

7.5.4    Sweden
Sweden is currently carrying out a study on end-of-life recreational boats in order to examine the situation in the country and to propose a solution to the problem.

The Swedish government has assigned this project to the Swedish Environmental Protection Agency. The results of this study may be available by the end of 2011.

7.5.5    Ongoing projects in EU countries
Besides the existing recycling facilities and activities, a number of projects are underway seeking to establish future environmentally friendly recycling capacity of recreational boats within the EU. The identified results of these projects are reproduced below and described in more detail in Appendix G.

Feasibility study End-of-Life Boats, Italy
UCINA - Unione Nazionale Cantieri e Industrie Nautiche ed Affini - is the Italian Marine Industry Association, a non-profit organization for the development and the promotion of boating.

UCINA has been working on 2 parallel projects concerning end-of-life boats:

1    Contribution to a working group inside UNI (Italian Organization for Standardization, representing Italy in ISO), which has the aim to define specific requirements for the “design for recycle”, material selection, construction, operative management and the end-of-life yachts cycle, considering the hull and superstructures materials of construction in order to carry out a safe and environmentally sound yacht recycling.
Recovery of obsolete vessels not used in the fishing trade

2 Implementation of a feasibility study on End-of-Life Boats. This study aims at finding the best way to decommission and recycle end-of-life boats, components, equipments and moulds in a financial and environmentally feasible and sustainable way.

Boatcycle Project - Management, Recycling and recovery of wastes of recreational boat scrapping, Spain

This project is carried out with the following consortium: Fundació Mar, Consiglio Nazionale delle Ricerche - CNR and Leitat Technological Center.

The main objective of the project is to reduce the impact of the nautical industry on the environment, through the development of methodologies for the treatment of boats as residues, both at management and waste recovery level. Sustainable Boats production based on a Life Cycle assessment (LCA) approach and Eco-design will be tested (demonstrated) and promoted.

Eurecomp project

The European project "EURECOMP" aims at developing a novel recycling route for thermoset composites through the solvolysis process whereby reinforcement fibres can be extracted in a thermo-chemical process using solvents. EURECOMP gathers partners from various fields of activity (industrial companies and universities; from material producers to end users). The project will collate the necessary information on upstream and downstream markets, economic efficiency and life cycle assessment.

EURECOMP’s key objective is to separate, through a water-based process, the different elements of the composites - chemicals from the matrix, fillers and fibres - to have them available in a suitable form for reuse in new applications.

Reuse of fibreglass for boat production, Sweden

A technique for recycling glass fibre from boats was developed in Sweden (Sponberg, 1999). In summary the process was devised as follows:

Ryds Battindustri AB is Sweden’s largest boat builder, producing about 3,600 small powerboats each year in 36 models ranging in size from 3.3m (11’) to 5.95m (20’). About six years ago, with the help of the Swedish Institute of Composites, Ryds began development on manufacturing boats with closed loop recycled scrap, which accounted for about 10 % of its layup production. The result was a 4.75m (15.5’) concept boat, containing about 20 % recycled fibre-glass by weight. The original single-skin laminates of sprayed-polyester fibre-glass in the hull and deck were cut back by 50 % and replaced with a sprayable polyester mixture containing 33 % to 40 % ground scrap. Core materials, such as plywood, Coremat and Divinycell, were replaced with the scrap mixture. The boat’s laminates had equal or better strength and, where the recycled compound replaced plywood, screw-holding power improved significantly.
The equipment for processing the scrap mix includes a grinder, a high/low shear mixer, and specially designed spray equipment. The grinder can quickly grind scrap to predetermined fibre lengths and keep fibres intact, which are important to the strength of boat laminates (Swedish Environmental Protection Agency, 2011).

7.5.6 Other non-EU experiences of interest - Norway

Norway is a non-EU country, but the following information on dismantling and recycling practices is included for information and comparison.

As part of a Norwegian project on management, recycling and recovery of wastes of boat scrapping “Gjenkomp” Veolia Miljø in 2009 collected 26 boats of wood, thermoplastics and composites, from 8 to 32 feet. Registrations of material compositions and a program for analyzing chemical components were performed. Further, during the dismantling procedure (for de-pollution and finding material composition for each boat) different methods were tested, all parts were logged and weighed and samples were taken for analysis.

The materials found comprised: Wood, Thermoplastics like PVC, PU and ropes among others, composites/thermoset plastics, metals (steel, aluminium, brass, led, etc), hazardous waste (oil, fuel), electric and electronic components, glass, engines (complex metals), batteries (lead).

The findings of the study included:

- Broad spectrum of material composition with large variations
- Challenging to separate materials suitable for mechanical recycling
- Negative influence of chemicals on environmental systems
- Old wooden boats – more toxic elements than expected

7.6 Re-use of boats or boat parts

Other occasional opportunities for use of vessels or parts thereof which has been mentioned by a number of stakeholders as fairly typical for small vessels are reuse of such parts for other applications, such as sheds, shelters etc. This is unlikely to provide more than minor capacity for dealing with end of life boats.

Figure 7-5 shows examples of such from i) the so-called "Holy Island" of Lindisfarne, a tidal island located just off of the north-east coast of England, where it is a local custom that retired ships are turned upside down and given new life as picturesque sheds, sometimes as harbor sheds and ii) Denmark, where part of a boat is used for a small house.
Recovery of obsolete vessels not used in the fishing trade

Concerning second-hand market in different EU countries, some comments have been made among workshop attendees, specially in the Spanish workshop, that in many cases, when a boat reaches it’s end-of-life status, the engine is still working and in many cases it is sold for reuse. Other parts of the boat such as radars, awnings, are also sold for reuse. An example of this second-hand market can be found in [http://www.chatarrerosdebarcos.es/](http://www.chatarrerosdebarcos.es/). This company sells second-hand engines [http://www.chatarrerosdebarcos.es/motores.html](http://www.chatarrerosdebarcos.es/motores.html) and second-hand boat accessories [http://www.chatarrerosdebarcos.es/accesorios.html](http://www.chatarrerosdebarcos.es/accesorios.html).

Similar companies are likely to exist in other EU countries as well.

Nowadays, there are approximately 6,000,000 recreational boats/vessels found in Europe. Most of these boats are made from fibreglass, a material that due to its limited recovery options causes dismantling activities to have a negative economic value. The immediate consequence of this negative value is the unwillingness of boat owners to pay for dismantling costs causing abandonment (in marinas, beaches, dumped at sea, etc) and incorrect management once the boat has reached its end-of-life status.
The use of existing facilities seems to be a possible option in different EU countries. Average prices of dismantling recreational boats are estimated at 800 EUR for boats/vessels up to 7 metres, 1,500 EUR from 10 to 12 metres and 15,000 EUR from 15 metres up. On the other hand, transport costs are another part of the burden for boat owners. Therefore, the local presence of these facilities seems the best option for the dismantling of recreational craft. This proximity would reduce transportation costs and its associated environmental impact. It also establishes a fluent relationship among the different agents involved (Ports, boat owners, repair&refit companies, among others).

7.7 Recycling of materials

The processes of metal recycling are well-known. Aluminium is extremely environment friendly in this respect, in that only about 4 % to 6 % of the energy needed for making virgin aluminium from bauxite is consumed when making “new” aluminium from scrap. Wood is also well-known but may be less attractive for materials recovery after having been treated with chemicals against rot. Waste fibreglass is complicated to handle. Nevertheless there are several research activities that are currently taking place such as grinding composites for plastic materials, the separation of fibreglass or mechanical recycling in order to introduce a certain percentage of fibreglass in a polymeric matrix. Solvolysis technology is also been studied, but no results have yet been given. Other applications of scrap fibreglass that look promising are the following:

- Pure materials recovery by grinding cured laminate into “recyclate” gives new materials with new properties which add value to virgin or old laminates in a variety of applications when mixed with resins.

- Alternatively, recyclate has been added to asphalt to improve performance.

On the other hand, fibreglass has been successfully used in the manufacture of cement. It is however evident that this way of recycling can only be successful when there is a supply of, and an infrastructure in place to collect, process and distribute, the necessary volume of ground FRP waste to preset specifications.

Nevertheless, little information is available concerning research projects’ results.

7.8 Assessment of impacts of current practices and of upgraded ones

Dismantling practices vary between dismantling afloat, on slipway and in dry docks. Dismantling quality standards do not need to be different between each
method but they do require different approaches types of management and presents different risks for the environment and its protection. These can be met by the application of relevant standards and conditions in permits coupled with management control. Standards of environmental protection should be consistent with those of other similar types of facilities dealing with end of life product dismantling, for example cars.

Those dismantling facilities that are compliant with requirements for permitting under EU legislation on waste would be expected to be managed and deal with vessels as wastes. Those not subject to such permits may operate to lower standards and not be subject to compliance and enforcement regimes. No specific EU instrument exists for ship recycling for EU Member States at this stage even at the level of the HKC (>500 GT) as it has not yet entered into force. A few examples of “informal” dismantling sites have been discovered.

7.8.1 Analysis of information on current and upgraded practices

Some current practices for small vessels are similar to those for End of Life vehicles (ELV). The difference is that the process does not lend itself to volume dismantling as employed in mechanised car dismantling yards. After depollution and removal of key components a car may be crushed and shredded by an automated process. The variation in size between cars is not so great as to cause handling difficulties. However, vessels smaller than 500 GT may still be of dramatically different sizes from around 2 - 70 metres long.

The different recycling practices can be ranked in terms of waste management by applying the EU Waste hierarchy, as laid down in the Waset Framework Directive (Directive 2008/98/EC on waste). The EU Waste hierarchy is shown in the following Figure 8-1.

![EU Waste hierarchy](image-url)

Besides the overall waste management practices applied within the different ship recycling practices local conditions, e.g. transportation distances must be considered to rank specific recycling facilities in terms of environment and health impacts. The overall overview of current and upgraded recycling prac-
Recovery of obsolete vessels not used in the fishing trade

Practices and their environmental impacts for the various vessel types as identified in the study is shown in the following Table 8.1.

Table 7.7 Overall overview of current and upgraded practices and their impacts

<table>
<thead>
<tr>
<th>Vessel type</th>
<th>Current practices</th>
<th>Upgraded practices</th>
<th>Impacts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Navy vessels</td>
<td>Commercial and approved recycling facilities in EU/outside EU (OECD) complying with the HKC facility requirements</td>
<td>Full implementation of the HKC, e.g. Inventory of Hazardous Materials etc.</td>
<td>Current practices are improve traceability and documentation of waste management etc.</td>
</tr>
<tr>
<td>Government owned vessels</td>
<td>Commercial and approved recycling facilities in EU/outside EU (OECD) complying with the HKC facility requirements</td>
<td>Full implementation of the HKC, e.g. Inventory of Hazardous Materials etc.</td>
<td>Improve traceability and documentation of waste management etc.</td>
</tr>
<tr>
<td>Inland vessels</td>
<td>Commercial and approved recycling facilities in EU</td>
<td>Full implementation of the HKC, e.g. Inventory of Hazardous Materials etc.</td>
<td>Improve traceability and documentation of waste management etc.</td>
</tr>
<tr>
<td>Recreational vessels</td>
<td>Landfills Incineration (energy recovery)</td>
<td>Recycling with materials reuse within approved recycling facilities</td>
<td>Upgrade will result in materials reuse, reduced land occupation, and minimisation of spread of hazardous substances in the environment, but potential increased transport distances with resulting increased air emission</td>
</tr>
<tr>
<td>Abandoned vessels</td>
<td>Sinking Open burning Landfilling Incineration (energy recovery)</td>
<td>Recycling with materials reuse within approved recycling facilities</td>
<td>Upgrade will result in materials reuse, reduced land occupation, reduced air emission including potential dioxin generation and minimisation of spread of hazardous substances in the environment. Further, the current practise with sinking can be in conflict with EU Nature Protection, e.g. Natura 2000 interests</td>
</tr>
</tbody>
</table>
7.9 Regulatory compliance and enforcement

Those Member States that gave information about regulatory compliance cited waste legislation as the primary basis for permits. Some States such as the UK have put in place controls for larger and smaller dismantling sites in accordance with the Waste Framework Directive and issues permits with conditions. The smaller sites permits were often based on ELV sites as “treatment facilities” and the range of waste to be treated included small vessels. Little information was made available generally about the frequency of inspections or enforcement.

7.10 Dissemination of best practices

To support the application of best practices in ship dismantling and management of abandoned vessels the following guidelines are developed as part of the study.

1. Best practices for the environmentally sound recycling of recreational vessels

2. Best practices for the management of abandoned vessels

3. Best practices for the dismantling of government owned vessels and navy vessels
8 Options for EU action and impact assessment

8.1 Justification for EU action

The EU competence to take action on ship dismantling matters comes in particular from the articles of the Treaty on the Functioning of the European Union related to the protection of the environment and to maritime transport.

According to Article 191(1) of the Treaty on the Functioning of the European Union, EU policy on the environment shall contribute, among other things, to promoting measures at international level to deal with regional or worldwide environmental problems.

Treaty provisions on common transport policy (Articles 90, 91 and 100.2) give the EU a right to take measures to improve the safety of transport at sea, which will include the issue of ship recycling.

Further, considering the subsidiary principles, the question is whether the problems related to the dismantling of ships not covered by the HKC and the abandoned vessels require EU actions or it could be handled by each Member State. The overall assessment does not indicate any major transboundary environmental problems. There is also not an issue of internal market distortions or similar competition issues that call for EU action.

Regarding the proportionality principle, the magnitude of any potential problems associated with dismantling of small vessels does not suggest that making specific legislation for this particular waste fraction could easily be justified.

Though the study has not directly identified any major problems with poor dismantling practices or environmental impacts at EU level, which in themselves require EU action, there are some arguments for considering policy options. Certain Members States have expressed concerns in relation to this subject, e.g. on an increasing number of abandoned vessels in ports and marinas. The study has also identified uncertainties in relation to the present and future situation within recycling of certain parts of the non-HKC vessels, which can justify an assessment of the feasibility of certain policy options.

17 ibid
8.2 Drivers

As discussed in the EU strategy for better ship dismantling (COM(2008) 767 final) and in section 2.3, the economics of ship dismantling for HKC vessels are driven by market factors such as freight rates, costs of maintenance and price of steel scrap which again influences the choice of dismantling location. The price offered by the recycling facility depends on the demand of steel and the costs of the recycling operation including costs for safe removal and disposal of hazardous materials like asbestos and PCB.

The same drivers are relevant for the larger of the steel-hulled non-HKC vessels, e.g. commercial vessels below 500 GT and navy vessels, although the latter are also prone to Member State decisions and budgets allowing operation of the vessels.

For small non-commercial and recreational vessels other drivers are more important, since they are more likely to have a negative end-of-life value. For those vessels factors like maintenance costs, dismantling costs and seaworthiness together with social factors are more likely to determine how long they are used as well as the choice of dismantling.

8.3 Policy options selected for the impact assessment

A number of general policy instruments are available to regulate the choice of dismantling process and facility. Such potential instruments and options have been discussed with stakeholders during the study, e.g. at several of the stakeholder workshops (see appendices for workshop reports).

Based on the discussions with the stakeholder community and on the results of the data collection activities of the study, the following options have been identified for the impact assessment:

1. No policy change (baseline)
2. Development of non-regulatory measures
   • Development of guidance documents
   • Development of a non-mandatory scheme for extended producer responsibility or a "return-system" for leisure vessels
   • Establishment of a non-mandatory recycling fund for leisure vessels (part of the extended producer responsibility)
3. Development of regulatory measures
   • Creation of European registration and deregistration system and/or control system that mirrors the HKC
• Development of a mandatory scheme for extended producer responsibility or "return-system" for leisure vessels

• Development of new legislation in order to implement elements of the HKC for navy vessels and government owned vessels.

A few of the identified options are only aimed at leisure boats as these are primarily non-metal hulled, which most often give them a negative value to the owner when disposing of for recycling, which again leads to less incentive to the boat owner to recycle correctly.

8.4 Impact assessment of policy options

8.4.1 Baseline
The baseline option is the business as usual with no policy change at EU level directed at the non-HKC vessels envisaged. Changes to the current recycling practices can of course occur over time resulting from general technological developments within e.g. waste management or caused by regulatory changes within other areas indirectly impacting the recycling of non-HKC vessels. Examples of such regulatory changes with a potential indirect impact on the recycling of non-HKC vessels could include an EU ban of landfilling of composite materials or the transposition of the HKC into EU legislation.

In summary, the EU fleet of small vessels not covered by the HKC numbers a total of 6-7 million vessels of which the leisure vessels account for the majority. Although data is not readily available to inform this study on a detailed level, projected future volumes of dismantling of small vessels seem to be rather stable as indicated in Figure 8-1, and within the limit of existing waste management capacities. The number of abandoned vessels (included in the dismantling numbers of the individual vessels types) is also on a moderate level, with data indicating a worst case scenario of some 10,000 primarily leisure vessels abandoned per year in the EU.

The baseline projections are for the small vessels based on the projected future dismantling volumes of non-HKC vessels presented in Table 4-10, an MIDN estimate of 40,000 tonnes of processed government owned vessels per year, and for the recreational vessels a total of 6 million vessels, an age distribution based on information in the Swedish pleasure boat survey, and an average lifetime of 45 years.
Recovery of obsolete vessels not used in the fishing trade

Impact

The available data do not indicate that the recovery of small vessels pose a significant problem from an environmental perspective. Thus, given the drivers behind dismantling of smaller vessels, there is at this moment an economic, albeit modest, incentive to dismantle commercial ships with metal hulls, including also the inland vessels. The same incentive applies to the dismantling of government owned vessels, although the general presence of relatively higher volumes of hazardous substances within navy vessels poses a special challenge for dismantling of this kind of vessels.

With an estimated steel content of between 60 and 90% for a tanker, bulker and a navy vessel, the composition of leisure vessels with up to 80% fibreglass and composites singles out this type of vessels as the biggest challenge from an environmental point of view. This is mainly due to the fact that at present the available technology does not allow efficient recycling of composites, leaving in most cases energy recovery as the only alternative to landfilling.

The calculated materials generation of selected materials fractions (tonnes/year) from recycling of EU-flagged non-HKC vessels are calculated and presented in Table 8-1. The calculations are based on projected future recycling volumes of the various vessel types. For leisure vessels detailed data from Sweden on average distribution between various leisure vessels types and average sizes are used for the entire EU fleet.
Recovery of obsolete vessels not used in the fishing trade

Table 8-1  Materials generation (selected fractions) from recycling of non-HKC vessels (tonnes/year) based on projected future recycling volumes of the various vessel types. For leisure vessels detailed data from Sweden on average distribution between various leisure vessel types and average sizes are used for the entire EU fleet

<table>
<thead>
<tr>
<th>Material</th>
<th>2015</th>
<th>2020</th>
<th>2025</th>
<th>2030</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metal</td>
<td>44.942</td>
<td>42.072</td>
<td>42.831</td>
<td>44.434</td>
</tr>
<tr>
<td>Non-ferrous metals</td>
<td>1.358</td>
<td>1.326</td>
<td>1.334</td>
<td>1.352</td>
</tr>
<tr>
<td>Machinery</td>
<td>14.774</td>
<td>15.401</td>
<td>15.254</td>
<td>14.981</td>
</tr>
<tr>
<td>Resale equipment</td>
<td>280</td>
<td>280</td>
<td>280</td>
<td>280</td>
</tr>
<tr>
<td>Electrical equipment</td>
<td>4.604</td>
<td>4.946</td>
<td>4.863</td>
<td>4.701</td>
</tr>
<tr>
<td>Glass</td>
<td>36</td>
<td>42</td>
<td>41</td>
<td>38</td>
</tr>
<tr>
<td>Ropes, sails etc</td>
<td>2.917</td>
<td>3.383</td>
<td>3.267</td>
<td>3.033</td>
</tr>
<tr>
<td>Joinery, wood</td>
<td>5.532</td>
<td>5.838</td>
<td>5.765</td>
<td>5.626</td>
</tr>
<tr>
<td>Plastics</td>
<td>29.383</td>
<td>33.867</td>
<td>32.747</td>
<td>30.507</td>
</tr>
<tr>
<td>Liquids</td>
<td>515</td>
<td>439</td>
<td>459</td>
<td>500</td>
</tr>
<tr>
<td>Chemicals + gases incl. minerals and asbestos</td>
<td>2.895</td>
<td>3.180</td>
<td>3.110</td>
<td>2.971</td>
</tr>
<tr>
<td>Fibreglass</td>
<td>44.479</td>
<td>51.596</td>
<td>49.817</td>
<td>46.258</td>
</tr>
</tbody>
</table>

The above estimates suggest a material generation from recycling of non-HKC vessels of around 150,000 tonnes/year, corresponding to a materials generation of around 0.3 kg/EU-citizen/year.

Each of the proposed policy options are analysed below. The available data on fleets, recycling practices etc. limits the analysis of the policy options to a more general and often more qualitative analyses of the feasibility and the impacts. Each policy option is analysed separately, but grouped in two: non-regulatory and regulatory options respectively.
8.4.2 Development of non-regulatory measures

8.4.2.1 Development of guidance documents

EU guidance documents to the shipping industry and ship owners could be of particular value if they succeed in providing ship owners with the necessary incentives to follow best practices for ship dismantling and waste management.

Feasibility

As there exist already several technical guidelines by ILO, IMO and Basel Convention on safe and environmentally sound ship recycling, and the IMO will elaborate new guidelines to accompany the Ship Recycling Convention, the idea of EU guidance documents is not to duplicate these efforts but to add new information with a focus on vessels not covered by the HKC, i.e. government owned vessels as well as leisure vessels and abandoned vessels. These three guidelines are developed as part of this study.

In order for the guidelines to reach the target groups, a translation into all EU-languages would probably be necessary. The target groups are believed to be all owners as well as manufacturers of small vessels not covered by the “HKC. This is a very diverse group of people, companies and institutions to be reached, and it is therefore recommended in a first step to communicate the guidelines to national authorities and/or boating associations, who would then communicate more directly with the appropriate target groups via websites, newsletters, conferences etc.

Impacts

The value of guidelines would depend on the success in reaching the relevant target groups, and the possible incentives that the guidelines may create among the ship owners to follow best practices for ship dismantling and waste management. In general the guidelines will have to be distributed as part of a campaign in order to be effective. The extent of the campaign and the selected means of communication will be decisive for the achieved effect.

