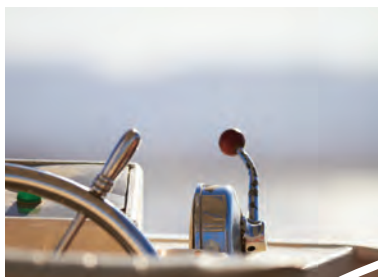


Disposal of plastic end-of-life-boats





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Executive summary

The aim of this Nordic project was to describe the challenges of the disposal of end-of-life boats (ELB) in Finland, Sweden, Norway and Denmark and the recycling and reuse of materials, environmental impacts and possible problems with dumping. As part of this project, a Nordic workshop on ELB was held in Stockholm, 3 December 2012; 50 participants attended from the four countries.

The total number of boats, which has been estimated from surveys performed in each country, amounts to nearly 3 million leisure boats (Finland 750,000, Sweden 900,000, Norway 1,000,000, Denmark 250,000). This is roughly half of the total estimated number of European recreational vessels (6 million).¹ Almost 20% are more than 40 years old, an indication that the problem of disposal is rising, which is in accordance with the opinion common at the workshop.

It has not been possible to come up with reliable figures on how many boats are disposed of each year because the lack of registration requirements in any of the Nordic countries. None of them have a mandatory system for the registration of leisure boats. However, in some cases registration is needed for boat insurance. Boats are abandoned on land and dumped into the sea, but it has not been possible to estimate the extent to which this happens. The lack of or insufficient registration of leisure boats makes it difficult for the public and the authorities to trace owners to demand that the boat is removed and brought to a scrap dealer.

Today, none of the four countries has a nation-wide system for dealing with ELB; a private more nation-wide system initiative does exist in Finland. It is unclear which authority is responsible for ELB in any of the countries. The countries have differing views on whether worn out boats should be considered as household waste.

None of the Nordic countries have a system with incentives the collection and disposal of worn out boats, which means it must be done on the expense of the boat owner. The disposal problem has two parts: 1) abandoned boats and 2) future ELB.

Many parts from a worn out boat are possible to reuse or recycle. Metals are economical to recycle and other parts that can easily be taken from the boat might be reused and sold on the market. The most prob-

¹ ICOMIA, International Council of Marine Industry Associations, Decommissioning of end-of-life boats – a status report, 2nd edition, December 2007.

lematic issue is what to do with the bulk of the ELB, namely the composite plastic material which amounts to between 25 and 50% of the total weight. Today, it is either incinerated or landfilled after needed pre-treatment. No good solution for taking care of the composite plastic materials has yet been found.

Little concern has been paid to the environmental issues related to the ELB dismantling process. Several hazardous substances have been identified in ELB, as well as priority substances, which should be taken care of in a safe and proper way. It is important to avoid and minimize risks of human exposure and the spread of pollutants during the dismantling process.

In conclusion, as long as a system for collection and environmental friendly recycling is lacking, a major risk exists for the ELB to end up abandoned on the property of the owner or in a boatyard, being burned, or being dumped in a lake or the sea. This problem will increase in future without a new system with better incentives and more clear responsibility.

1. Introduction to the project

The Department of Environmental Science (ITM) at Stockholm University has taken the initiative to do a common Nordic project on the disposal of recreational boats with a focus on:

- resources – components for reuse, recycling and energy recovery,
- content of hazardous components and elements – hazardous waste, and
- illegal dumping and marine littering.

ITM invited partners from Finland, Denmark and Norway to join the project and develop a project proposal to apply for financing from the Nordic Council of Ministers and the Nordic Waste Group (NAG). The project obtained 40% financing of its initial budget and has had to reduce the scope of this Nordic cooperation project.

The project had two parts:

- A *report* with an overview of situation in the Nordic countries where the state-of-the-art initiatives are taken to develop a better system for the collection and recycling of ELB.
- Organization of a *workshop* for the different stakeholders in the Nordic countries on challenges around ELB. This was organized together with Keep Sweden Tidy (HSR) and held in Stockholm the 3 December 2012 and attended by 50 participants. Part of the discussions is included in this report and in Annex 3 are the complete responses, which were compiled from the groups' discussions.

1.1 Partners

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2. Background

Since the 1950s leisure boats have mostly been constructed of plastic materials and between 1950 and 2012 a great number of new plastic boats have been sold. These boats have a long life expectancy and can last between 30 and 50 years, which means there has been an accumulation of leisure boats in society. Today the Nordic countries have just under half of all the 6 million leisure boats in Europe.² However, although the boats will reach their end of life, most Nordic countries have no national regulations on how to dispose of them. In Finland a private initiative is establishing a national system to take care of boats that need disposal. Because the number of ELB is increasing, having systems for disposing of boats will become a more important issue.

² ICOMIA, International Council of Marine Industry Associations, Decommissioning of end-of-life boats – a status report, 2nd edition, December 2007.

3. Aim

The aim of this project is to describe the situation on ELB for leisure boats in Finland, Sweden, Norway and Denmark in regard to the following: how recycling is done today, the parts that are and may be recycled, environmental problems in connection with ELB, and possible problems with dumping of boats. As a background to the ELB problem, the report starts by presenting some statistics on the number of boats and information on the existing regulations in the four countries.

4. Boat statistics

4.1 Introduction

In general, it is a challenge to come up with reliable figures for the total number of leisure boats in the Nordic countries, and in particular, the number of boats that have been permanently taken out of use. The total number of boats has been estimated from inquiries and calculations and the number of scrapped and abandoned boats can only be roughly estimated. Figures on new boats that have been sold are easier to come by.

Since the existing data in the Nordic countries are based on different sources and methods for calculating the number of boats, it has not been possible, in this report, to present the numbers in a uniform way. The information is presented separately for each country with comments on the results.

4.2 Boat population

An overall estimate of the total number of boats in each of the Nordic country is presented in table 1. The figures are based on inquiries in the respective countries.

Table 1 Total number of boats in the Nordic countries estimated from inquiry surveys

Country	No of boats	No of boats > 40 years old
Finland	750,000	?
Sweden	943,000 ($\pm 83,000$)	> 100,000
Norway	752,000–1,100,000	Approx. 40,000
Denmark	250,000–370,000	Approx. 20,000

The estimated total number of boats in the Nordic countries adds up to approximately 3 million. A rough estimate of the number of boats older than 40 years shows this to be almost 6% of the boats.

In general, there are national systems to register imports and exports, number, weight and economic value of recreational boats. However, how these are presented differs among the countries and so will the figures presented in this report.

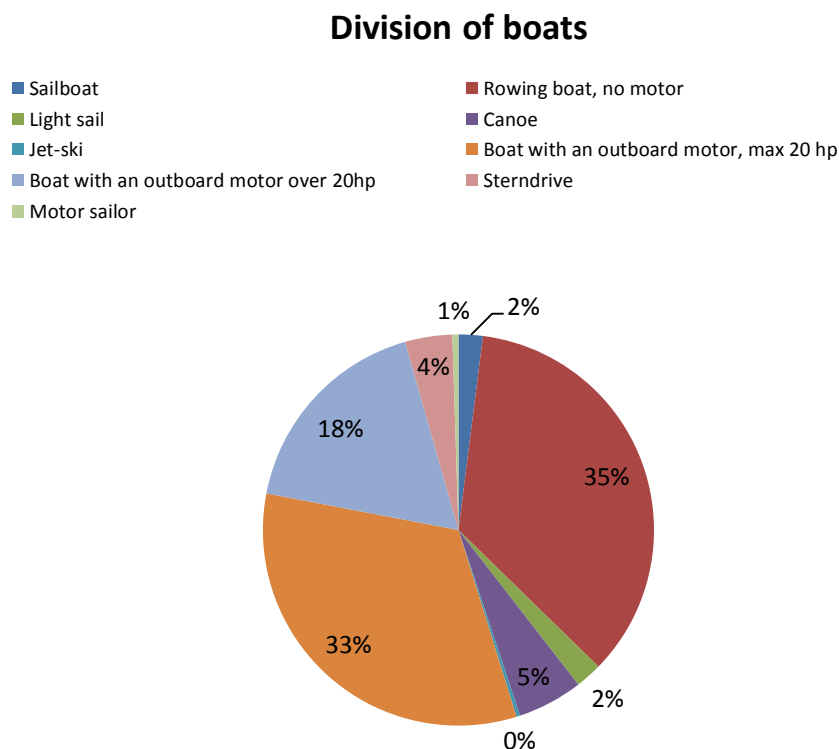
4.2.1 Finland – Number and use of boats

Boats in Finland

Boating plays a big role in the leisure of the Finnish people. There is one boat for every seventh Finnish person, which means that Finland has the most boats per capita in the world. This can be explained with the fact that Finland has large, wide-spread recreational water areas on the coastline and inland in the Lake District. In addition, as a hobby boating can be seen relatively independent and borderless because of the extensive everyman's rights, which allow berthing at almost any island and/or beach (excluding Åland).

The total estimated number of boats in Finland is 750,000 and the different categories are shown in figure 1. Of the total number of boats, 181,000 are motorboats (with outboard motors over 20.4 horsepower or stern drive motors over 50 horsepower) and 15,000 sailboats. This leaves approximately 554,000 "ordinary smaller boats" < 4.5 m, most commonly used at summer cottages and when fishing.³

Figure 1 Categories of boats in percentage⁴



³ ELB, End-of-life Boat recycling in Finland 2009. J. Savolainen.

⁴ Boating in Finland and its economic impacts 5/2005. Finnish Maritime Administration.

Boat associations in Finland

Because there are many boats in Finland, there are also many boating associations. The umbrella organization SPV (Suomen Purjehdus ja Veneily) has 332 boating associations as members, and the members have 22,783⁵ boats. The owners are traditionally very aware of environmental issues, and have their boats in the national boat register (see chapter 4). The assumption is that these 22,783 boats are likely handled properly when they reach ELB status.

Finnboat, Finnish Marine Industries Federation, is an umbrella organization for Finland's marine industry and trade. Members of Finnboat accounts for close to one hundred percent of both the nation's domestic marine industry turnover and the value of boat exports.⁶

Use of boats in Finland

"The ordinary boat" in Finland is mainly used by people when fishing and spending time at summer cottages. Their length is 4.5 m or less, usually made of fibreglass, and they have a long life expectancy. The boats may have an outboard motor, or they may be used just for rowing. These boats do not need to be registered unless they have a motor more powerful than 15 kW (please see chapter 4.).

The ordinary boat is the typical ELB in Finland and usually in a cheaper price category than those in the boat register database. The fact that they are cheaper usually leads to neglect of yearly maintenance. If the ordinary boat is severely damaged it is not likely to be repaired but more likely it will be disposed of somehow.⁷

4.2.2 Sweden — Number and use of boats

Boats in Sweden

The total number of boats in Sweden has been estimated in surveys carried out by Statistics Sweden, which were done on behalf of the Swedish Maritime Administration in 2004⁸ and by MIND Research on behalf of the Swedish Transport Agency in 2010.⁹ The total number in 2004 was 718,000 ± 66,000 boats and in 2010 was 943,000 ± 83,000 boats, which corresponds to an increase of almost 20% in six years. More than one quarter (25.7%) of the total number of boats was more than 40 years old

⁵ SPV information via email 23.10.2012.

⁶ www.finnboat.fi, referenced 23.10.2012.

⁷ ELB, End-of-life Boat recycling in Finland 2009. J. Savolainen.

⁸ Båtlivsundersökningen 2004 – en undersökning av svenska fritidsbåtar och hur de används. Statistics Sweden, 2004. www.sjofartsverket.se

⁹ Båtlivsundersökningen 2010 – en undersökning av svenska fritidsbåtar och hur de används. Swedish Transport, 2010. www.transportstyrelsen.se/en/

and, of the almost 1 million boats in 2010, 62,000 were defined as non-sea worthy.

According to the last survey of boats¹⁰ the types and lengths were as shown in table 2.

Table 2% boats at different lengths and categories.

Boat category	0-5 m	6-10 m	11-15 m	16-20 m	>20 m	Do not know
Small boat	79.5	7.5	0.1	0	0.1	12.8
Day cruiser	57.2	29.8	1.5	1.0	0.1	10.3
Motorboats for overnight	34.2	62.1	1.5	0.4	0.1	1.7
Sailboats for overnight	2.2	72.7	23.9	0	0,2	1.0
Total (in %)	58.9	28.7	2.5	0.4	0.1	9.4

Source: Båtlivsundersökningen 2010

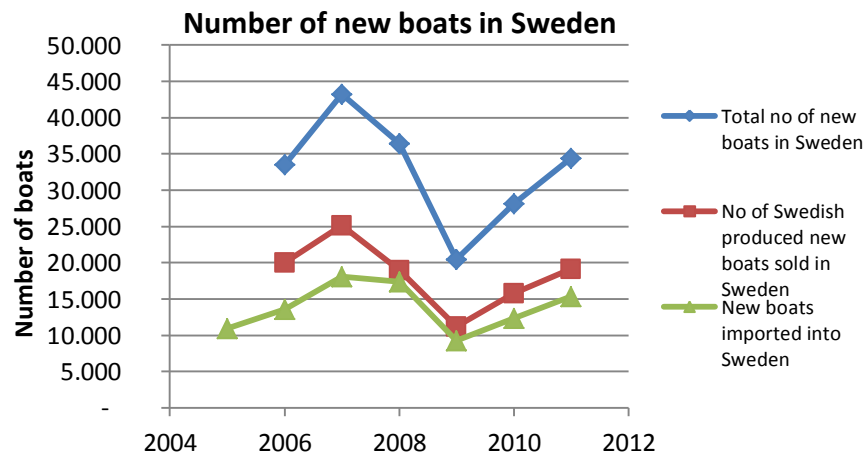
The total number of new boats, sold and imported, has been compiled by Sweboat in cooperation with Swedish authorities.¹¹ Most of boats are smaller < 5 m (58.9%) (table 2).

