

Preliminary study into introducing a circular economy for recreational craft

2022

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Executive summary

This paper presents the research, expert contributions and conclusions regarding the development of a 'circular economy' chain for the Belgian recreational craft sector and the management of end-of-life vessels, with a particular focus on composite boats, which are currently not recycled, or only to a limited extent.

The analyses show that the fleet registered in Belgium is made up of an estimated 93,000 vessels. However, it should be borne in mind that there are no accurate statistics on the vessels actually moored in Belgium (vessels registered in Belgium may be moored abroad and vessels registered abroad may be moored in Belgium).

To date, our findings are as follows:

- An estimated fleet of +/- 10,000 end-of-life boats (40-50 years after they entered service in the 1970s and 80s)
- An estimated supply of 2,000 end-of-life boats per year
- More than 75% of the boats are made of composite materials
- At the European level, an estimated 120,000 tons of waste need to be processed annually

An analysis of European benchmarks, as well as consultations with experts from the maritime sector, public administrations, waste management and also industrial solutions for the generation and recovery of waste, made it possible to identify the obstacles and measures to be taken for the development of a waste chain within the sector.

In summary, we observe the following:

- Local pilot initiatives - including Circular Flanders - but there is a lack of a structured chain for dismantling and recovering the various fractions, in particular the composite fraction
- This preliminary study is part of the Federal Circular Economy Action Plan and the Federal Action Plan on Marine Litter.
- The technical complexity to be able to recover the composite fraction (that goes beyond a downcycling approach or sometimes even limited to energy recovery - incineration).
- Various obstacles to decommissioning and dismantling vessels/wrecks. These are more emotional aspects (difficulty in letting go of an object with sentimental value), economic aspects (the cost of dismantling, recycling certain fractions and/or clean disposal of non-recyclable waste), technical aspects, including in particular the logistical aspects of transporting waste to processing sites, and legal aspects, in particular the need to identify the owner and processing wrecks or abandoned vessels.
- The limited market size in terms of tonnage at the Belgian level does not represent an opportunity for an industrial sector, hence the need to provide a common framework for recreational craft at the EU level and to integrate other sectors that consume composite

materials to be recycled (e.g. wind turbine blades, polyester fibre structures, swimming pools, etc.)

The proposed approach to achieve progress on this issue integrates two aspects:

First aspect: developing a chain and mechanism to encourage adequate management of the current stock of end-of-life boats and prevent abandonment. The latter is comparable to fly-tipping, the management costs of which are borne by private operators (marinas, landowners) or public operators (waterway operators, managers of roads and the public space).

Second aspect: stimulating recovery chains for composite waste from end-of-life vessels, to reduce incineration and eliminate landfill. Raising awareness and developing a circular economy model for new boats in collaboration with shipyards (there are currently no operational shipyards in Belgium) and repair yards (in Belgium and Europe) to extend the life of boats in circulation.

Four levers were identified to achieve progress in two aspects:

- 1 Improving awareness and communication on the responsibility of boat owners for the processing and recycling of their end-of-life vessels
- 2 Improving the design, repair and recycling of vessels to reduce their impact on the environment. By laying down obligations and targets, we can ensure that as many recycling chains as possible are encouraged to enhance the recovery value of the waste and reduce the incinerated fraction. For the second aspect, it will be possible to set a course and lay down obligations to include the % of recyclable materials. This last point needs to be addressed at the European level, with fibre and composite material manufacturers and European recreational craft manufacturers (R&D and production) being involved.
- 3 Improving the quality of the follow-up of recreational craft, and in particular of old boats in poor condition or even abandoned by their owners (in cooperation with private actors such as marinas)
- 4 For the implementation of these various measures, roles and responsibilities will be specified by enhancing the cooperation between the various institutional stakeholders active in the sector (regional and federal level)

Following this study, it is proposed reflecting on an evolution of the legal framework, in collaboration with a legal expert, in line with these recommendations (making owners responsible for declaring and handling the dismantling of their end-of-life vessels, for processing abandoned craft and the introduction of a contribution model for a fund for financing a processing and recycling chain for waste from recreational craft).

It is also recommended that training and awareness-raising campaigns be envisaged for the various authorities involved in monitoring the situation - identifying Belgian and foreign vessels within the territory, following-up end-of-life vessels, processing wrecks or abandoned vessels. It will be ensured that performance indicators are put in place and complied with.

Furthermore, it is also recommended following-up the pilot initiatives (private and/or public) by regional actors (who are at the vanguard of promoting circular economy models), but also by European actors (given the pan-European nature of the issue).

1 Reference framework of the study

1.1 Objectives of the study

The recreational craft industry goes back as far as the 16th century. Although in the early days it was only a privilege for the elite, it quickly became accessible to the general public and these days is ubiquitous. Following a long period in which vessels were primarily built from wood and steel, the second half of the last century witnessed the mass construction of (recreational) boats in composite.

Thanks to the specific properties of composite, the average lifespan of these vessels has therefore been estimated at 30 to 50 years. This means that many vessels are now coming to the end of their useful life and are therefore ready for the scrapyards. The fact that many vessels are ready for the scrapyards is also evident from the many neglected and/or abandoned recreational craft in both Belgian waterways as well as on the quayside, after extended winter storage, among other things.

To date, no acceptable solution has been envisaged in Belgium to process composite vessels. The structure and properties of composite mean that these vessels are difficult and complicated to process. In addition, with the entry into force of EU Directive 2008/98/EC, dumping plastics in landfills was banned. Today, polyester simply ends up in the container press where it is processed as residual or bulky waste. Moreover, organising suitable collection channels is not straightforward due to the uncertainty regarding volumes and the quality of the composite waste stream.

In recent years, Belgium has been actively working towards a circular economy. Raw materials can no longer be used as if they were inexhaustible, so solutions need to be found to recycle materials as much as possible. Indeed, recycling is better for the environment. For example, recycling should make it possible to reduce the use of primary raw materials, which can help mitigate the scarcity of resources. In addition, significantly less energy is needed to recycle products than to manufacture them.

The mountain of composite waste continues to grow around the world, in part due to the recreational craft industry. **With this preliminary study, the DG Maritime Affairs of the FPS Mobility and Transport intends to identify the possible, further avenues for implementing a circular economy in the Belgian recreational craft sector, both at sea and on inland waterways.**

1.2 Method

The first part of the study was to gather together the available information on the issue, namely:

- Historical analysis of the issue,
- The volume of recreational craft,
- Benchmarking the solutions,
- Analyses of the dismantling process and of the various materials,
- Analyses of the various challenges for the parties involved,
- Analysis of the different current scenarios and their impact,
- Analysis of the value chain for recreational craft.

We then worked with the stakeholders on the ground (industry, governments, port managers, etc.) around two key themes, namely the technical aspect and the disposal possibilities for end-of-life recreational craft, as well as the systemic aspect of the solutions to be considered.

These 2 workshops made it possible to:

- measure the level of expectation of the various parties involved regarding the issue
- identify the day-to-day interests and responsibilities of the various parties involved
- Identify the technical, legal and financial obstacles and barriers
- identify the possible solutions.