From an environmental point of view, the guidelines could potentially contribute to a more resource efficient use of the end-of-life vessels, reduction of the number of abandoned vessels, and fewer ship hulls at dumping sites and landfills. It is very difficult to assess the magnitude of the impact. It would mainly have an impact in a situation where information about the best dismantling practice is lacking. Overall, only a very limited impact can be expected.

From an economic point of view, the costs of developing the guidelines are part of this study. Additional costs for implementing such guidelines would include costs for translation and for a supporting communication campaign. Costs would therefore only result from the suggested translation into the 23 official EU-languages. With an estimated translation cost of 40 EUR/page, and an estimated number of 10-20 pages per guidelines, the total costs of translation would be 26,400 EUR. In addition to translation, there will be costs for communication at national level. A minimum model for the national authorities and/or boating association would be to post the guidelines on their websites. Assuming an average of 100 hours for national authorities and/or boating associations within each EU 27 Member State to prepare and execute the campaign
via website information, newsletters etc. and an average hourly rate of 25 EUR a total cost for the minimum campaign model can be calculated at 67,500 EUR. A much more extensive campaign involving various communication sources will based on experience from consumer campaigns in Denmark easily amount to between 0.5 and 1.0 million EUR per country or between 13.5 and 27 million EUR total for EU 27. The costs are summarised in the following table.

Table 8-2 Costs of translating the three guidelines prepared as part of this study into the 23 official EU-languages and communicating them in a minimum model on existing websites, newsletters etc. and a large campaign involving various communication channels like TV etc.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Cost, EUR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Translation of guidelines</td>
<td>26,400 - 54,800</td>
</tr>
<tr>
<td>Minimum communication campaign: communicate the guidelines via existing websites, newsletters etc.</td>
<td>67,500</td>
</tr>
<tr>
<td>Large communication campaign: communicate via various channels like TV, fliers in ports etc.</td>
<td>13,500,000 - 27,000,000</td>
</tr>
</tbody>
</table>

A reduction in abandoned and/or dumped vessels could potentially have a (marginal) positive effect on employment, where the increase in dismantling activities would have positive effect on dismantling and waste management facilities. Thus, also from a social point of view there is a potential benefit however limited.

8.4.2.2 Development of a non-mandatory scheme for extended producer responsibility or a "return-system" for leisure vessels

Extended Producer Responsibility (EPR) is a concept where manufacturers and importers should bear a significant degree of responsibility for the environmental impacts of their products throughout the product life-cycle, including upstream impacts inherent in the selection of materials for the products, impacts from manufacturers' production process itself and downstream impacts from the use and disposal of the products. Producers accept their responsibility when designing their products to minimise life-cycle environmental impacts and when accepting legal physical or socio-economic responsibility for environmental impacts that cannot be eliminated by design.\(^\text{18}\)

The polluter pays principle is enshrined in Article 224 of the Treaty on the Functioning of the European Union: "EU policy on the environment shall (…) be based on the precautionary principle and on the principles that preventive action should be taken, that environmental damage should as a priority be rectified at source, and that the polluter should pay".

\[^{18}\] Fact Sheet: Extended Producer Responsibility, OECD, 2001
From Article 14 of Directive 2008/98/EC on waste it will appear that in accordance with the polluter-pays principle the costs of waste management shall be borne by the original waste producer or by the current or previous waste holders. This is further extended in Article 8 of the said directive. Thus following Article 8 (1) of Directive 2008/98/EC, Member States may take legislative or non-legislative measures to ensure that any natural or legal person who professionally develops, manufactures, processes, treats, sells or imports products (producer of the product) has an extended producer responsibility. Such measures may include an acceptance of returned products and of the waste that remains after those products have been used, as well as the subsequent management of the waste and financial responsibility for such activities.

Also following Article 8 (2), Member States may take appropriate measures to encourage the design of products in order to reduce their environmental impacts and the generation of waste in the course of the production and subsequent use of products. Such measures may encourage, inter alia, the development, production, and marketing of products that are suitable for multiple use, that are technically durable and that are, after having become waste, suitable for proper and safe recovery and environmentally compatible disposal.

When applying the extended producer responsibility, Member States shall in accordance with Article 8 (3) take into account the technical feasibility and economic viability and the overall environmental, human health and social impacts, respecting the need to ensure the proper functioning of the internal market.

Feasibility

The extended producer responsibility has been applied to inter alia end-of-life vehicles, but on a mandatory level. Compared to vehicles, vessels have a much longer lifetime of up to, say 60 years for a leisure vessel. The longer the lifetime, the less effective it will be to apply the extended producer responsibility. This is mainly due to the large number of manufacturers, but also the difficulties in identifying the manufacturer of a particular vessel when the vessel is ready for dismantling. Thus, the manufacturer of smaller leisure vessels may not even be in business anymore. The responsibility to increase e.g. the re-useable and/or recyclable part of a leisure boat is not likely to have effect over a period which may even exceed the lifetime of the manufacturer himself. With a non-mandatory scheme, these barriers will prevail, and it is therefore necessary to add certain incentives in order to motivate voluntary action from the manufacturer.

Impacts

Given the above arguments, it is unlikely that non-mandatory EPR would have any significant positive impacts.

A non-mandatory scheme for extended producer responsibility can, however, potentially improve the re-usable and recyclable parts of small vessels, and thereby also the impact on the environment.

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19 Repealing Directive 2006/12/EC
As in the scenario with the EU guidance documents (see Section 8.4.2.1, the non-mandatory scheme could potentially contribute to a more resource efficient use of the end-of-life vessels, reduction of the number of abandoned vessels and fewer ship hulls at dumping sites and landfills. From an economic point of view, the costs of developing and implementing the scheme would involve not only the drafting of specific guidance documentation, but would also require a certain administration and adaptation to national, regional and local conditions. In addition there will be a need for national authorities to meet with national boating manufacturers association to discuss and agree to the details of a non-mandatory scheme. Even though the scheme is non-mandatory, it will also be necessary with a kind of soft enforcement and follow-up, including monitoring the development of ships destined for dismantling.

Assuming that the scheme achieves a complete dismantling of all leisure vessels, and also assuming that:

- the number of vessels ready for scrapping are split equally between motor vessels and sailing vessels,
- the average length of the vessels is 5 meters,
- the average expected lifetime is 45 years,

then the total costs of dismantling the projected average number of end-of-life vessels amounts to between 100 - 400 million. EUR per year based on the estimated costs of 100-150 EUR/m for sailing vessels and 200-1,000 EUR/m for motor vessels.

In general it appears that a combination of policy instruments is required to effectively divert waste from dumping and landfills. Thus according to EEA report no. 7/2009\textsuperscript{20}, economic instruments such as user charges, landfill tax and product charges can have a significant role if designed to regulate the behaviour of households, waste companies and producers.

Although information on gate fees on landfilling and incineration is very scarce, the above mentioned report suggests that in 2004 Germany and Italy had the highest gate fees for landfilling at EUR 80-90 EUR per tonnes in 2005 prices with incineration prices 30-70 % higher than the landfill gate fees.

Assuming that compliance with Directive 99/31/EC on the landfill of waste and Directive 2000/76/EC on the incineration of waste has led to a certain increase in gate fees, the costs of two additional scenarios can be estimated based on an average gate fee for landfilling at EUR 100 and for incineration at EUR 150:

- Recreational boats being landfilled: 150,000 x 100 = 15,000,000 EUR
- Recreational boats being incinerated: 150,000 x 150 = 22,500,000 EUR

\textsuperscript{20} EEA report no. 7/2009, Diverting waste from landfills. Effectiveness of waste-management policies in the EURpean Union.
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The estimate is based on an average weight per leisure boat of 1 tonne, and excluding transport costs, which may well be significant compared to the gate fees. Thus, it is not unlikely that the costs of transporting a leisure vessel from a marina to the landfill or incineration plant at least equals the gate fees. Total costs for landfilling could therefore easily reach the level of 30 mio. EUR and for incineration 45 mio. EUR.

Assuming instead an average weight of 5 tonnes, the total costs of landfilling would reach at least 150 mio. EUR and the costs for incineration would reach 225 mio. EUR. An average weight of 5 tonnes per leisure boat may not be realistic, but the example helps to indicate a possible range of costs of between 15 - 150 mio. EUR for landfilling and 22.5 - 225 mio. for incineration.

A reduction in abandoned and/or dumped vessels, could potentially have a (marginal) positive effect on employment, where the increase in dismantling activities would have a positive effect on dismantling and waste management facilities. The administration, enforcement and monitoring would also have a positive effect on the employment. Thus, also from a social point of view there is a potential benefit from setting up a non-mandatory scheme for extended producer responsibility.

8.4.2.3 Establishment of a non-mandatory recycling fund for leisure vessels

The objective of a non-mandatory recycling fund for small vessels would be to provide a financial mechanism to facilitate the dismantling of small vessels to which recycling most often is associated with a negative income for the vessel owner, which increases the incentive for the owner to evade the correct dismantling option.

Feasibility

A non-mandatory recycling fund would require the manufacturers of small vessels to fund the dismantling by ear marking a certain amount of money for every new vessel sold. Assuming e.g. that the sale of new leisure vessels equals the number of vessels ready for dismantling, the annual funding would need to cover the total costs for the dismantling of these vessels. The establishment of a fund would probably entail a significant administrative burden at national level (not estimated), but could optimally result in a situation where the ship owners do not avoid the dismantling from a cost point of view alone.

With the Interdepartmental Committee on the Dismantling of Civilian and Military End-of Life Ships, a number of mechanisms to provide dismantling assistance, including financial support, were considered. Although the scope of the Committee were larger ships, now covered by the HKC, the suggested mechanisms may potentially also support the need for improved dismantling of smaller vessels not covered by the Convention, including in particular the leisure boats.

21 Interdepartmental Committee on the Dismantling of Civilian and Military End-of-Life Ships, Annex IX, Conceivable mechanisms to provide dismantling assistance, March 2007.
Recovery of obsolete vessels not used in the fishing trade

Impacts

A non-mandatory recycling fund can potentially provide the necessary incentives for ship owners to dismantle their vessels in an environmentally sound manner, and thereby also reduce the possible negative impact on the environment.

From an economic point of view, the costs of developing and implementing the fund would involve not only the drafting of EU guidance documentation, but would also require a certain administration and adaptation to national, regional and local conditions. In addition there will be a need for national authorities to meet with national boating manufacturers associations to discuss and agree to the details of a non-mandatory fund. Even though the fund is non-mandatory, it will also be necessary with a kind of soft enforcement and follow-up, including to monitor the development of vessels being dismantled.

The maximum volume of the market to be considered comprises almost all end-of-life leisure vessels. The costs to be covered in order to ensure appropriate dismantling of these vessels, depends firstly on the estimation of the volume. Data on the number of leisure boats for dismantling is not readily available. Based on a Swedish survey (Transportstyrelsen, 2010), however, the average number of leisure boats for dismantling has been estimated to 141,425 per year based on an expected lifetime of 45 years.

Assuming, as an illustration, that the fund creates the necessary incentives for ship owners to dismantle all leisure vessels, and assuming also that the number of vessels ready for scrapping are split equally between motor vessels and sailing vessels with an average length of 5 meters and an expected average lifetime of 45 years, the total costs which should be covered by the fund on an annual basis is somewhere in between 100 - 400 mio. EUR. With the funding mechanism in place, an equal amount of money should therefore be transferred to the fund every year.

The fund raising model considered by the Interdepartmental Committee is based on a tax levied on each new ship, similar to the system in place for motor vehicles in Scandinavian countries or in The Netherlands. Applying this model on the leisure vessel market, and assuming that the sale of new vessel equals the number of vessels ready for dismantling, this would mean a tax totalling an amount of between 100 - 400 mio. EUR every year, or 700 - 2,800 EUR per new leisure vessel sold. The calculation is based on very simple assumptions regarding the type of vessels, the size and the lifetime. A more detailed calculation would require additional data on the split between different types of vessels and their size, in order for the tax to be based on more accurate dismantling costs for the specific type of vessel.

The second model considered by the Committee is based on the IMO registration number, which will be withdrawn in the event of failure to pay annual tax. Contrary to the commercial vessels, leisure vessels are not registered in a harmonized way throughout the EU. Introducing such a system could, however, also improve the monitoring of the future development on this particular market segment. Although the ownership of numerous leisure vessels may remain unknown, distributing the total anticipated costs of dismantling equally on vessel
owners, the annual tax to be paid by the owner of a leisure vessel could be marginalised to somewhere in between 16 - 67 EUR.

A reduction in abandoned and/or dumped vessels could potentially have a (marginal) positive effect on employment, where the increase in dismantling activities would have positive effect on dismantling and waste management facilities. The administration, enforcement and monitoring would also have a positive effect on the employment. Thus, also from a social point of view there is a potential benefit from setting up a non-mandatory scheme for extended producer responsibility.

Our data do not allow an estimate of how many ship manufacturers would opt to follow the scheme on a short and longer timescale. However, assuming that such a funding scheme also has a positive branding value, it would be expected that in particular major ship manufacturers would have an interest to participate. A successful implementation will depend on a number of factors, such as the level of organisation amongst the ship manufacturers, their willingness to co-finance a recycling fund, the chosen model for the funding scheme, the expected branding value and the possible (legal) alternatives to a non-mandatory recycling fund.

8.4.3 Development of regulatory measures

8.4.3.1 Creation of a European registration and deregistration system and/or control system that mirrors HCK

A registration system for small boats exists in several EU Member States but, according to the information available, it does not include information concerning vessels that have reached their end-of-life status. In addition, the registers are not standardized at EU level, nor available in many cases and deregistration seldom occurs. Based on the information obtained through the study, it appears that government owned vessels as well as commercial vessels are well handled by national authorities. Thus, given the few problems observed, such a system is primarily considered relevant for leisure vessels.

Feasibility

Establishing a registration system to keep track of all the approximately 6 million different kinds of leisure vessels in the existing fleet is expected to be a difficult task. Without any incentives for owners of leisure vessels to update their ownership registration, a high level of compliance can not be expected. For the smallest vessels to the costs of establishing and operating a registration system could exceed the costs of scrapping the same vessels. Development of a mandatory scheme for extended producer responsibility or "return-system"

8.4.3.2 Development of a mandatory scheme for extended producer responsibility or "return-system" for leisure vessels

The extended producer responsibility has already been addressed above, but as a non-mandatory scheme. In substance, a mandatory scheme would have the same costs and benefits compared to a non-mandatory scheme. However, the important difference is, that the manufacturer cannot decide by himself whether
or not to participate. An adequate enforcement mechanism is therefore key to a successful implementation of a mandatory scheme.

Following Article 8 (3) of Directive 2008/98/EC on waste, the extended producer responsibility can be taken to a mandatory level by Member States. It may also be taken to a mandatory level by the EU legislators in specific waste legislation, like e.g. end of life vehicles.

The extended producer responsibility has been applied to end-of-life vehicles. Directive 2005/64/EC on the type-approval of motor vehicles with regard to their re-usability, recyclability and recoverability facilitate the recycling and recovery of component parts of end-of-life vehicles by obliging manufacturers to incorporate recycling from the vehicle design stage onwards. Thus, manufacturers must design vehicles from the viewpoint of dismantling and recycling, for example by using a large proportion of materials which are potentially able to be recycled and recovered.

In accordance with Directive 2005/64/EC, vehicles may be placed on the market only if they are re-useable and/or recyclable to a minimum of 85 per cent by mass or are re-useable and/or recoverable to a minimum of 95 per cent by mass. To ensure compliance, the manufacturer must put in place procedures to obtain a certificate of compliance, while Member States must appoint a competent organisation responsible for carrying out the preliminary assessment of the manufacturer and granting the certificate of compliance.

Feasibility

When applying the extended producer responsibility, Member States shall in accordance with Article 8 (3) of Directive 2008/98/EC take into account the technical feasibility and economic viability and the overall environmental, human health and social impacts, respecting the need to ensure the proper functioning of the internal market.

Compared to vehicles, vessels have a much longer lifetime of up to, say 60 years for a leisure vessel. The longer the lifetime, the less effective it will be to apply the extended producer responsibility. This is mainly due to the large number of manufacturers, but also the difficulties in identifying the manufacturer of a particular vessel when it is finally ready for dismantling. Thus, the manufacturer of a smaller leisure vessels may not even be in business anymore. The responsibility to increase e.g. the re-useable and/or recyclable part of a leisure vessel is not likely to have effect over a period which may even exceed the lifetime of the manufacturer.

Impacts

A mandatory scheme for extended producer responsibility can potentially improve the re-useable and recyclable parts of small vessels, and thereby also the impact on the environment.

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22 Extended Producer Responsibility in EU Waste Legislation, EPR Seminar Packaging 2020: Cradle to cradle management, 6 October 2010, Artemis Hatzi-Hull, DG ENV
As for the above options, a mandatory scheme could potentially contribute to a more resource-efficient use of the end-of-life vessels, reduction of abandoned vessels and fewer ship hulls at dumping sites and landfills. Targets would probably have to be set for the re-useable and recyclable parts of the vessels.

From an economic point of view, the costs of developing and implementing the scheme would involve not only the legislative process at EU and Member State level, but the Member States would need to set up and implement national funding mechanisms etc., which would lead to a significant administrative burden. Assuming again that the scheme results in a complete dismantling of all leisure boats, and also assuming that:

- the number of boats ready for scrapping are split equally between motor boats and sailing boats,
- the average length of the boats are 5 meters,
- the average expected lifetime is 45 years,

then the total costs of dismantling the projected average number of end-of-life vessels amounts to between 100 - 400 million EUR per year.

The costs of the two scenarios on landfilling and incineration described in 11.2.2. above, would of course also apply to a mandatory scheme of EPR.

A reduction in abandoned and/or dumped vessels could potentially have a (marginal) positive effect on employment, where the increase in dismantling activities would have positive effect on dismantling and waste management facilities. The administration, enforcement and monitoring would also have a positive effect on the employment. Thus, also from a social point of view, there is a potential benefit from setting up a non-mandatory scheme for extended producer responsibility.

8.4.3.3 Development of new legislation in order to implement elements of the HKC for navy vessels and government owned vessels

The HKC addresses all the issues around ship recycling, including the fact that ships sold for scrapping may contain environmentally hazardous substances such as asbestos, heavy metals, hydrocarbons, ozone-depleting substances and others\(^\text{24}\).

Regulations in the new Convention cover 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, incorporating certification and reporting requirements.

Upon entry into force of the Convention, ships to be sent for recycling will be required to carry an inventory of hazardous materials, which will be specific to each ship. An appendix to the Convention provides a list of hazardous materials for which the installation or use is prohibited or restricted in shipyards, ship repair yards, and ships of Parties to the Convention. Ships will be required to have an initial survey to verify the inventory of hazardous materials, additional surveys during the life of the ship, and a final survey prior to recycling.

In the Communication on an EU strategy for better ship dismantling\textsuperscript{25} the need for measures going beyond the HKC is envisaged. Such a measure could be to remove the Convention exemption on three categories of ships from its scope. Small vessels below 500 GT, ships used only on government non-commercial service, including warships (which have a relatively high contamination with asbestos and other hazardous materials), and ships operating throughout their life only inside domestic waters are all exempted from the Convention.

This option would be to develop new legislation that implements the Convention's requirements on hazardous material inventories and recycling plans for these categories of vessels.

\textbf{Feasibility}

Unlike the IMO, which traditionally provides for a "government" exemption due to concerns for national sovereignty, the EU is not a priori prevented from laying down environmental and safety rules for state-owned vessels.\textsuperscript{26} In particular Article 346 of the Treaty on the Functioning of the European Union, does not rule out EU action, but allows for such an exemption only in exceptional and clearly defined cases, if this is necessary for the protection of Member States' essential security interests which are 'connected with the production of or trade in arms and war material'. However, in so far as the future HKC also regulates the design, construction and operation of ships (for instance requiring an Inventory of Hazardous Materials), interests of military secrecy would have to be taken into account. With its legislation, the EU would follow the explicit provision in Article 3(2) of the Convention that exempted ships should act in a manner consistent with the Convention. It should be noted that already today some recyclers of navy vessels follow the HCK requirements.

\textbf{Impacts}

An explicit legal requirement at EU level to dismantle all state-owned or-operated ships in Europe according to the Convention standards would in substance not go beyond the already existing EU Waste Shipment Regulation (Regulation (EC) 1013/2006 on shipments of waste) but would clarify the legal situation and explicitly oblige Member States to act in an exemplary fashion with regard to their own ships.

From an environmental perspective, implementing elements from the Convention could have a potential positive impact, due to better practices based on improved documentation. In addition, the required inventory and surveys would also improve the monitoring and forecast of future dismantling volumes. How-

\textsuperscript{25} Communication on an EU strategy for better ship dismantling, COM(2008) 767 final
\textsuperscript{26} Commission staff working document, Impact assessment for an EU strategy for better ship dismantling, SEC(2008) 2846
Recovery of obsolete vessels not used in the fishing trade

ever, the potential positive environmental impact from better waste management would not necessarily be significant as this study has not identified any major issues regarding the current practices for these vessels. Furthermore, if the option would result in vessels being dismantled outside of EU, the environmental impact could even be negative.

Requiring an inventory of hazardous materials and recycling plans for each vessel would result in additional dismantling costs. Based on the costs for large vessels, the following estimation illustrates the significance of these costs. The inventory, recycling plan and Ready for Recycling Certificate could cost around 8,500 EUR for a small vessel. Assuming that the income from selling a medium sized small vessel (150 LDT) is around 15,000 EUR, the income to the owner of the vessel would be reduced by more than 50%.

This illustrates that introducing requirements on inventories and ship recycling plans in the EU for government owned vessels would create a stronger incentive to have the vessels dismantled outside of the EU. This would result in loss of turnover and jobs for EU recyclers and as mentioned above potentially have negative environmental impacts if the non-EU recyclers have lower environmental performance.

8.5 Summary of options

Overall, the environmental impact from recovery of smaller vessels has proved to be very limited, and specific to local conditions. It is therefore our assessment that recovery of smaller vessels within the EU is best managed at national level. This will allow Member States to address the specificities of the (few) observed discrepancies related to the scrapping of smaller vessels in an efficient way, including in particular the leisure vessels. The discussed options for action are listed in Table 8-3.