The total number of new boats sold on the Swedish market the last few years is shown in figure 2. Around 35,000 new boats were sold each year between 2004 and 2011, except after the financial crisis in 2008 when a dip is seen in the numbers for 2009. The number of Swedish-produced boats sold in Sweden roughly equals the number of new boats imported into Sweden. Most of the imported boats are from Finland, the USA, and Poland. Swedish-produced boats are exported, mainly to Norway, Denmark, the United Kingdom and Germany; in 2010 the number sold reached 5,350.

¹⁰ Båtlivsundersökningen 2010 – en undersökning av svenska fritidsbåtar och hur de används. Swedish Transport, 2010. www.transportstyrelsen.se/en/

¹¹ Fakta om Båtlivet i Sverige 2012.

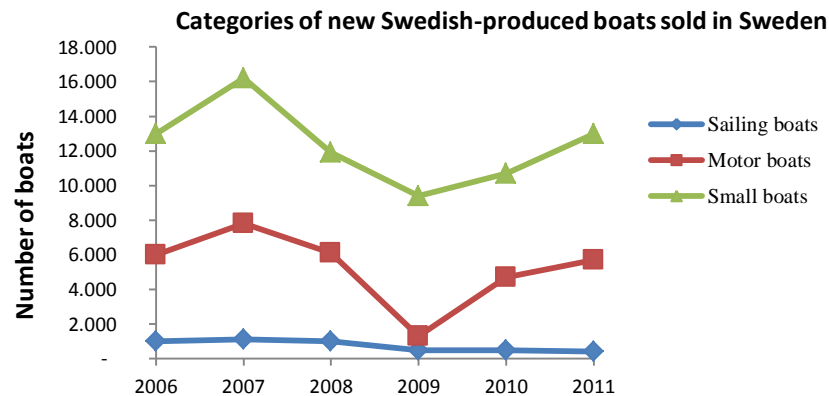
Figure 2 *Estimated total numbers of new boats in Sweden, Swedish-produced new boats and imported new boats into to Sweden*



Source: Fakta om båtlivet i Sverige 2012

The categories of boats sold in Sweden are shown in figure 3.

Figure 3 *The Swedish-produced boats sold in Sweden divided into types of boat*



Source: Fakta om båtlivet i Sverige 2012.

More than half (ca 65% except in 2009 where it was 84%) of the new boats sold in Sweden are smaller boats < 5 m (figure 2). Motorboats are approximately 30% of the total number of boats sold in Sweden and sailboats are at most, 5%.

Boat associations in Sweden

SweBoat is a national umbrella organization for eight different areas of the boating industry. Among the groups in the association are the boat producers, Swedish dockyard society and the finance and insurance group. Furthermore, there is the common group and personal members.

SweBoat actively works with the promotion of boating, EU-issues, fiscal- and environmental issues and represents the business in organizations such as the Maritime Safety Council and on standardization issues. Swe-Boat also produces and compiles statistics on the import and export of boats and motors and arranges boat shows.

Sweden has three large boat associations for boat owners: the Swedish Boat Union (SBU), the Swedish Sailing union (SSF) and the Swedish Cruising Association (SXX). The SBU has 172,000 members in 900 boat clubs; the SSF has 127,000 members; and the SXX has 42,000 members.¹² This makes up a total of 341 000 members. If each member own one boat it means that most boat owners are not members in any boating organization since the total number of boats is almost 1 million.

Use of boats in Sweden

In Sweden, 17.8% of the households own one or several boats. During 2010, approximately 38% of Sweden's adult population (20–74 years old) has spent time in a leisure boat. On average, the boats were used 25 days during the season, usually by 2–3 persons. The most common use is for day trips and fishing trips. On average, approximately 134,000 boats per day were used from May to September 2010.¹³

4.2.3 Norway – Number and use of boats

Boats in Norway

Two sources provide information on the estimated number of leisure boats in Norway: a report for the Climate and Pollution Agency (2008) and a boat branch survey of boats and boat life (2012). The two sources have used different methods reported different results.

- Report on number of boats sold and ELB

In, a report developed for the national Climate and Pollution Agency (KLIF) calculated the boat population based on the production, the export and import, and the estimated number of boats scrapped, which was based on assumptions about the life expectancy of boats.¹⁴ Using various data sets and reports, the report estimated there were 1.0 mill leisure boats in Norway. They were divided in to four main categories:

¹² Fakta om Båtlivet i Sverige 2012.

¹³ Båtlivsundersökningen 2010 – en undersökning av svenska fritidsbåtar och hur de används. Swedish Transport, 2010. www.transportstyrelsen.se/en/

¹⁴ Utrangerede fritidsbåter, kartlegging av miljøproblem og vurdering av tiltak og virkemidler. Statens forurensningstilsyn TA 2391-2008.

- 300,000 small boats without motors
- 550,000 motorboats < 7 m
- 100,000 motorboats > 7 m
- 50,000 sailboats

A report from 1994 estimated the number to be 810,000 and a report from 2005 estimated there were 740,000 units. The last was a survey about traveling habits.

Information about the total sale of boats between 2007 and 2011 indicated that the number has increased by approximately 100 000 over the last four years.

The prognosis for ELB indicates that the number will increase from approximately 5 000 units in 2007 to 15 000 units in 2017.

- Survey of boat life in Norway

A report from 2012, based on questionnaires with 4,600 interviews, made a survey focusing on use and habits regarding boat life in Norway.¹⁵ The total number of leisure boats was estimated to be 752,000; they were divided into four categories:

- 232,000 small boats without motors.
- 290,000 motorboats without cabin (beds).
- 176,000 motorboats with cabin (beds).
- 52,000 sailboats.

Approximately 80% of the leisure boats are made of plastic or glass fibre-reinforced plastic (GRF), and 5% of the boats were built before 1969.

Conclusions

There can be several explanations why the two methods give different result. Some are:

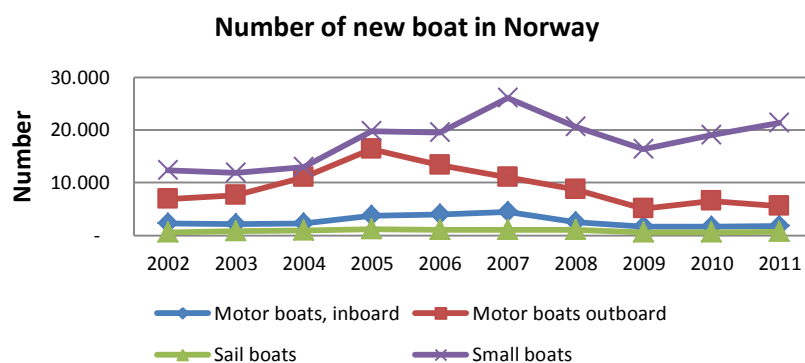
- The survey does not include all small boats, e.g. canoes.
- There are many boats that are not in use and therefore not included in the survey.
- The number of scrapped boats has been higher than statistically calculated.

¹⁵ Båtlivsundersøkelsen – fritidsbåtlivet i Norge 2012. Konglige norks båtforbund og Norboat.

In the report we choose to use the estimate of 1000 000 boats in Norway in 2012.

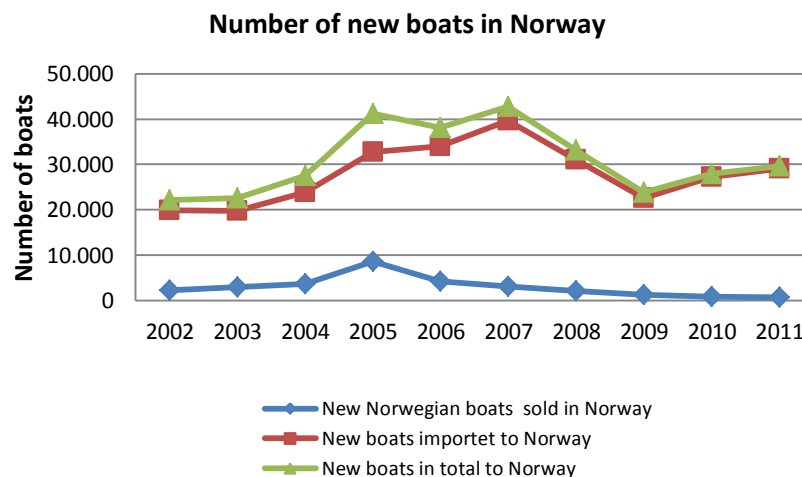
Mepex Consult AS has based on the report for SFT from 2008¹⁶ made updated calculation of number of new boats put on the market where also data from 2008–2011 are included.¹⁷ The result is presented in the following graphs.

Figure 4 Number of new boats in Norway by different categories¹⁸



The data in figure 4 show that the market share of small boats has increased in Norway.

Figure 5 Number of new boats in Norway divided import and production¹⁹



¹⁶ Utrangerte fritidsbåter, kartlegging av miljøproblem og vurdering av tiltak og virkemidler. Statens forurensningstilsyn TA 2391-2008.

¹⁷ Statistisk sentralbyrå.

¹⁸ Olav Skogesal, Mepex 2012.

¹⁹ Olav Skogesal, Mepex 2012.

The graph in Figure 5 shows a clear decrease of new Norwegian boats sold in Norway since 2005.

Boat associations in Norway

NorBoat is a national boating association that actively works with organizing exhibitions and boat shows, promotion, EU-issues, and fiscal- and environmental issues and that represents business interests in different organization. NorBoat also produces and compiles statistics on the import and export of boats and motors. The organization has 400 members, including producers, importers, maintenance shops, marinas, suppliers of equipment, dealers and construction units.

Kongelig Norsk Båtforbund (KNBF) is the leading organization for boat owners in Norway. They have six regional departments and a local boat organization connected to the national organization.

Use of boats in Norway

In Norway, 24.5% of the households own one or several boats. Approximately 86% of boat owners used their boat in 2011. The most common use is for day trips and fishing trips. On average the boats were in use 34 days per year.²⁰

When there is no system for the collection and environmentally friendly recycling of boats, there is a major risk that ELB will remain on the property of owners or in a boatyard, be burned, or be dumped in a lake or in the sea.²¹

4.2.4 Denmark –Number and use of boats

The number of leisure boats in Denmark is uncertain due to lack of registration. Compilations made by Danish authorities and boat organizations indicated in 2002 approximately 55,000 leisure boats larger than 7.5 m were in use and 10,000–15,000 were not.²² The authorities enhanced the estimations when they included other boats and dinghies that were less than 7.5 m and in use, to approximately 250,000 in use and some 30–40,000 that were not.²³

A number of Danish boat associations conducted a survey in 2009 which showed that the number of leisure boats in marinas has increased

²⁰ Båtlivsundersøkelsen – fritidsbåtlivet i Norge 2012. Kongelige norsks båtforbund og Norboat

²¹ Utrangerte fritidsbåter, kartlegging av miljøproblem og vurdering av tiltak og virkemidler. Statens forurensningstilsyn TA 2391-200.

²² Bak, F., Jensen, M. G. and Hansen K.F. (2003), Forurening fra traktorer og ikke-veigående maskiner i Danmark, Miljøprojekt nr. 779, Miljøstyrelsen.

²³ Bak, F., Jensen, M. G. and Hansen K.F. (2003), Forurening fra traktorer og ikke-veigående maskiner i Danmark, Miljøprojekt nr. 779, Miljøstyrelsen.

from 37,000 in 1986 to 57,000 in 2009. Furthermore, the percent age of sailboats has dropped from 67% to 57%, in favour of motorboats.²⁴

The number of leisure boats > 7.5 m in use had increased to 60,000 in 2012, according to the Danish Organization of Marinas.²⁵

The number of leisure boats is not clear. There are 60,000 boats larger than 7.5 m, which is accurate, but the number of abandoned and small boats (less than 7.5 m) is unclear. The percent age of boats more than 40 years and wooden boats is considered to be marginal by the boat organizations.^{26 27 28}

Boats in Denmark

The number of imported and exported boats is unknown because of a lack of registration; only boats larger than 20 GRT are obliged to register. After the financial crisis put the Danish economy on hold, sales in the Danish boat market dropped, stabilizing at a low level.²⁹

Boat associations in Denmark

In Denmark, the sailing is organized by different groups. Danboat is the organization for companies in the trade sector and covers the industry, business, insurance companies, etc., and deals with professional issues and the development of the sector and maritime safety. Boat owners are organized in the Danish Sailing Federation (Dansk Sejlunion) or the Danish Leisure Sailors (Danske Tursejlere). Both organizations work for better conditions for boat owners, provide advice, develop guidelines, and support maritime safety and member activities.