Finally, we structured the two previous sections into the same paper, to be able to propose possible solutions for these different elements. We also included elements drawn from the various benchmarks to illustrate cases identified elsewhere.



2 Background and key figures on recreational craft

2.1 Estimated volumes

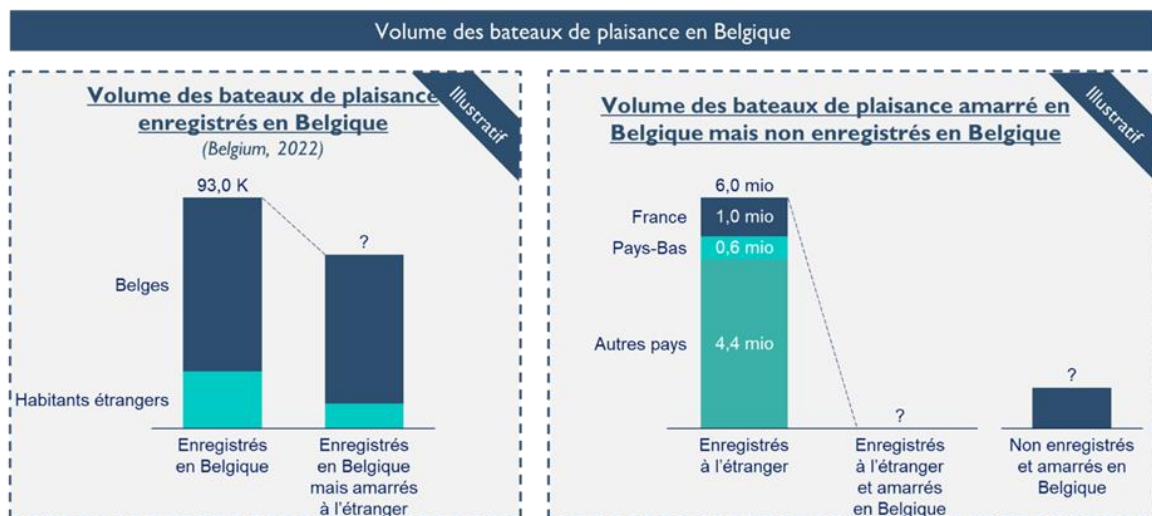
In general, it is **difficult for** all countries to **precisely calculate** the number of recreational craft within their territory.

According to European Directive 2003/44/EC, recreational craft are defined as "any boat of any type intended for sports and leisure purposes of hull length from 2,5 m to 24 m, measured according to the harmonised standard ..." In Belgium, since the Royal Decree of 28 June 2019 on recreational craft, registering recreational craft over 2.5 metres used in Belgian waters is mandatory.

Despite the mandatory registration, it is not straightforward for Belgium to provide exact figures either, as not all vessels are registered.

And even if they were, they are by nature movable property (cf. Figure 1), a ship may be registered in Belgium but moored and sailing abroad (left column). Or vice versa: a French or Dutch vessel may be registered in its country of origin but moored and sailing in Belgium.

Figure 1: Number of recreational craft in Belgium (for illustrative purposes).

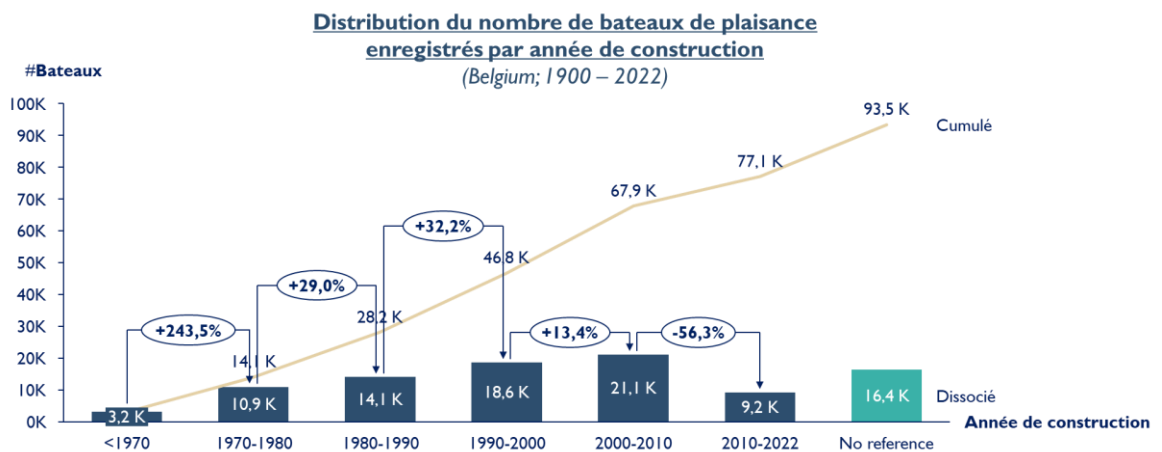


2.1.1 Estimated numbers in Belgium

For the calculation, we based our calculations on the vessels registered in Belgium, without knowing whether they are actually moored in Belgium in 2022. This **number is estimated at 93,452** (Source: *FPS Mobility*). However, numerous recreational craft were already neglected and abandoned in Belgian inland waterways or at a quayside prior to 2019 (the year of the new royal decree).

The graph below (Figure 2; source: *FPS Mobility*), shown by year of construction, gives an idea of the total number of vessels. Indeed, we see that the number of vessels built/in circulation increased sharply from 1970 and continued to grow substantially in subsequent years. It should be noted that no year of construction was reported for 16,000 vessels. For these vessels, we can assume that they were built before 2005.

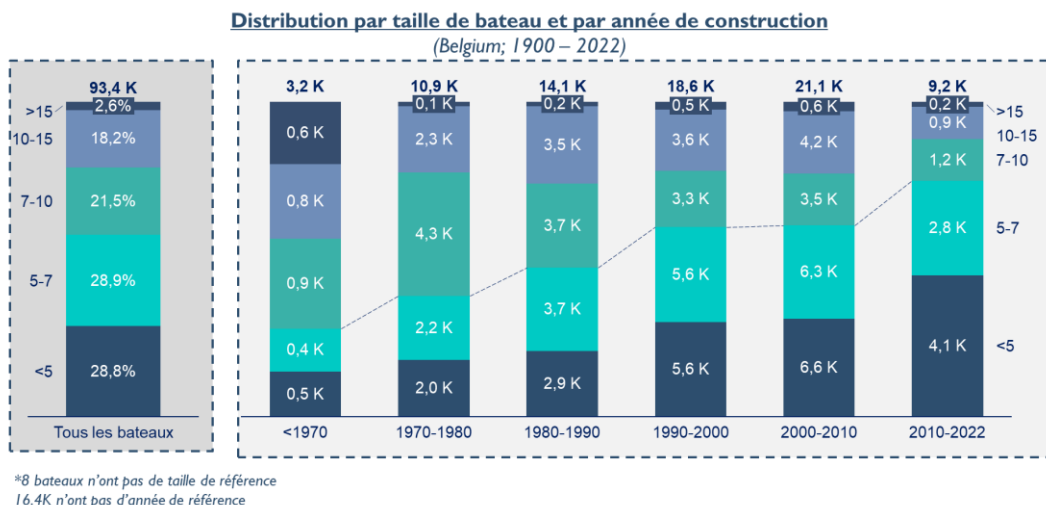
Figure 2: Distribution of the number of registered recreational craft by year of construction



This number can also be broken down by size (Figure 3; source: *FPS Mobility*), by hull type (Figure 4; source: *FPS Mobility*) and by vessel type (Figure 5; source: *FPS Mobility*).