Table 8-3 Summary of options

<table>
<thead>
<tr>
<th>Feasibility</th>
<th>Economic</th>
<th>Environmental</th>
<th>Social</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guidelines on best practice (non-mandatory)</td>
<td>Feasible</td>
<td>Limited costs but should at best be supplemented with a campaign</td>
<td>Limited impacts</td>
</tr>
<tr>
<td>Non-mandatory Extended Producer Responsibility</td>
<td>Not very feasible - long lifetime means limited or no effects</td>
<td>Limited impacts</td>
<td>Limited impacts</td>
</tr>
<tr>
<td>Non-mandatory recycling funds</td>
<td>Feasible</td>
<td>Could cover dismantling costs and lead to better dismantling practice</td>
<td>Some costs to establish and operate</td>
</tr>
</tbody>
</table>
Recovery of obsolete vessels not used in the fishing trade

<table>
<thead>
<tr>
<th>Feasibility</th>
<th>Economic</th>
<th>Environmental</th>
<th>Social</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mandatory registration system</td>
<td>Not very feasible - would be costly to establish and operate</td>
<td>Limited impacts</td>
<td>Limited impacts</td>
</tr>
<tr>
<td>Mandatory Extended Producer Reponsibility</td>
<td>Not very feasible - long lifetime means limited or no effects</td>
<td>Limited impacts</td>
<td>Limited impacts</td>
</tr>
<tr>
<td>Implement elements of the HKC for navy vessels and government owned vessels (mandatory)</td>
<td>In principle feasible</td>
<td>Increased costs of dismantling could lead to vessels being dismantled outside EU</td>
<td>Risk of negative impacts due to export of vessels</td>
</tr>
</tbody>
</table>

However, based on the above, there may be a scope for developing EU guidance on how to best handle smaller vessels, when the costs of keeping and maintaining them exceed the benefits. The impact of such guidance documents, however, is limited, if not combined with campaigns or additional activities to attract the attention of relevant stakeholders at national, regional or even local level.

In addition, it could well be justified to further explore the option of a recycling fund, which is seen as potentially feasible, in order to cover the costs of dismantling, and lead to better dismantling practices. Applying the model suggested by the Interdepartmental Committee on the Dismantling of Civilian and Military End-of Life Ships\(^\text{27}\), on the leisure vessel market, the one-time paid tax on each new sold leisure boat would amount to somewhere in between 700 - 2,800 EUR\(^\text{28}\), or an annual tax to be paid by the owner of a leisure vessel of somewhere in between 16 - 67 EUR. These calculations are based on very simple assumptions regarding the type of vessels, size and lifetime. A more detailed calculation would require additional data on the split between different types of vessels and their size in order for the tax to be based on more accurate dismantling costs for the specific type of vessel.

Given a successful implementation of a recycling fund, which would indeed demand the support or at least acceptance from producers and vessel owners, some costs to establish and operate the fund should of course be anticipated.

\(^{27}\) Interdepartmental Committee on the Dismantling of Civilian and Military End-of-Life Ships, Annex IX, Conceivable mechanisms to provide dismantling assistance, March 2007.

\(^{28}\) The figures are based on calculated dismantling costs data from authorities as well as marine federations, and a Swedish pleasure boat survey, based on which the average number of pleasure boats for dismantling has been projected. The costs data are calculated with no fixed year, while the Swedish survey was conducted in 2010.
but with a positive impact on abandoned vessels as well as recovery, recycling and employment.

A non-mandatory recycling fund could be combined with an extended producer's responsibility. With an expected average lifetime of a leisure vessel of up to perhaps 60 years, the option is, however not seen as very feasible, and with limited or no effect of the producers responsibility as such. Compared to vehicles for instance, vessels have a much longer lifetime. The longer the lifetime, the less effective it will be to apply the extended producer responsibility. This is mainly due to the large number of manufacturers, but also the difficulties in identifying the manufacturer of a particular vessel when the vessel is ready for dismantling. Thus, the manufacturer of a smaller leisure vessel may not even be in business anymore. The responsibility to increase e.g. the re-useable and/or recyclable part of leisure vessel is not likely to have effect over a period which may even exceed the lifetime of the manufacturer himself.

A registration system to allow for keeping track of all leisure vessels as described in section 8.4.3.1 would be difficult to establish. If there is no incentive for owners of leisure vessels to update the ownership registration it is unlikely to happen. Hence, the administrative costs of such a system could be very high. For the smallest vessels it could cost more to establish and operate a registration system for tracking the vessels throughout their entire lifetime than the costs of scrapping the vessel.

Finally, introducing elements of the HKC requirements for government owned vessels including navy vessels would decrease the income to the owner of the vessels when selling them to recyclers. Potentially, more then half of the income would have to be used on preparing inventories of hazardous materials, recycling plans and certificates. The effect could be an even larger export of these vessels to recyclers outside of the EU. Potentially, this would have negative environmental impacts. It would also reduce the activity of EU recyclers leading to loss of income and jobs.
9 Conclusion

The study has completed the picture of the size of the EU fleet and the projected recycling volumes by adding the EU non-HKC vessels to the EU HKC vessels studied in previous EU reports. The updated data on the EU HKC vessels compiled as part of this study for completeness show volumes by number of the EU fleet, consistent with those of the earlier EU reports. A rapid increase in the present rate of larger vessels being decommissioned for recycling has however been noted compared to projections in the earlier reports. This is believed to be a result of the international financial crisis experienced during the last years.

Based on the results of the study it can be concluded that the various EU fleet types in general are less well documented in terms of numbers, composition, recycling practices etc. when it comes to non-commercial vessels. The reason for this is believed to be that they are not subject to strongly enforced registration systems and that they have private non-professional owners without strong organisation.

In terms of recycling of non-HKC vessels and potential problems in relation to ensuring that current practices follow safe and environmentally sound recycling practices, the study has shown that the important indicator is the hull material of the vessel and mainly a distinction between metal hulled and non-metal hulled vessels. The reason for this is the difference in economics associated with recycling of vessels composed of these two different hull materials, which for metal hulled vessels in general is cash positive for the vessel owner, whereas it is normally cash negative for the owner recycling a non-metal hulled vessel.

The fact that metal hulled vessels most often have a net positive scrap value, increases the incentive of proper recycling of such vessels, whereas the net negative scrap value associated with non-metal hulled vessels can increase the incentive to find other methods of disposing of the vessel to evade paying the recycling cost. The study thus also concludes that recycling of metal hulled vessels not covered by the HKC in general is performed within the EU at authorised facilities following EU regulations on environmental, health and safety. The study has however identified indications that implementation of the specific EU regulatory requirements could be enhanced among some EU Member States, but this is not an issue calling for EU action.
The majority of the non-metal hulled vessels is found within the around 6 million leisure boats in the EU. The operating lives of these vessels are on average longer than for metal hulled vessels. Projections of the recycling volumes of these vessels indicate a rather large recycling number, which however could not be verified from the disposal end.

At present there are no feasible recycling methods for the glass-fibre making up most of the non-metal hulled material, wherefore it is primarily land filled or incinerated for energy recovery. Various alternative options for glass fibre recycling is under testing and could be commercially attractive for future scenarios with increased volumes of glass fibres available for recycling.

The study concludes that abandonment of non-HKC vessels primarily is an issue for non-metal hulled vessels as a result of their net negative scrap value. The number of abandoned vessels is at present estimated at a moderate level in EU as a whole, but can be at a level of local concern, e.g. within specific marinas etc. A better monitoring and reporting system of the numbers of abandoned vessels across the EU would assist in identifying the future scale of this issue.

In summary, the EU fleet of vessels not covered by the HKC numbers a total of 6-7 million vessels of which the leisure vessels account for the majority. Although data is not readily available to inform this study on a detailed level, projected future volumes of dismantling of small vessels seem to be rather stable, and within the limit of existing EU waste management capacities. Overall, the direct environmental impact from the recovery of non-HKC vessels is expected to be very limited, and specific to local conditions.

The feasibility and potential impact of selected policy options and instruments are discussed in the light of the study results and evaluated justification for EU action. The selected options which intend to regulate the choice of dismantling process and facility include soft measures such as guidelines on best practices, non-mandatory schemes as well as mandatory schemes which require development of legislation at EU level. Although it is concluded that no major problems at EU level are identified at present, there are indications that the volume of leisure vessels for dismantling may increase in the future. The establishment of a non-mandatory recycling fund to cover the costs of dismantling of leisure vessels and ensure better recycling practices is considered a feasible option. Data does however not allow providing a qualified estimate of how many manufacturers are likely to follow the scheme. This would need to be further investigated. Other options are not expected to reduce the environmental impact of ship dismantling significantly.
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Appendix A  List of EU legislation relevant to non-Hong Kong Convention ships

A list of key existing EU legislation relevant to non-HKIC ships has been prepared to support the analysis of potential violations and poor practices in the ship dismantling.

EU legislation setting out definitions on ships and recreational craft


Regulation (EC) 782/2003 on the prohibition of organotin compounds on ships


Relevant EU legislation for industrial development and industrial activities

Natura 2000:


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Relevant EU Legislation on limitation and use of certain hazardous substances


Regulation (EC) 2037/2000 on substances that deplete the ozone layer sets requirements to protect human health and the environment by reducing emissions of ozone depleting chemicals (OSD Regulation)


Relevant EU waste legislation:

1) Waste framework legislation


2) Legislation on waste management operations


3) Legislation on specific waste streams

Directive 2006/66/EC on batteries and accumulators and waste batteries and accumulators (Batteries Directive)


Directive 96/59/EC on the disposal of PCBs and PCTs (PCB Directive)

Relevant EU Legislation on radioactive substances and waste


The proposal for a Council Directive on the management of spent fuel and radioactive waste (COM (2010)618final) will also be taken into account as relevant. It is noted that the scoped is proposed limited radioactive waste management, from generation up to disposal, when the radioactive waste results from civilian activities or is managed within civilian activities.

Other main EU environment legislation


Key maritime legislation


Appendix B  Projected dismantling volumes of small vessels with alternative lifetimes

This appendix presents the result of a sensitivity analysis on the applied average lifetimes of small vessels. The table below shows the projected future volumes of dismantling of small vessels when applying average lifetimes that are 50 per cent higher than the lifetimes used in the base analysis. Results are presented by year of scrap in terms of number of ships and total volume in GT and LDT as the total of all ship types.

<table>
<thead>
<tr>
<th>Year</th>
<th>Total number of Ships</th>
<th>Total volume (GT)</th>
<th>Total volume (LDT)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>All</td>
<td>EU-flagged</td>
<td>All</td>
</tr>
<tr>
<td>2011</td>
<td>1.031</td>
<td>166</td>
<td>256.248</td>
</tr>
<tr>
<td>2013</td>
<td>664</td>
<td>107</td>
<td>165.406</td>
</tr>
<tr>
<td>2014</td>
<td>576</td>
<td>93</td>
<td>143.932</td>
</tr>
<tr>
<td>2015</td>
<td>527</td>
<td>85</td>
<td>132.054</td>
</tr>
<tr>
<td>2016</td>
<td>499</td>
<td>80</td>
<td>125.529</td>
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<tr>
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<td>2019</td>
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<tr>
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<td>467</td>
<td>72</td>
<td>120.239</td>
</tr>
<tr>
<td>2022</td>
<td>462</td>
<td>70</td>
<td>119.568</td>
</tr>
</tbody>
</table>
Recovery of obsolete vessels not used in the fishing trade

<table>
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<td>56</td>
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<td>Average per year</td>
<td>526</td>
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Not surprisingly, when the average lifetimes of small vessels are increased by 50% the projected future volume of dismantling in the period from 2011 to 2030 is significantly reduced. The average number of ships dismantled per year in the period is projected to 526 which is a reduction of 242 compared to the based case where average lifetimes are not increased by 50 per cent.
Appendix C  Stakeholder workshop in Belgium held on 8 April 2011

Presentations and discussion

The meeting started with an introduction by Roy Watkinson for the consultants followed by an overview of the project and its purpose by Laurence Matringe for the European Commission. Then followed introductions to each of the project topic areas by the project team with discussions by those present. The current known situation to small vessels was presented by Lola Rodriguez. Information on abandoned vessels was presented by Sonja Mikkelsen and navy vessels were presented by Roy Watkinson.

Key findings and observations

1. It was estimated by the representative from the European Boating Industry that the recreational boat fleet is currently about 6 million.

2. There could be a large discrepancy between the actual amount of boats that are "ready" for dismantling and the number of boats that people actually wish to dismantle. There may be different reasons for dismantling or not - feelings for instance.

3. Composites are currently the preferred hull material for recreational boats. Very small boats are made of polymers while larger boats - more than 20 metres long - are made from aluminium.

4. Bio-based materials and eco-building are starting to show on the market but the market share is still minimal.

5. The boats being built today will be more difficult to dismantle because the construction technology is more sophisticated. The boats will be harder to break down as builders tend to ensure rigidity and lighter weight through tighter component bonding.

6. Regarding the questionnaire it was suggested that the reason for the poor response rate for the internet questionnaire was that it is too long, has strange questions, is a lot of work and has sensitive answers. Speaking to people directly instead was recommended.

7. It was stated that EU ships are sent to non-OECD countries, such as West Africa and that all kinds of small tonnage are dumped in Mauritania. (No documentation was presented). Sailing obsolete vessels to countries outside the EU as a is an issue that needs to be investigated further.

8. It may be a possibility to contact NATO for information on recovery of obsolete vessels.
9 Italian UCINA is conducting a feasibility study on End-of-Life Boats Concerned with finding the best way to decommission and recycle the end-of-life boats, components, equipments and moulds in a financially viable and environmentally sustainable way and the organisation is willing to share results from the study.²⁹

Summary and conclusions

The information that is needed from the various Member States to complete the European picture is:

- More historical information on numbers, weight and composition/structure and materials on board
- Information on dismantling costs, practices and locations
- Information about destination of waste residues

The European Boating Industry highly supports the project and will provide contact information for their member organisations. The EBI suggests that the national boating associations would be a good place to seek information on fleet sizes since they make their own estimations of the national situation.

It is expected that the following national workshops in the United Kingdom, Poland, Greece and Belgium together with various ongoing data collection activities will provide a more coherent picture of the situation concerning recovery of obsolete vessels not used in the fishing trade in the EU.

Workshop agenda

Introduction of the workshop and of the study (09:30– 10:00)

Session 1: Recovery of small vessels (10:00- 11:00)

- Presentation of the preliminary results of the data collection (number of ships, current dismantling practices and materials outputs and management) (15 min)
- Stakeholder feedback on preliminary results and gaps (30 min)
- Discussion with stakeholders on specific challenges for environmentally sound dismantling of these vessels; critical issues and expectations for future policy at EU level (10 min).

²⁹ Information from UCINA regarding the End-of-Life Boats project was received after the workshop.
Recovery of obsolete vessels not used in the fishing trade

11:00 – 11:15 Lunch break

Session 2: Recovery of abandoned vessels (11:15-12:45)

- Presentation of the preliminary results of the data collection (number of ships, current dismantling practices and materials outputs and management) (15 min)
- Stakeholder feedback on preliminary results and gaps (30 min)
- Discussion with stakeholders on specific challenges for environmentally sound dismantling of these vessels; critical issues and expectations for future policy at EU level (10 min).
- Conclusion and next steps (12h50-13h00)

13:00 – 14:30 Lunch break

- Introduction of the afternoon session (14:30-14:45)
- Short introduction and background of the study with focus on navy vessels

Session 3: Recovery of government owned vessels including navy vessels (14:45 – 16:30)

- Presentation of the preliminary results of the data collection (number of ships, current dismantling practices and materials outputs and management) (30 min)
- Stakeholder feedback on preliminary results and gaps (60 min)
- Discussion with stakeholders on specific challenges for environmentally sound dismantling of these vessels; critical issues and expectations for future policy at EU level (15 min)

Conclusion and next steps (16h30-17h)

- Obtaining additional information
- Maintaining contact
## Workshop attendees

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Recovery of obsolete vessels not used in the fishing trade

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Appendix D  National stakeholder workshops

The following workshop notes are included:

D1  Spain WS1 and WS2 in Madrid: Small vessels

D2  UK WS1 in Portsmouth: Navy and government owned vessels

D3  UK WS2 in London: Small vessels

D4  Poland WS1 and WS2 in Szczecin: Small and abandoned vessels, Government owned and inland vessels

D5  Greece WS1: Small, abandoned and inland vessels
Appendix D1 National workshop 1 and 2 in Madrid, Spain

Presentations and discussion

The meeting started with an introduction of the workshop and of the study by LEITAT. Several presentations took place by LEITAT and by several experts. Five sessions were held during the two workshops in Madrid, all of them with stakeholder feedback and group discussions.

Key findings and observations

1. It is very important to include the six-metre fleet and below in the scope of the project, taking into consideration that this kind of fleet is abundant in European countries.

2. Important aspects that should be taken into consideration are the vessel production in the EU and the capacity of EU marinas.

3. In order to estimate the quantity of vessels to be dismantled, port occupation should be considered.

4. The importance of the evolution of the quality of materials used for ship/boatbuilding was mentioned, since this also affects life expectancy.

5. For recreational craft it is very important to differentiate between sailboats and motorboats. Sailboats bear time much better than motorboats; they are usually better taken care of and better preserved. Motorboats suffer more than sailboats. An important aspect is that inflatable boats or semirigid boats last for 10 to 20 years.

6. It was concluded that Spain has a maximum of ten dismantling facilities (amongst which some were thought not to comply with current EU legislation). According to Reciclauto Navarra SL (from the RECYSHIP project), there are two facilities in Spain (Desguace Industrial y Naval SL in Vizkaia and Desguaces Navales e Industriales Angel Pérez in Galicia) with capacity for dismantling of 100-130 metre vessels and with waste management permits. Both of them using oxy welding cutting technology. There are two other facilities (Recuperaciones Siderúrgicas y Navales SL in Cantabria and Desguaces Santa Cruz in Galicia) with capacity for dismantling 250 metre vessels for the former company and 100 metre vessels for the second one. Oxy welding cutting technology is used. These two companies are rudimentary and non-compliant facilities. Two other facilities exist in Andalucia (Antonio España e Hijos and Chatarras y demoliciones Huelva) for dismantling vessels aground. In Andalucia there are three scrap dealers (Desguaces y reciclajes de la bahia, Romero Puerto and Maex-XXI) that are known to carry out dismantling activities, but have no permanent facilities.
7 Reuse must be an option for vessels. For example, navy vessels have been sometimes been turned into yachts and oil tankers have been turned into bulk carriers.

8 The use of other types of waste management facilities could be an option for small, especially recreational craft.

9 In Mediterranean ports, the industrial activity competes with the touristic activity related to cruises and to beach-and-sun activities. Many ports are “labelled” with a specific activity. There are “passenger” ports, “commercial” ports, “repair” ports, among others. In this sense, it is very important to take into consideration that not all ports would accept vessel dismantling activities in their facilities because of the different kind of impacts that this activity could cause, such as: bad image, dirtiness, negative impact for tourism activities. It could be a reason for people to choose other ports for their boats/vessels instead of the port with a dismantling activity in it, among others.

10 Reciclauto Navarra (RECYSHIP) mentions that they are currently working on defining Spain’s capacity as a country that could absorb vessel dismantling and future treatment. They have identified several geographical areas in which this activity could take place in Spain.

11 It is considered normal that each EU country should want to absorb the dismantling of own fleet, especially regarding small vessels.

12 ISO 30000 for ship recycling exists, although it has several deficiencies it should also be taken into consideration.

13 Second-hand markets exist in European countries.

14 Second-hand markets in third countries reuse engines and other materials. Elements that do not have any value in the Spanish market (or in other markets of the European countries) are absorbed by third countries. For this reason, it is important to take into consideration the reality of each county and it is important to know what each country can absorb.

15 Nowadays, waste management companies located in coastal areas sometimes take in recreational boats. It is not a business itself but complementary activity which they sometimes carry out.

16 Many shipyards in European countries are currently in disuse and/or abandoned and these facilities could be used for vessel dismantling activities.

17 Fibreglass boats/vessels pose a specific problem since they represent a negative economic value when they reach their end-of-life status. The quantity of fibreglass is also a problem to consider although the volume of this material when dismantling takes place is not extensive. The following proposal is made: fibreglass could be gathered in a specific place (storage) for a certain
amount of time, and then, once it reaches a certain volume, it can be collected.

18 One of the main problems regarding abandoned vessels is that they take up valuable space in recreational ports.

19 The numbers mentioned for abandonment in recreational ports in Spain are approximately 2 or three units per port per year. This number is currently increasing. In Spain there are 358 recreational ports and marinas.

20 When a boat/vessel is abandoned it deteriorates very rapidly. It only generates expenses. If legal procedures were speeded up, the boat/vessel would have more value because it would not be so deteriorated/damaged once the process is over. Another important aspect to be considered is that the more time a boat/vessel is abandoned the higher the risk of environmental impact.

21 It would have to be decided who could be the responsible body for declaring a boat/vessel an “abandoned vessel”. A possibility could be the ITB (Boat Technical Inspection).

22 In Spain, the Port Law includes the sinking of boats/vessels. An open question arises concerning this matter, whether this is incongruous with the London Convention.

23 It is important to define the real meaning of “treatment” and “decontamination” as a boat/vessel is often considered to be decontaminated even if it still includes paints, pipes etc. If vessels are really decontaminated, they can be sunk and act as artificial reefs for eco-touristic interests.

Summary and Conclusions

• Because of their size, vessels of 60,000 GT are very easy to control. On the other hand vessels between 500 and 2000 GT are not as easy to control. A quick estimation was made among the workshop attendees, and more or less 50 per cent of the fleet between 500 and 2000 GT is unknown. Many are abandoned in rivers or in third countries, others are sunk. If these vessels are hard to control, it is easy to imagine how hard it is to control vessels/boats below 500 GT.

• It is important to separate the recreational fleet from non-recreational fleet, even if they are all “below 500 GT”. There are common characteristics but there are important differences found in the fleet typology as well as in the materials that are used.

• Concerning boat/shipbuilding, eco-design is a key aspect to be considered. This could help not only for dismantling activities but also for repair and maintenance activities. Eco-design should be a priority and/or an obligation for boat/shipbuilders in 15 years time.
Recovery of obsolete vessels not used in the fishing trade

- It is very important to define when a boat/vessel becomes “waste”. The definition for waste given by the Basel Convention is considered insufficient. The Basel Convention defines waste as “substances which are disposed of or are intended to be disposed of or are required to be disposed of”. It is not possible to know when an owner intends to dispose of specific waste.