Danish marinas are organized in the national Organization of Danish Marinas (Foreningen af lystbådehavne i Danmark), which is an interest organization for Danish private and municipal marinas.

Use of boats in Denmark

The majority of the boats in Denmark are sailboats because sailing is a strong cultural tradition. Only a small percentage is motorboats. The sailboats are often owned by dedicated sailors who maintain and use their boats frequently, unlike motorboat owners. As a result of the financial crisis, many motorboat owners laid up their boats because they used them for leisure, while sailors use their boats because of the seamanship and heritage.

²⁴ Danboat, (2009). Survey, Danboats havneundersøgelse 2009 – Danboat Marina Survey 2009, Danboat.

²⁵ Højenvang, J. (2012). CEO (Foreningen af lystbådehavne), Organization of Danish Marinas, telephone interview, 2012-10-31.

²⁶ Højenvang, J. (2012). CEO (Foreningen af lystbådehavne), Organization of Danish Marinas, telephone interview, 2012-10-31.

²⁷ Hansen, J. (2012). Chairman of Danboat, telephone interview, 2012-11-01.

²⁸ Nielsen, L. (2012). Manager of (Danske Tursejlere) Danish Leisure Sailors, telephone interview, 2012-11-01.

²⁹ Øverup, S. (2012). Editor on (Bådmagasinet) Journal of boats, telephone interview, 2012-10-31.

5. Existing and non-existing regulations on disposal of boats

Two important issues can be identified when it comes to regulations on the disposal of ELB. The first is the responsibility for their disposal, which include a system to identify abandoned boats. The second issue is how to define waste from ELB: is it waste from household, industry or something else?

In all the Nordic countries owners are responsible to take care of the end-of-life boat and are not allowed to abandon a boat or to dump it into the sea. Further, since it is illegal to litter outdoors, the owner is not allowed to place the boat anywhere where the public have access to or view of it including their property. However, it is legal to let it remain in a boatyard.

Whether leisure boats are considered household waste differs in the Nordic countries. For example, in Norway ELB are considered household waste but not in Sweden and in Denmark they are considered to somewhere between household and bulk waste. There are also examples of interpretations varying between municipalities and at some recycling stations. In Sweden small open boats made of wood and plastic can be turned in for disposal, although the municipalities are not obliged to take care of them.

None of the Nordic countries have a mandatory system for the registration of leisure boats. Table 4 shows the systems in each country. Nor do any of the Nordic countries have a system for stimulating the collection of worn out boats.

Table 3 Registration of leisure boats in the Nordic countries

Country	Registration of boats	
Finland	All boats > 5.5 m or with a motor more powerful than 15 kW (20.4 hp) should be registered in a national boat register data base.	This law was enforced 1 October 2007. In November 2012, 177,479 boats were registered. ³⁰
Sweden	No mandatory registration. A voluntary system exists in cooperation with insurance companies.	A public mandatory register was instated in 1988 and was run by the Swedish Maritime Administration and the county administrations. The obligation to register included boats > 5 m or with a certain motor capacity. The register was revoked at the end of 1992. ³¹
Norway	No mandatory registration, but registration is needed to have insurance.	In 1 January 1998 a national mandatory register for leisure boats (Småbåtsregistret) was put into operation by the Norwegian Directorate of customs and Excise. The new register replaced local police registers. On 1 January 2003, the authorities made registration voluntary. All insurance companies require a system of registration and comments system to insure boats. In 2007 approximately 300,000 boats were in the Småbåtsregisteret, but in 2012 the number was 160,000. Securemark has taken part of the market. ³² It is estimated that 300,000 boats still have insurance.
Denmark	No mandatory registration for boats less than 20 GRT but optional for boats between 5 and 20 GRT. No mandatory insurances.	It is mandatory to have insurance to become members of marinas, participate in competitions or if there is a mortgage on the boat. These registrations are subject to some kind of recording.

5.1 Problems that the regulation/ non-regulation lead to

The lack of or inadequate registration of leisure boats in the Nordic country makes it difficult for the public and the authorities to trace owners to demand that the boat is removed and brought to a scrap dealer. In addition, the poorly written legislation regarding abandoned boats makes it difficult to know what obligations and what rights the public has to manage these cases.

The lack of national system for disposal of ELB in Sweden, Norway and Denmark means owners of a worn out boat abandon their boats on land. According to information from Keep Sweden Tidy, it is not uncommon for each boat club to have one to three boats abandoned because the owners do not know what to do with them.³³

Because there is no producers' liability or scrapping bonus in any of the countries and the cost to recycle leisure boats is high, the incentive for boat owners to recycle is slim. The problem with abandoned boats

³⁰ email with Local register Office Officer Katri Asikainen in 2.11.2012.

³¹ Statskontoret (The Swedish Agency for Public Management) 2008, Vrak och ägarlösa båtar (2008:6).

³² Redningsselskapet, mail 12.07.2012 and www.Securemark.no

³³ Personal communication, Eva Blidberg at Keep Sweden Tidy 2012-12-03.

can be expected to increase in the near future because more plastic boats are reaching the end of their lives. As was noted at the workshop, boats produced in the recent decades are expected to have shorter life expectancy because they are often built with thinner hulls than older boats.³⁴ This will further increase the number of ELB.

In a lack of clear responsibility between different authorities, none have taken any initiative to find practical solutions to this problem. The municipalities are not interested in developing better solutions and rather, are waiting for national authorities to propose a system which the government can decide on.

In conclusion, when a system for collection and environmental friendly recycling is not in place, the risk is high that the ELB will end up on the property of the owner or in a boatyard, being burned, or being dumped in a lake or in the sea.

5.1.1 Finland

At present, Finland has no extended producer responsibility (EPR) when it comes to disposing of boats. The owner is responsible to take care of the boat when it comes to the end of its product life cycle (PLC). The problem of recycling and disposing of ELBs does not lie with registered boats as they are usually more expensive boats and well taken care of, which also means they have a good second-hand market.

The problem lies with the typical ELB, the smaller boats used at summer cottages, because they do not need to be registered and it is not possible to identify their owners.

5.1.2 Sweden

Leisure boats in Sweden are not considered household waste and thus not the community's responsibility to collect and dispose of.³⁵ However, small open boats made of wood and plastic are accepted at some recycling stations even though the municipalities have no obligation to do this.³⁶ Swedish legislation prohibits littering and dumping of waste at sea.

³⁴ Personal communication, Lennart Falck, Kryssarklubben 2012-12-03.

³⁵ Statskontoret (The Swedish Agency for Public Management) 2008, Vrak och ägarlösa båtar (2008:6).

³⁶ Håll Sverige Rent (Keep Sweden Tidy), www.hsr.se, 2012-06-05

5.1.3 Norway

In Norway, the national authorities consider end-of-life-boats to be household waste and a municipal responsibility. However, the municipal regulations do not take ELB into consideration. In practice, there is no official system to deal with ELB, but normally municipalities have possibility to receive smaller boats.

Norwegian legislation prohibits all littering and dumping of waste at sea. The Norwegian legislation regarding littering and dumping of waste give the municipalities possibilities to order to clean up waste when they and identify the owner or to pay the municipality for cleaning it up. A fee for pollution can also be set. These possibilities are not easy to use and require a great deal of administration and financing. The municipal are not interested in developing better solution and taking financial responsibility, and are rather waiting for a producer-responsibility system. In a lack of clear responsibility, the authorities in question have not taken any initiative to find solutions.

5.1.4 Denmark

Danish legislation prohibits all littering and dumping of waste at sea. ELB are considered as something between household waste and bulk waste, which by national legislation is regulated by local authorities. Each municipality is obliged to provide systems for handling, treating or recycling ELB.³⁷ Nevertheless the municipal regulations do not consider ELB because of their limited number. In practice, there is no official system to deal with ELB.³⁸

³⁷ Miljøstyrelsen 2012.

³⁸ Hansen 2012.

6. Disposal of boats – dumping and ELB today

The awareness of the problem and the need to take care of ELB exists in all Nordic countries. However, until recently only Finland has had a nation-wide system for disposal of boats.

Since the registration of boats is not mandatory in any Nordic country, it is impossible to correctly estimate the number of scrapped boats. Some boats may be sold in other countries, left on the property of the boat owner or even dumped in the sea.

6.1 Dumping of boats

Since there is no easy way to dispose of plastic ELB and the existing methods are quite costly, it can be tempting to get rid of the problem by dumping them somewhere in nature or in the sea. Boats on land are found abandoned on land in all countries. Many rumours claim that boats are dumped in the sea, but as long as there is no mandatory registry of boats there is no way to get figures on the extent of the problem.

6.1.1 *Finland*

It is not known how many boats are illegally dumped annually in Finland. Many of the typical ELB lie in the backyards of people's summer cottages and houses. In the past, it was common to sink an ELB or leave it in a reed bed. It is not known how common this is today, but some large-scale illegal dump sites were recently found near Kotka, which indicates that it still happens. These discoveries have led to criminal investigations.

In Finland, Kuusakoski Ltd. has a very well-organized ELB collection system (see section 5.2). It is efficient; but for it to be even more efficient, more boats need to enter the system. This again leads to the question of economics: who is to pay and to what extent. Today the cost of transporting a boat may act as a constraint to some potential ELB owners.

6.1.2 Sweden

To get an estimate of how many boats are abandoned or possibly dumped, phone calls were made to supervisors of the Stockholm archipelago working for the foundation "Skärgårdsstiftelsen". None had noticed any abandoned boats or observed boats being dumped into the sea. But that it does occur was proven by a workshop participant who showed pictures of 13 abandoned boats on a rocky inlet on the west coast of Sweden.³⁹

Wharf owners were questioned whether boat owners asked for their help with the disposal of worn out boats. They said it only happened occasionally and, in most cases, the boats found a new buyer who wished to restore it.

6.1.3 Norway

There is no reliable information about the number of abandoned boats in Norway. Norway has a long coast line with few people and short distances to deep water, so it is easy to dump a boat, and, in many places, it is still acceptable. (SFT 2008). Based on contact with divers clubs and boat forums it is certain that dumping and burning of boats still exists and may account for at least 1 000 abandoned boats per year.⁴⁰ This number can be much higher. Likely, a great number are also stored on private properties.

6.1.4 Denmark

Since the Danish waters are shallow boating organizations and authorities believe that boats are not dumped in Danish territorial waters. The shallow water does not give cover for a dumped boat and the populated coastline does not give privacy for illegal actions at sea. The fact that it is much easy to leave boats on land without consequences might be the reason for lack of dumping in the sea. Danish Marine Authorities does not keep a record on dumped wrecks and they are not aware of any dumped leisure boats.⁴¹

³⁹ Bengt Arvidsson, Yacht consult. Personal information at workshop on ELB 2012-12-03.

⁴⁰ SFT 2008. Utrangerte Fritidsbåter, Kartlegging av miljøproblemer. Vurdering av tiltak og virkemidler. Rapport 2391.

⁴¹ Söfartsstyrelsen 2012.

6.2 ELB systems of today

The challenges to achieve nation-wide systems for disposal of ELB in Sweden, Norway and Denmark were discussed at the workshop held in Stockholm 3 December 2012. The situation in Finland may also be improved and not only rely on the private actor. The workshop pointed out a number of related issues that should be attended to. The most important were

- the lack of clear regulation,
- no defined senior authority,
- the need for better statistics on the extent of the problem,
- the need for better knowledge on how to reuse/recycle the rests of glass fibres,
- the need to decide on a system on how to finance the disposal/recycling of boat,
- the need to develop a system for ELB that considers risks to both humans and the environment, and
- the need to develop a system that is simple for all to use.

Further suggestions from the workshop can be read in Annex 3.

6.2.1 ELB in Finland

In Finland, yearly, approximately 3 000 boats end up being ELB.

According to Kuusakoski Ltd., approximately 250 to 300 boats are recycled each year through their system; 80% of the boats are made out of fibre-reinforced plastic and ABS-plastic and 20% are made out of metal and wood. A typical Finnish boat that is disposed of and/or recycled is smaller (approximately 4.5 m long), made of fibreglass, and has an outboard motor. The composition of these types of boats is presented in table 4.

Table 4 Materials in a typical boat in Finland ⁴²

Boat parts	Materials	with motor (kg)		without motor (kg)	
Hull		105		105	
Motor		50		0	
Other		5		5	
	Fibreglass	102	64%	102	93%
	Aluminium	40	25%	1	1%
	Iron	8	5%	2	2%
	Plastics	5	3%	2	2%
	Other	5	3%	3	3%

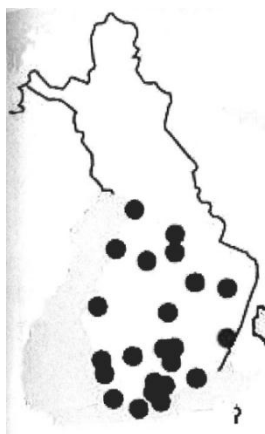
⁴² ELB, End-of-life Boat recycling in Finland 2009. J. Savolainen.