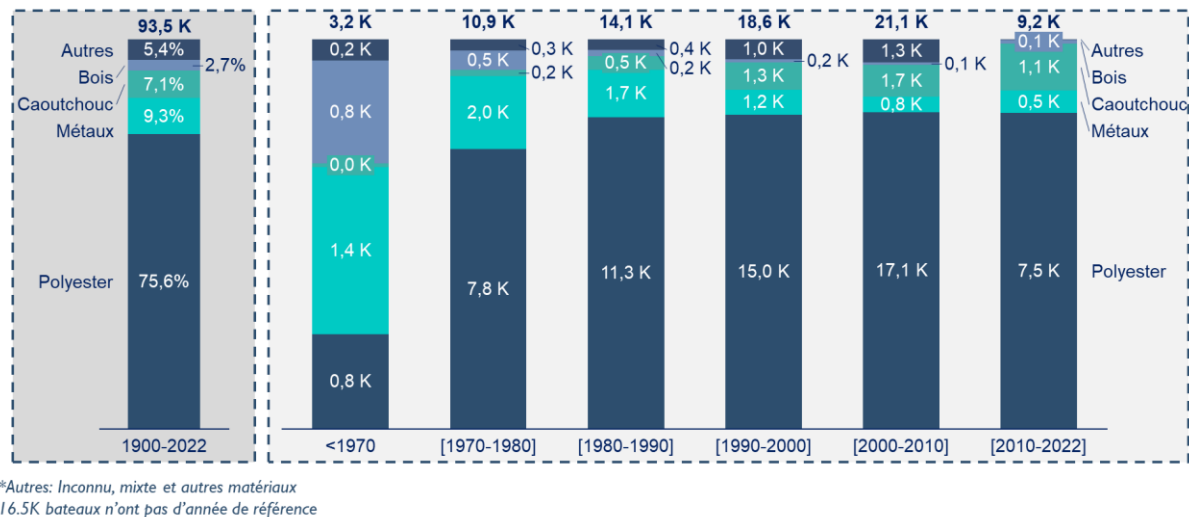
- **By vessel size:** Nearly 58% of the vessels are smaller than 7 metres. The rest of the fleet primarily consists of vessels between 7 and 15 metres long (40%). If we look at the distribution by year of construction, we see that vessels smaller than 7 metres take up a higher proportion every year compared to larger vessels (38% of vessels between 1970 and 1980, and 75% between 2010 and 2022).

Figure 3: Distribution by vessel size and year of construction



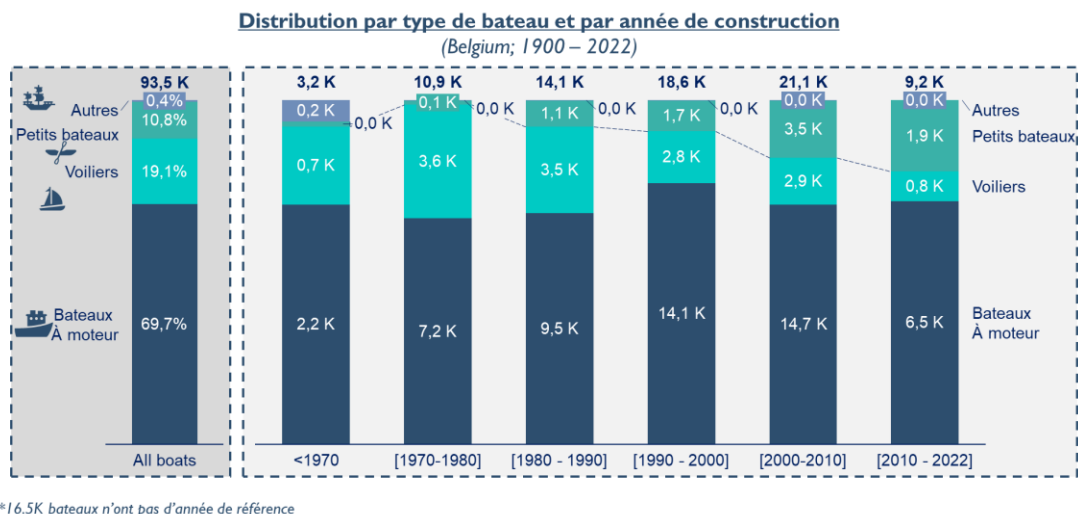
- **By hull type:** Most ships (76%) have polyester hulls. This proportion is observed for vessels from the 1970s on. The other vessels are more often made of metal (9%), rubber (7.1%) and wood (3%). Bear in mind that it is this group of vessels which is now reaching the end of its useful life.

Figure 4: Distribution of the number of vessels by hull type and by year of construction



- **By vessel type:** Most vessels are motor vessels (70%). These are followed by sailing vessels (19%) and finally small vessels (11%). The remaining vessels are either barges or unidentifiable.

Figure 5: Distribution by vessel type and year of construction



2.1.2 Estimated numbers in Europe and in France

A. Europe

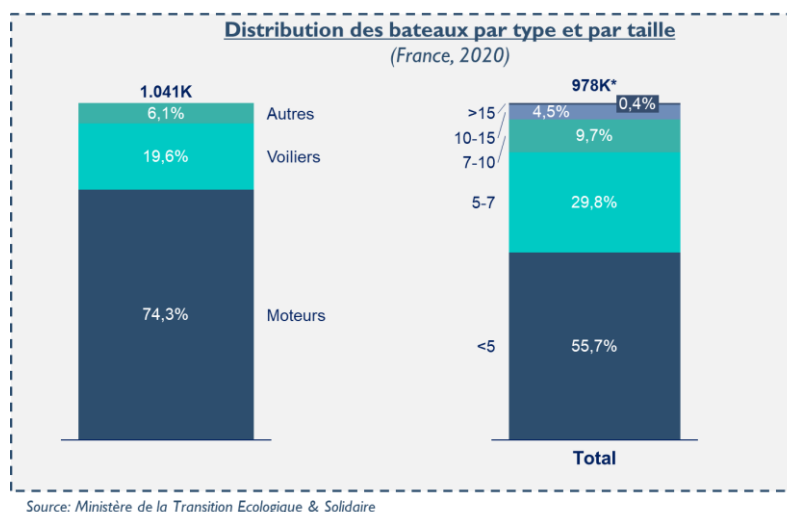
According to a European study, there are approximately **6 million recreational craft in the EU**, most of which (around 95%) are less than 12 metres long. Moreover, 95% of these are fibre-reinforced composites. The European maritime industry also estimates that 80,000 recreational craft are **ready for the scrapyard every year**. This is around **1.5%** of the estimated European fleet of recreational craft. Assuming an average of 1.5 tons per vessel, this equates to **120,000 tons of waste to be processed per year** (European Commission, Directorate-General for Maritime Affairs and Fisheries, 2017; Dejhall and Legovic, 2018).