- Some boat/shipbuilders are starting to see the optimisation of the boat/vessels life cycle as an added value as well as an interesting marketing strategy.

- The example of cars, both for management and for legal procedures, could be taken into consideration and could be transferred to the boat/vessel sector.

- Currently, a regular supply of end-of-life vessels cannot be guaranteed (steel nor fiberglass vessels). This must be taken into consideration concerning vessel dismantling companies. For a company a regular supply (per month or per year) is crucial for their economic activity.

Workshop agenda

Thursday April 28th 2011, 09.00-16.45

Registration (9:00-9:30)

Opening session (9:30-9:40)

Introduction of the workshop and of the study (09:40– 10:10)

Session 1: Identification and characterization of small vessels (below 500 GT) (10:00- 11:40)

- Presentation of the preliminary results of the data collection
- Brief overview of the European situation today
- Brief overview of the Spanish situation today

Speaker: LEITAT Technological Center

- Stakeholder feedback and group discussions

All attendees

- Specific stakeholder questions

All attendees
Recovery of obsolete vessels not used in the fishing trade

11:40 – 12:00 Coffee break

Session 2: Current scrapping/ recycling practices of small vessels (below 500 GT) (12:00 – 13:15)

Chairman: Rafael Gutierrez Fraile – Spanish Naval Engineering Association (AINE)

- Presentation of the preliminary results of the data collection
- Brief overview of the European situation today
- Brief overview of the Spanish situation today

Speaker: LEITAT Technological Center

- Stakeholder feedback and group discussions

All attendees.

13:15 – 14:45 Lunch break

Continuation of the previous session (14:45 – 16:30)

Possibilities for vessel dismantling and recycling:

Chairman: Miguel García, Reciclauto Navarra

- Use of the existing infrastructures

Speaker: Rafael Pardo, Spanish Association for Car Dismantling and Recycling (AEDRA)

- Ferrous and non-ferrous metals recovery sector.


Metal vessels

Speaker: Miguel García, Reciclauto Navarra

- Other possibilities.

All attendees

- Stakeholder feedback and group discussions

All attendees

Conclusion and next steps (16:30 - 16:45)
Friday April 29th 2011, 09.00-16.00h

Registration (9:30-9:45)

Session 3: Identification and characterization of abandoned vessels (9:45-11:00)

Chairman: Gabriel Sandoval, President of the Spanish Federation of Leisure Ports and Marinas

- Presentation of the preliminary results of the data collection (scope for abandoned vessels)

Speaker: LEITAT Technological Center.

- Current situation in Spain in relation to abandoned boats/vessels in recreational ports

Speaker: Gabriel Sandoval, President of the Spanish Federation of Nautical Ports.

- Stakeholder feedback and group discussions.

All attendees

11:00 – 11:30 Coffee break

Session 4: Acquisition of vessels (11:30 – 13:00)

Chairman: Antonio Barredo, Reciclauto Navarra.

- Current problems concerning the acquisition of steel vessels

Speaker: Antonio Barredo, Reciclauto Navarra,

- Stakeholder feedback and group discussions

13:00– 14:00 Lunch break

Session 5: Previous analysis on the approach of a possible community legislation for dismantling and treatment of vessels below 500 GT (14:00 – 15:15)

Chairman: Rafael Acedo – Ministry of the Environment and Rural and Marine Affairs (MARM)

- Previous analysis on the approach of a possible community legislation for dismantling and treatment of vessels below 500 GT.
Recovery of obsolete vessels not used in the fishing trade

Speaker: Rafael Acedo – Ministry of the Environment and Rural and Marine Affairs (MARM)

• Stakeholder feedback and group discussions

All attendees

Conclusion and next steps (15:15 - 15:30)

• Obtaining additional information
• Maintaining contact

Workshop attendees

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Recovery of obsolete vessels not used in the fishing trade

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### Appendix D2 National workshop 1 in UK, Portsmouth, held on 13 April 2011

**Introduction**

This is the report of the first national workshop in the United Kingdom on recycling of vessels not covered by the HKC and not used in the fishing trade. The workshop was conducted as part of the study: "Recycling of small vessels not used in the fishing trade" performed by COWI A/S in cooperation with RWEC and Leitat under the study contract European Commission, Directorate-General Environment and Climate Action, Recovery of Obsolete Vessels not used in the Fishing Trade ENV.C.2/ETU/2010/0031.
The focus of the workshop was recycling of government owned vessels in the UK with specific focus on navy vessels.

The workshop was conducted at the offices of the Ministry of Defence Disposal and Reserve Ships Organisation at the HM Naval Base in Portsmouth and hosted by Mr Bob Lane, Officer in Charge, who was thanked for his contribution.

**Key findings**
In the following the discussions and conclusions from the workshop are summarised.

**Introductions - overview of project scope, objectives**
The meeting started with an introduction by Roy Watkinson for the consultants followed by an overview of the project and its purpose by George Kiayias for the European Commission.

The reason for excluding fishing vessels was raised by the participants, as this area has been somewhat uncontrolled according to several of the participants. A fairly recent example of exporting 40 - 50 fishing vessels from Scotland to Denmark for scrapping without following the notification procedures etc. were mentioned.

**UK Policy context UK ship recycling strategy**
Alison Gadsby of the UK Environment Ministry, Defra provided a brief the background to the UK approach on ship recycling including the development of the UK Ship Recycling Strategy and its application.

The strategy was developed following the import of the “ghost ships” from the US. It focuses on government owned vessels above 500 GT but is applicable to other vessels.

**Methodology for Royal Navy vessels**
Mr Bob Lane presented the work of the UK Ministry of Defence (MOD) Disposal Reserve Ship Organisation (DRSO). This is a small specialised unit of some 22 staff lead by Mr Lane. It is responsible for handling and preparing all UK naval vessels taken out of service for their further destiny, which can include one of four options:

1. “Hot” sale (intact ship)
2. “Cold” sale (de-equipped and declassified ship)
3. Commercial sale (recycling)
4. Sinking (fairly seldom, for testing of military equipment etc.)

Technically in the last case the vessel remains in the ownership of the Ministry of Defence, classified as a wreck, otherwise ownership is transferred to the buyer.
The DRSO take in Royal Navy vessels, which have been taken out of service and declared for sale. The destiny of the vessel depends on the vessel and market conditions. Price examples obtained for the three sales options (excluding the sinking, which is only performed rarely) according to Mr Lane:

- Hot frigate: GPB 25 million
- Cold frigate: GPB 5-10 million
- Few 100,000 GBP for unclassified sale

The cost for preparing and sinking the last vessel so treated was around GPB 8 million to cover pre-cleaning and monitoring equipment to test the efficacy of weapons.

The DRSO disposal sequence is shown schematically in the Figure below.

Figure 10.1  UK MOD DRSO disposal sequence

The DRSO does not dispose of ships itself, but instead only prepare the ships for disposal. The preparation process is managed by a project officer who has in depth knowledge of the naval vessels. The process is conducted using a manual of procedures that covers what must be done to prepare vessels for sale in accordance with all appropriate legislation and standards.

The preparation of the vessel is often commenced by the ship owner’s company producing inventories of stores and location of hazardous materials, tank condition etc. DRSO plays a vital part in the disposal process which includes e.g. clearing the ship’s inventory development of a “green passport”, highlighting the hazardous material on board including an asbestos survey etc. and commis-
sioning removal of such materials when possible. The ultimate objective is that the condition of the ship is known and documented.

When selling for recycling an inter-departmental committee comprising representatives of defence, environment and transport ministries evaluates the recyclers based on a commercial bid process against set criteria based on the UK Ship Recycling Strategy.

Until now the DRSO has only recycled steel ships.

The Royal Navy also possesses glass fibre-hulled ships used for mine detection. One is in the custody of the DRSO and could be recycled within the coming period. The expected income from selling of the vessel for recycling may be 400,000 EUR. While the hull is considered to be of little value and its disposal route – not yet determined - may be for example cutting up for landfill, other valuable non-ferrous metals and equipment may still allow a sale to yield a positive value.

Green Passports for Royal Navy vessels (hazardous materials)

The DRSO have recycled around 11 vessels for which they have prepared green passports. The costs for preparing the green passports have ranged from GBP 3,000 to 25,000. Two approaches for preparing the green passports have been applied: i) external people preparing the passport, ii) using the people who know the vessel.

According to DRSO, asbestos may cost around GBP 30,000 for a large vessel.

The DRSO has taken particular care to identify poly-chlorinated biphenyls (PCB) in ships, including its presence in solid matrices (e.g. cables) as liquid PCB is not used. A protocol was developed for their use by academic specialists to determine the presence of PCB. So far they have never found PCB at levels exceeding the EU limit of 50 ppm for classification as PCB (or hazardous waste in the UK).

As an example the vessel Rame Head was prepared for recycling by cleaning it from an environmental point of view. The cost of this was approx. GBP 750,000.

**Lessons for recovery of other government vessels (not fishing), small vessels and abandoned ships**

The MOD DRSO has developed a framework for recycling state-owned vessels, which according to DRSO could easily be utilised to competitively recycle other vessels, e.g. other government owned vessels or private vessels.

The UK Maritime and Coast Guard Agency has checked its registries on government-owned vessels, but no such list of government-owned vessels exists.
The possibility for cooperation between the DRSO and other EU countries on recycling of naval/government owned vessels was discussed. The DRSO is very interested in such cooperation.

Abandoned vessels are seen from time to time in the harbour of Portsmouth. Such vessels (small leisure boats) are collected, stored for some time and then transported usually to a landfill for disposal.

It was not recognised by the workshop attendees that many small vessels go to existing metal scrap sites for recycling.

The workshop attendees believe that it is essential to focus on hull materials for defining various boat types, as a shift in the recycling economics is seen when changing from steel type boats (positive economics of recycling) to composites or wood type boats (negative economics of recycling).

The UK has as the only country in the EU a free take-back of pyrotechnics from vessels etc. Introduction of this scheme has lead to considerably reduced illegal dumping of pyrotechnics in UK marine areas, and at the same time much foreign (non-UK) pyrotechnics being delivered to the take back centres.

**Site ship visit (comprising escorted tour of selected areas of the dockyard by boat)**

An escorted tour by boat to selected areas of the dockyard was made. As part of the tour various navy vessels were seen including vessels in the custody of the DRSO e.g. two vessels fully prepared for recycling and just awaiting the recycler to come and collect the vessels.

**Tour of the hangar with the Ark Royal on disposal**

An escorted tour of the aircraft carrier Ark Royal was provided. Ark Royal was in the process of being de-stored and prepared for disposal. The party was able to visit the hangar area and the flight deck.

**Main conclusions**

The UK Ministry of Defence operates a flexible but controlled system for disposal of naval vessels. Preparation for recycling is an established process involving cooperation with the ship owner’s company in the transition from active service to disposal, within defined custody arrangements.

The whole process ensures conformity with the UK’s own Ship Recycling Strategy including environmental compliance requirements.

This may be considered as a basis for a model approach to disposal of government owned vessels. The principles can be employed directly and procedures are capable of modification based on the size and type of vessels to be dealt with.
Workshop venue and agenda

Venue
The workshop was conducted on 13 April 2011 at the Offices of the Disposal and Reserve Ships Organisation at the HM Naval Base in Portsmouth and hosted by Mr Bob Lane, Officer in Charge.

Agenda
Below can be seen the workshop agenda.

09.00 - Arrival at Portsmouth Naval Base and escort to venue (tea and coffee)
10.00 - Introductions - overview of project scope, objectives (COWI/RWEC)
10.10 – UK Policy context UK Ship Recycling Strategy
10.15 – 11.40 Methodology for Royal Navy vessels (DRSO)
  • Green Passports for Royal Navy vessels (hazardous materials) (DRSO)
  • Questions, Discussion
  • Lessons for recovery of other Government vessels (not fishing) larger vessels and abandoned ships
12.00 – Lunch at Boat House 7
13.00 – 14.00 Site Visit comprising escorted tour of selected areas of the dockyard by boat: sighting the three Type 42 destroyers at the moorings for disposal. (Depart Boat House 7 to Semaphore steps, board NUTBOURNE, harbour tour, return Semaphore steps)
  • Discussions continue on board
14.05 – 15.15 DRSO Vehicles or coach to ARK ROYAL (in disposal) – tour hangar, flight deck
15.30 – Return DRSO – depart.

Participants
List of participants in the workshop:

<table>
<thead>
<tr>
<th>Organisation</th>
<th>Name</th>
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<tbody>
<tr>
<td>DRSO</td>
<td>Mr Bob Lane</td>
</tr>
<tr>
<td>EU DG Environment</td>
<td>Mr George Kiayias</td>
</tr>
</tbody>
</table>
Recovery of obsolete vessels not used in the fishing trade

<table>
<thead>
<tr>
<th>Organisation</th>
<th>Name</th>
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<tbody>
<tr>
<td>DEFRA</td>
<td>Ms Alison Gadsby</td>
</tr>
<tr>
<td>Ministry of Defence Disposal Services Authority</td>
<td>Mr Richard Norris</td>
</tr>
<tr>
<td>Maritime and Coast Guard Agency</td>
<td>Mr Jonathan Simpson</td>
</tr>
<tr>
<td>Environment Agency for England and Wales</td>
<td>Mr David Bradley</td>
</tr>
<tr>
<td>British Chamber of Shipping</td>
<td>Mr Adrian Lester</td>
</tr>
<tr>
<td>British Marine Federation</td>
<td>Mr Chris Ford</td>
</tr>
<tr>
<td>RWEC</td>
<td>Mr Roy Watkinson</td>
</tr>
<tr>
<td>COWI A/S</td>
<td>Mr Klaus Winther Ringgaard</td>
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Appendix D3 National Workshop 2 in UK, London held on 3 May 2011

Presentations and discussion

Following introductions on item 2 of the agenda the meeting was introduced by Roy Watkinson for the consultants followed by an overview of the project and its purpose by George Kiayias for the European Commission. To provide a common understanding of the objectives, scope and findings to date of the project the consultants presented a summary of the first Brussels workshop held on 8 April 2011. On Item 3 Ulla Brandt for the consultants described the findings from analysis of the data provided by the Commission. Then followed introductions to each of the topic areas by those present, with discussion.

A representative of the UK Environment Ministry (Defra), Alison Gadsby, for item 4 provided the background to the UK approach on ship recycling including the development of the UK Ship Recycling Strategy and its application, which also complies with instruments on waste at the European level. Some indicated that there may be difficulties with compliance with this policy for other government-owned vessels (not Navy vessels which adheres well to the policy), although it was pointed out that the strategy is a rare example of its kind in Europe and awareness can be improved.

Brian Clark introduced item 5 speaking on behalf of the British Marine Federation, with an overview of the organisation of the group. This represents 4,300 businesses and 1,500 members from large and small boat builders, to marinas, insurers and chandlers. Through its membership of ICOMIA Brian himself is Vice Chair of ICOMIA’s International Environment Committee. Connections with industry and the relevant Government Ministry (Business Information and Skills) and BMF are made through the UK Marine Industry Leadership Council’s Sustainability Group. Discussion on boat registration revealed that this is normal for inland waterways as a means of obtaining funding for the authorities to maintain the waterways. In the marine setting this is optional and small boats do not need to be registered to the UK flag unless undertaking international voyages. Insurers may have further information. Therefore estimates of boat ownership only may be available for marine users (a follow up comprehensive document with annual survey of boat use including ownership was provided via the RYA). Some indications were given that older boats may be sold on to owners in Eastern Europe as their value declines. Generally speaking the long life expectancy of recreational craft (in excess of 30 years) means that little concern is given to end of life disposal/ decommissioning by owners and there would be likely resistance to measures introduced at purchase. Some boat builders have records that may assist with data. An update to the ICOMIA report was made in 2010 and Mr Clark will seek permission to forward this.

On item 6 on abandoned vessels little data was available (a report of an academic dissertation was provided afterwards by RYA indicating general level of abandonment in some UK harbours). The general view was that in marinas and
Recovery of obsolete vessels not used in the fishing trade

Harbours dealing with such vessels were a self-regulating process through contract or local rules, where failure to pay mooring fees resulted in seizure and sale of the boats. Regular auctions are held to sell the boats and examples of these were later provided. No indication that this was a major problem was given, although it is clear that the definition of abandonment and classification can be improved. A number of examples showed the range from those older commercial vessels kept at moorings as a cheaper alternative to costly dismantling (especially if hazardous materials are expected to be on board) and those simply neglected by their owners.

On recycling practices under item 9 Stuart Halsey of Leavesley described the processes for dismantling steel hulled vessels in the UK using his company’s approach at Liverpool as an example, where some of the ex UK Navy vessels have been dismantled. At this larger scale vessel dismantling using a dry dock is the norm. Scrap metal is usually exported to Spain or Turkey. Similarly a new facility at Swansea Dry Docks is in the process of being permitted. One clear issue is the paucity of supply of vessels for dismantling (not being able to compete for purchase with Asian markets) that presents continuity problems for maintaining dedicated facilities. Hence the intention at Swansea is to combine the activity with ship repair.

On future options comment was made that future approaches for other vessels outside the scope of the HKC should be compatible with it to avoid confusion. It was recognised that there would be reluctance to accept measures for recycling of recreational boats at point of sale and that more needed to be done to identify a driver/justification before settling on suitable options. Industry voluntary measures would be a first step to consider. In terms of design for end of life further work on this area might be beneficial to revitalise studies on “concept boats” previously made in the UK.

The hosts (Defra) were thanked for providing the venue.

Key Findings and Observations

- It was suggested by the representative from Lloyd’s Register of Shipping that the project need to revise the methodology used to calculate the future recycling volumes for small vessels between 100-500 GT. The methodology may not be suitable because the underlying assumptions, with respect to vessel ages etc, for this group may be different and need to be reassessed.

- It was not recognized by the workshop attendees that car dismantling enterprises usually have the necessary facilities for dismantling of small vessels.

- It was suggested by the representative from British Marine Federation that many small leisure boats move east. Used but not obsolete leisure boats from the western part of Europe are sold to the eastern part of Europe for use here. Then after use in Eastern Europe the
used but still not obsolete vessel are sold on for use in countries in East Asia.

- It was a general opinion by the stakeholders that the lifetime expectancy of leisure boats is longer than we have been expecting so far in the project. Around 30 years was seen as being a very low estimate.

- It was suggested that the categories we have chosen to define the scope of the project may not be the optimal categories to focus on in the data collection. It might be more fruitful to focus on hull materials (commercial steel types or leisure boats of composites or wood) rather than sizes and usage.

- We need to make a clearer definition of "abandoned" or maybe use another term. "Laid up" and "unlikely to be maintained" are suggested.

- The volumes of composites materials are to low for it to be of commercial value and interest. Maybe it would be more profitable if composite boats dismantlers could cooperate with other industries.

- We have to be careful not to loose focus on PCB or asbestos in small vessels. The substances do not figure in the table in our presentation showing volume percentages of different boat components, but this do not mean that they do not exist on small vessels. It was suggested by several stakeholders that the substances were very common.

- It was suggested that we looked into the concept "small ships graveyard" or "small ships cemetery".

Summary and Conclusions

The workshop proved highly instructive in demonstrating the unique circumstances of Member States’ approach to managing small boats. All relevant stakeholders were present in a small but well informed group. This meeting gave a clear impression that while consideration has been given to the general issues of small vessel recycling and disposal by the trade associations, including as part of the wider ICOMIA study, the perception is that this does not present a major problem. Little actual data exists however and this conclusion does not preclude a future issue arising. The car dismantling industry in UK is not normally attracted to this activity as they are not equipped to deal with vessels in their mechanised dismantling processes nor are the (non-metallic) materials of interest to them having a zero or negative resale value. In terms of classifying small vessels a more helpful distinction may be made between the category of small vessels constructed of steel and those from the modern composites as these have different treatment routes, rather than simply by vessel size or use. A cross industry and academia network for composites exists and identifies major issues with a reliable volume of supply as waste sufficient to attract implementation of viable economic alternative treatment to landfill (even with a high UK landfill tax – planned increases in this may incentivise further work). More in-
vestigation of this issue is needed. On dismantling locations for smaller vessels a connection with decommissioning fishing vessels was identified which may use the same sites. It may be useful to follow this up.

**Venue:** Room 301, Department for Environment Food and Rural Affairs, Ergon House Smith Square, London.

**Agenda**

10:00 - Arrival (tea and coffee)

10:00 - Welcome, Introductions

- Overview of project rationale, context and objectives (EC/RWEC)

10:35 – Data - European Perspective (RWEC/COWI)

- Project aims, tasks, deliverables and timescales
- Information overview, progress
- Further information needs
- Discussion, Q&A

11:25 – UK Perspective

- Policy context UK Ship Recycling Strategy (Defra)
- Application to non-HKC vessels

11:40 – Specific Issues concerning small vessels and recreational craft (British Marine)

- Industry perspective
- Inland waterways
- Recreational craft
- Materials inventory and recovery
- Data sources (registers etc)

12:00- Specific Issues concerning Abandoned vessels

- Locations
- Types
- Scale
- Recovery/retrieval practices
- Materials inventory and recovery
- Data sources

12:20 - Specific Issues concerning recovery of Government owned (non-navy) vessels

- Types
- Numbers
Recovery of obsolete vessels not used in the fishing trade

- Destination
- Materials inventory and recovery
- Data sources

12:30 – Lunch (buffet)

13:30 – Recovery (Recycling) Practices

- Examples of good practice,
- Activities in ports
- At vehicle dismantling sites
- At dedicated facilities

14:30 Discussion

- Factors for future capacity and potential policy options for recycling of vessels not covered by the HKC
- Other
- Q and A

15:30 – Concluding remarks

Workshop Attendees

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<tr>
<th>Organisation</th>
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<tbody>
<tr>
<td>RWEC</td>
<td>Mr Roy Watkinson</td>
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<tr>
<td>COWI A/S</td>
<td>Ulla Kristine Brandt</td>
</tr>
<tr>
<td>European Commission</td>
<td>Mr George Kiayias/</td>
</tr>
<tr>
<td>Defra</td>
<td>Ms Alison Gadsby, Senior Policy Adviser</td>
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<td></td>
<td>Mr Andy Howarth</td>
</tr>
<tr>
<td>Royal Yachting Association</td>
<td>Dan Reading</td>
</tr>
<tr>
<td>Lloyd’s Register of Shipping</td>
<td>Mr Robin Townsend</td>
</tr>
<tr>
<td>British Ports Association</td>
<td>Mr David Whitehead</td>
</tr>
<tr>
<td>Swansea Drydocks Limited</td>
<td>Viv Sloan</td>
</tr>
<tr>
<td>Leavesley International</td>
<td>Stuart Halsey</td>
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Recovery of obsolete vessels not used in the fishing trade

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<thead>
<tr>
<th>Organisation</th>
<th>Name</th>
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<tbody>
<tr>
<td>British Marine Federation</td>
<td>Mr Brian Clark</td>
</tr>
<tr>
<td>British Metals Recycling Association</td>
<td>Mr Howard Bluck</td>
</tr>
</tbody>
</table>
Appendix D4 National Workshop 1 and 2 in Szczecin, Poland held on 23 and 24 May 2011

I. Workshop objectives

The workshop conducted in Poland was aiming at identifying the size of the problems related to the recovery of small and abandoned vessels as well as inland and government owned vessels not used in the fishing trade with a tonnage below 500 GT in the EU countries, and to suggest solutions and evaluate the impact of the suggested solutions. The purposes of the workshop were as follows:

- To investigate the situation in Poland and conclude if the problem exists on the national level or on the EU level;
- To identify the scale of the problem and the potential dismantling volume based on statistical data;
- To present the data referring to the situation in other European countries, identification of the best practices for vessels dismantling and attempt to adapt them to Polish conditions;
- To present EU and national legislation which regulate dismantling and recovery of vessels;
- To identify the instruments to make recycling a profitable business, environmentally sound, and EU and national incentives.