In Finland, landfills accept ELB, but depending on what the material the boat is made of, they either dispose of or recycle the boat. This varies between municipalities, and in this study it was impossible to discover the variations.

Recycling system in Finland

Kuusakoski Ltd. has made a good start in recycling ELB, especially boats made out of fibreglass and other plastics. They have created a process which makes disposal easy and cost effective for the boat owner.

Figure 5 Kuusakoski collection points in Finland



Kuusakoski has 22 collection sites around in Finland, with the northern most being in Oulu. Kuusakoski will also collect a boat from any destination on land by truck for a fee. In 2006 the fee for boats < 6.0 m was €10 per m boat length and for boats > 6.0 m it was €150 per tonne. The cost for could be kept this low because of the efficient recovery system. Collection was quite expensive with a price of €70 per hour. Trailer rental was free.⁴³

At the collection site, the boat is identified and measured, and the batteries, oils, explosive materials (fire extinguishers) and other hazardous materials are removed and neutralized. After this, the boats are transported to one of Kuusakoski's crushers, which are located in Heinola, Vantaa and Kuopio. Transportation usually takes place once a year.⁴⁴

⁴³ http://www.eba.eu.com/site-documents/environmental-docs/environmental-2008/Decommissioning-of%20End-of-Life%20Boats%20_Rev-Dec-07.pdf Referenced 20.11.2012

⁴⁴ ELB, End-of-life Boat recycling in Finland 2009. J. Savolainen.

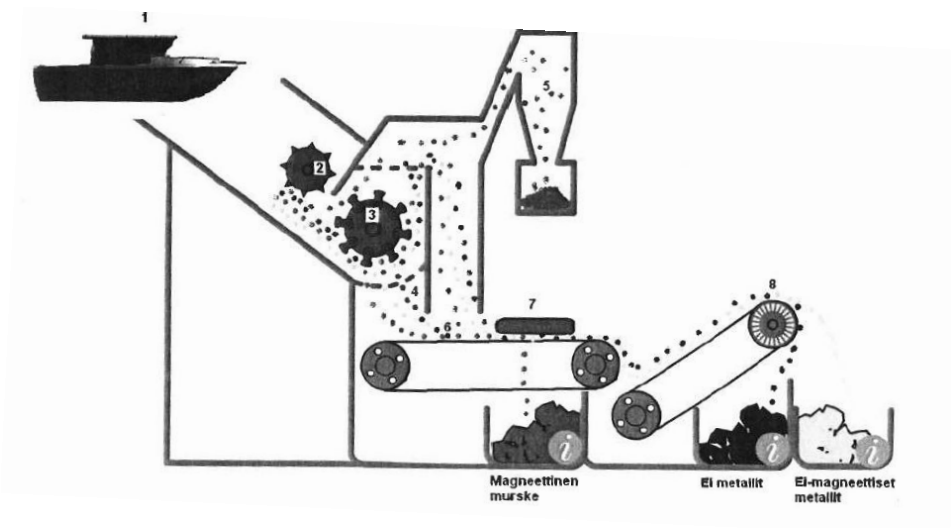
Technical details of the Kuusakoski system

The boats are crushed in groups that consist of only boats. If they are crushed with cars, the level of material that can be recycled is lower because the separation of the materials is based on electrical conductivity, material density, magnetism and different colours.

The materials are separated the best when they are crushed to optimal grain size, which is approximately 40 mm. They are separated by physical, chemical or optical methods.

- The boat is fed to the conveyor.
- The feed roller feeds the boat towards the rotor.
- The hammers attached to the rotor crush the boat when rotating at 600 rpm.
- The sieves let through the particles that are at the defined size (40mm); larger particles stay in the crushing rotors.
- During the crushing process dust is being sucked from the crusher to the cyclone, where it is being fed to the sludge scrubber and then on to waste.
- The transfer conveyor moves the crush towards the separation plant.
- The magnetic carpet is used to separate the magnetized crush from the overheads of the wind separator.
- The eddy current separator separates aluminium from other metals and waste.

Figure 6 The method for crushing boats in the Kuusakoski system⁴⁵



⁴⁵ ELB, End-of-life Boat recycling in Finland 2009. J. Savolainen.

6.2.2 *ELB in Sweden*

Swedish households own 943,000 boats of which 881,000 are fit for use. This means that approximately 100,000 are in such bad condition that they should be disposed of but only < 100 boats are scrapped every year,⁴⁶ probably due to the cost of disposal.

Recycling systems in Sweden

A few operators officially handle the scrapping of ELB. For example, established recycling companies and businesses on both the east and the west coasts of Sweden specialize in recycling boats. The procedure is that the boat owner contacts the company. The boat is transported to a scrapping place where it is decontaminated so all hazardous substances are removed (oil, cooling agents, batteries and so on). Removable parts and materials which can be used again are taken off. Then the remaining materials are removed and separated for final handling.⁴⁷

Today the plastic (composite) in the boats is usually burned in furnaces. One problem is that the residual fibres remain and cannot be recycled and thus end up as landfill.⁴⁸ A typical composite contains 40% glass fibre and 60% thermoset.⁴⁹

6.2.3 *ELB in Norway*

The 2008 study estimated that the total number of ELB in 2007 was 5 500 (small boats 3,500) and calculated that the number in 2017 would be 15,200 (small boats 6,400).⁵⁰ These numbers are not certified and the disposal of ELB is unknown. This also underlines the uncertainty of the calculations.

Recycling systems in Norway

Norway has no system for collection and decontamination of ELB and, to date; this has not been a priority for the Norwegian Climate and Pollution Control Agency (KLIF). The study carried out in 2008⁵¹ was based on initiatives from the Parliament. Their conclusions were that the prob-

⁴⁶ Naturvårdsverket (Swedish Environmental Protection Agency) 2010, Nedskräpande och uttjänta fritidsbåtar

⁴⁷ Naturvårdsverket (Swedish Environmental Protection Agency) 2010, Nedskräpande och uttjänta fritidsbåtar.

⁴⁸ Båtmiljö.se, www.batmiljo.se, noncommercial homepage spreading information for a more environmentally friendly boat life, cooperation between BalticSea2020, World Wildlife Found (WWF) and Skärgårdsstiftelsen, 2012-05-23.

⁴⁹ Petterson C., Andreasson S. – Stena Metall AB, Skrifvars M., Åkesson D. – Högskolan i Borås (2010).

⁵⁰ SFT 2008. Utrangerede Fritidsbåter, Kartlegging av miljøproblemer. Vurdering av tiltak og virkemidler. Rapport 2391.

⁵¹ SFT 2008. Utrangerede Fritidsbåter, Kartlegging av miljøproblemer. Vurdering av tiltak og virkemidler. Rapport 2391.

lem was not yet crucial and no quick action was needed and that the authorities would follow developments and wait for results from projects within the branch. At the same time, the municipalities were informed they might become responsible for receiving ELB.

A Norwegian research and development project, Gjenkomp, is considering having different kinds of collection sites in the future to ensure good accessibility for a boat's last owner. The proposal is also to develop a system for decontamination of boats. Preliminary, not yet published, results show that transport costs from receiving stations to relevant central treatment facilities will be high. Pre-crushing or fragmentation is being considered, but will depend on the final treatment in order to recycle/recover the boat. The structure of collection sites could include;

- End-of-life Vehicle receiving operators/decontamination plants,
- Leisure boatyards, and
- Municipal waste plants.

This development will depend on how a future system is organized in terms of responsibility and related financing systems. In addition, the structure will take into account the actual treatment solution and need for pre-treatment at the first stage. Recycling of GRP will require solutions other than the production of fuel for the cement industry or other incinerators.

6.2.4 ELB in Denmark

During the financial crisis, the number of boats abandoned on land increased and the number of boats abandoned at the marinas increased drastically.⁵² Denmark has neither a national strategy nor a system to handle ELB. The responsibility finding practical solutions has been given to the municipalities, which provide no disposal systems for boat owners.

When ELB are abandoned at the marinas, the managers are left with finding a practical solution and the jurisdictional challenges. It takes the enforcement court and external assessors to get rid of a boat.

A significant number of unregistered boats on trailers contain an unknown percentage of ELB stored around in the country, waiting for alternative systems to handle such waste. Only few boats are turned in as waste at the civic recycling centres, so only few municipalities have developed specific systems for handling ELB. This leaves the boat owners with only one costly alternative, the scrap dealer.

⁵² Højenvang 2012.

Recycling systems in Denmark

Denmark has recycling systems for many different waste fractions and materials but no solution for ELB or fibreglass/plastic composites in general. The fibreglass is mainly as landfill but some is incinerated to produce energy for district heating.

Denmark is one of the leading countries in production of wind turbines built of large amounts of plastic composites. The wind turbine industry has not been capable of finding a permanent solution for recycling their fibreglass/plastic composites. Several other smaller companies have been started to solve the problem but none have managed to survive or find a recycling solution for the materials.

Different companies have come up with different recycling ideas:

- Cut fibreglass into pieces and reuse it in new products.
- Heat treating of fibreglass to split the fibres from the adhesives. The fibres would be reused to supplement new fibres and the adhesives would be used as supplementary fuel for energy production.
- Pulverize the fibreglass and use what is left as fill in cement production.

None of these processes have what is needed to work economically or technically, which leaves the society with no alternatives other than incineration and putting the waste in landfill.

During 2012 in Denmark, the leading companies on plastic composite production (wind turbines, boats, etc.) raised the finances to start a major project to solve the problem. The 43.4 million DKK project is managed by some of the leading research institutions in Denmark.⁵³

The municipal authorities have the responsibility to provide boat owners with a solution for ELB. The responsibility has been difficult to deal with and practical solutions vary among the municipalities. Proactive municipalities have solutions for receiving ELB at civic waste sites or to providing the boat owner with information about how to do so. Other municipalities leave the boat owner or marina to deal with the problem.

⁵³ SFI, (2012). Styrelsen for Forskning og Innovation, Danish Research and Innovation Agency, www.fi.dk, 2012-11-02.

7. Potential reuse and recycling of parts from unwanted boats

For a society to be sustainable, it should reuse products as much as possible. See table 5 on parts that may be reused.

The conclusions from the discussion groups in the workshop of 3 December 2012 showed that the parts from old boats that could be reused were winches, tanks, masts and engines, depending on their condition. The materials that were identified as being recyclable were mainly metals, for example, lead, aluminium and stainless steel, which all are economical to recycle. Other parts that can be economical to recycle are batteries and liquids like oils, diesel and gasoline. Electronic equipment can be reused if it is not too old, but since changes occur quickly in this area there is probably not a large market for it.

Some inventive people may find quite different uses for parts taken from boats. One workshop participant reported on a firm that makes bags from sails. Other detachable parts that may be removed and reused include kitchen stoves, toilets, windows, ropes, starters, propellers and pinions. Most furnishings on boats are made out of wood if they are not an integrated part of the composite plastic structure. The wood is often a type of precious wood, which could be recycled in the wood industry or at least incinerated.

Boat motors are similar to cars motors and may fit in to common systems for car recycling. After the engine has been removed, the composite materials make up by far the largest part of what remains. Today there are no cost-effective way to reuse the plastic even if processes exist by which it could be done. This is a field that needs further development.

A study from Norway investigated the composition of ELB in order to identify their recycling potential.⁵⁴ The results are presented in figures 7 and 8 and show that plastic composite and metal are the main materials for recycling. Plastic composite can be between 25–50% of total weight of a normal 16 feet long boat. Engine, and other metal, parts are the most valuable components today.

⁵⁴ Gjenvinning av fritidsbåter, kartlegging av materialsammensetning og miljøgifter i utrangerte fritidsbåter, Mepex Consult for Veolie Miljø 2011.