B. France

More than one million boats are registered in France (Source: *Ministère de la Transition Ecologie et Solidaire*). This equates to 1 boat for every 67 residents. The majority are motorboats (74%), followed by sail boats (19%), as is the case in Belgium. In terms of size, 86% of the vessels are less than 7 metres long (58% for Belgium).

For information: France has 1,029 ports (full count: 473 seaports & 556 inland waterway ports (Observatoire des ports de plaisance, 2015 report). This results in an average of 1,000 vessels per port.

Figure 6: Distribution of vessels by type and size (France)

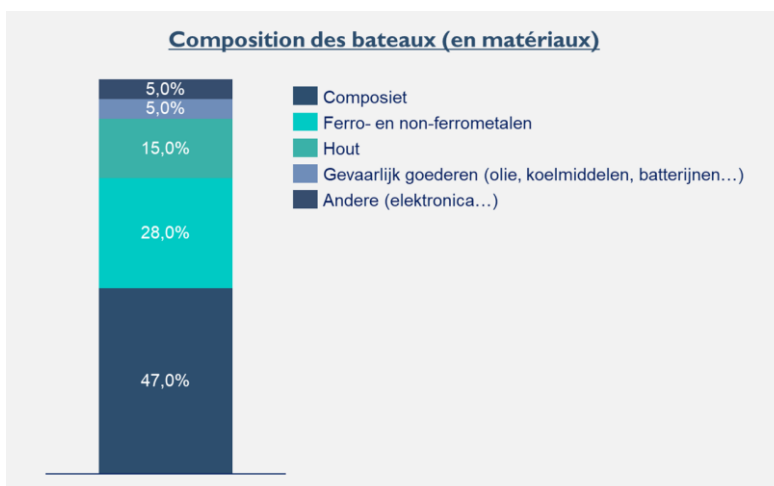


2.2 Materials and components of vessels

In addition to the number of vessels within Belgium, there is also their respective composition, which, again, is no small task when it comes to estimating their volume.

Depending on the type of vessel, its size or even its hull, the quantities and proportions of the various materials used vary. Drawing on various sources, we calculated an average ratio of different materials for the composite vessels (Figure 7).

Figure 7: Material composition for composite vessels (average)



The materials can be split into **five main categories**, discussed individually below. For the vast majority of materials, well-developed recycling processes already exist, but this is not the case for all materials.

As shown on the figure above, composites and metals are the main materials that need to be recycled in a recreational craft. To begin with, recreational craft are primarily composed of composite, which is mainly found in the hull of the craft and in the structural elements such as the mast. The second largest

group is metals such as steel, aluminium, copper and brass. Wood is also used in the construction of a vessel, for example for furniture. There are also hazardous items such as batteries, refrigerants and oil, and the last group includes electronic devices.

a. Plastic: (glass fibre-reinforced) Polyester

Recreational craft are **made primarily of fibre-reinforced thermoset**. A composite consists of at least two components with different properties which, when combined, form a material with specific characteristics. With fibre-reinforced composites, a matrix (often a plastic) is combined with fibres to create a strong end product. Specifically for recreational craft, glass fibres combined with polyester are commonly used. Polyester is a thermosetting matrix material, which means it will not melt at high temperatures unlike thermoplastics (OVAM, consortium Vito, Centexbel-VKC & Sirris, 2016; Önal & Neşer, 2018; Driel, 2010).

Fibre-reinforced thermosets are used in a range of industries, including transport and construction. Its high strength and rigidity combined with low weight make it attractive for use. In addition, it is highly resistant to corrosion and environmental conditions (Önal & Neşer, 2018; OVAM, consortium Vito, Centexbel-VKC & Sirris, 2016; Driel, 2010).

For the time being, polyester is not recycled in Belgium. Although the techniques exist, there are several bottlenecks that prevent a recycling process being set up. **The main problem** in recycling recreational craft is therefore due to the use of **polyester**. Recycling techniques for polyester are discussed under 2.5.

b. Metals

Metals can be split into two categories, ferrous metals and non-ferrous metals. Ferrous metals primarily consist of iron and have magnetic properties. Steel and iron are just some examples. Metals that do not contain iron or do not have iron as a main component fall under non-ferrous metals. Examples include copper, lead and aluminium.

Metals are **already being recycled and reused** today. Mature recycling processes are therefore already in place, and many Belgian companies actively recycle metals. Indeed, metals can be recycled with little or no loss in quality. Steel, for example, can be recycled infinitely without any loss in its physical properties. It can therefore be used in the same applications without any problems. Furthermore, recycling steel offers the advantage that 80% less energy is needed compared to when it is produced. Aluminium can also be used for the same applications after it is recycled, and over 90% less energy is needed to recycle it compared to producing it. In addition, there appear to be fewer carbon emissions from the production of metals from secondary raw materials than from primary raw materials (EMIS, sd; EuRIC aisbl, 2020).

c. Wood

There are also **mature recycling processes** for wood, and therefore Belgian companies performing this activity. Wood waste can be used as a raw material in various applications. When no other use is possible, it can be incinerated with energy recovery (Fedustria NPO, sd).

d. Hazardous goods

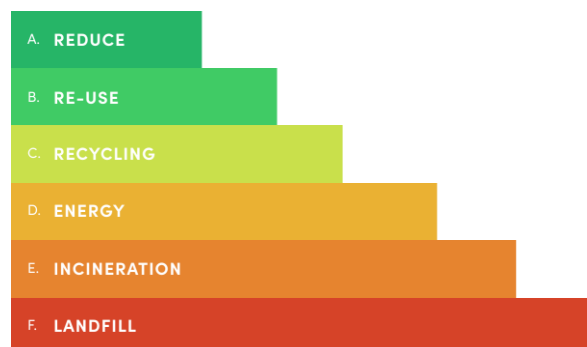
Processing facilities are also already available for various materials that fall under hazardous goods, at approved recycling centres. For example, fuel, if the quality is still sufficient, can be used as an alternative fuel for large industrial boilers. Batteries can also be processed and the lead, plastic and battery acid can be reused.

e. Other (electronic and electrical devices)

Electronic devices are also found in vessels. If these are not suitable for reuse, they need to be collected **in accordance with the Waste Electrical and Electronic Equipment (WEEE) system**. The various components can be recovered and reused as raw materials. WEEE must be recycled according to specific standards and therefore can only be deposited with licensed processing facilities. **European Directive 2012/19** on Waste Electrical and Electronic Equipment provides a legal framework for the collection and treatment of WEEE (Eklund, Syversen, Eisted, & Hanna, 2013; Court of Audit, 2021; EMIS, sd).