II. Main issues related to Recovery of obsolete vessels not used in the fishing trade under 500 GT in Poland

1. Statistical data referring to fleet (quantity, type of construction)

In Poland there is no one central (DATA BASE) in place comprising complete data with regard to the fleet of small vessels not used in the fishing trade and below 500 GT. However, the registrations of ships dependent on size and category and place of use is kept by a number of the State institutions and associations.

In the initial phase preceding the workshop it was found that in Poland there is a number of units and institutions dealing with registration of vessels in operation.

It was found that none of these institutions record data with regard to obsolete/abandoned vessels.
Recovery of obsolete vessels not used in the fishing trade

Three Maritime Offices located in Gdynia, Słupsk and Szczecin are the main units and institutions keeping data registers with regard to small vessels not used in the fishing trade under 500 GT are

The key legal act regulating the registration of ships in the Maritime Offices is Regulation of Minister of Infrastructure dated on April 27, 2004 on regulation of seagoing vessels in Maritime Offices. This regulation describes the process of registration of seagoing vessels which are not a subject to obligatory entry in the ship register of the Polish Yachting Association (PYA). Separate registers exist for vessels in operation and vessels under construction.

The registration is mandatory; vessels having no registration certificate can be banned for sailing by the maritime or inland water Police. Therefore, the registration is assumed to be quite complete and reliable.

Eight Inland Waters Navigation Offices located in Bydgoszcz, Gdańsk, Giżycko, Kędzierzyn-Koźle, Kraków, Szczecin, Warszawa and Wrocław

The main legal act regulating operation of ships on inland waters is Law issued on December 21, 2000 on inland sailing.

According to this Polish Law every inland vessel is subject to obligatory registration to Polish Inland Water Navigation Office. This Law is not applied to a vessel used exclusively for sports or recreation irrespective of its type and size or to vessels used for angling without power drive and the size not exceeding 20 m² or with the power drive of 20 kW.

The register is kept by the director of Inland Waters Navigation Office relevant for the Home port of the vessel (Chapter 4, Administrative registry and measurement of vessels). The registration is obligatory; and vessels having no registration certificate not allowed to sail in inland waters. This ban is enforced by the inland water Police and therefore, the registration is assumed to be quite complete.

Sixteen Polish Powerboating Offices

Polish Powerboating holds the registration of vessels used only for sports and recreational purposes.

The main legal act regulating the registration of vessels in Polish Powerboating is Ministry of Sport and Tourism regulation dated 11 April, 2008 on the procedures for registration of vessels operating on inland waters used for sport or recreation. The registration of ships used exclusively for sport or recreation is based on written application including statement of

1. The ship owner for vessels with a hull length over 12 m or power-driven engine with a power greater than 15 kW or

2. The vessel owner who is not obliged to register. The vessel registration number consists of two letters:
a) First letter means a province relevant for the powerboating office - home port of the vessel:

- B - podlaskie,
- C - kujawsko-pomorskie,
- D - dolnośląskie,
- E - lódzkie,
- F - lubuskie,
- G - pomorskie,
- K - małopolskie,
- L - lubelskie,
- N - warmińsko-mazurskie,
- O - opolskie,
- P - wielkopolskie,
- R - podkarpackie,
- S - śląskie,
- T - świętokrzyskie,
- W - mazowieckie,
- Z - zachodniopomorskie

b) Second letter means the register book where ship is entered:

- "M" - power driven
- "Z" - without power driven or likely to have an auxiliary power drive

The registration is obligatory; and vessels having no registration certificate are banned from sailing by the maritime and inland water Police. Therefore, the registration is assumed to be quite complete.

**Polish Yachting Association in Warszawa**

The main legal act regulating registration of sea going yachts at PYA is Ministry of Infrastructure Regulation dated on December 23, 2004 on Polish register of yachts (Off. J. 2005, no 6, pos. 14)

The basis for registration is issued by expert evidence confirming the dimensions (geometry) of the yacht, including at least the length and the width.

The registration is obligatory; vessels having no registration certificate are banned from sailing by the maritime and inland water Police. Therefore, the registration is assumed to be quite complete.
Regional Yachting Associations

Regional Yachting Associations keep the record of inland sailing yachts.

According to the Law the registration is optional for yachts up to 12m as well as vessels with power - engine with the engine power of 15 kW. No technical information is required to be registered. Based on Act dated on 11 May, 2007 amending the Act on inland navigation "Polish vessels used solely for sport or recreation purpose, with exception of units driven by man power, with hull length over 12m and engine power greater than 15kW, shall be the subject of registration of vessels used exclusively for sport or recreation. Vessels which are not obliged to be registered may be registered at the request of the owner.

The registration is obligatory; vessels having no registration certificate are the banned for sailing by the maritime and inland water Police. Therefore, the registration is assumed to be quite complete.

Poviats register

There are 314 poviats in Poland and 65 cities with the statutes of poviat.

Poviats keep register of angling boats, according to place of owner ship residence. This involves completing of form and fee of 16 PLN. Registration is unique and no technical overhauls are required.

The registration is obligatory; vessels having no registration certificate are the banned from sailing by the inland water Police. Therefore, the registration is assumed to be quite complete.

These institutions cover the entire country with respect to establishing an inventory of vessels in Poland. In addition information about small vessels is collected by the Statistical Office in Szczecin, appointed by the Main Statistical Office to collect and keeping maritime business related statistical data inclusive small vessels. However, the Statistical Office in Szczecin has no complete and updated information about small ships in Poland and does not keep any register of vessels but collects and processes statistical data about in maritime business.

However, the Statistical Office in Szczecin has a possibility to collect complete data from of the state institutions and associations having the regulatory instruments like the Law of Statistics to allow collecting all the data.

Polish Register of Shipping (PRS)

- Concise Seagoing Ships Register Book
- Concise Inland Vessels Register Book
- List of Ships Entering PRS Class
- Class Suspension, Withdrawal, Reinstatement - List of Ships
The Polish Register of Shipping is a class society and therefore it is a register of a ship category open for both Polish and foreign owned vessels, and is not a register of vessels with a purpose of an inventory.

PRS classification covers:

- seagoing ships
- inland waterway vessels
- seagoing yachts
- motor boats
- submersibles
- floating docks
- offshore drilling units
- refrigerating plants onboard ships

Classification activity covers the following processes:

- Development and updating of rules, guidelines, standards and evaluation criteria for project assessment and construction of ships and floating units in scope of structure, equipment, materials and products, mainly on the basis of results of scientific research projects;
- Approval of technical documentation and supervision of new buildings and units in service for conformance with rules and documents, referred to above;
- Assignment of class, issue and confirmation of class certificates and entry to Ship Register.

Polish Register of Ships defines 49 types of inland ships under its registry. In terms of quantity it is 1520 ships, from large to small ones. Due to lack of tonnage GT-data (PRS gives only dimension of units and their capacity) it was estimated based only on dimensions that all units are below convention limit 500 GT.

PRS also keeps a register of foreign ships, and therefore information on seagoing ships is estimated based on own studies. It has to be noted that the register kept by the PRS is not obligatory and can not be treated as complete data for the specific type of vessels. As an example the military government owned vessels are not always officially registered in PRS due to military secret.

Many owners of vessels in Poland are not willing to register under Polish flag and very often their technical classification is registered under other foreign
register. Registering of Polish vessels under foreign flags, very often outside EU has increased due to unfavourable employment conditions in the Polish regulation on Maritime Labour. Vessels registered by Polish owners abroad are most likely not included in any of Polish register database. The general opinion of the workshop attendees' was, that transfer of ownership from "flag" to "owner" would make the inventory of Polish ships more reliable.

In the phase preceding the workshop and during the workshop, data with regards to the Polish fleet was gathered from various data sources like PRS, the Statistical Office in Szczecin, queries in the Maritime Offices, harbours in Szczecin, Gdańsk and Gdynia and other places. The gathered information was processed and can be reflected as presented below.

**Small ships**

Information gathered from the Maritime Offices, the man harbours in Szczecin, Gdańsk and Gdynia showed that there are the following seagoing vessels:

- 17 pilot boats
- Owned by Maritime Search and Rescue Service (SAR): 12 ships, plus 6 boats
- 53 tugboats
- 30 passenger ships
- 120 angler boats
- 30 technical vessels
- 10 other small units
- 6 boats for general purposes

The figures presented above should only be treated as indicative.

Information obtained from Sailing Associations and District Motorboat Associations shows the following.

- Polish Yachting Association has registered 6350 sports sea going ships AND BOATS where more than ONE half are motor boats. Recently increasing number of water scooters was noticed what disturbs the view of the structure.

- Sailing yachts are registered in District Associations. In years 2005 - 2009 there were 37216 yachts registered. Sailing boats on inland waters with the length shorter than 12m are not the subject of registration.

- Maritime Offices do not keep the record of sport ships at all.
Recovery of obsolete vessels not used in the fishing trade

• Polish Motorboat Association does not keep the central register of motor boats in inland waters. This register is kept by Regional Associations which are distributed in the number of 16 in Poland. It may be estimated that the number of motor boats registered in Poland is at the level of 11,000.

None of the above mentioned institutions keep registers of neither obsolete nor abandoned vessels. Therefore, there is no data available on the number of obsolete and abandoned ships in Poland.

Government owned ships

Government owned ships cannot be the subject of general public mandatory registration so there is no classification for them but they are recommended to be handled in accordance with recommendation of many conventions (including SOLAS).

This type of ships is owned in Poland by:

Polish Navy

Information about Polish Navy fleet is confidential. Therefore, only general data may be gathered.

Custom Offices

There are three Custom offices in Poland located in: Szczecin, Gdynia and Olsztyń. Each unit has one patrol boat.

Regional Board of Water Management

The Regional Board of Water Management located in twelve regions operate with the auxiliary units such as ice breakers and dredgers chartered from the private hands or other owners.

State Border Guard Authority

Presently in the Maritime Department of State Border Guard Authority there are 52 units in operation (Przegląd Morski, May 2011, No 5).

Patrol craft

<table>
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<tr>
<th>Type</th>
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<tr>
<td>SKS – 40</td>
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<tr>
<td>918</td>
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</table>
Recovery of obsolete vessels not used in the fishing trade

**Support crafts**

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<tr>
<td>90</td>
<td>2</td>
</tr>
<tr>
<td>s/y C-46</td>
<td>1</td>
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<tr>
<td>s/y C-45</td>
<td>1</td>
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<tr>
<td>M-35</td>
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**Intervention vessels**

<table>
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<tbody>
<tr>
<td>SAR 1500</td>
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</tr>
<tr>
<td>Griffon 2000TD</td>
<td>2</td>
</tr>
<tr>
<td>IC 16 M III</td>
<td>4</td>
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<tr>
<td>Patrol 240 Baltic</td>
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**Lightweight floating**

<table>
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<tr>
<td>MR - 4800B</td>
<td>4</td>
</tr>
<tr>
<td>S-7500K</td>
<td>3</td>
</tr>
<tr>
<td>Tropik 380</td>
<td>1</td>
</tr>
<tr>
<td>SŁP-7500K</td>
<td>2</td>
</tr>
<tr>
<td>SŁP-6100</td>
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</table>
All ships which are owned by the government can be treated as government ships. These ships include primarily Polish Navy, Border Guard, and Custom Office vessels.

There are also other types of government owned vessels, operated by Maritime, Inland Administration and maritimes academies which are fully subject to all applicable provisions for the civil fleet and are registered in the Polish Register of Ships.

The types are as follows:

- Research vessels
- Training vessels
- Hydrographical vessels
- Pilot vessels
- Delivery ships
- Rescue ships
- Tug aircrafts

**Conclusions**

In Poland there is not one central database in place which keeps a complete register of small ships fleet not used in the fishing trade under 500 GT, but a number of the state institutions and associations hold registers of vessels.

It was found that none of these institutions keep data with regards to obsolete/abandoned vessels.

In order to collect reliable statistical data on the number of small ships as well as obsolete/abandoned vessels there is a possibility to engage the Statistical Office in Szczecin appointed by the Main Statistical Office to collect the complete set of data.

**Polish and EU legislation**

In Poland there is no specific legislation addressing recycling of small ships. Poland has not yet signed the “Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships”. However, Poland as an EU Member State has adopted the Waste Shipments Regulation.

Other relevant legislation in place include:
Recovery of obsolete vessels not used in the fishing trade


An EU strategy for better ship dismantling
{SEC(2008) 2846}
{SEC(2008) 2847}
Council Conclusions on an EU Strategy for better ship dismantling
2968th ENVIRONMENT Council meeting
Luxembourg, 21 October 2009

Conclusions

In Poland there are no developed procedures, standards, good practices and technical infrastructure for recycling of waste, originating from decommissioning of ships (vessels). However, there are a number of laws and implementation regulations e.g. Environmental Law, Waste Law which address the issue of recycling of waste originating from decommissioning of ships.

Practices of recycling in Poland in conformity with EU and Polish regulation and economic calculation
In Poland there is no professional organization of an industrial scale for ship recycling business. There is no National legislation regulating recycling of ships and there are neither professional procedures nor good practices developed as yet.

Due to the value of metal from decommissioning, recycling of small metal ships take place in Poland while recycling of composite and wooden ships is basically not taking place on an industrial scale but is managed by the owners.

Decommissioning of small metal ships and recycling of waste originating from small metal ships takes place in existing industrial facilities suited for decommissioning of vehicles, wagons, machines, cars and ships in the ships yards, ships servicing and maintenance workshops, and scrap iron recycling centres.

Decommissioning of small sea-going ships takes place primarily in the coastal area. The inland ships like barges and pontoons are decommissioned primarily in the scrap iron recycling centres. The volume of scrap metal obtained in 2010 is assumed at the level of about 12 000 tonnes however the exact number is difficult to verify due to trade secrets of operators.

The table below presents the types of materials used for vessels construction. It is not possible to present the exact information on volume and measurements. The proportions for given ships category are known but there are no precise data for whole fleet.
Recovery of obsolete vessels not used in the fishing trade

Information on % of volumes for materials used for vessels construction

<table>
<thead>
<tr>
<th>MATERIALS (% OF VOLUME)</th>
<th>MOTOR BOATS</th>
<th>INFLATABLE BOATS</th>
<th>YACHTS</th>
<th>OTHER BOATS</th>
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<tbody>
<tr>
<td>Resins reinforced glass fibre</td>
<td>60</td>
<td>2</td>
<td>60</td>
<td>65</td>
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<td>Ropes</td>
<td>0</td>
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<td>Wood</td>
<td>5</td>
<td>0</td>
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<td>5</td>
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<td>Steel</td>
<td>5</td>
<td>2</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Glass</td>
<td>0,05</td>
<td>0</td>
<td>0,05</td>
<td>2</td>
</tr>
<tr>
<td>Plastic</td>
<td>0,3</td>
<td>20</td>
<td>0,3</td>
<td>2</td>
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<tr>
<td>PVC/ elastomer</td>
<td>0,5</td>
<td>56</td>
<td>0,5</td>
<td>2</td>
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<tr>
<td>Electrical wire</td>
<td>0,05</td>
<td>1</td>
<td>0,05</td>
<td>1</td>
</tr>
<tr>
<td>Water washings</td>
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<tr>
<td>Motors</td>
<td>10</td>
<td>10</td>
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<td>Electrical components</td>
<td>3</td>
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<td>Other</td>
<td>5</td>
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<td>Bath equipment</td>
<td>5</td>
<td>0</td>
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<td>Furniture</td>
<td>5</td>
<td>2</td>
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<tr>
<td>Sails</td>
<td>0</td>
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<tr>
<td>Oils</td>
<td>0,05</td>
<td>1</td>
<td>0,05</td>
<td>1</td>
</tr>
<tr>
<td>Refrigerators</td>
<td>0,05</td>
<td>1</td>
<td>0,05</td>
<td>1</td>
</tr>
<tr>
<td>Batteries</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Materials (% of volume) in total</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

Conclusions

Currently, decommissioning of ships and recycling of waste originating from ships take place on a limited scale at shipyards, service and maintenance workshops rendering services for maritime business and a number of scrap iron recycling centres in Poland, primarily in the coastal area.

Based on known figures the scale of recycling of ships is low. The number of ships decommissioned and recycled in the past years is considered very little.

In the view of the current low supply of small ships for decommissioning and recycling, current regulatory framework and lack of business incentives to enhance recycling of small ships there is no need for new recycling facilities. No financial incentives are offered by EU or Polish government to ship owners to promote proper recycling of ships according to regulation. Small ships are dismantled and steel parts are sold to scrap yard as prices of scrap metal are attractive in Poland. However, other materials may constitute a problem for the envi-
Recovery of obsolete vessels not used in the fishing trade

Environment as waste i.e. polished wood and composites (synthetic resin, glass fibre, asbestos). Due to high cost of the offered technology as well as health and safety costs, processing of composites is not profitable.

**Key Findings and Observations**

A problem with verification of data for the fleet below 500 GT in Poland was identified. It was proposed by the stakeholders to request the Statistical Office in Szczecin, Maritime Statistics Centre to collect the complete set of data about small ships.

It was a general understanding by the stakeholders that there is a lack of EU regulation referring to small vessels.

It was a general conclusion of the stakeholders that resolutions, regulations referring to recycling of vessels need to be revised. Vessels cannot be treated as a "waste" but "vessel destined for recycling" which would ease transportation of vessels to the recycling place.

The situation of Polish ship owners "escaping" Polish Law to sail / operate under foreign flag to avoid Polish customs and tax requirements was discussed and the consequences of employment law in maritime business in Poland.

It was recognized by the workshop attendees that car dismantling enterprises could be used for dismantling of small vessels. However, these units are specialised for cars dismantling and it would be technically and economically less efficient to use it for ships dismantling.

It was suggested that the categories chosen for defining the scope of problem in Poland may not be the optimal categories to focus on in the data collection process. According to participants it would be more significant if material used for vessel construction (steel, wood or composite material) was taken under consideration rather than sizes or usage.

Focus shall be kept on PCB or asbestos in small vessels. The substances do not appear in the table in our presentation showing volume percentages of different boat components, but this does not mean that small vessels do not contain this sort of waste.

**Summary and Conclusions**

The workshop discussions indicated that the presented subject has a slightly different nature in other European countries, however some aspects are similar.

Difficulties to collect a complete set of Polish data on small vessels are related to the fact that a number state institutions and associations are responsible for individual registers. The other problems results from the fact that registration of Polish owned ships is done under foreign flags mostly outside the EU due to economical reasons.
Recovery of obsolete vessels not used in the fishing trade

The workshop gave a clear impression that the major problem is not recycling of small vessels under 500 GT but recycling of vessels in general.

The construction material value, costs of compliance with environmental requirements when recycling small ships (e.g. utilisation of hazardous materials) and other economical and tax issues need to be taken into account when drafting laws and procedures related to recycling of small ships to make it a profitable business.

Field visit

At the end of Day one a short visit was paid to Almex Spółka z o.o. which is a scrap company established in 1999. Almex Spółka z o.o. is primarily involved in buying and processing of steel scrap but also dismantle steel hulled ships to obtain steel for improvement of the quality of the different steel scrap fractions. Almex Spółka z o.o is located directly at the waterfront and dismantles ships up to 100 m length and 6 m wide. Dismantling occurs at the wharf. Work was carried out in line with Polish legislation and inspections by the different involved authorities were common.

This site visit demonstrated a well-organised and what appeared to be a compliant facility primarily organised with the purpose of processing scrap but with capacity for a certain amount of steel ship dismantling. Work was not ongoing on the day of the visit due to an unexpected electricity cut.