Figure 7 Material compositions of 9 different plastic boats in Norway

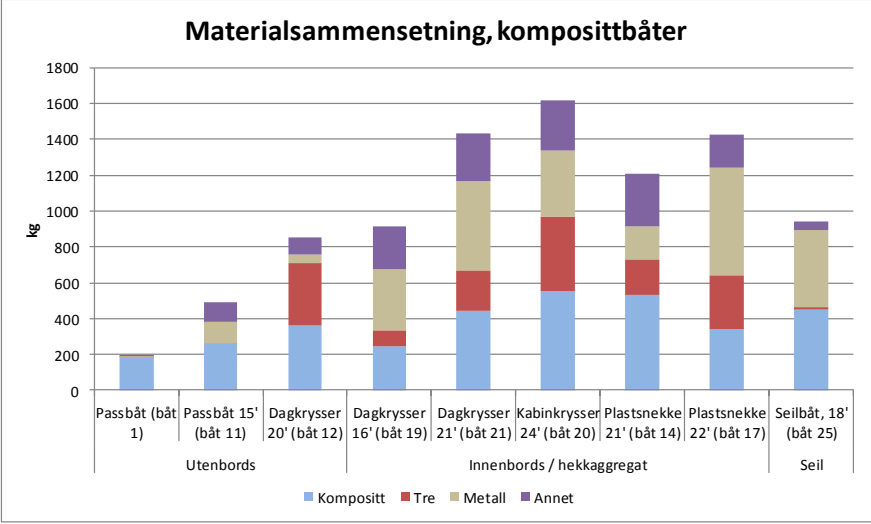
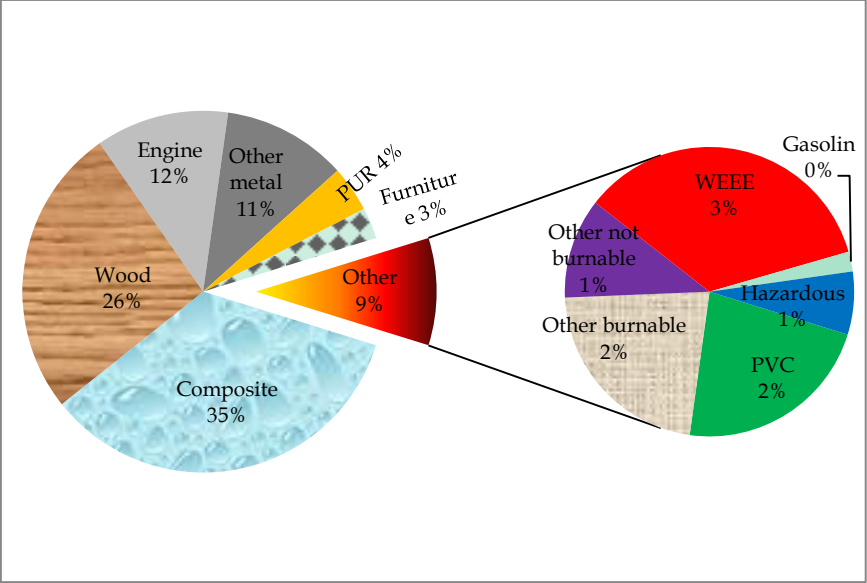


Figure 8 Detailed material composition for a Selco queen 24 feet



8. Environmental pollution by ELB

In the process of dismantling an ELB, caution has to be taken to avoid health risks and to not spread pollutants into the environment. One of the main recommendations from the workshop was that decontaminating and dismantling ELB should be performed by professionals at certified firms. This should ensure that the health risks are minimized and the process is conducted in an environmentally friendly way. A suggestion was made that a standard for the procedure should be developed.

For an overview of contaminants that may be found in different parts of a leisure boat see table 5.^{55,56} The table also indicates if the material is reusable or recyclable with today's methods.

Table 5 Boat parts, materials and pollutants reusable/ recyclable status

Boat part	Material	Pollutant	Reusable/Recyclable
Hull	Anti-fouling paints and gelcoat	TBT, copper, irgarol, diuron, lead, zineb, zinc	No. All listed pollutants are toxic and in need of removal before the plastic hull is disposed of
	Plastic composite		No commercial technology available. Low-energy yield
	Thermoplastic	Pigments with Cd and lead (colour stabilization)	Material recycling can be limited depending on actual levels
	Wood	PCB from paints and jointing materials	No material containing PCB should be recycled
	Zinc anodes	Zinc Cd	The zinc anodes are often contaminated with traces of Cd, which should be considered in the recycling process
Superstructure	Deck		For energy (if wood)
	Fenders	Lead in PVC plastic	Not suitable for recycling of PVC.
	Sandwich construction with foam	CFC and HCFC gasses	Not suitable for recycling
	Mast		If metal yes If wood – for energy
	Sail		If plastic – maybe If textile – yes

⁵⁵ Kemikalieinspektionen (Swedish Chemicals Agency): Commodity guide, www.kemi.se

⁵⁶ Mepex Consult AS. Gjenvinning av fritidsbåter, kartlegging av materialsammensetning og miljøgifter (2011).

Boat part	Material	Pollutant	Reusable/Recyclable
Furnishings	Rope		If plastic – yes If natural material – no
	Windows	PCB in sealing	Material containing PCB should not be recycled
	Textiles	Flame retardants	
	Wood	White paint may contain lead	For energy
	Paint	White paint may contain lead	No
	Toilet		May be removed and reused
	Oven and stove	Metal	May be removed and reused
Motor	Engine parts	PAH	Yes
	Starter		May be removed and reused
	Battery	Acids and lead	Yes
	Iron parts from motors		Yes
	Oil	PAHs	No
	Propeller		May be removed and reused
	Pinion (drev)		May be removed and reused
Electrical equipment	GPS/navigator, radio, sonar	Flame retardants	Perhaps

Hulls

Most boat hulls are coated with anti-fouling paints containing toxic substances, which may be spread in the disposal process. Many of these are priority substances (e.g., TBT, lead) which, according to the Water Frame Directive (Directive 2000/60/EC), should be phased out as soon as possible. All anti-fouling coatings are recommended to be removed before further processing is done.

Today, the composite may be crushed and ground into smaller pieces that may be used as filling material in cement. However, this is only a way of replacing the material and is not an end solution.

A plastic boat hull consists in large part of glass fibre, which functions as armour in the material. More research needs to be done on methods for reusing the glass fibres.

Super structure

The parts that are in good condition may be reused.

Furnishings

The wood used in furnishings is normally painted with problematic organic substances or white paint containing lead. These substances can be incinerated at temperatures above 1100 °C. In this process the organics are destroyed and the metals will be found in the ashes.

Motor

Before reuse, motors should be emptied for oils, fuels and preserving agents like glycol.

Electrical equipment

The electrical equipment in boats is similar to other electrical equipment and the environmental impacts are the same. Problematic substances as heavy metals, organic compounds and brominated flame retardants (BFR) are substances likely to be spread in nature. The EU has introduced producer responsibility, which should also cover electrical equipment from boats. Electronics devices from the marine sector should be collected as part of the existing collection systems for waste electrical and electronic equipment (WEEE).

9. Examples of initiatives on ELB in the Nordic countries today

9.1 Finland

In the summer of 2005, between the beginning of June and the end of August, Finnboat and Kuusakoski launched a campaign promoting ELB recycling. The campaign was implemented in the Turku Archipelago area and southwest Finland where the density of summer cottages and boats is high.

Four boat collection sites were established and one additional collection “site” was Keep the Archipelago Tidy Association’s service boat *M/S Roope*. There were four collection points altogether. Two in Turku, one in Kemiö and one in Taalintehdas. The collection boat went around the campaign area of for two weeks and collected ELB from private boat owners, from both private docks and from public harbours.

ELB < 10 m could be left free of charge at any collection site. Longer boats had to be delivered to the Turku site because of the lack of space at the other sites.

During the campaign, the type of raw material in the boats was not important and wooden, fibreglass and metal boats were all accepted. In addition, parts with hazardous waste such as batteries and used motors were accepted.

Altogether 180 boats were delivered to the collections points during the campaign. Not all of the boats were scrapped because a used boat market developed. One person’s trash can end up being another one’s treasure.⁵⁷

A similar campaign has not been done since, but modifications of the original campaign have been done with the support of Kuusakoski. Since 2006, Kuusakoski has collected ELB in its 22 collection points.

⁵⁷ <http://www.venemestari.fi/file/0eb0c28d356fa1ef87392ce07a3e3ca4>. Referenced 20.11.2012

9.2 Sweden

9.2.1 *Collection and decontamination*

Sweden has no system for the collection of ELB. The Swedish Environmental Protection Agency (SEPA) suggests that the boat industry take the lead and create a system in which they decide which participants in the transport and recycling industry to cooperate with and create funds for ELB as well as a solution on how to share the costs among the boat producers. SEPA propose that the boat owners would transport their boat to the nearest pound, a maximum distance of 50 km, as for cars, and then the responsibility would transfer to the boat producers. Some pre-treatment would be necessary at the pound, for example, emptying the boats of toxic waste and doing preliminary fragmentation. This facilitates transportation to a central location where further fragmentation and separation would occur.⁵⁸

9.2.2 *Reusing and recycling*

The first ELB scrapyards in Sweden was in Muskö, Stockholm. The scrapyards also recycle and sell used boat parts.⁵⁹ It has an on-going project in which it is recycling seven different types of plastic boats to learn more about how to dismantle leisure boats and to test the scrapyards' process for environmentally correct recycling.

Some studies have been done in Sweden on recycling glass or coal fibres in thermosets, but the problem is to make it economically sustainable. Another on-going project is to try and reuse the plastic in the cement industry or to grind and use it, for example, as fill in road construction.⁶⁰

Composites can be recycled through mechanical grinding into a material which can be used as fill in virgin composite. However, this process has been shown to result in lower quality and it is not economically profitable. The high proportion of inorganic material gives the composite low-energy content. This can be burned along with other waste. A project was started in 2009 by Stena Metall AB and Högskolan in Borås to investigate the possibilities of using recycled composite for energy recovery by microwave pyrolysis and to evaluate the potential for recycling combined materials, such as composite. Microwave pyrolysis is a process in which the material is heated by microwaves, in an inert envi-

⁵⁸ Swedish Environmental Protection Agency, 2010.

⁵⁹ www.batskroten.se, 2012-05-24.

⁶⁰ Batmiljo.se, www.batmiljo.se, noncommercial homepage spreading information for a more environmentally friendly boat life, cooperation between BalticSea2020, World Wildlife Fund (WWF) and Skärgårdsstiftelsen, 2012-05-23.

ronment. After pyrolysis of glass-fibre-reinforced plastic two fractions emerges – an oil and an inorganic fraction. The oil is composed mainly of aromatic compounds and can be used for energy extraction. The inorganic fraction is made up of recycled glass fibres. However, when used to create new composite, they give it inferior mechanical properties because their coating has partly degraded during pyrolysis.⁶¹

9.3 Norway

The Norwegian Ministry of Environment is planning to present a national waste management plan before the summer of 2013. This plan is expected to include a proposal for a better system for ELB, eight years after the topic was put on the agenda in the Parliament.

As a result of the KLIF study from 2008, a research program started up with focus on the total value chain and especially on new recycling methods for GRP. The project included the following elements:

- Practical collection from marinas, etc.
- Dismantling, decontaminating and crushing of 20–30 boats to determine material composition and hazardous elements
- technology development – new process for chemical recycling of GRP (SINTEF)
- proposal for an integrated system, including organizing and financing

In December 2012, Norboat send a proposal for a system to the Ministry of Environment. The contents are still confidential.

⁶¹ Petterson C., Andreasson S. – Stena Metall AB, Skrifvars M., Åkesson D. – Högskolan i Borås (2010): Waste Refinery rapport WR22: Jämförelse av befintliga återvinningsprocesser för kompositmaterial – en förstudie gällande mikrovågspyrolys. Downloaded 2012-05-22 from: www.wasterefinery.se

9.4 Denmark

Denmark has no national strategy and the Danish EPA leaves the initiatives to the municipal authorities because ELB is considered as waste, which is a part of the municipal jurisdiction. The challenges with ELB have not reached a level that forces the authorities to act. According to the different boat and marina organizations this will become a problem in the near future. The number of abandoned leisure boats will increase and the questionable condition of the stored abandoned boats will force society to come up with solution.^{62, 63, 64}

⁶² Højenvang, 2012, telephone interview.

⁶³ Nielsen, 2012, telephone interview.

⁶⁴ Hansen, 2012, telephone interview.

10. Financial problems

10.1 Finland

The governmental has not discussed extending producers liability to boats. Some interest groups want to extend the liability to new boats (price included in the purchase price) and force the producers and re-sellers of boats to take care of the existing waste. However, this suggestion is not included in the new waste law, coming into force 1 May 2013.⁶⁵

There is also a growing need to create “cash from trash”, an issue being addressed by the LUMI project led by Research Director Martti Kempainen from Mikkeli University of Applied Sciences. The EU Directive 2008/98/EC bans the disposal of GRP in any landfill site starting in 2015. In Germany, the directive came into effect in 2005 and the country already has a working recycling system for GRP waste. In the German recycling system, the waste is ground into small pieces, which are mixed with thermoplastic waste, becoming appropriate raw material for a cement kiln. In the kiln, the plastic components are burned to create the energy needed to heat the kiln, while the glass fibres melt and become mixed with other solid raw materials to form high-quality cement. The LUMI project aims to build a similar fibre-reinforced plastic recycling system in Finland.

10.2 Sweden

In Sweden, several suggestions have been made for financial solutions for the cost of recycling of ELB. The SEPA suggests a producer’s liability in which the financing can be provided, mainly in three ways: 1) pre-financing for newly sold boats and pay as you go for the existing waste, 2) pay as you go, and 3) a recycling fund.⁶⁶ Other possible ways of financing are a boat recycling fee (where the cost for the existing waste is partly financed by the boat owners) or financing through insurance or a bank warranty (combined with a pay-as-you-go system).

⁶⁵ email with The Centres for Economic Development, Transport and the Environment Senior Inspector Jonna Paatonen in 21.11.2012.