It should be noted that while there are many disposal possibilities for a range of materials, according to Lansink's ladder of waste, they only score very low (cf. Figure 8) or the proportion falling into the higher scales of the ladder is very low. The wood industry, for example, has many possibilities to recycle and reuse wood waste, but most of it still too often ends up as an energy source.

Figure 8: Lansink's ladder of waste.



Finally, in France, certain materials, such as flares, have meant that an entirely new processing chain has had to be set up (cf. APER Pyro).

2.3 Implications

The growing mountain of recreational craft being abandoned and/or ready for the scrapyards also has implications. To start with, neglected vessels are taking up ever more **space in our waters** and the proliferation is also causing **visual pollution**. In marinas, these vessels occupy berths that can be made available to other boat owners. When marinas cannot trace the owners, they also face the problem of

unpaid bills. There is also a potential for accidents due to the growing number of abandoned recreational craft that prevent safe passage in our waters, therefore **compromising safety**. Moreover, there is the risk that a broken mast falls onto a nearby vessel and subsequently causes damage. (Wageningen University, 2015; Haaksi, 2019; International Maritime Organization, 2019).

The hulls of recreational craft fall under the category of plastic. When a vessel is left in the water, it will therefore eventually decompose into microplastics and **harm the marine environment**. Finally, there is also the danger of oil or fuel **leakage** with abandoned vessels. The growing problem of abandoned or neglected recreational craft therefore leads to major environmental implications, which means it is crucial to look for solutions (Wageningen University, 2015; Haaksi, 2019; International Maritime Organization, 2019).

2.4 Dismantling process

To recycle a vessel's materials, they must first be separated from each other. The method to dismantle a recreational craft can vary depending on the type and size of the craft, but there are **4 general processes** that apply to virtually all recreational craft.

a. Administration and transport

The first step is bringing the **necessary administrative formalities into compliance, and transport**. More specifically, the size of the vessel will first be verified to ensure the dismantling process is suitable. In addition, the price, which depends on several factors, will be calculated for the entire dismantling process. Verification of ownership is also important to avoid possible legal claims, among other things. Eventually, the vessel will have to be de-registered. Transport then needs to be arranged to get the vessel to the dismantling site. Depending on the condition of the vessel and the location of the dismantling site, this will have to be via water or via land (Monsó, 2012; Royal Belgian Institute of Marine Engineers, 2009; BoatDIGEST, sd).

b. Preliminary inspection and decontamination

The second step in the process is a **preliminary inspection and decontamination** of the vessel. The preliminary inspection is essential to identify **potential environmental or safety hazards**. For example, it must be examined whether the vessel can still be safely boarded and what hazardous goods are on board. Once it can be assured that the vessel can be safely boarded, the decontamination begins. Decontamination means that the **vessel will be purified**. All hazardous materials such as oil, batteries, fuels, chemicals and liquids are removed and recovered as much as possible (Monsó, 2012; Royal Belgian Institute of Marine Engineers, 2009; BoatDIGEST, sd).

c. Manual dismantling and mechanical dismantling

Once a vessel has been decontaminated, the **actual dismantling** is the next step. Technical tools such as hydraulic saws and hammers are used to loosen and remove elements. This usually involves working from the top down to the keel and from the outside in. For example, the upper deck structures such as the mast and sails will first be removed. The interior will then be dismantled, which includes loosening and removing furniture, lights and appliances. During this process, parts that are reusable such as the engine are examined and then set aside for possible sale. After the **manual dismantling**, the **mechanical dismantling** for large and heavy parts takes place. Large machines (such as hydraulic crane shears) can be used to separate the deck from the hull. Large parts can also be cut into smaller pieces to allow further processing (BoatDIGEST, sd; BoatCycle, 2012).

d. Sorting and dismantling subgroups for further processing

Finally, all **different types of waste must be separated and sorted** according to material group. Further dismantling into smaller parts may be required to eventually allow recycling. Once the waste is sorted, each type of waste will undergo the necessary processing by the competent bodies.

2.5 Recycling techniques: glass fibre-reinforced polyester

After the dismantling of the vessel, each type of waste will be processed and/or recycled accordingly. For this study, the focus is on polyester recycling. As mentioned above, a vessel primarily consists of polyester, but no processing facilities are currently available for this. This chapter will therefore focus only on recycling techniques for glass fibre-reinforced polyester.

The use of (glass) fibre-reinforced thermosets is growing. Although it offers various advantages thanks to its specific properties, recycling it poses a challenge. Thermoplastics, on the other hand, are highly suitable for recycling as they completely liquefy at high temperatures. The current recycling techniques for glass fibre-reinforced thermosets can be split into three categories, each with its disadvantages (Sirris, sd).

a. Mechanical recycling

The first possibility is mechanical recycling, in which the glass fibre-reinforced thermoset is **ground into small granules or fine powder** that can then be used as **filler or raw material** in the production of new materials. The small parts obtained after shredding still contain the strength property of composite. This means it can be used as a reinforcing material in the production of other materials (OVAM, consortium Vito, Centexbel-VKC & Sirris, 2016).

b. Chemical recycling

A second option is chemical recycling, more specifically **solvolysis**. This technique uses **solvents to separate the components into basic components**. These basic components can then also be used in the production of other products (OVAM, consortium Vito, Centexbel-VKC & Sirris, 2016).

c. Thermal recycling

Finally, there is also the possibility of thermal recycling in which **very high temperatures** (450-700°C) are applied in an oxygen-free environment to **recover the basic components**. This is also known as **pyrolysis** (OVAM, consortium Vito, Centexbel-VKC & Sirris, 2016; Job, 2013).

A specific and increasingly popular **example** of thermal recycling is **co-processing in cement kilns**. High temperatures are needed in the manufacturing of cement. By using the combustible components (resin) as fuel, some of the energy can be recovered. The non-combustible components (glass fibre) are then used as the raw material/filler in the cement. This is therefore a case of **material and energy recycling** (OVAM, consortium Vito, Centexbel-VKC & Sirris, 2016; BiinC & Drogdt, 2017). In this regard, the European Commission has approved the use of composite waste in cement production as a recycling technology (Directive 2008/98/EC).

All three processes involve **loss of quality**. The ultimately obtained components or the recycle are **less and less strong**, meaning that they are not (or cannot be) used as a material in and of themselves, but rather as filler or reinforcing material. It is impossible to transform the components back to perfectly pure base components. The material that is ultimately recovered therefore also has an increasingly **lower market value**. Moreover, most **processes tend to be too expensive** relative to the market value that can be obtained from the recycle (Eklund, Syversen, Eisted, & Hanna, 2013; Önal & Neşer, 2018; BiinC & Drogdt, 2017).

2.6 The stakeholders, their responsibilities and impact

During the study, we observed that there are a large number of stakeholders who have their respective roles in connection with the challenges of end-of-life recreational craft, as well as interests and obstacles in terms of managing end-of-life/abandoned craft.