Figure 10-2 Different scrap fractions Figure 10-3 Barge made ready for dismantling at the wharf
Recovery of obsolete vessels not used in the fishing trade

**Figure 10-4** Collection point for hazardous substances  **Figure 10-5.** View of the site

**Venue:** Campanile Hotel, Szczecin

**AGENDA DAY 1**

Focus on: small and abandoned vessels

Monday May 23rd 10:00-16:00

10:00-10:30 Introduction of the workshop and of the study (*COWI A/S*)

Session 1: Identification and characterization of small and abandoned vessels

10:30-11:00 Presentation of the preliminary results of data collection about the European situation (*COWI A/S*)

11:00-11:30 Overview of the Polish situation concerning small vessels below 500 GT and abandoned vessels (*Maritime Experts Association*)

Break

11:40-12:10 Overview of the legal basis and legislation concerning small and abandoned vessels as well as inland and government owned vessels in Poland (*COWI Polska*)

2:10-12:30 Stakeholder questions

Lunch break

Session 2: Current scrapping/ recycling practices of small and abandoned vessels

14:00-14:30 Current scrapping/recycling practices of small and abandoned vessels (*COWI A/S*)
Recovery of obsolete vessels not used in the fishing trade

14:30-15:00 Overview of the Polish situation concerning recycling of small vessels (Maritime Experts Association)

Break

15:10-15:40 Stakeholder discussion and questions
Specific challenges for environmentally sound dismantling of government owned vessels in Greece. Key issues and expectations for future policy at EU level

15:40-16:00 Conclusion and next steps
Obtaining additional information. Maintaining contact

AGENDA DAY 2

Focus on: inland and government owned vessels

Tuesday May 24th 10:00-16:00

10:00-10:30 Introduction of the workshop and of the study (COWI A/S)

Session 1: Identification and characterization of small and abandoned vessels

10:30-11:00 Presentation of the preliminary results of data collection about the European situation (COWI A/S)

11:00-12:00 Overview of the Polish situation concerning inland and government owned vessels (Maritime Experts Association)

Break

12:10-12:30 Stakeholder questions

Lunch break

Session 2: Current scrapping/recycling practices of inland and government owned vessels

14:00-14:50 Current scrapping/recycling practices for inland and government owned vessels (COWI A/S)

14:50-15:20 Overview of the Polish situation concerning recycling inland and government owned vessels (Maritime Experts Association)

Break

15:30-15:40 Stakeholder discussion and questions
Specific challenges for environmentally sound dismantling of inland and government owned vessels in Poland. Key issues and expectations for future policy at EU level
Recovery of obsolete vessels not used in the fishing trade

15:40-16:00 Conclusion and next steps
Obtaining additional information. Maintaining contact

Workshop participants

<table>
<thead>
<tr>
<th>Organisation</th>
<th>Name</th>
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</thead>
<tbody>
<tr>
<td>IMS TECINN Mieczysław Scheibe</td>
<td>Mieczysław Scheibe</td>
</tr>
<tr>
<td>Akademia Morska w Szczecinie (Maritime University of Szczecin)</td>
<td>Krzysztof Pleskacz, Capt.</td>
</tr>
<tr>
<td>Urząd Morski w Słupsku (Maritime Office in Słupsk)</td>
<td>Piotr Pryputniewicz</td>
</tr>
<tr>
<td>Urząd Żeglugi Śródlądowej (Inland Sailing Office)</td>
<td>Piotr Szalański</td>
</tr>
<tr>
<td>Urząd Statystyczny w Szczecinie (Statistical Office in Szczecin Maritime Statistics Centre)</td>
<td>Aniela Litke, DR/PhD</td>
</tr>
<tr>
<td>Urząd Statystyczny w Szczecinie (Statistical Office in Szczecin Maritime Statistics Centre)</td>
<td>Anna Bilska</td>
</tr>
<tr>
<td>Polski Rejestr Statków (Polish Register of Shipping)</td>
<td>Michał Jahnke</td>
</tr>
<tr>
<td>Stowarzyszenie ekspertów Morskich (Maritime Experts Association)</td>
<td>Krzysztof Lewanowicz, Capt.</td>
</tr>
<tr>
<td>Stowarzyszenie ekspertów Morskich (Maritime Experts Association)</td>
<td>Jacek Ciepłowski, Capt.</td>
</tr>
<tr>
<td>Stowarzyszenie ekspertów Morskich (Maritime Experts Association)</td>
<td>Andrzej Kryżan, Capt.</td>
</tr>
<tr>
<td>Akademia Morska w Szczecinie (Maritime University of Szczecin)</td>
<td>Zofia Jóźwiak, PhD</td>
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<td>Akademia Morska w Szczecinie (Maritime University of Szczecin)</td>
<td>Wiesław Galor, PhD</td>
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<td>Akademia Morska w Szczecinie (Maritime University of Szczecin)</td>
<td>Marek Górzeński, Capt.</td>
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<td>Akademia Morska w Szczecinie (Maritime University of Szczecin)</td>
<td>Uchytil Vojtech</td>
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<td>Akademia Morska w Szczecinie (Maritime University of Szczecin)</td>
<td>Milena Stałęga</td>
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<td>Dawid Dowlacz</td>
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<td>Andrzej Nowakowski</td>
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<td>Akademia Morska w Szczecinie (Maritime University of Szczecin)</td>
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<tr>
<td>Zarząd Morskich Portów Szczecin i Świnoujście S.A. (Szczecin and Swinoujscie Seaports Authority)</td>
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<tr>
<td>Polskie Stowarzyszenie Morskie - Gospodarcze im. Eugeniusza Kwiatkowski</td>
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## Recovery of obsolete vessels not used in the fishing trade

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<tr>
<td>Szczecińska Stocznia Remontowa GRYFIA SA (Szczecin Ship Yard GRYFIA JSC)</td>
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<td>Almex Sp. z o.o.</td>
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<td>Autocomp Electronic Sp. z o.o.</td>
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<tr>
<td>Journalist</td>
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<tr>
<td>Zachodniopomorski Urząd Marszałkowski (Office of the Marshal of the Zachodniopomorskie Voivodship)</td>
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<td>IMS TECINN Mieczysław Scheibe</td>
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Appendix D5 National Workshop in Athens, Greece, held on 25 May 2011

Presentations and Discussion

The meeting started with an overview by Maria Banti followed by a summary of the project and its purpose by George Kiayias for the European Commission.

Captain Sampatakakis provided an overview of the HKC and emphasised the intention for it to be implemented uniformly. He reflected on EU aims of improving recycling practices and pointed to the need for IMO rules to be implemented generally. Furthermore Mr. Sampatakakis pointed out that Greece is a cross road for vessels. Many obsolete vessels end their lifecycle in Greece.

Roy Watkinson for the consultants presented an introduction to the project itself and the tasks to be undertaken. To provide a common understanding of the objectives, scope and findings to date of the project the consultants presented a summary of the first Brussels workshop of 8th April 2011; Ulla Brandt for the consultants described the findings from analysis of the data provided by the Commission. There followed introductions to each of the topic areas by those present, with discussion.

Maria Kiposoglou, representative of the Greek Ministry of Citizen Protection, Hellenic Coast Guard provided the background to the Greek situation concerning abandoned ships, wrecks, hazardous and confiscated vessels (seized for illegal activity). Ms. Kiposoglou described the applicable legislation in particular the law 2881/2001 on the Regulation of the Recovery of Shipwrecks. This was followed by a discussion of the registration system for vessels in Greece. Ms. Kiposoglou explained that all vessels above 2 metres must be registered by name, owner, condition (e.g. abandoned, shipwreck) and type with the Port Authority. Each port authority is responsible to register every vessel above 2 metres and inform the Hellenic Coast Guard accordingly. It is the responsibility of the local port authority to enforce the legislation which applies throughout Greece. Furthermore she described the activity of a working group aimed at establishing the administration system for permission to dismantle a vessel.

Ms. Kiposoglou identified that up to the end of 2010 some 743 vessels had been reported as abandoned (under different categories) of which 55 had been recovered and 678 were “pending”. A formal process for disposing of recovered vessels exists which may lead to sale by tender by the municipality if an owner is not identified.

Ulla Brandt presented the preliminary results obtained during the study of abandoned vessels data.

In response to questions on scrapping it was stated that according to the Greek environmental legislation recycling facilities must have specific permits (operation permit and decision on environmental terms). There is not much experience about ship recycling in Greece since there is only one permitted recycling
Recovery of obsolete vessels not used in the fishing trade

facility. Most of the vessels made with steel hulls would be destined to Turkish dismantling/recycling facilities. In Greece local authorities have important role for inspection of any such facility and enforcement, although other bodies, such as Environmental Inspectorate of the Ministry of Environment, Energy and Climate Change have the authority to make inspections in recycling facilities in order to ensure that the terms of environmental permits are followed. The Division of Control of Air Pollution and Noise of the Ministry of Environment, Energy and Climate Change is responsible for permitting recycling facilities of high capacity.

Mr Varelidis described in more detail the one permitted facility known to scrap vessels in Greece. It has the capacity to deal with some 50 vessels per year, mostly small steel-hulled ships, and is subject to an environmental permit. Recreational craft were not dismantled at this facility. Other ships exported to Turkey according to the Basel Convention and the provisions of European Waste Shipment Regulation 1013/2006. Ships with valid legal navigation certificates were not regarded as waste.

Greece was considering proposals to deal with small vessels as with end of life vehicles, currently examining the scope and technical issues.

In discussion on Government owned ships a general statement was made by a representative of the Ministry of Defence that identified a list of norms according to which naval vessels are removed from service and how they may be disposed of. This may include sale for further use, use as training ship, scrapping; hazardous materials would be removed along with equipment and consultation with other concerned Ministries on standards of treatment.

The hosts Ministry of Environment, Energy and Climate Change were thanked for providing the venue.

Key Findings and Observations

1 There is only one permitted ship recycling facility in Greece.

2 Larger vessels are sent abroad, many to Turkey, for dismantling in line with trans-boundary shipment rules.

3 Greece is considering introducing a system to control recycling of small vessels equivalent to that for end of life vehicles. Meaning that ships with valid legal navigation certificates are not regarded as waste.

4 They expect that more sites will become established over time.

5 About navy vessels more information will be available in the near future (next weeks).

6 Most of the control with abandoned vessels lies with the local authorities.
7 The bureaucracy related to permissions to dismantle vessels in Greece is perceived by some as being an obstacle for the industry that wishes to operate nationally. This is recognized by the Greek authorities who are working a simplification of the process.

Summary and Conclusions

A system of monitoring and reporting on abandoned vessels is in place. No other data on vessels sent for dismantling was readily available. Few facilities exist in Greece for ship dismantling either for larger vessels or smaller ones. The only permitted ship recycling facility deals mainly with small steel hulled vessels. Larger ships and abandoned vessels particularly would be exported according to transboundary waste shipment rules. Naval vessels may be sold on for use or scrapped. The most likely destination for ships to dismantling facilities is Aliaga, Turkey. A working group is examining additional requirements for recycling small vessels and a consultation paper is expected to be produced.

Venue: Ministry of Environment, Energy and Climate Change, 119, Mesogeion ave., Athens, Greece

Agenda

10:00-10:30 Introduction of the workshop and of the study

Session 1: Identification of small and abandoned vessels

10:30-11:00 Presentation of the preliminary results of data collection (Speakers: project team member: Mr. Roy Watkinson and Mrs. Ulla Kristine Brandt)

11:00-11:30 Overview of the Greek situation concerning small vessels below 500 GT (including recreational craft and commercial vessels eg. small ferries etc) (Speaker: Mrs. Maria Kiposoglou Ministry of Citizen Protection, Hellenic Coast Guard)

Break

11:40-12:10 Overview of the legal basis and legislation in Greece concerning abandoned vessels. (Speaker: Mrs. Maria Kiposoglou Ministry of Citizen Protection, Hellenic Coast Guard)

2:10-12.30 Stakeholder questions

Lunch break

Session 2: Current scrapping/ recycling practices of inland and abandoned vessels
14:00-14:30 Current scrapping/recycling practices of small vessels in the EU. Presentation of the preliminary results of the data collection ((Speakers: project team member: Mr. Roy Watkinson and Mrs. Ulla Kristine Brandt)

14:30-15:00 Overview of the Greek situation concerning recovery and dismantling of inland and abandoned vessels (Speaker: Mr Petros Varelidis, Ministry of Environment, Energy & Climate Change Cabinet of the General Secretary)

Break

15:10-15:40 Stakeholder discussion and questions
Specific challenges for environmentally sound dismantling of government owned vessels in Greece. Key issues and expectations for future policy at EU level

15:40-16:00 Conclusion and next steps
Obtaining additional information. Maintaining contact

Participants

<table>
<thead>
<tr>
<th>Organisation</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ministry of Maritime Affairs, Islands &amp; Fisheries Minister’s cabinet</td>
<td>Captain (H.C.G.) (T), SAMPATAKAKIS Elias</td>
</tr>
<tr>
<td>Ministry of Defense General Staff of the Navy</td>
<td>Mr. Manolis, General Director of economical planning and support</td>
</tr>
<tr>
<td>Ministry of Environment, Energy &amp; Climate Change, Minister’s cabinet Deputy Minister’s cabinet General Secretary of Environment General Director of Environment Division of Environmental Planning Waste Management Department Unit of Alternative Management of packing and other products Division of Air and Noise Pollution Department of Industries Special Secretariat For Water</td>
<td>Mr. Psyhas Mr. Kourmousis Mr. Varelidis Mr. Manouris Mr. Mahairas Ms. Banti Mrs. Xenou</td>
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<tr>
<td>National Organization of Alternative Management of packing and other products</td>
<td>Ms. Banti</td>
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<tr>
<td>Hellenic Chamber of Shipping</td>
<td>Mr. George Gabriel</td>
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<tr>
<td>Germanischer Lloyd Greece, Piraeus</td>
<td>Athanasios Reisopoulos Area Office Southern Europe (Maritime Services)</td>
</tr>
<tr>
<td>UNEP/MAP</td>
<td>Tatiana Hema; Maria Luisa Silva</td>
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<td></td>
<td>Dimitris Tsotsos</td>
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</table>
Appendix E  Stakeholder questionnaire

The four questionnaires are intended to gather information about the recovery practices for small vessels, government service vessels (and navy vessels) and abandoned vessels. Some types of very small craft are excluded from the scope as specified hereunder.

THIS TEXT IS SENT TO ALL RESPONDENTS. IT IS STATED IN THE INTRODUCTION EMAIL THAT IT CONTAINS INTERNET LINKS TO ALL FOUR QUESTIONNAIRES.

A significant amount of work has been carried out in the area of ship recycling and the impacts of these activities. Most of this existing work has been focusing on large, seagoing, commercial ships, i.e. ships covered by the HKC.

To get a comprehensive picture of the current practices and impacts of vessel dismantling not covered by the HKC, the European Commission, Directorate General Environment has commissioned COWI together with Leitat and RWEC to undertake a study of the issues associated with these non-HKC vessels:

- Ships below 500 GT
- Ships above 500 gross tonnes operating only in the sovereign waters of the country whose flag they are entitled to fly
- Government-owned vessels including navy vessels and abandoned vessels

Certain vessel types are not within the scope of this study, and if you are exclusively dealing with only the vessel types, mentioned at the end of this mail, then this questionnaire study does not apply to you.

As part of the study, a questionnaire has been developed to gather information about numbers of vessels in operation and for dismantling, current dismantling practices and the impacts of these practices.

The questionnaire has been divided into four parts focusing on the main vessel types and the current recycling facilities/practices:

- Small vessels below 500 GT (Examples of relevant stakeholders: vessel owners associations, vessel registration bodies and classification societies). [Link to questionnaire]
- Government owned vessels including naval vessels (Examples of relevant stakeholders: navies of EU member states, EU state owned ferry companies, national Ministries and maritime authorities) [Link to questionnaire]
- Abandoned vessels (Examples of relevant stakeholders: harbours, coastal and inland waterway authorities of EU member states, IGOs and NGOs) [Link to questionnaire]
Recovery of obsolete vessels not used in the fishing trade

- Recycling facilities/practices for the above-mentioned vessel types (Examples of relevant stakeholders: regulatory authorities and agencies of EU member states and vessel recycling facilities)
  [Link to questionnaire]

We have contacted you as a stakeholder who could hold valuable information about one or several of the above areas. If you hold information relevant for more than one of the above questionnaires, please fill in these questionnaires individually.

It is our estimation that it takes less than 10 minutes to complete a questionnaire. We would appreciate your input, also if you do not have data available for answering all questions within the questionnaire. We would appreciate very much receiving your answers before March 14th 2011.

If you are not the correct person in your organisation to answer these questions, please help us by trying to locate the right recipient and forward this email.

Please do not hesitate to contact Ulla Kristine Brandt: ukbr@cowi.com with your questions or comments.

Thank you very much in advance for your time and cooperation.

Excluded in this study are:
- Fishing vessels
- Wrecks (any vessel covered by the Wreck Removal Convention)
- Personal watercrafts (jet skis)
- Kite surfing equipment
- Very small craft, e.g. less than 4m
- Rubber dinghies (with/without outboard motors).
QUESTIONNAIRE TEXT. INTRODUCTION TO ALL FOUR QUESTIONNAIRES

Welcome to the questionnaire on recovery and dismantling of obsolete vessels not used in the fishing trade.

Thank you for taking the time to answer the questionnaire.

In the questionnaire, we will ask you to provide information about obsolete vessels. Please remember that you do not have to provide accurate information if you do not have it. An approximate amount or your most qualified assessment is sufficient.

You enter the questionnaire by clicking the 'Next-button' below.

If you have any questions related to content issues, do not hesitate to contact Ulla Kristine Brandt at UKBR@cowi.dk (Tel: +45 87 39 68 31). Any technical questions encountered will be answered if you contact Nis Benn at NVBE@cowi.dk (Tel: +45 45 97 19 79).

What is the name of the organisation that you represent?
What is the role of your organisation?

→ Governmental agency
→ Ministry
→ Trade organisation
→ NGO
→ Boat owners organisation
→ Shipbuilding and/or repair company
→ Other

What is the address of your organisation's main office / headquarters
What is your email address?
What is your telephone number?

For your information: The questionnaire consists of two distinct parts. Part A regards abandoned vessels and Part B concerns the general recycling of non-Hong Kong vessels.

TEXT FROM THE FOUR QUESTIONNAIRES (EXPLANATORY TEXT IN THE INTERNET VERSION IS EXCLUDED HERE)

QUESTIONNAIRE ON ABANDONED VESSELS

For which country can you provide data?
If relevant, please specify your area of responsibility within your country.
Recovery of obsolete vessels not used in the fishing trade

Which unit will you be using, when you are answering?

→ Light Displacement Tonnes (LDT)
→ Gross Tonnes (GT)

How many cases of ship abandonment are typically reported in a year?

Please give the percentage of abandoned vessels in each of the following locations.

→ Harbour / Port
→ Beach
→ Controlled waters
→ Other

Can you describe the most typical circumstances surrounding ship abandonment?

Are the abandoned vessels recorded in an official register?

→ No
→ Yes

Please enter the name of this register.

Is the register available on the Internet?

→ Yes
→ No

Please indicate which types of information are included in the registers.

Do you normally make attempts to trace the owner of an abandoned vessel?

→ No
→ Yes

How often are you successful in tracking down the owner of the vessel?

→ Never
→ Not very often
→ Sometimes
→ Often
Recovery of obsolete vessels not used in the fishing trade

→ Always or almost always

How many percent of the abandoned vessels are...
→ Left alone to break up naturally
→ Recovered by authorities
→ Other

What are the approximate recovery costs per vessel?

You have now finished Part A of the questionnaire and are about to commence answering the questions in part B about the general recycling of non-Hong Kong vessels.

Can you describe which factors determine the decision to dismantle?

How far is a vessel typically sent to be dismantled?

Please indicate the percentage of obsolete vessels sent to each of the following destinations to be dismantled / recovered / broken.
→ Not moved
→ In nearest harbour / port
→ In country of origin
→ In another EU state
→ Outside EU

What is the average dismantling cost per tonne?
What is the average dismantling cost per vessel?
What is the average income per vessel (from re-use, recovery or sales of materials and equipment)?
What is the average cost for residue disposal per vessel?

QUESTIONNAIRE ON RECYCLING FACILITIES/PRACTICES

For which country can you provide data?

If relevant, please specify your area of responsibility within your country

Which unit will you be using, when you are answering?
→ Light Displacement Tonnes (LDT)
→ Gross Tonnes (GT)

Which dismantling, breaking or recycling locations are known to be employed in your area of responsibility?
→ Dock
Recovery of obsolete vessels not used in the fishing trade

- Pier
- Slipway
- Beach / Foreshore
  - Proportion of vessels treated in this way
  - Total tonnage of vessels
  - Number of vessels
  - Period for which data is provided here

Please indicate the number of dismantling, breaking or recovery sites known to be operating within your area of responsibility.

Please describe the geographical location or spread of these facilities.

Please indicate the number of permits currently issued for dismantling operations within your area of responsibility.

How many tonnes are treated per year in these facilities? If you don't know, please indicate the total capacity of these facilities.

Please indicate the percentage of materials from dismantling that goes to each of the waste treatment operations.
- Re-use
- Recycling
- Incineration
- Land-fill
- Other treatment
  - Please describe

Please indicate an approximate number of informal dismantling, breaking or recovery sites known to be operating within your area of responsibility.

What is the approximate proportion of obsolete vessels treated at these sites?

Please describe, in your own terms, what you understand by the phrase 'good practice for vessel recovery'.
Can you please supply any information available to you about the typical containment methods employed to prevent the escape of pollutants at the facilities you know of.

Please describe any prevalent sub-standard practices that you are aware of.

You have now finished Part A of the questionnaire and are about to commence answering the questions in part B about the general recycling of non-Hong Kong vessels.

Can you describe which factors determine the decision to dismantle?

How far is a vessel typically sent to be dismantled? (Enter approximate number of kilometres)

Please indicate the percentage of obsolete vessels sent to each of the following destinations to be dismantled / recovered / broken.

- Not moved
- In nearest harbour / port
- In country of origin
- In another EU state
- Outside EU

What is the average dismantling cost per tonne?

What is the average dismantling cost per vessel?

What is the average income per vessel (from re-use, recovery or sales of materials and equipment)? Please give your answer in Euros.

What is the average cost for residue disposal per vessel?

Are the obsolete vessels recorded in an official register?

- No
- Yes

Please enter the name of this register
QUESTIONNAIRE ON GOVERNMENT OWNED VESSELS INCLUDING NAVAL VESSELS

For which country can you provide data?