⁶⁶ Naturvårdsverket (Swedish Environmental Protection Agency) 2010, Nedskräpande och uttjänta fritidsbåtar (Abandoned end-of-life boats).

10.3 Norway

Norway has no official policy regarding ELB, but producer responsibility is under consideration. However, it is possible to read existing legislation in a way that the municipalities have responsibility to receive ELB owned by private persons as household waste. In practice, no municipality has any system to treat ELB properly, but some ELB are sent to landfill for a normal landfill fee. Several members of Parliament have raised the question about the need for better solution for ELB in Norway.

The organization Norboat has taken part in a research project with representatives from industry and waste operators to develop a proposal for a solution, including a financial solution. A fee on new boats to cover operation cost for ELB is part of the proposal. Norboat is clear that this fee should not cover cleaning up boats that have already been dumped.

10.4 Denmark

Since no national strategy has been developed in Denmark, no financial systems for covering the cost of ELB treatment have been suggested. Nevertheless, the boat organizations seem to be considering different proposals for solving the problem.

Danish Leisure Sailors have proposed a system for financing the removal of wrecks through mandatory insurance for all boat owners.⁶⁷ This system could easily be developed to include the waste management after the end of life for leisure boats.

As in the other countries, the system could be based on fees, taxes etc. The proposal covers only new boats. According to the boat and marina organizations in Denmark, no system will be put in place to cover the cost of disposing of existing boats.

⁶⁷ Nielsen, 2012, telephone interview.

11. Concluding remarks and recommendations

11.1 Boat statistics

As has been shown, in all the Nordic countries it is difficult to reach anything other than estimates on the total numbers of leisure boats; in particular, the estimates for the number of ELB are very unreliable. The number of new boats sold is reliable for Sweden and Norway.

- A more uniform way of presenting statistics on boats within the Nordic countries would facilitate future estimations of, e.g. need for systems for ELB.
- The figures presented in this report are not sufficient to estimate the extent of the problem and need for ELB.
- A rough estimate of the number of boats older than 40 years shows it to be almost 6% of the total number of boats.
- Our conclusion, as well as the conclusion from the workshop held 3 December 2012 in Stockholm, is that the number of ELB will grow in the near future.

11.2 Legislation for registration of leisure boats

None of the Nordic countries have a mandatory system for registration of leisure boats. A system is needed both for insurance purposes and for the identification of owners. Since the majority (60-70%) of the boats are smaller, often less than 5 m in length, the workshop delegates suggested the following:

- All small boats (e.g. < 5 m) should be tagged with a RFI chip by which the owner can be identified and approached. If a boat were not tagged the local authorities would be allowed to take care of them.
- It should be possible to deliver smaller boats < 5 m to municipal recycling stations.
- All boats > 5 m should need to be registered in a national registry and handled the same way as cars are with respect to insurance and operations, when sold to a new owner.

None of the Nordic countries have a system for stimulating the collection of worn out boats, so their disposal will be at the expense of the boat owner. This problem can be divided in two parts: 1) boats that are already abandoned and 2) future ELB, which may need different approaches, as was discussed at the workshop (see Appendix 3).

- To get rid of the littering and waste problem of abandoned boats, a collection campaign is needed. This could be conducted by the different organizations for keeping the countries tidy (Keep the Archipelago Tidy, Keep Sweden Tidy, Keep Norway Tidy and Keep Denmark Tidy). The states need to contribute money for this.
- An EPR should be enforced to pay for the future costs of abandoned boats.
- A scrapping bonus could be necessary to have all non-seaworthy boats handed over for proper ELB handling.

11.3 Environmental problems when scrapping boats

Several health and environmental risks have been identified and should be taken care of in a systematic way. It is of utmost importance that hazardous substances are not spread (diluted) further in the ELB process. We suggest the following:

- Decontaminating and dismantling of ELB should be performed by professionals at certified firms.
- One authority should be appointed by each country to have the full responsibility of ELB.
- A standard for how to decontaminate and dismantle ELB should be carried out ought to be developed.

In connection with disposal of boats, the environmental and health problems are more complicated than they need to be because of boats' complex structure and material composition.

- New boats should be built with as few components and materials as possible to facilitate their final disposal.

11.4 Reuse/recycling of parts from worn out boats

The different parts that may be reused/recycled from ELB with a profit are all metals, some liquids (e.g., oils, fuels), batteries, and electric equipment (if relatively new). Other parts that might be reusable are removable parts like kitchen stoves, toilets, winches, and parts from the engines.

- A second-hand market should be stimulated to increase the reuse of parts from ELB.

11.5 ELB in the future

Today, only Finland has a private system for ELB. In the other countries only few actors are handling ELB. Recommendations for meeting the challenges of handling ELB are

- development of nation-wide systems for ELB,
- appointment of responsible authority needs to be for each nation,
- development of a system that is simple for boat owners to use,
- building, new boats with few materials in a way that they can easily be decontaminated and dismantled to facilitate future ELB,
- selection collection points for ELB should be,
- development a certification system be so that ELB is conducted in a safe and environmental friendly way, and
- development of a financing system both for abandoned boats and future ELB.

In conclusion, as long as there is no system for collection and environmental friendly recycling, there is a major risk that the ELB will end up abandoned on the property of the owner or in a boatyard, being burned, or being dumped in lakes or in the sea. For this reason it is important to take action NOW.

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13. Appendix 1

List of reports mainly used, including short summary

Nedskräpande och uttjänta fritidsbåtar (Abandoned end-of-life boats) – Swedish Environmental Protection Agency (NV-01515-10).

Summary: The Swedish government commissioned the SEPA (Naturvårdsverket) to propose: 1) a system that will prevent end-of-life boats from being abandoned, 2) how producer responsibility for recreational craft can be introduced at EU level, 3) a system for tracing owners, and 4) a possible way for municipalities to deal with abandoned boats.

The agency propose an extended producer responsibility in which the producers takes responsibility once the boat has been left at a collection point by the owner. The proposed solution includes setting up a recycling fund within the industry, where a fixed amount is set aside for each new boat placed on the Swedish market. These funds will then be used to cover the cost of recycling of the end-of-life boats. The agency proposed that a suitable system for tracing owners would be a compulsory recreational craft register encompassing all recreational craft that are not registered elsewhere with corresponding traceability. The municipalities should be given the capability to deal with abandoned boats in the same manner as abandoned vehicles.

Vrak och ägarlösa båtar – The Swedish Agency for Public Management (2008:6)

Summary: The government entrusted the Swedish Agency for Public Management to investigate who should have the authority or responsibility to take care of, decontaminate and move shipwrecks and ownerless boats. The problem has three aspects: obstruction (hindrance in the fairway), environmental risks (mostly spills from bigger ships), and littering (mostly small vessels and leisure boats). It was concluded that the knowledge of the environmental hazard of ship wrecks is insufficient and needs to be improved. However, shipwrecks and ownerless boats were not seen as a major environmental problem beyond the risk of a spill of polluting substances, mainly meaning fluids. The report states that there is a need 1) for an inventory of potentially environmentally hazardous wrecks and 2) for a comprehensive system for tracking boat owners so action can be demanded from them and the authorities can take action in cases where the boat owner does not.

ELB, End-of-life Boat recycling in Finland – Jaakko Savolainen (2009)

Summary: The aim of this master's thesis was to study the boat recycling situation in Finland and to develop a boat recycling system in Finland. One result was that it was important to inform consumers about the correct way to recycle boat. The goal was also to find cost-efficient ways to recycle the boat materials.

The result was that a working, cost-efficient, national boat recycling system is now running in Finland. This system will be used as a correct and environmentally friendly way to dispose of boats in Finland.

Danboats Havneundersøgelser 2009 – Danboat, J. Hansen (2012).

Danboat has, in cooperation with the Danish Sailors Organization (Dansk sejlfunion) and the Association of Danish Marinas (Foreningen af lystbådehavne i Danmark), made an accounting of the leisure boats in Denmark. They found that there were 57 000 leisure boats but it was unclear how many other boats the country contained. They found, furthermore, that 57 % of the boats were sailboats and the rest were motorboats. This is highly reliable data but it only covers the boats that are registered.

Forurening fra traktorer og ikkevejgående maskiner i Danmark – Miljøprojekt Nr. 779 (2003) and Armeret epoxy- og polyesterplast - forbrug og affaldsmængder – Miljøprojekt Nr. 656 2002.

The Danish EPA has carried out two studies that provide some information on waste caused by boats. One was "Air emission caused by tractors and non-road traffic" and one was "Reinforced epoxy- and polyester plastics – consumed and waste amounts". None of these studies are directly connected to the theme of this report but do contain estimates on the numbers of boats in Denmark. The two reports refer to the same investigations to estimate the amount of waste connected to boat production and the air emissions connected to use of boats. The numbers represents the latest public surveys and provide us with the best available picture of the situation.

The statistics on leisure boats in Denmark were based on surveys on imported boats and estimates on the production of boats and the actual number of members of marinas. These sources provided us with a precise number of active large leisure boats but left us with unclear number of other leisure boats. Since no registration has been done there is no record of the number of neither abandoned large leisure boats nor small leisure boats.

Statens forurensningstilsyn (2008) Utrangerte fritidsbåter, kartlegging av miljøproblem og vurdering av tiltak og virkemidler. Rapport no TA 2391/2008. Mepex Consult AS

The Norwegian EPA carried out a study regarding ELB in Norway; it was performed by Mepex Consult in 2008. The study provided facts about the number of boats and expected growth in number being scrapped. The environmental problems are discussed, based on available information, and proposals for actions and initiatives to reduce the problems are described and analysed.

Konglige Norsk Båtforbund og Norboat (2012) Båtlivsundersøkelsen – fritidsbåtlivet i Norge 2012

This study is a new version of older studies but is based on a similar Swedish study from 2010. The aim was to provide facts about different aspects of the leisure boat life in Norway. The study is based on total of 4 650 telephone interviews of people, of which 1 140 lived in household with one or several boats. Some results were:

- Norway has an estimated population of 750 000 boats and almost 25 % of all households have boats.
- Of this, 62 % boats are motorboats and 7 %, sailboats, 31 %, small boats.
- 86 % of boat owners used the boat in 2011 and for an average of 34 days per year.
- 4 out of 10 boats have insurance (300 000 units).
- 1 out of 10 household have a boat they are considered scrapping.

Veolia Miljø Metall AS (2011)

The report «*Gjenvinning av fritidsbåter – kartlegging av materialsammensetning og miljøgifter i utrangerte fritidsbåter*». Mepex Consult AS is a part of a research program on recycling boats and an integrated system in the value chain from boat owner to recycler/end disposal. The report provides results from the practical dismantling, decontaminating and crushing of 26 boats of different kinds. All the materials were identified and sorted, before registered and weighed. XRF pistols were used to detect different pollutions; this was combined with samples and laboratory analysis. The report documented the complex combinations of material in the boats and found there were several serious hazardous elements in the boats.

14. Appendix 2

The ELB situation in Greenland and The Faroe Islands

Greenland and the Faroe Islands are self-governing regions in the northwestern region of the Atlantic Ocean and part of the United Kingdom of Denmark. They have strong sailing traditions because of the difficulties for building roads on land and access to vast areas of the ocean, as well as their cultural heritage. Greenland and the Faroe Islands have the same challenges as other northern countries when it comes to ELB. The various authorities do not keep official registers for leisure boats other than those kept by insurance companies and boating organizations. Nor have they implemented regulation of leisure boats or provided any system for handling ELB.

The common procedure on the Faroe Islands is to dispose of ELB by shredding and incinerating the composite parts to produce heat and reduce the volume of waste. Larger boats are usually disposed of in the landfills (IRF, 2012). Greenland is practicing the same method in towns with incineration plants, when capacity permits it. Most ELB are disposed at landfills or abandoned on land (Qeqqata Kommunia, 2012).

The number of dumped boats in Greenland and the Faroe Islands waters is unknown due to the lack of authorities in the sparsely populated areas. Dumping a boat in northwestern Atlantic waters is dangerous and considerably more difficult than abandoning them on land.

15. Annex 3

Results from workshop on ELB in Stockholm, 3 December 2012

The NMR project group organized, in collaboration with Keep Sweden Tidy (HSR), a workshop in Stockholm, 3 December 2012.

15.1.1 Participants and program

The invitation was sent out to boat producers, boat organizations, wharfs, environmental authorities and other interested stakeholders in Finland, Sweden, Norway and Denmark. The Swedish Agency for Marine and Water Management sponsored the lunch and coffee breaks.

The main goal of the workshop was to have the participants discuss disposal of ELB and issues around ELB.

The workshop had 50 participants registered, and most were able to attend.

9.30 – 10.00	<i>Registration (coffee/tea)</i>
10.00 – 10.10	Welcome (NMR project group and HSR).
10.10 – 10.30	Disposal of plastic end-of-life-boats - Status in the Nordic countries today (results from the NMR project so far)
10.30 – 10.45	To scrap ELB - a mission impossible in Sweden? (HSR)
10.45 – 12.00	<i>Coffee/tea and discussions in smaller groups</i>
12.00 – 13.30	A visit to Briggen Tre Kronor and after that lunch
13.30 – 13.50	Seven years of practical experiences in Finland (Jaakko Savolainen)
13.50 – 14.10	Abandoned pleasure boats – an overview on status and developing projects in Norway (Frode Syversen, Mepex Consult and Jan-Fredrik Bergman, Norsk Gjenvinning Norge AS)
14.10 – 15.30	<i>Coffee/tea and discussions in smaller groups.</i>
15.30 – 16.30	Summing up and general discussion.