Ship vendors	<ul style="list-style-type: none"> ● Are often at a distance from the problem. ● They may be involved if a buyer wants to sell a second-hand boat to buy a new one.
Ship owners	<ul style="list-style-type: none"> ● The owners, or their heirs, hesitate to dispose of their boat owing to the sentimental value of the vessel. ● They are responsible for their boat, but for the time being insurance is not mandatory ● It is important to make the owner (and their heirs?) aware of their responsibility for their boat and disposing it at the end of its useful life, and convince them to opt for a suitable end-of-life solution (dismantling, upcycling, downcycling, repair)
Marina managers	<ul style="list-style-type: none"> ● The marina is responsible for the safety of users and other vessels ● There is an obligation to take out second tier insurance to the extent that the owner is not insured and the boat sinks to the sea bed (cost of salvage and evacuation estimated at €30,000) ● Difficulty in identifying who the official owner of the boat is ● Owners sell their boats without notifying marinas

	<ul style="list-style-type: none"> ● The club must intervene if a boat compromises safety, but there is a legal risk regarding this situation. ● For example, the initiatives in the marinas of Nieuwpoort and La Rochelle that organise resale (auctions) in order to "liquidate abandoned vessels."
Site owners	<ul style="list-style-type: none"> ● Some vessels are "abandoned" in public spaces (not necessarily on the banks of waterways, but on the public domain along the road).
Waterway operators	<ul style="list-style-type: none"> ● Some vessels are moored without permits ● For safety reasons, the responsible parties for these areas must take steps to remove wrecks or unlicensed vessels, even if it is recommended to wait 60 days before an abandoned or unlicensed vessel can be removed. (It may be useful to amend this provision and envisage a shorter period if there is no response from the last known owner)
Port municipalities	<ul style="list-style-type: none"> ● Decisions to expropriate or dispose of property can be made at the level of the municipality.
Government departments	<ul style="list-style-type: none"> ● These inspect ships that may be called and may declare a ship unseaworthy (see declaring a vessel a wreck).
Responsible parties for port areas	<ul style="list-style-type: none"> ● These are less involved, and shift responsibility to the clubs and associations responsible for the marinas.
Insurance companies	<ul style="list-style-type: none"> ● These offer insurance for vessel owners even though this is not mandatory. ● They intervene in the event of a disaster
Experts appointed by the insurance companies	<ul style="list-style-type: none"> ● These intervene when insurance is required to authorise repair of damage to a vessel
Industrial firms and waste collection companies.	<ul style="list-style-type: none"> ● These are already on site and "offer" technical solutions for dismantling, but these are currently loss-making. ● They accept wrecks if they are offered a solution for reusing vessels in exchange for salvaging them (e.g.: a wreck which can be processed into cable ducts)

3 Policy objectives and stakeholder interests

3.1 Objectives and prioritisation

During the systemic workshop, there was a discussion of the goals and priorities of each of the stakeholders around the table. For the exercise, each participant was given 10 votes and had to distribute them among the 52 boxes of the table according to their preferences. This involved 13 objectives and for each objective one could indicate whether it was outside the scope (Won't), or within the scope, but with a different priority level (Must = level 1; Should = level 2; Could= level 3). Each participant had stickers in a given colour according to the organisation they represented:

- The port or club administrators (blue)
- The federations (green)
- The government bodies (pink)

In the results (Figure 9), we see, first of all, no significant difference between the choices of the 3 types of stakeholders. On the other hand, we observe **very high expectations** among the stakeholders (70% vote for "Must").

Of the 4 possible types of objectives, 70% went to either **processing wrecks (30%)** or **recycling incentives to be introduced (40%)**.

Next, looking by type of objective:

- Processing of wrecks: The stakeholders prefer **facilitating the disposal of wrecks and measures to protect the environment**
- Recycling incentives: The distribution of votes is more or less balanced among the different levels of solutions for recycling vessels. Note that there were only 3 votes to develop a circular economy. This result needs to be qualified by the fact that **no stakeholder appears to envisage a miraculous technical solution** to achieve a perfect circular economy for vessels (as indicated below, it is considered necessary to first create a dismantling/processing chain for vessels, as composite vessels begin to reach the end of their useful life).
- Vessel types: The choice covers all vessels, not just composite vessels.
- Level of integration: Initially, the stakeholders want a **solution at the federal level** and, to a lesser extent, a solution at the European level. Developing a model at the regional level does not appear to be relevant for the stakeholders.

Figure 9: Prioritising the objectives (MoSCoW).

		Must	Should	Could	Won't		
1	Place dans les ports	6	3	2	0	11	
2	Enlever les épaves	15	3	0	0	18	30%
3	Protection de l'environ.	14	0	0	0	14	
4	Incitation à la réparation	14	2	0	0	16	
5	Incitation au recyclage	12	1	3	0	16	
6	Développer le recyclage ind.	10	2	4	0	16	45%
7	Dev. chaîne valeur circulaire	0	3	0	0	3	
8	Dev. Pour l'écoconception	10	0	4	0	14	
9	Tous les bateaux	9	1	0	0	10	
10	Uniquement composite	3	4	0	0	7	12%
11	Regional	0	0	2	2	4	
12	Fédéral	7	0	0	0	7	14%
13	Europe	1	7	1	0	9	
		101	26	16	2	145	
		70%	18%	11%	1%		

3.2 The obstacles to achieving the objectives

Before proposing possible solutions, it is necessary to identify the current obstacles that need to be overcome to enable a viable "circular economy for recreational craft" model.

3.2.1 Repair or reuse of vessels

- There is **no obligation** or incentive for owners to maintain their boat and keep it in good condition
- The ratio of **labour costs** to the value of materials is not very interesting for repairing or reusing vessels.

3.2.2 Preventing/removing wrecks

- **The costs** of dismantling and other activities to dispose of the vessel **are significant and deter** owners from making the decision to get rid of it.
- Once the vessel becomes a wreck, the environment is affected. When a vessel is abandoned, it is **not always possible to identify the owner** to hold them responsible for the correct processing.
- A significant number of vessels are "**abandoned and orphaned**" (no information regarding the owner), as the registration system for vessels already sailing before the introduction of the registration requirement had various shortcomings. Moreover, it could be vessels registered abroad, for which the Belgian administration has no information regarding the owner.
- The situation in the event of **death and inheritance also creates complicated situations** as the new owner (heir) may not have been aware of the boat or knows nothing about maintaining it. In the case of inheritance, boats are not always declared, especially if it is a small boat.
- **The legal framework means that it is not straightforward to take action**, before the situation deteriorates, to replace the owner, as the procedure for transfer of ownership is complicated (general conditions of marina managers, the role of the municipality to register the expropriation). We also see a lack of interest in suddenly becoming the owner of a boat whose net value, taking into account the dismantling costs, is negative.
- In some situations, action cannot be taken before the situation deteriorates (e.g. club/port managers, insurers, etc.).
- **Raising a wreck** from the sea bed is expensive (>€30,000)
- If the owner is identified, they are **not always able to pay**.
- The **transport costs** for boats of a certain size quickly add up.
- Owners **are often not well informed about the possible options** for processing their end-of-life vessel.