Which unit will you be using, when you are answering?
⇒ Light Displacement Tonnes (LDT)
⇒ Gross Tonnes

Please give any historical information you have about number and/or weight of obsolete government owned vessels.
⇒ Year: For which year/years is this data?
⇒ Please give total weight (in GT or LDT) of obsolete vessels
⇒ Number: Please give the total number of obsolete vessels with a length under 15 m
⇒ Please give the total number of obsolete vessels with a length from 15 to 24 metres
⇒ Please give the total number of obsolete vessels with a length above 24 m

Please indicate the future expected tonnage or number of obsolete government owned vessels which will be sent for recovery - if you have any such data.
⇒ Year: For which year/years is this data?
⇒ Please give total weight (in GT or LDT) of obsolete vessels
⇒ Number: Please give the total number of obsolete vessels with a length under 15 m
⇒ Please give the total number of obsolete vessels with a length from 15 to 24 metres
⇒ Please give the total number of obsolete vessels with a length above 24 m

Are the obsolete government owned vessels recorded in an official register?
⇒ No
⇒ Yes

Please enter the name of this register
Please indicate what other materials are found on board of obsolete government owned vessels by typing an approximate average quantity where possible:

- Fuels
- Oils
- Batteries (lead-acid)
- PCBs
- Heavy metals
- Paint additives
- Radioactive substances
- Boat safety (flares)
- Any other potentially hazardous materials

You have now finished Part A of the questionnaire and are about to commence answering the questions in part B about the general recycling of non-Hong Kong vessels.

Can you describe which factors determine the decision to dismantle?

How far is a vessel typically sent to be dismantled?

Please indicate the percentage of obsolete vessels sent to each of the following destinations to be dismantled / recovered / broken.

- Not moved
- In nearest harbour / port
- In country of origin
- In another EU state
- Outside EU

What is the average dismantling cost per tonne?

What is the average dismantling cost per vessel?

What is the average income per vessel (from re-use, recovery or sales of materials and equipment)?
Recovery of obsolete vessels not used in the fishing trade

What is the average cost for residue disposal per vessel?

QUESTIONNAIRE ON SMALL VESSELS BELOW 500 GT
For which will you be filling out data?
→ Country
→ Region
→ EU-27

For which type / types of obsolete vessels do you have data?
→ Passenger ferries
→ Freight vessels
→ General cargo vessels
→ Dredgers, cable layers and other special purpose vessels
→ Research and monitoring vessels
→ Tugs and off-shore workboats
→ Naval vessels
→ Motorboats and yachts
→ Diving platforms
→ Other

Which unit will you be using, when you are answering?
→ Light Displacement Tonnes (LDT)
→ Gross Tonnes (GT)

Please give any information you have about number and/or weight of obsolete vessels.
→ Year: For which year is this data?
→ Please give total weight (in GT or LDT) of this type of obsolete vessel
→ Number: Please give the total number of this type of obsolete vessel with a length under 15 m
→ Please give the total number of this type of obsolete vessels with a length from 15 to 24 metres
→ Please give the total number of this type of obsolete vessels with a length above 24 m
Are the obsolete vessels recorded in an official register?

→ No
→ Yes

Please enter the name of this register

What is (on average) the main material of which the hull is composed for these types of obsolete vessels?

→ Type of vessel

- Passenger ferries
- Freight vessels
- General cargo vessels
- Dredgers
- Cable layers and other special purpose vessels
- Research and monitoring vessels
- Tugs and off-shore workboats
- Motorboats and yachts
- Diving platforms
- Other
  - Steel
  - Fibre-glass
  - Wood
  - Other

What are the approximate average quantities of materials by tonnes/weight for each obsolete vessel of this type?

→ Type of vessel

- Passenger ferries
- Freight vessels
- General cargo vessels
- Dredgers
- Cable layers and other special purpose vessels
- Research and monitoring vessels
- Tugs and off-shore workboats
Recovery of obsolete vessels not used in the fishing trade

- Motorboats and yachts
- Diving platforms
- Other
  - Steel
  - Non-ferrous metals
  - Wood
  - Fibre-glass
  - Composites

Please indicate what other materials are found on board of these types of obsolete vessels by typing an approximate average quantity where possible. You may also supply the typical range of the quantity.

Type of vessel

- Passenger ferries
- Freight vessels
- General cargo vessels
- Dredgers
- Cable layers and other special purpose vessels
- Research and monitoring vessels
- Tugs and off-shore workboats
- Motorboats and yachts
- Diving platforms
- Other
  - Fuels
  - Oils
  - Batteries (lead-acid)
  - PCBs
  - Heavy metals
  - Paint additives
  - Firefighting equipment (type of chemical if known)
  - Boat safety (flares)
  - Any other potentially hazardous materials
Recovery of obsolete vessels not used in the fishing trade

Please indicate how old these types of obsolete vessels are when they are sent for recovery.

Type of vessel
- Passenger ferries
- Freight vessels
- General cargo vessels
- Dredgers
- Cable layers and other special purpose vessels
- Research and monitoring vessels
- Tugs and off-shore workboats
- Motorboats and yachts
- Diving platforms
- Other
  - 0-9 years
  - 10-19 years
  - 20-24 years
  - 25-29 years
  - 30-34 years
  - 35-39 years
  - 40 years or older

Please indicate the future expected tonnage or number of obsolete vessels which will be sent for recovery - if you have any such data

Type of vessel
- Passenger ferries
- Freight vessels
- General cargo vessels
- Dredgers
- Cable layers and other special purpose vessels
- Research and monitoring vessels
- Tugs and off-shore workboats
- Motorboats and yachts
- Diving platforms
- Other
Recovery of obsolete vessels not used in the fishing trade

- Total tonnage
- Number
- Time period for forecast

Please indicate the most common location for dismantling for recovery of these types of obsolete vessels

➔ Type of vessel
  - Passenger ferries
  - Freight vessels
  - General cargo vessels
  - Dredgers
  - Cable layers and other special purpose vessels
  - Research and monitoring vessels
  - Tugs and off-shore workboats
  - Motorboats and yachts
  - Diving platforms
  - Other
    - On a beach
    - Mooring
    - At a dry-dock
    - At a boat or ship-breaking yard
    - At another yard - e.g. car dismantler
    - Other

Please indicate the typical destination of equipment after breaking or recovery of these types of obsolete vessels.

➔ Type of vessel
  - Passenger ferries
  - Freight vessels
  - General cargo vessels
  - Dredgers
  - Cable layers and other special purpose vessels
  - Research and monitoring vessels
  - Tugs and off-shore workboats
Recovery of obsolete vessels not used in the fishing trade

- Motorboats and yachts
- Diving platforms
- Other
  - Re-use
  - Shops
  - Breaking for spares
  - Disposal

Where do the residues end up, when obsolete vessels are broken up?

⇒ Type of vessel
  - Passenger ferries
  - Freight vessels
  - General cargo vessels
  - Dredgers
  - Cable layers and other special purpose vessels
  - Research and monitoring vessels
  - Tugs and off-shore workboats
  - Motorboats and yachts
  - Diving platforms
  - Other
    - Landfill
    - Recovery
    - Incineration
    - Reuse

Can you describe which factors determine the decision to dismantle?

How far is a vessel typically sent to be dismantled?

Please indicate the percentage of obsolete vessels sent to each of the following destinations to be dismantled / recovered / broken.

⇒ Not moved
⇒ In nearest harbour / port
⇒ In country of origin
Recovery of obsolete vessels not used in the fishing trade

→ In another EU state
→ Outside EU

What is the average dismantling cost per tonne?

What is the average dismantling cost per vessel?

What is the average income per vessel (from re-use, recovery or sales of materials and equipment)?

What is the average cost for residue disposal per vessel?

Closing Thanks

FINISH
Appendix F  Field visit reports

The following field visit reports are included:

F1 Desguaces Petrallo S.L., Port of A Coruña, Galicia, Spain

F2 Van Heyghen Recycling, Ghent, Belgium

F3 DK, Fornaes, Grenaa,

The field visit to Portsmouth Naval Base, Disposal and Reserve ships Organisation, is included in Appendix D2
Appendix F1 Desguaces Petrallo/LEMA, ES

Field Visit 1: DESGUACES PETRALLO:

Desguaces Petrallo is a ship dismantling company located in the Port of A Coruña, in Galicia, Spain.

During the field visit, the owner, Jose María Sánchez Mouzo, showed us the work they carried out and where they carried it out; they explained the details of their activity and invited us to enter a fishing vessel they were in the process of dismantling in order to make a better explanation. This information is provided below:

Desguaces Petrallo started their activity in 1994 and their every-day activity is the dismantling of fishing vessels. Apart from fishing vessels, they have also dismantled other types of vessels such as small merchant vessels (around 50m) or recreational boats (fibreglass catamarans); even through this isn’t considered part of their every-day activity but something done from time to time.

The first thing they have to do is to have their permits in order. The “Capitanía Marítima” (Maritime Authority that is part of the Ministry of Development) is the organ that has to issue a binding mandatory report to the Port Authority for dismantling activities inside port facilities. On the other hand, if the dismantling company wants to carry out the dismantling of any other vessel, different from the type they usually dismantle it is the Port Authority that gives the permit. According to Desguaces Petrallo, when you want to dismantle a different kind of vessel (merchant, recreational, among others) the only requirement made by the Port Authority is that the vessels fits in the “rail” (figure 1 & 2).

Figure 1
Figure 2
Recovery of obsolete vessels not used in the fishing trade

So, to the question made concerning this matter: Could you then dismantle whatever type of vessel? The answer was that the only requirement they had to meet was the “rail” measures.

Once they have the permits, their activity is carried out in two different areas in the Port of A Coruña:

1. Dock: Decontamination and degasification. Figures 3 & 4
2. Dry dock: Dismantling. Figure 5 & 6

Desguaces Petrallo carries out decontamination and degasification processes in the dock and then rents the dry dock (in the same Port) for dismantling activities. The rent costs approximately 12,000 EURs per vessel. Decontamination and degasification activities take from 15 to 30 days in the dock and dismantling activities take from 2 to 7 days in dry dock.

Degasification is carried out by an external company. Once degasification activities are finished ATISAE, an authorized control body (OCA)\(^\text{30}\) certifies degasification.

\(^{30}\) ATISAE authorized control body (OCA) - http://www.atisae.com/opencms/opencms/sectores/seguridad_industrial/OCA.pdf
During the decontamination process carried out in the dock the hydraulic grapple takes out parts of the vessels and puts them into the truck parked in the dock. During this process it sometimes drops pieces of metal into the sea. We do not know if every once in a while a diver is hired in order to recover the material that has fallen into the sea. This may have a negative environmental impact. (Figure 7)

Figure 7

Vessel dismantling (Figure 8 & 9) is a manual process with high risks for workers. Workers do not wear their personal protective equipment (PPE) in order to prevent working accidents, even though they are asked to by the owner of the company. Workers do not wear protective goggles nor protective masks, something that might be recommendable taking into consideration that the air quality inside the vessel that was being dismantled was not clean. Both the owner and the son of the owner explained that this activity has had an impact in their health over the years.
Once the dismantling activities are over, Petrallo contacts different waste management companies (they often work with companies such as VECINO and FINSA). The most common materials they find are metals, wood, cork and foam. All materials are taken by a waste management company. Wood is ground and taken to Santiago de Compostela (another city in Galicia, one hour away) for conglomerates.

When dismantling fibreglass vessels, fibreglass is either taken to waste management companies or taken to landfill.

Figure 10 overview of process
Desguaces LEMA is a company specialized in industrial dismantling, hazardous and non-hazardous waste management and metal valuation. Desguaces LEMA is authorized for waste management by the Galician government (Xunta de Galicia).

Desguaces Lema carries out the dismantling of vessels that have run aground. They also carry out activities such as the extraction of material from the bottom of the sea. For this work, they have high capacity cranes and qualified personnel.

Desguaces Lema invited us to their office (Figure 11) where we had the opportunity of having a conversation with the commercial director, José Antonio Lema, on the following matters: (There was no possibility of visiting their plant.)

They have mobile equipment, something that enables them to move from one point to another in order to carry out their activity.

When dismantling a vessel, Desguaces Lema issues a “destruction certificate” in which the registration number is always indicated.

As a waste management company that they are, they sometimes buy material to vessel dismantling companies, especially metal for smelting. They separate these metals and classify them in their plant. Wood is used for conglomerate.

They have worked with fibreglass in several occasions (dismantling recreational boats from time to time) but they always grind it and then it’s taken to landfill. They say that there is not enough amount of fibreglass in order for them to try and do something with it. They also say that fibreglass is a complicated material for a waste management company. The equipment that they normally use for fibreglass is industrial shears.

Sometimes they have transported a vessel with a truck to their plant for dismantling. The approximate cost of this transport is 2000EUR.
Some of the activities they have carried out in relation to vessel dismantling are the following:

- Dismantling and removal of the Greek oil tanker “Mar Egeo” (figures 12 & 13)
- Dismantling of the Cypriot vessel “Frihav”
- Rescue and unloading of the burnt down bulk “Diana María”
Appendix F2  Van Heyghen Recycling, Belgium

Site Visit Van Heyghen Recycling  22 June 2011

Purpose
This site visit is part of the overall programme of work under this study arranged to obtain updated information about ship dismantling practices in Europe with a view to identifying good practice for small and government owned vessels.

Present
Peter Wyntin – Van Heyghen Recycling
Sonja Hagen Mikkelsen - COWI
George Kaiayis – European Commission
Roy Watkinson -RWEC Ltd

The Company
Van Heyghen Recycling Ltd is part of Group Galloo, established in 1939. The group deals with ferrous and non-ferrous metals, WEEE and ELVs. Van Heyghen Recycling joined the group in 2002. Some 1 million tonnes of ferrous metals are processed per annum along with 60,000 tonnes of other metals and 20,000 tonnes of plastics. Van Heyghen Recycling has hundreds of metal categories according to quality and destination market.

Van Heyghen Recycling has 50 employees, 30 administrative and 20 working with ship dismantling. In additional 10-15 contractors are involved in the work.

Site Description
The site is located on the seaport of Gent at the further extremity of the Ghent-Terneuzen Canal. On the land side the site comprises some 10 hectares of open land for the most part laid to concrete varying from 1 metre (on the ship slipway) to 40 cm thick elsewhere. This provides a level firm surface for vehicle access and controlled drainage for surface water run-off and pollutant capture. The site is drained to a central pit connected to water treatment plant to remove oils and other sedimentary material dissolved matter.
The site is accessible by the main road network around Gent. The entrance to the site from the adjacent highway is controlled with a barrier and from the site reception office with nearby weighbridge.

Access to the site by sea is via the Schelde River through the canal limited only by the size of the lock gates at Terneuzen at the entrance to the canal. These have a draught of 12.5m deep and can accommodate a ship up to 265m long by 37m wide.

The site has a quayside of some 600metres length alongside which initial ship docking and preparation for subsequent dismantling can take place. A slipway some 38metres wide protected on the canal side by a double boom system (absorbent and curtain) is used for the final processing of ships.
Two high power winches are available to draw a ship of 5000 T lightweight fully up the slipway for dismantling. A mobile shear is used to size reduce the metal ship hull suitable for final processing grading and sorting.

A number of large concrete walled bays open on one side are provided for the storage of the various grades of metal separated by the site processing plant. Larger quantities of non-ferrous metals are in stockpiles in the middle of the site.
Recovery of obsolete vessels not used in the fishing trade

The ship recycling area is co-located with processes for treating end of life vehicles and other scrap metals.

**Plant and Equipment**
The site is substantially mechanised with most operations being carried out using mechanical equipment, fixed and mobile cranes with grabs and electromagnets, fixed and mobile shears, lorries and mechanical shovels for loading. A limited amount of cutting equipment is used for specialist tasks to assist in removal of superstructures and gain access to parts that mechanical shears cannot reach. Shredders and separating equipment are used to grade and prepare stock for sale to markets.
Recovery of obsolete vessels not used in the fishing trade

Throughputs
Van Heyghen Recycling processes some 40 vessels of varying sizes per annum amounting to approximately 25,000 tonnes annually. Capacity to treat up to 50,000 tonnes exists. 75 per cent by number of the received vessels are non-Hong Kong vessels corresponding to approximately 20 per cent by tonnage.

Cost for metal ships varies but are typical in the range of 100-150 EUR/tonnes.

Mostly smaller to medium sized vessels are treated up to 4,000 tonnes LDT and wooden and composite boats are also accepted. The largest vessel accepted in recent years was a UK Royal Navy ship “Brambleleaf” of some 9,000 tonnes LDT. Another UK Royal navy ship "Fearless" (16950 tonnes LDT) took 12 months to treat. Asbestos is often what holds the process back.

Van Heyghen Recycling is believed to be the largest such facility for ship recycling in Europe. Competition is primarily from Turkey. Heavy-laden asbestos vessels do normally not go to Turkey, as they are not up to standards.

More that 98 per cent of the material is recycled.

Process
Initial reception of a ship at site is on the quayside of the site within the canal. Here oil, fuel, asbestos and other hazardous materials on board the ship are checked against documentation identified and removed. Asbestos is removed from within the vessel by specialist subcontractors after the interiors have been removed. Subcontractors are using standard effective airborne fibre containment methods (temporary enclosure, airlocks for access and egress and changing and negative pressure system).

The vessels’ superstructure is cut and removed by crane to shore for dismantling. The ship may then be moved further along the dock adjacent to the slipway and internal equipment and engines for recovery are removed. The sides of the vessels are cut down to approximately 8 metres depth to allow the slipway dismantling shear to operate effectively within it.
Recovery of obsolete vessels not used in the fishing trade

The vessel is drawn up the slipway by winch and then finally dismantled by mobile shear. Size reduced steel is removed for processing.

**Hazardous Materials**
Hazardous wastes are removed before transport to the slipway.

All hazardous materials are removed and taken off site for disposal by specialist contractors. Records of total site hazardous materials removed were seen.

These waste streams are numerous from wood for recycling, waste destined for incineration or landfill, oily substances, asbestos, neon tubes, smoke detectors, cooling liquids, refrigeration liquids, paints, etc.

Many waste products are treated within the Group Galloo: white and brown goods, batteries, all types of ferrous and non-ferrous scrap etc.

The polyester and glass fibre waste is upgraded to solid recovered fuel and used as fuel in the cement industry (coincineration).

On average 10,000 ton of waste products (not ferrous or non-ferrous related) are treated by specialized subcontractors.

Asbestos-removal is the most costly part in recycling and is often under-estimated. Therefore van Heyghen is now doing own inventory. As an example “Brambleleaf” was estimated to have 4 tonnes but the actual amount was 23 tonnes. Asbestos waste is packed in double bags before removal. Non-friable asbestos is landfilled and friable asbestos is mixed with concrete.

Costs related to disposal of waste amounts to on average 600,000,00 EUR every year.

**Environmental Control**
The site management and procedures for environmental protection are conducted within ISO 9000 and ISO 14000 management systems framework. The site itself is open to inspection by customers and is inspected formally by the local municipal authority at Gent, several Governmental inspections (medical, health & safety, environment) and exports subject to EU Waste shipment controls through the national regulator OVAM.

Last environmental accident was an oil spill in 2006.

**Health and safety**
Last accident was a fall in 2006. Typical accidents and incidents have been trips, falls, burns, cuts and situations where workers get something in the eyes.
Appendix F3  Fornaes Recycling ApS, Denmark

Site Visit Fornaes Recycling ApS 30 June 2011

Purpose
This site visit is part of the overall programme of work under the study Recycling of Small Vessels not used in the Fishing Trade arranged to obtain updated information about ship dismantling practices in Europe with a view to identifying good practice for small and government owned vessels.

Present
Kresten Hjelm – Fornaes
Klaus Winther Ringgaard - COWI

The Company
The Company Fornaes Aps was founded in 1993 and has, since then, scrapped well over 1000 ships and vessels. Major part of them has been fishing vessels of various sizes, but there were also freighters, supply vessels, ferries and a military vessel among them. Most of the vessels being scrapped at Fornaes come from Scandinavia, UK, Germany and The Netherlands.

Fornaes' business is centred around dismantling of vessels for recycling of the metals and other valuable materials, but to a very large extent also on removing various equipment and ship parts and stocks for selling and reuse. Fornaes thus are believed to operate Northern Europe’s largest stock of used ship-equipment and marine machinery.

Figure 10-20  Pictures of ship-equipment and marine machinery at Fornaes ready for reuse

Fornaes has a staff of 25 people of which five are administrative.

Site Description
Fornaes Shipbreaking is located at the Port of Grenaa in the middle of Jutland Denmark.
On the land side the site comprises a relatively small cutting area of some 70 x 70 metres and around an additional 55,000 m2 for storage of the various fractions from the recycling operations including waste but mainly for storage of equipment and machinery for re-sell. 8,000 of these 55,000 m2 are under roof.

Ships waiting for and under preparation for recycling are anchored around the Port of Grenaa at positions provided by the port. At the time of visit some 10 ship of varying sizes were awaiting recycling and under varying stages of preparation for this. Images of some of these vessels are seen below.

*Figure 10-21 Two of the ships (ferry and a fishing vessel) anchored around the Port of Grenaa awaiting recycling at Fornaes*

The site is an integrated part of the Port of Grenaa and is thus not a separated and dedicated area. The cutting area is protected from the surroundings via a 1.5 metre concrete wall and the various storage areas are fenced off or inside buildings at the port, but these can generally be accessed during opening hours to allow customers to go round and inspect the equipment etc. on sale.

Waste and the different material fractions are stored in containers at the site. Generally metal waste are cut in to manageable pieces at the recycling site and loaded directly onto trucks bringing the metal to the metal recycling facility.

*Figure 10-22 Waste and various material fractions are stored in containers at site. Here containers for small metal scrap*
Plant and Equipment
The site is actually very simple as many operations are subcontracted to specialist companies. This also includes the reprocessing of metals and other recyclable materials, which is performed by another company. Fornaes thus only cut the material fractions into managerial fractions which are then collected by the specialist company doing the further sorting and reprocessing of material fraction at their own site.

Fornaes' plant thus only account to three mobile shears, a few smaller caterpillars and mobile cranes with varying equipment like grabs and shovels and cutting equipment used for removal of superstructures, gain access to parts that mechanical shears cannot reach and cutting of heavy duty pieces, which the shears cannot manage.

Throughputs
Fornaes ApS normally processes between 30 - 40 ships per year of varying sizes. The highest number processed was 100 ships one year when the layup of fishing vessels were at its highest.

Mostly smaller to medium sized vessels are treated. Mostly metal vessels are treated but also wooden and composite boats are accepted. The largest vessel accepted and treated at Fornaes to date was a 144 metre boat of around 4000 GT (estimate). During site visit a 114 metre and 2,600 tonnes ferry, Claire was awaiting recycling.