The discussions in the morning were aimed at defining the problems and in the afternoon were focused on practical solutions to what was brought up in the morning discussion.

The discussion was organized into six groups, with two parallel sessions. Each group discussed three questions in the morning session and three in the afternoon session.

15.1.2 Summary of the workshop as understood by the Nordic project group

As a result of the discussion a clear agreement was reached that an ELB can be defined as a boat that has no value to anyone; it cannot be sold, fixed or used. It was also agreed that the ELB situation is a problem in all the Nordic countries and is growing.

In the discussion a few issues received more attention than the others: boat registration, statistics and numbers, research needs and the economics of the issue.

Boat registration:

- Registration policies vary in all Nordic countries. No register includes all boats (and boat types). Registers that are similar should be established in all of the Nordic countries.
- A traceable marking system of boats is needed to help in identifying owners of abandoned boats.

Statistics and numbers:

- It is impossible to know the exact number of boats and ELB in different Nordic countries because of the lack of comprehensive registers.
- When new statistics are compiled, it would be beneficial if they compiled in a similar way in all Nordic countries, so comparisons could be made of the statistics and situation, across borders.

Economics of the issue:

- Today the cost of recycling the boat is being solely paid by the owner. This does not stimulate recycling of ELB.
- At this stage producer's liability does not exist for boats. An increased liability might partially help to finance the recycling.
- No clear trash-to-cash system exists and a market for recycled materials (fibreglass) needs to be created. A market for metals and reusable parts already exist.

Research needs:

- We need to know how many boats lie abandoned on land and the seabed.
- We need to do more research on what can be done with the fibreglass, how to recycle it or to resell it.
- We need to be able to know the total number of leisure boats in the Nordic countries so we can estimate the number of ELB in the future.
- We need to study the long-term and short-term effects of hazardous substances on humans and the environment, both on land and when they leak into the sea.

The participants were divided into six groups who each discussed all six presented topics and the related questions. Below is first the summary of all answers on the respective topic and after that are the answers as they were written down by the separate groups. Since most participants spoke their native language the answers are written in that language.

15.1.3 Summary of the answers of the groups on the questions discussed at the workshop on “Disposal of end of life boats (ELB) in Stockholm 2012-12-03 as presented by the participants at the end of the workshop.

Annex 3 Table 1 Summaries of the topics by the participants

Topic	Questions	Summaries
ELB today	<ol style="list-style-type: none"> 1. How do we define ELB? 2. Is ELB a problem today and if it is how big a problem is it? 3. Where do ELB end up today? 4. How will the ELB issue develop in the future? 	<ol style="list-style-type: none"> 1. A boat that no one wants 2. yes and a growing problem 3. All over the place 4. It will grow
Recycling of materials from boats	<ol style="list-style-type: none"> 1. What parts in an ELB can be recycled and what parts are economical feasible to recycle? 2. Where can recycling be carried out today and what are the methods used? 3. What are the most important challenges in order to achieve a nation-wide system for ELB? 	<ol style="list-style-type: none"> 1. Reuse: winches, tanks, mast, engines 2. Recycle: mainly metals – lead, aluminium, stainless steel 3. <i>Where:</i> Båtskroten Muskö, Stena metall - Båtskroten i väst, Kuusakoski, återvinningsstation - <i>How:</i> Boats are broken into pieces and parts are separated, sorted and recycled like regular waste categories 4. Economy: attitude, national regulation, int. regulations, head responsible authority, simple for private people - Statistics of the problem, - how to reuse/recycle glassfibre
Environmental problems	<ol style="list-style-type: none"> 1. Are there any environmental problems when ELB:s are left in the sea or on land? 2. What parts in the whole chain needed in an ELB disposal chain involves the highest risks to the environment? 3. What parts in the whole chain needed in an ELB disposal chain involves the highest risks to the humans? 4. Are there gaps in the risks around the ELB disposal process that we need to know more about? 	<ol style="list-style-type: none"> 1. Exposure to hazardous waste/chemicals during salvage process, transport etc. If not done by professionals, also under the scrapping process 2. In the environment: oil, gasoline, antifouling paint, batteries... - Abandoned boats have the highest risk. - Littering before ELB-process 3. Are ELB an environmental problem? How is toxic substances spread to nature? - Abandoned boats needs to get into the process. How?

Topic	Questions	Summaries
Start of the chain	<ol style="list-style-type: none"> Who ought to be responsible for what? What can the individual do, the municipality, the boat club etc? What solutions to prevent littering can we propose? How can a functional collection of ELB be organized and by whom? Is there a need for regulation to facilitate ELB? 	<ol style="list-style-type: none"> I første hand – egaren har det fysiske ansvar <ul style="list-style-type: none"> - Myndigheterne -> register for båter (store) - Centrale myndigheter -> regelverk/ retn linjer - Kommunene -> ÅVC – små båter - Kommunene -> informere små båter - Båtklubb -> informere - Båtklubb -> kampanjer - Produsent/imp – økonomisk ansvar - EPR + fond rydde opp Informasjon/påvirke opinion <ul style="list-style-type: none"> - Reporterings system - Rydde opp/keep it tidy' Gratis innlevering/ skrotpremie EPR Finlands system – volunteer + sponsors <ul style="list-style-type: none"> - Produsentansvar/miljøbegyr - Statlige midler Yes
Depollution and dismantling	<ol style="list-style-type: none"> What health and environmental problems are seen in the separation process of different parts of the boats? How should potential health and environmental risks be dealt with? Who should do dismantling of boat? Anyone or should authorization be needed? Or other regulation? 	<ol style="list-style-type: none"> Identifera riskerna – använd befintliga och nye tekniker for att hantera riskerna (ex særskild plats for demontering. Krav på spillskydd och kompetens, Etc) Ja, någon form av oberoende auktorisation (for att påvisa attt man har rätt kompetens /metoder) Ja, definitivt en standard for oskadliggörandet och demontering Steg 1: Nordisk standard (harmonisering) Steg 2: Europeisk standard (harmonisering)
End of the chain	<ol style="list-style-type: none"> What parts should be separated? And which part are economical to separate and what parts might be economical to separate in the future? What do we do with the separate parts? What systems are needed? <ol style="list-style-type: none"> The composite? The motors? Electronic devices? Etc Are any regulation needed? 	<ol style="list-style-type: none"> Återvinning av delar: <ol style="list-style-type: none"> Metaller - plusvärde Batterier – plusvärde Elektronik +/- Farligt avfall - kostnad b + c återvinning <ul style="list-style-type: none"> - a+d förbränning (deponi) - Återvinning fungerar - Problemet är vägen dit Lagstiftning <ul style="list-style-type: none"> - Producentansvar - Certifiering - Reglerad marknad imp/exp

15.1.4 *Compiled answers by each of the six discussion groups as they were written down during the morning and the afternoon sessions.*

ELB today (topic A)

1. How do we define ELB?
2. Is ELB a problem today and if it is how big problem is it?
3. Where do ELB end up today?
4. How will the ELB issue develop in the future?

Group 1	Group 2	Group 3
ELB – en båt som ingen vill äga eller bruka	ELB – something with no value for anyone and which represent a risk for humans and environment	No or low value - can't be sold - can't be fixed - Can't be used
Vad vill vi ska hända? Olika system. Underliggande behov av kraschade drömmar Idag inget stort problem. Ansvarsfrågan är framförallt det stora problemet Försäkring => premier	ELB is not an obvious problem today.	It is a growing problem New boats every week As long as they are ashore is more a visual social problem than an environmental one.
Största problemet att båtarna lämnas på land	ELB end up at the bottom of the ocean and in marinas	- As wreck on land or even worse, on the bottom - in someones back yard - in public areas, forests, parking lots
Ökande	Produce new boats easy to scrap	It will grow
Group 4	Group 5	Group 6
Ej brukbara båtar som star på annans mark. I vatten när den är på väg att sjunka/bedöms som ej brukbar	En båt som saknar bruksvärde och ingen vill ta hand om längre. Som utgör risk för människan eller miljön. Eller kan klassas som nedskräpning	A boat that no one wants and that is useless. Boat with no value (but can have value as spare parts /material that can be reused)
Behöver utredas, t.ex genom HSR Frivilliga organisation kanske kan inventera?	Svårt bedöma hur stort problemet är. Vi saknar kunskap. Båtagare vet ej hur de ska göra	Even wooden boats are huge problems. Yes litter creates more litter. But we need to know more about the environmental impact (leakage and so) Yes, economic impact. We can see the boats <i>on land</i> but we do not see the boats <i>under water</i> .
Överges i naturen, sänks i havet	Varv, vassruggar, tomter ÅVC	On land (own back yard/ others properties) In the water
Tror det kommer öka	Större problem pga flera gamla uttjänta båtar	The boats are produced with the same procedures today that in the 60-ties and 70-ties.

Recycling of materials from boats (topic B)

1. What parts in an ELB can be recycled and what parts are economical feasible to recycle?
2. Where can recycling be carried out today and what are the methods used?
3. What are the most important challenges in order to achieve a nation-wide system for ELB?
4. Is there a need for more knowledge, on which topics?

Group 1	Group 2	Group 3
Restvärdet på komponenter har att göra med skicket på materialet	Recycle parts: composite, meta (engine) wood, electronics (incl wires) Economically feasible to recycle: metal, plastic (in special condition)	Reuse: winches, tanks, mast, engines Recycled: Mainly metals – lead, aluminium, stainless steel
Båtskroten i Sv ÅVC	Boats are broken into pieces and parts are sorted and recycled like regular waste categories	Båtskroten Muskö Stena metall Båtskroten, väst Kuusakoski Finland ÅVC – småbitar Landfill companies – not recycling
Ekonomi, attityd, nationellt regelverk, Samlat myndighetsansvar Enklare för varje privatperson Målbild olika för olika intressenter – viktigt Nya båtar – ska tillverkas efter återvinningsprincipen	Economics (who pays?) Is there a market for recyclables? More knowledge on dividing between composite and plastic.	Lack of producer responsibility Legislation: Boat register Possibility to take abandoned boats to ELB Who will take the cost!!! How big is the problem? Needs to be defined
Group 4	Group 5	Group 6
Alla metaller, segel (t.ex till väskor el annat)	Allt utom glasfiber är enkelt o prisvärt att återvinna. Glasfiber går, men är dyrt	Recycle -> metal parts Winscreens form old wooden boats -> reuse Plastic can be used in cement (but not with any economic benefits)
I Sverige 2 ställen	60% är under 5 m = kan tas omhand av ÅVC	There are no places on the west coast A small boat, you divide it into small parts and leave it the recycling stations
Producentansvar framöver Kostnaden Få bort gifter i båtarna för att förenkla återvinning	Internationell konkurrens mellan länder. Kostnader för konsumenter	
Glasfiberåtervinning	Glasfiberåtervinning	

Environmental problems (topic C)

1. What parts in an ELB process involves the highest risks to humans?
2. What parts in an ELB process involves the highest risks to the environment?
3. Are there gaps in the ELB process that we need to know more about?

Group 1	Group 2	Group 3
Definiera hela processen!	People are exposed to hazardous chemicals from scrapes during transport to ELB Children playing in highly contaminated (i.e. under abandoned boats) Particularly important for wooden boats which are coated with Pb.	Safety – issues in salvage process Lifting – transport and so on Exposure to toxics for staff handling the ELB
Före ELB revp och ej professionell hantering	Highest risk when boats are abandoned: oil and antifouling leaching, contaminating water and nearby soil	Littering before ELB process Toxics released during salvage Oil spill and so on
Saknas tillverkarinfor om material, innehåll, ämne samt var substanserna finns och rekommenderad demontering/processplan. Hur mäta och ha koll på ämnen om ej info finns?		Biggest problem is to get abandoned boats into a ELB process - finding owner - who is to pay? - getting permits
Group 4	Group 5	Group 6
Allt farligt avfall bör saneras av certifierade firmor - damm från glasfiber - säkerhetsaspekt med dåliga skrov	Privatpersoner som ej har kunskap om handhavandet av materialet. Ta hand om ELB innebär att man blir exponerad för kemikalier, asbest, bottenfärger (klämskadör)	We have to deal with 2 different scenarios; - history (Boats in environment today) - future (how to deal with the problem in the future. Chemicals Antifouling paints Asbest
Bottenfärgsrester på/i marken	När båten ligger i naturen är olja, bensin, batterier, båtbottnfärger sådant som påverkar miljön negativt	Batteries Fuel Chemicals Littering prblem (many people dump other waste where ELB are put) Are the toxic effects worse when the boats are in the water than on land? Tiny fractions coming off from boats when they are used and/or ELBs
Spridning av miljögifter	Är gamla bilar ett miljöproblem idag? Information till båtägare hur man hanterar ELB. Behövs fler aktörer som kan ta hand om ELB	To have motivation (money/regulation) for starting the process. You have to have places to leave the material/parts.