3.2.3 Location of the dismantling centre(s)

Prior to recycling the vessel, it needs to be dismantled into various fractions. Each of these fractions needs to be disposed of at the relevant processing centres. It is possible to have one dismantling centre

for Belgium as a whole, or multiple locally distributed centres. **This decision will depend on several elements:**

- The size of certain vessels, taking into account the cost of transporting a ship (size, exceptional transport), transport by waterway provided the vessel is still in sufficiently good condition to sail or be towed.
- Owners are often not aware of the alternatives for transporting their vessel to a dismantling centre.
- Legislation varies between the different regions (Flanders, Wallonia, Brussels) and certain conditions are necessary for smooth coordination (e.g.: specific documents, procurement at the level of the 3 regions, etc.).

3.2.4 Recycling and processing of end-of-life vessels

- Although the **volume of end-of-life vessels** is estimated to be gradually increasing, it is **too low to make investments** in dedicated recycling facilities for this chain.
- The actual design of vessels (multiple layers of different types of composites) makes **qualitative recycling technically complicated**. The existing chains primarily involve downcycling or energy recovery (cement plants, incinerators).
- **Few options for commercialisation**: this is due to the low quality of the 'recyclate', which cannot be transformed into 'fibres' used for casting ship hulls and decks.
- Currently, there are **too few options for disposing of the 'composite' part of the vessel** (primarily downcycling).
- **Unprocessed materials are less expensive** and require less processing (e.g., adding other fibre and resin components to obtain a more controllable, stronger and stiffer 'blend').
- **The cost of recycling and reusing materials from a vessel is too high**, and there is no incentive for industry to work in this direction.
- It should also be noted that recreational craft are no longer manufactured in Belgium (the last remaining shipyard, Etap, has closed). There are industrial manufacturers of fibres such as 3B fibreglass. A circular chain for the maritime industry should be looked into at the European level.
- There are various existing solutions for waste recovery. The cheapest option is still energy recovery, even though this is the least relevant from a circular economy perspective. Some cement manufacturers incinerate waste and incorporate the ash into their mixture. There is currently no framework that encourages the use of other chains (legal obligation, promoting recycling and reuse chains, monitoring what is actually recycled or sent to incinerators, etc.). Moreover, combustion releases certain chemicals and CO² into the atmosphere.

4 Levers for initiatives to achieve the objectives

4.1 Better awareness raising and communication to make owners responsible for recycling their boats

As we have seen above, awareness of dismantling chains is very limited.

A campaign and effective communication tools will need to be developed to make owners aware of the procedure for managing end-of-life recreational craft and of the importance (and responsibility of the owner) of using a professional processing chain for the dismantling and recovery of the various waste fractions after this dismantling.

The communication **will need to highlight the benefits to the owner** of processing via a chain recognised by the various stakeholders in the recreational craft sector (professionals, marina managers, waterway authorities, regional authorities):

- The fact that the waste is removed in an optimal manner
- The fact that as many materials as possible can be reused or recycled for a second life
- The possibility of benefiting from financing (in whole or in part, see section 4.4) in this regard

Besides highlighting the benefits, there is also an important informational element. For example, owners should be informed about the following elements, among other things:

- Administrative obligations in terms of deregistering an end-of-life vessel
- Liabilities if the obligations are not met

This communication will be published on the website of the FPS Mobility, but also on the sites of the various stakeholders of the recreational craft sector (professionals, marina managers, waterway managers, regional authorities).

It must be ensured that the **communication involves all the different stakeholders and addresses the emotional aspect** of managing an end-of-life recreational craft.

In short, an awareness/accountability campaign for owners and professionals:

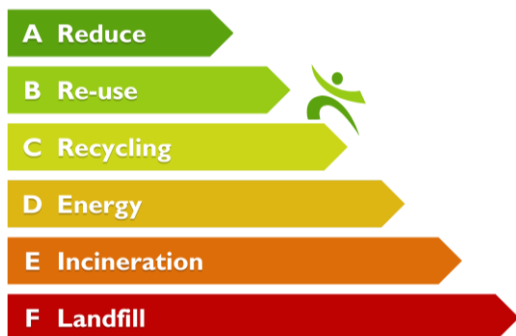
- Positive communication on handling the "emotional" hesitation
- 'Give a second life to what was once your dream'
- Single platform indicating the regional stakeholders
- Utilisation of various channels (including public and private partners to communicate about this chain)

4.2 Improving the design, repair and recycling chains for vessels, to reduce their environmental impact

We believe it would be useful to envisage two strands:

- A first strand to **ensure the 'cleanest' possible reuse or dismantling** of a vessel whose owner can no longer keep or maintain it or which is no longer seaworthy (e.g., danger of sinking or risk to the safety of others). Recycling chains will also be encouraged as much as possible **to recover more waste and reduce the incinerated fraction**.
- A second strand **to encourage (foreign) manufacturers to integrate ecodesign** into their designs (resin and glass fibre manufacturers, shipyards). The composite fraction is currently not recovered enough, as it consists of different and difficult to separate materials. Moreover, the existing recycling chains are primarily downcycling chains (e.g. cable trays) and there is no reuse for the production of new vessels. More ecological chains are still in the 'test phase', for example constructing hulls from plant fibres (flax fibre). For this second strand, it is recommended that the brainstorming be conducted with other applications of PE fibre composites such as prefabricated swimming pools or wind turbine blade manufacturers. The financial resources collected in the context of an EPR scheme should therefore be partially **invested in R&D initiatives** to improve the level of circularity (from waste to raw material via smart recycling).

Lansink's ladder of waste:



The first strand can be managed at the level of Belgium and the 3 regions, the second will require joining R&D projects at the European level, including fibre and composite materials producers and manufacturers of recreational craft.

For both strands, it will be possible to **set a course and lay down obligations to include the percentage of recyclable materials**.

4.3 Improving the quality of monitoring of neglected and orphaned recreational craft

4.3.1 Context

Within the framework of devising a circular economy strategy for the recreational craft sector, the specific issue arises of neglected - orphaned or otherwise - recreational craft that pose a risk to people and the wider environment (e.g., including the navigability of waterways).

In this regard, the workshops highlighted the following **priority legal challenges**:

- 1) how to identify the owner of neglected/orphaned recreational craft;
- 2) what the intervention options are if there is no response from the owner, and 3) how to be reimbursed for the costs incurred?

These challenges are explored in more detail below.

4.3.2 Further description of the identified questions

How to identify the owner?

Identifying the owner is essential, among other things, to request that he or she take action if their recreational craft represents a danger to people and the environment (preventive aspect); or to be able to recover from the owner any damage caused by the recreational craft (remedial aspect).

There has been a registration requirement in recent years¹. For the recreational craft that fall under this requirement, the owner can be easily identified. For vessels that do not fall under this requirement, identifying owners is particularly difficult or even impossible in some cases.