Process
Initial reception of a ship at site is on the quayside of the Port. The vessels’ superstructure is removed by crane to shore for reuse/recycling. Further internal equipment and engines for recovery are removed by the use of hand tools and cutting equipment. The sides of the vessels are cut down to approximately 1 metre above sea-level after which the remaining structure is lifted onto the cutting area for final cutting. The lifting is done by rented floating crane or land based cranes for smaller vessels. Before ships are lifted onto the cutting area a specialist company has removed asbestos and electrical equipment. Further prior to lifting to the cutting area the ship is being emptied for oil and slop water via the company's' own suction truck.

When preparing larger ships, which can not be placed closer to the quayside than one metre a floating boom is placed around the vessel. For recycling of smaller vessels below 200 tonnes the entire vessel has to be taken onto the cutting area for cutting.
Materials generation and costs including hazardous materials
As described above hazardous wastes are removed before transport to the cutting area unless for smaller vessels, which are lifted in one piece to the cutting area. All hazardous materials are removed and taken off site for disposal by specialist contractors.

Fornaes has the following waste streams based on discussion and supplemented by info in its environmental approval.

Table 10-1 Waste streams, storage conditions and estimated max. volume stored at site

<table>
<thead>
<tr>
<th>Waste fraction</th>
<th>Storage</th>
<th>Estimated max. volume at site, tonnes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Recovery of obsolete vessels not used in the fishing trade

<table>
<thead>
<tr>
<th>Item</th>
<th>Storage Location</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metal</td>
<td>In containers out- or indoor</td>
<td>10</td>
</tr>
<tr>
<td>Cables</td>
<td>Outdoor</td>
<td>4</td>
</tr>
<tr>
<td>Oil filters</td>
<td>Indoor in tight and closed containers</td>
<td>0.0</td>
</tr>
<tr>
<td>Electronics</td>
<td>Indoor in cages</td>
<td>3</td>
</tr>
<tr>
<td>Motor, gear and lubricating oils</td>
<td>Outdoor under roof in containers placed on trays</td>
<td>0.5</td>
</tr>
<tr>
<td>Oil containing water/slop</td>
<td>Outdoor under roof in containers placed on trays</td>
<td>5</td>
</tr>
<tr>
<td>Wood</td>
<td>Outdoor in containers</td>
<td>5</td>
</tr>
<tr>
<td>Insulation</td>
<td>Outdoor in containers</td>
<td>3</td>
</tr>
<tr>
<td>Concrete</td>
<td>Outdoor in containers</td>
<td>25</td>
</tr>
<tr>
<td>Soil with metal pieces</td>
<td>Outdoor in containers</td>
<td>8</td>
</tr>
<tr>
<td>Soil</td>
<td>Outdoor in containers</td>
<td>2</td>
</tr>
<tr>
<td>Accumulators</td>
<td>In-/outdoor in dedicated boxes with a lid on</td>
<td>5</td>
</tr>
<tr>
<td>Solid oil contaminated waste</td>
<td>Indoor in watertight jar</td>
<td>0.1</td>
</tr>
<tr>
<td>Hydraulic oil</td>
<td>Indoor in watertight containers</td>
<td>0.1</td>
</tr>
<tr>
<td>Oil from oily/water separator</td>
<td></td>
<td>0.1</td>
</tr>
<tr>
<td>Household waste</td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>

Asbestos is not listed as it is removed and disposed of by a specialist subcontractor and thus not stored at site.

Fornaes has recycled a number of wooden boats and also have experience with recycling of glass fibre hulled boat. The hull materials of these boats, painted wood and glass fibre were disposed off as hazardous waste at a cost of around 1,000 DKK/tonnes.
Environmental Control
The site itself is open to inspection by customers and is inspected formally by the local municipal authority of Norddjurs, which have issued an environmental approval for Fornaes Recycling ApS. This environmental approval dated 28 July 2010 describes the operating conditions etc. for the facility to comply with.
Appendix G  Recycling activities in EU and EU projects on recycling

a.  Recycling activities for recreational vessels in EU

Finland

The information available in Finland is based on the study “End of life boat disposal in Finland” compiled by Triskel Consultants Ltd for the European Confederation of Nautical Industries (now European Boating Industry - EBI).

This study is based on the visit to the Kussakoski recycling plant in Finland organised by Jouko Huju (Finnboat - Finnish Marine Industries Federation), Jaako SEderholm (Kuusakoski Recycling plant) at the request of EBI with the contribution of Vincent Guilbaud of Groupe Beneteau.

Figure 10-25  Kussakoski recycling plant

Statistics provided by Finnboat indicate that 90 per cent of the boat population are vessels under 6m with light weight (<600kg) and outboard propulsion. These vessels are straightforward to dispose of and there are no significant issues related to size, weight, shape or management of hazardous wastes such as diesel or oil. Detailed data is not available for old boats greater than 6m in length but many are believed to be wooden, or of wooden construction which has been clad with GRP to extend the boat’s life.

Summary and conclusions of the study

By working in partnership with Kuusakoski, a well established recycling company, Finnboat now offers their members a solution for the disposal of unwanted recreational craft. According to FINNBOAT/kuusakoski this partnership with a commercial provider, which already has the necessary knowledge and infrastructure, ensures that the system is self funding and requires no new investment or complex, long term financing arrangements.

If a recycling plant were to be built exclusively for boats, the level of capital expenditure would be extremely high and it is questionable whether the numbers of craft to be recycled would justify it. It is clear from the Finnish example that the separation technology required is highly sophisticated and would
Recovery of obsolete vessels not used in the fishing trade

probably have to be bought in, increasing further the capital costs of a dedicated boat plant. Add to this the requirement to transport and consolidate the material and it is difficult to imagine a viable system dedicated only to boats.

The key to the Finnish success appears to be the fact that they are not handling boats as such, they are handling scrap. Once this shift in perception has been made, an unwanted boat can be disposed of in the same way as any other unwanted item using the same infrastructure and at the same cost.

Business model

The operating model agreed was that Finnboat would promote and encourage the responsible recycling of boats at the end of their useful life. Kuusakoski would provide a complete commercial disposal service using its existing infrastructure but at the minimum possible cost to the user.

No dedicated facilities have been built and no marine specific infrastructure has been necessary. Boats are treated like any other scrap material with the owner paying for collection and disposal in the same way as they would for any other large unwanted item.

The disposal process

Kuusakoski have their own fleet of trucks which operate across the country and are equipped with cranes and cutting equipment. Standard scrap trucks are used to collect the boats and deliver them to one of the 24 national collection points.

Because the boat is to be destroyed, no special transport is required. Power shears can be used to cut off appendages (mast or keel for example) and a grab crane then crushes the hull and pushes it into a container on the back of the truck.

At the intermediate collection point, the scrap boat is further compressed before onward transportation to one of the three major recycling plants. These are large scale units capable of destroying and recycling virtually any item from a car to a train.

There is no attempt to dismantle the boat prior to crushing or to salvage any items for reuse. The only pre-treatment is to cut or squash the object into manageable size pieces and remove all hazardous fluids prior to final destruction. Kuusakoski have a dedicated facility for fluids. Apart from this step, all other materials remain in place and are sorted after crushing.

Large items are broken down manually into smaller pieces and then loaded by grab crane on to the plant’s main conveyor belt. The conveyor feeds the scrap through a large rotating hammer followed by a grinder which reduces it to pieces a few centimetres across.
Recovery of obsolete vessels not used in the fishing trade

Following crushing and grinding, there are a series of operations designed to separate out all of the different materials present. Multiple fans and filters draw off light fibrous elements such as ABS plastic, foam, GRP and wood; ferrous material is removed using electromagnets; aluminium and copper are separated using eddy currents; stainless steel is identified and removed using automated vision systems.

Figure 10-26  Grab crane and conveyor loading scrap into the plant.

Figure 10-27  One of the internal separation processes.

The different waste streams are collected and most are sold:

- Aluminium is smelted on site and sold as ingots
• ABS plastic is sold for reuse, mostly to the Far East
• Ferrous and non-ferrous metals are sold to clients in the EU
• Most wood is used for energy recovery
• Foam used to provide buoyancy in small boats has to be disposed of as hazardous waste due to the gases used to create the mousse

**GRP** from boats currently goes to landfill. Other options exist for its disposal but the volumes produced in the Finnish plants are too small to warrant any special treatment or specific arrangements. Very few of the boats recycled to date have been GRP and the material that has been produced has been extensively contaminated with grit, paint and oil making its disposal, other than by burning or burial, very difficult.

**France**

As an illustration, the French nautical industry produces about 95 per cent of boats in Fibre-reinforced plastic (FRP), about 3 per cent in aluminium, some 2 per cent in wood (plywood and moulded wood), and 1 per cent at most in steel.\(^{31}\)

**APER – Association pour la Plaisance Eco Responsible** - is a French association who is organizing the recycling and the deconstruction of old sailing - motor boats in France.

After many years of surveys, in April 2009, the French Nautical Industries (FIN) has created this structure in Normandy, in Caen.

**2002 - 2005 - French Nautical Industries 1st project**

During 8 years, the French Nautical Industries had employed a waste engineer consultant to study and to develop solutions with the idea to create 6 recycling centers over France coasts. Recycling centers were planed to recycle 1 500 old sailing boats per year. When they tried the scenario of deconstruction, a problem had arisen. They found the pool was not as big as expected and transport costs were too high.

**2009 – 2011 APER - Association pour la Plaisance Eco Responsible –Creation, development and results**

APER is managing the recycling and the deconstruction of old boats in France.

After many years of surveys, in April 2009, the French Nautical Industries took the initiative to **create the structure in Normandy, in Caen**.

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Figure 10-28  Boat for disposal

APER functioning: **One office at Caen, Informations APER Points and several waste firms.** APER or Informations Points APER advice amateur sailors to find environment solutions to recycle their boats. APER is the front door for amateur sailors, police, customs, government, French institutions, people, sail experts, insurance companies when boat owners have a problem with old boats.

Today APER has selected **6 waste firms who can transport, depolute, recycle, recover and treat the waste of old boats.** All waste firms sign a strict functional specification permitting APER to select the best firms. For each boat, APER asks for several cost estimations to be sure owners can get the best price for the best service. These firms represent 40 locations and they are: Veolia Propreté, Derichebourg, Praxy, Romi Recyclage, Arc Environment and Veron Eco-services.

There are **25 Informations Points APER in France.** APER’s results for the moment are:

- 170 sailing dinghies
- 20 boats – 6 to 7 m
- 10 preparing estimates
- First in Europe
- Works with French government
- 40 waste firms place to treat boats
- Tries to find some solutions to recycle GRP
- Recovery GPR : cement works, material recovery, waste to energy plants

Spain
In Spain, dismantling activities can take place both in car scrapyards or in port facilities.

Casa Nualart ([http://www.casanualart.com/](http://www.casanualart.com/)), a car scrapping company, has a large experience in boat scrapping and has the necessary equipment in order to carry out the different boat scrapping processes requirements in a safe and effective way. Each time a boat is dismantled, a certificate of destruction is issued.

Casa Nualart dismantles boats at their facilities or in some cases they do it directly at port facilities. The decision depends basically on the type of boat they have to dismantle, on transportation difficulties or on whether there are appropriate facilities for dismantling at the collection point.

Casa Nualart facilities are located in Pineda de Mar (Barcelona) and Tordera (Girona). [http://www.casanualart.com/embarcaciones.php](http://www.casanualart.com/embarcaciones.php) The recycling centre located in Tordera is principally committed to the reception and storage of waste cardboard, batteries, iron and metals.

Some images of their activity are found below:

*Figure 10-29  Dismantling of a yacht – Boatcycle project.*

[Desguaces Lema S.L](http://www.grupolemaco.com/).

Information concerning Desguaces Lema is specified in the field visit report.

**Desguaces Petrallo**

Information concerning Desguaces Lema is broken down in the field visit report.
Sweden

Sweden is currently carrying out a study on end-of-life recreational boats in order to know about the situation in Sweden and in order to propose a solution to the problem.

The Swedish government has assigned this project to the Swedish Environmental Protection Agency.

Even though this study has just started, for the moment, the information provided by them for the moment is already included in this report.

The results of this study could be available by the end of 2011.

United Kingdom

In the so-called "Holy Island" of Lindisfarne, a tidal island located just off of the north-east coast of England, there is a local custom where retired ships are turned upside down and given new life as picturesque sheds, sometimes as harbour sheds. Below are some pictures as examples.

*Figure 10-30 Retired ships in the "Holy Island" of Lindisfarne*
EU projects on recycling

RECYSHIP project

Recyship is an ambitious European project framed within the LIFE+ program in the action line of “Environment Policy and Governance” to be developed during the period 2009-2012. The intention is to address the issue of ship scrapping in matters of occupational safety, health and environmental protection.

This project seeks to support the European Commission in developing rules and guidelines in relation to vessels that, for various reasons, must be removed becoming a unique residue very complex to manage.

A pilot plant will be developed in Aveiro, Portugal, to optimize the processes of ship decontamination in order to encourage such operations on European territory and avoid international shipments of hazardous waste. At the same time it aims to develop an integrated management system of quality, environmental and occupational risk prevention applicable to such facilities in Europe and other countries.

The expected results of the project are:

- Proposal of regulations for proper management of ships out of use.
- Inclusion of the needs, problems and expectations of stakeholders.
- Definition of potential host environments (based on ability and ecological criteria).
- Streamlined processes for decontamination and dismantling of ships out of use or the environmentally sound management of European ships.
- Solving environmental problems of the current scrapping yards.
- Feasibility Plan for decontamination and dismantling of ships out of use facilities.

No specific information can be consulted, since the results of the Recyship project will be available at the end of 2011.

Ongoing projects in EU countries - recreational fleet

Italy

Feasibility study End-of-Life Boats

UCINA - Unione Nazionale Cantieri e Industrie Nautiche ed Affini - is the Italian Marine Industry Association, a non-profit organization for the development and the promotion of boating.
UCINA has been working on 2 parallel projects concerning end-of-life boats:

1. Contribution to a working group inside UNI (Italian Organization for Standardization, representing Italy in ISO), which has the aim to define specific requirements for the “design for recycle”, material selection, construction, operative management and the end-of-life yachts cycle, considering the hull and superstructures materials of construction in order to carry out a safe and environmentally sound yacht recycling.

2. Implementation of the feasibility study End-of-Life Boats.

Concerning the feasibility study, the aim to find the best way to decommission and recycle the end-of-life boats, components, equipments and moulds in a financially viable and environmentally sustainable way.

ELB philosophy: All material used to build craft and it’s moulds can be reused or recycled, avoiding disposal procedures. Avoiding as well thermovalorization, pyrolysis and disposal by landfill.

UCINA promotes the use of green technologies that exploit reuse and recycling of materials and of primary-secondary parts. The ELB project plans to set up two different types of operational platforms.

The first one will focus on building up and disassembling products followed by the start-up of recycling various materials deriving from this; most of these materials will be sent directly to traditional recycling plants.

The second will focus on the FRP and on other leftover materials to be processed through the aforesaid new technologies; this conversion will be obtained through a cold emulsion process, with or without the use of solvents and additional natural materials, to create a new material, recyclable n times since it is thermoplastic. It can also be used as structural component in the building sector.

This material can be called a technical composite; it can have diverse structural characteristics and diverse possibilities of use depending on the technologies and characteristics of composition percentage, obtained by mixing several materials.
Recovery of obsolete vessels not used in the fishing trade

Figure 10-31 Recycling technology solutions for FRP

3 – FRP RECYCLING TECHNOLOGY SOLUTIONS
WSMC: THE TECHNOCOMPOSITE

Therefore a double environmental benefit is obtained blending two abundant wastes (e.g. in Italy 60,000 tons of polystyrene in 2008).

It can be used to make pellets, to be used for moulds in traditional 3/5 extrusion, injection systems or in autoclaves, or directly in sheets of different thicknesses to make boards and floors.

In order to carry out these studies (most of which are already internationally patented) UCINA signed an agreement in 2009 with CNR (Italian Research Council – Molecular Design Department), and signed specific contracts with DSA (Architectural Sciences Department) of the University of Genova as well as with SDA Bocconi School of Management.

Spain, BOATCYCLE Project

BOATCYCLE Project- Management, Recycling and recovery of wastes of recreational boat scrapping

This project is carried out with the following consortium: Fundació Mar, Consiglio Nazionale delle Ricerche - CNR and Leitat Technological Center.

The main objective of the project is to reduce the impact of the nautical industry on the environment, through the development of methodologies for the treatment of boats as residues, both at management and waste recovery level. Boats sustainable production based on a Life Cycle assessment (LCA) approach and Eco-design will be tested (demonstrated) and promoted.

The specific objectives are:
Recovery of obsolete vessels not used in the fishing trade

- To collect, select and manage all the different wastes becoming from the scrapping process of an inflatable boat, a yacht and a sailboat.
- To develop a system of recycling and valorising: fibreglass, neoprene, wood and PVC.
- To implement the best practices of the recycling and valorisation of the four wastes through demonstrative pilot experiences.
- To develop a comprehensive guide for sustainable production and eco-design of both fibreglass/wood and neoprene/PVC inflatable boats.
- To develop both policy and technical recommendations for boat’s waste management and revalorisation.
- To disseminate and raise awareness among all actors involved in the entire boat life cycle.

The phases of the project are:

I. **Diagnosis**: Definition and analysis of the current situation of the leisure sailing end-of-life boats.
II. **Collection and boat scrapping**: Research on the best process for scrapping and waste management of three of the most common nautical boats in their end-of-life: an inflatable boat, a yacht and a sailboat.
III. **Technical analysis and pilot experience of fibreglass, neoprene and wood**: Analysis of the quality of recovered fibreglass, neoprene and wood of the current recycling technologies, and finally process it as filler in new polymers, to obtain new composites. Pilot experience approach can be viewed in the following images:

*Figure 10-32  Pilot experience: Extrusion of new composites*

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**Pilot Experience: EXTRUSION OF NEW COMPOSITES**

![Extrusion Parameters: Extrusion melt velocity, Extrusion temperatures, Extrusion pressure, Extrusion feeding velocity, Additive concentration, Torque]
Recovery of obsolete vessels not used in the fishing trade

Figure 10-33  Pilot experience: Grinding of fibreglass, neoprene, wood.

Pilot Experience: GRINDING OF FIBREGLASS, NEOPRENE, WOOD

- Study of production/hour
- Collection of FG, neoprene or wood size distribution
- Blending of the ground FG, neoprene and wood to optimum particle size for activation

V.  Technical analysis and pilot experience of PVC

Figure 10-34  Pilot experience: Characterization

Pilot Experience: CHARACTERIZATION

- Testing:
  - Density
  - DSC
  - Ashes analysis
  - Impact properties
  - Mechanical properties

Characterization Report

VI.  Life Cycle Assessment and Eco-design: Boat life cycle assessment will analyze the environmental aspects of this product throughout its life cycle, from the obtainment of raw materials, through production and later life, to his end-of-life (waste), including all the processes, transportation and other stages involved.

EURECOMP, European project

The EURECOMP project aims at developing a novel recycling route for thermoset composites through the solvolysis process. EURECOMP gathers partners from various fields of activity (industrial companies and universities; from ma-
terial producers to end users). The project will collate the necessary information on upstream and downstream markets, economic efficiency and life cycle assessment.

EURECOMP’s key objective is to separate, through a water-based process, the different elements of the composites - chemicals from the matrix, fillers and fibres - to have them available in a suitable form for reuse in new applications.

Solvolysis technology should be able to solve the problems of recycling thermoset composites, with their cross linked state, as well as circumvent the drawbacks of other recycling techniques (mainly combustion methodologies) that do not allow for reuse of organic components.

The project was officially launched in May 2009 and will continue for a duration of 36 months.

*Figure 10-35 Solvolysis process*

![Solvolysis process diagram]

Partners: Plastic Omnium Auto Exterieur, Volvo Technology Corporation, Xietong Automobile Accessories, SACMO, ECRC (European Composites Recycling Services Company), BPF (British Plastic Federation), URIARTE Safybox, ICAM Nantes, GAIKER, University of Limerick, University of Exeter, University of Bristol and COMPOSITEC.

**Other non-EU experiences of interest - recreational fleet**

Even though Norway is a non-EU country, the following information on dismantling and recycling practices is included in this report in order to be able to take this information into consideration throughout the project.

**Norway**

Norwegian project on management, recycling and recovery of wastes of boat scrapping “Gjenkomp” (joint Venture between Veolia Miljø, Norboat, Norsk Komposittforbund, Sintef and Reichhold).
Approach of the project:

- In 2009, Veolia MiljØ collected 26 boats of wood, thermoplastics and composites, from 8 to 32 feet.
- Mepex made registrations of material compositions and a program for analyzing chemical components on a contract for Veolia MiljØ.

During the dismantling procedure (for de-pollution and finding material composition for each boat) different methods were tested, all parts were logged and weighed and samples were taken for analysis.

Materials: Wood, Thermoplastics like PVC, PU and ropes among others, composites/thermoset plastics, Metals (steel, aluminium, brass, led, etc), hazardous waste (oil, fuel), electric and electronic components, glass, engines (complex metals), batteries (led).

**Figure 10-36  Boat for disposal**

**Findings**

- Broad specter of material composition with large variations.
- Challenging to separate materials suitable for mechanical recycling.
- Negative influence of chemicals on environmental systems.
- Old wooden boats – more toxic elements than expected.

Sintef has a joint venture on “chemical recycling of unsaturated polyester” together with Reichhold. Sintef / Reichhold Chemical recycling:

(a) Glycolysis can be used in synthesis of unsaturated polyester.

(b) Aminolysis can be used in synthesis of epoxy.

(c) Goal: Yield≥70%, less than 220°C, 6 hours, atm pressure.
Recovery of obsolete vessels not used in the fishing trade

(d) Clear cast crushed to fractions.

(e) Result: Polyester 95%, epoxy 100%, within 6 hours.

(f) Positive results on reuse of raw materials.

(g) Recycled polymers have a potential of 5-10 times higher economic value than original polymer (Japanese study).

Figure 10-37 Picture taken during the project execution

Norsk Komposittforbund has focused extensively on using composites as alternative fuels in Cement Production.

Cement production:

(h) Composites/ Thermosetting resins used as alternative fuel in cement furnaces has proved its value through pilot projects: Miljøtek NO and Ercom DE.

(i) Maximum allowed content of FRP in the furnace is 10%, and the smoke has to be controlled/filtered.

(j) The reinforcement and filler components become part of the final cement.

The Norwegian Project will present their conclusion by late winter/spring 2011.