Start of the chain (Topic D)

1. Who ought to be responsible for what? What can individuals do, the municipality, the boat club etc?
2. What solutions to prevent littering can we propose?
3. How can economical and functional collection and transportation of ELB be organized and by whom?

Group 1	Group 2	Group 3
<p>I första hand sista ägaren har fysiska ansvaret.</p> <p>Ekonomiska ansvaret bör fördelas över alla ägare t.ex producentansvar.</p> <p>Kommuner ansvarar för nedskräpning. Båtklubbar borde ha ett regelverk som förhindrar att båtar blir nedskräpande objekt</p> <p>En myndighet borde vara ansvarig</p> <p>Båtregister –</p> <p>Transportstyrelsen</p> <p>Import, försäljning</p> <p>Skrotning, brottsförebyggande</p> <p>Båtbranchen-statistik</p> <p>Det måste vara lätt att göra rätt. Bilda opinion, ge information, förändra beteenden.</p> <p>Ta bort båtar som skräpar genast!</p> <p>Företag, vilket som helst som har intresse men det måste göras på rätt sätt. Finlands system verkar bra</p>	<p>Boat owners should have the responsibility of notifying for how long they leave the boats unused (so that they won't be considered abandoned)</p> <p>Registration of boats should be compulsory</p> <p>Boat clubs should help the municipality in managing ELB problems</p> <p>Dismantling ELB should be for free or owners should get in return a discount when buying new boats</p> <p>Collaboration between boat owners, municipality, recycling companies or waste management companies, "scrap dealers"</p>	<p>Primary the owner, boatclub</p> <p>Local authorities</p> <p>Municipality</p> <p>Easy reporting system</p> <p>Hot line ASP</p> <p>Regulations</p> <p>Boat on land must be marked with owner. It should be easy to in pound</p> <p>Later auction or recycling</p> <p>Company good will</p> <p>Sponsring</p> <p>Tax !?</p>
Group 4	Group 5	Group 6
<p>Båtar som ligger i naturen idag bör samlas in genom kampanjer ex HSR</p> <p>Bygga upp system för uppsamlingsplatser</p> <p>Kommuner bör ha ansvar för att ta emot mindre båtar ex < 5 m. Kanske också kunna ta hand om större båtar</p> <p>Göra synligt gn att uppmana allmänhet att ta kort på övergivna båtar – läggs upp på hemsida => skapa gruppträck</p> <p>På lång sikt producentansvar. På kort sikt – statliga medel behöver skjutas till</p>	<p>Återvinningsföretag kan påverka hur bra slutprodukten/avfallsprodukten blir</p> <p>Individen måste ta ansvar för sin egen båt</p> <p>Båtklubben vet vem som äger båten (om den inte lämnats där) Båtklubbar kan sätta tryck</p> <p>Information från myndigheter – hur göra/var kan jag lämna</p> <p>Måste vara relativt enkelt och möjligt att betala för skrotning</p> <p>Utökat producentansvar gn lagstiftning eller frivilligt producentansvar ex kampanj för att lösa in gamla båtar när nya köps</p> <p>NGOs – Jobba med/mot båtklubbar för att få dom sätta tryck på enskilda ägare</p> <p>Information fr kommunerna var man kan återvinna/skrota båtar.</p> <p>Krävs nytänk – dvs få in i båtägarnas medvetanden att en båt slutligen måste skrotas</p>	<p>Voluntary for boat owners</p> <p>Information about where you can recycle.</p> <p>Bonus for leaving the boat to recycling.</p> <p>Try to change the law so you can define a boat as litter.</p> <p>This is a issue to be lifted to EU-level</p> <p>Lift this to HELCOM?</p>

Depollution and dismantling of the boats (Topic E)

1. How should potential health and environmental risks be dealt with?
2. Who should do dismantling of boats? Anyone or should authorization be needed? Or other regulation?
3. Is there a need for a manual/standard for how depollution and dismantling should be done?

Group 1	Group 2	Group 3
<p>Utbildning/kunskap om vad som är farligt!</p> <p>Auktorisering minskar risken för habo? Effekter</p> <p>Ingår i lagstiftningen</p> <p>För att minska miljöpåverkan bör arbetet utföras under kontrollerade former på rätt plats</p> <p>Företag som är ackrediterade. Eventuellt kan en svensk standard för arbetet vara till hjälp.</p> <p>Som grupp 2</p>	<p>Staff working with ELB dismantling should wear proper protective equipment.</p> <p>Dismounting should not be done on site.</p> <p>Instead, in controlled environments where the spread of contaminants is at minimum</p> <p>Authorization for dismantling already exist in Norway (same as for cars). Professionals only should do it</p> <p>There should be standards for production which also describe how proper dismantling should be done. The problem will grow in the future because:</p> <p>Boats produced nowadays are of lower quality than before.</p> <p>More boats are imported and these are buildt with a shorter lifte time</p>	<p>Regulations</p> <p>Licenses</p> <p>Education</p> <p>It is already regulated: You need an approved site/plant</p> <p>Environmental authorities regulates and controls these</p> <p>There is already standards for waste management of toxic waste</p>
Group 4	Group 5	Group 6
<p>Identifiera riskerna som görs av certifierad personal och anläggning. Ställ krav på att båtar byggs så att de lätt kan demonteras (liksom för bilar)</p> <p>Certifiering bör vara obligatorisk t.ex från länsstyrelsen liksom för bilskrotar</p> <p>Bör finnas en checklista för vilka hazardous substances som ska tas bort.</p> <p>Olika checklistor beroende på fortsatt destruktionsförlopp (förbränning, deponi eller återvinning)</p>	<p>Identify risks</p> <p>More knowledge</p> <p>Minimize risk/export</p> <p>Ye, authorization is needed.</p> <p>Environmental permission.</p> <p>Learning from other sectors</p> <p>Copy guideline (from Finland)</p> <p>And share experineces</p> <p>Use existing legislation that is in place</p>	<p>Redan känd skyddsteknik (spillskydd, rening, ventilation etc)</p> <p>Kravspecifikation för hur man går till väga</p> <p>Ja definitivt, Utgå från Finlands process och arbeta först fram en nordisk standard som sen kan lyftas till Europeanivå</p>

End of the chain (Topic F)

1. What parts should be separated? And what parts are economical to separate and what parts might be economical to separate in the future based on available technology?
2. What do we do with the separate parts? What system is needed?
 - The composite?
 - The motors?
 - Electronic devices?
 - Hazardous waste, etc?
3. Requires further legislation in addition to the existing?

Group 1	Group 2	Group 3
Många delar har ett andrahandsvärde som reservdelar, återanvändning är bra. Annars se grupp 2	Composite Metal Wood Research needs to be done for proper sorting of composite There is already a market for spare parts (b, c) and it should be supported. Perhaps encourage imports of ELB from other countries and recycle/reuse materials => create a market	Valuable metals In the future maybe composite All things that has a value on the second hand market Once the boat is in the recycling industry it seems to be working fine. The problem is to get them into the system
Det krävs ny lagstiftning som incitament för en förändring till ett fungerande system t.ex producentansvar, båtregister mm	Regulate market	The legislation is there but is not followed-up in some aspects. For example littering
Group 4	Group 5	Group 6
Alla metalldelar = plusvärde Batterier = + värde Vätskor (plaj, diesel, bensin) =+ Elektronik +/- Segel – kan göras väskor av	Se och ta lärdom av byggbranschen och ex kuusakoski	Metals Oil All parts that can be recycled or reused All toxic paints Wood Future – find a new use for glass fiber
Textilier(BFR) – förbränning Motorer – säljs eller smälts ner AF-färger – vid förbränning > 1100 grader är OK. Vid lägre temp ? Compositmaterial – ca 50% av skrotvikten är glasfiber	Försök: ställ ut en gammal båt på Stureplan och se vilken ordning delarna försvinner; dyrast först. Det som blir kvar = kostnad	Försäljning av begagnade båtdelar – sto data bas Uppmärkning av komponenterna
Det bör införas certifieringssystem för varv som tar hand om båtarna på rätt sätt. Sådana bör finna jämt fördelat över hela landet	Öka kraven på återvinningsbarhet	

16. Sammanfattning

Syftet med detta Nordiska projekt var att beskriva de utmaningar som skrotning av båtar (end-of-life boats (ELB)) utgör i Finland, Sverige, Norge och Danmark när det gäller recirkulering och återanvändning av material, miljöpåverkan och möjliga problem med dumpning. Som en del av projektet hölls en nordisk workshop om ELB i Stockholm den 3 december 2012 där 50 personer från alla fyra länder deltog.

Det totala antalet båtar, baserat på undersökningar i de olika länderna, uppgår till nära 3 miljoner fritidsbåtar (Finland 750 000, Sverige 900 000, Norge 1 000 000, Danmark 250 000). Detta är nästan hälften av det totala antalet fritidsbåtar i Europa.⁶⁸ Nästan 20 % av nordens båtar är mer än 40 år gamla vilket indikerar att problemet med skrotning kommer att öka framöver. Detta var också den allmänna uppfattningen bland deltagarna i workshopen.

Det har inte varit möjligt att få fram tillförlitliga siffror över hur många båtar som skrotas varje år beroende på att inget av de nordiska länderna har något obligatoriskt krav på registrering för fritidsbåtar. Däremot kan registrering ibland krävas för att få en båt försäkrad. Båtar överges på land eller dumpas i havet men det har inte varit möjligt att få fram i vilken omfattning detta sker. Otillräcklig registrering av fritidsbåtar gör det svårt för allmänheten och myndigheter att spåra ägare och kräva bortforsling eller att båten tas till en skrotfirma.

Idag har inget av de fyra länderna något nationellt system för att ta hand om ELB, men i Finland finns det ett privat initiativ för att ta hand om skrotbåtar. Det är i samtliga länder oklart vilken myndighet som har ansvaret för skrotning av båtar. Det skiljer sig också mellan de fyra länderna om vad som ska anses vara hushållsavfall och om minde båtar kan ses som sådant.

I inget av de nordiska länderna finns det någon stimulansåtgärd för att samla in och göra sig av med skrotbåtar, vilket innebär att ägaren får stå för den fulla kostnaden. Skrotning av båtar kan delas upp i två problem: 1) redan existerande skrotbåtar och 2) skrotbåtshantering framöver.

Många delar av en skrotbåt är möjliga att återanvända eller återvinna. Metaller är ekonomiskt att återvinna och andra delar, som lätt kan tas bort från båten, skulle kunna återanvändas och säljas på marknaden. Det

⁶⁸ ICOMIA, International Council of Marine Industry Associations, Decommissioning of end-of-life boats – a status report, 2nd edition, December 2007.

mest problematiska är vad man ska göra med bulkmassan av ELB, nämligen kompositplasten som uppgår till mellan 25 och 50 % av den totala vikten. Idag, antingen bränns den eller används som fyllnadsmaterial på land efter söndermalning. Det finns idag pluralis lösningar för att ta hand om kompositplasten men ingen som är kommersiell gångbar.

Miljöeffekter i samband med skrotning av båtar har hitills fått endast liten uppmärksamhet. Åtskilliga farliga substanser, även prioriterade ämnen, har blivit identifierade i ELBs och bör tas omhand på ett säkert sätt både för människan och miljön. Det är viktigt att helst undvika eller minimera riskerna för exponering av människan och minimera spridning av gifter i samband med skrotningsprocessen.

Som slutsummering kan sägas, att så länge det inte finns något system för att samla in och omhänderta skrotbåtar är risken stor att dessa hamnar övergivna på allmän mark, blir kvar på båtclubbarna, blir stående på ägarens tomt, blir uppeldade, eller blir dumpad i någon sjö eller i havet. Detta problem kommer att öka i framtiden om samhället inte får till ett nytt fungerande system för ELB och mer klara ansvarsåtaganden bland olika intressenter och myndigheter.



Disposal of plastic end-of-life-boats

Of Europe's approximately 6 million boats almost half are found in the Nordic countries. In spite of the long durability of plastic boats, the problem of End of Life Boats (ELB) now starts to arise. However, the responsibilities are unclear and there is no regulation on how the dismantling and disposal is to be conducted. Investigations have been going on in the various Nordic countries on how to perform scrapping of plastic boats, but there is yet no consensus on how to handle the problem.

The aim of this study was to provide information on statistics on boats in the Nordic countries and relate to the future need for scrapping plastic boats (ELB). More specific, the project dealt with the magnitude of dumping of boats, contents of contaminants in ELBs as well as possibilities for reuse and recycling of materials. Part of the project was to organize a Nordic Workshop with essential stakeholders and their views on ELB is compiled in this report.

The project provides a good background to the problem of disposing of boats and highlights the various issues that must be addressed. Since the scrapping of boats is a future waste problem which need to be solved, this project is relevant to many different stakeholders from boaters, boat organizations, shipyards, waste companies and government institutions at various levels.