Prior to 1 September 2019, recreational craft (L<20m) for inland waterways were required to have an immatriculation document. The immatriculation document, or a copy of it, must be kept on board. The immatriculation number must be affixed to the centre of the hull or at the bow, on either side of the vessel. The immatriculation number is definitive and remains with the recreational craft.

The immatriculation document gradually loses its validity according to the registration date, and must be replaced by a registration letter before the expiry of this validity period (between 2020 and 2025). For the oldest vessels (from prior to 1 January 1990), registration must be completed by 31 December 2025. From that point on, it should be possible to identify the owner for the vast majority of recreational craft.

With the registration requirement for new recreational craft and the transitional scheme for existing boats, the problem of identifying the owners of recreational craft would appear to be less and less of a problem. Of course, it is assumed that this scheme is backed up with the necessary accompanying enforcement measures.

There will naturally be vessels every now and then for which the owners are unknown. In such cases, attempts can still be made to identify the owner by cross-checking the immatriculation database with

¹ <https://mobilit.belgium.be/nl/scheepvaart/pleziervaart/vaartuig/registratie>

other databases/registers such as those for insurance; ports and crane operators, etc. In addition, it could also be agreed with recreational craft ports, for example, that they will check whether their customers' recreational craft are registered and, if necessary, at least alert them to the obligation to register, suspend any further services and transfer the necessary information to the competent authorities.

Note that also in cases of inheritance, a database accessible in the owner's name can ensure that the notary can find out whether a recreational craft is included in the estate of the testator.

What intervention options are there if there is no response from the owner?

If the owner is not known or - after a reminder - cannot or will not take action (due to insufficient financial resources) to remedy a dangerous situation, it may be necessary for a third party to intervene to prevent harm to people and the environment.

This may be the government or a third party (e.g., port authority).

This raises a number of practical questions:

- Is this third party sufficiently authorised by law or contract (sufficient legal basis) to take action?
- What actions can this third party perform: acts of custody, acts of management or acts of disposition? For example, a repair or a sale of the vessel (wreck)?
- What if damage is caused during such intervention? Can the third party be held liable in this regard?

It may be possible to handle certain situations contractually, for example, in the relationship between the port operator and the owner of the recreational craft who uses the port services. Other cases will require more generally applicable legal regulation, for example, action taken by the waterway authority in the case of orphaned recreational craft. Even from the perspective of the current legal framework, certain legal possibilities such as 'benevolent intervention'¹² may provide relief in certain cases.

² Art. 5.128 (et seq.) NCC - There is a case of benevolent intervention when a person, without being obliged to do so, voluntarily and usefully intervenes with regard to another person's property without resistance from the master of that property being reasonably foreseeable (freely translated). These requirements are considered fulfilled if the master approves this benevolent intervention.

How to be reimbursed for expenses incurred?

When - if there is no action on the part of the owner - a third party acts to protect people and the environment, this third party may incur certain costs. This then raises the question of whether and how this third party can be compensated for their intervention, and whom they need to contact in this regard. More specifically, the following questions arise:

- On what basis (legal or contractual) and under what conditions can an intervening third party recover reimbursement of costs incurred from the owner?

What if the owner is unknown or insolvent? For example, can the recreational craft then be sold and the proceeds used to compensate the third party? Or does the intervening third party need to solicit another party?

4.3.3 Recommendation

The three above-mentioned bottlenecks/questions are largely related to the existing legal framework. Legal analysis of these questions is beyond the scope of the current study. An effective and efficient approach to the problem of neglected and orphaned recreational craft requires **further investigation for these legal aspects**. The focus in this regard should ideally be to:

- Identify the legal and/or contractual possibilities and limitations;
- Identify and evaluate options to improve or adapt the legal or contractual framework;
- Envisage possible accompanying measures that support the effectiveness/efficiency of the options for improvement (e.g., periodic inspection of the recreational craft to ensure the boat is in good condition; and/or tax incentives; fast-track measures against unregistered recreational craft, etc.)

4.4 Develop a financial model to support the various chains

The financial model to be implemented should take into account **3 aspects**:

- **The intended purposes to be financed** (waste management & recovery, logistical financing of the vessels, additional operating and communication costs of the scheme & awareness raising)
- **The necessary funds** for the intended objectives.
- The possible financial **levers**.

For this exercise, we will estimate the financing needs exclusively for waste management.

4.4.1 Financing needs for waste management

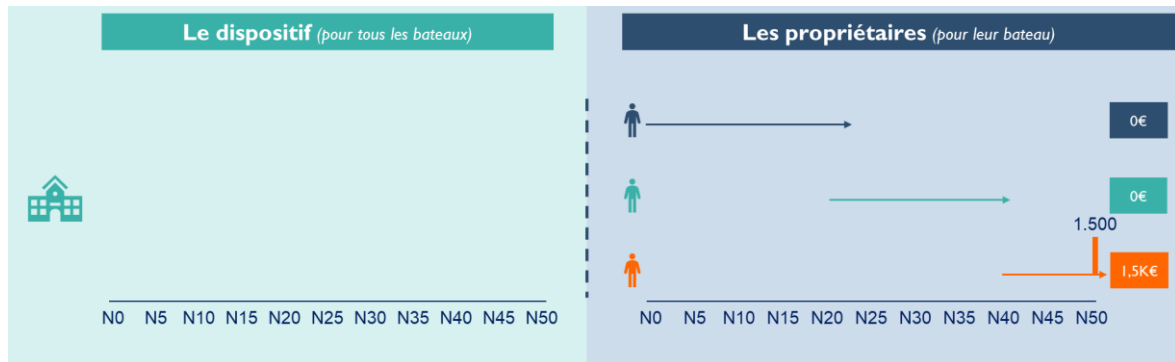
With regard to dismantling vessels, the total cost of the dismantling must be taken into account, after deducting any recovery of materials in unaltered form (recycling and/or resale of materials). According to our sources, the ratio between the two is budgeted at a loss of €1,500 per boat. If we take into account the fact that around 2% of vessels are scrapped each year, this amounts to 1,870 vessels to be financed (note that we do not take into account a possible rush in the initial years because the service is more affordable for ship owners). In total, more than €2.8 million needs to be financed. We have deliberately **rounded up to €3 million**, assuming that there will at the least be additional costs to implement the solution(s), although this increase will have to be subsequently re-evaluated, depending on the resources deployed.

For the sake of simplicity, this amount will be the basis for each year, but obviously in practice it will be important to envisage a small buffer to cover variable years (number of new registrations, number of boat purchases, etc.).

The current situation can therefore be summarised as follows:

- The scheme, which does not yet exist, has no income and no expenses.
- Taking into account the fact that the boat changes hands during its useful life, not all the owners have to deal with the end-of-life issue. For example, owner 1 and 2 both used the boat for 20 years, but it is the last owner who has to pay for the cost of processing the boat (*recycling*).

Figure 10: As-Is condition



The financial study will be examined at a later stage. This will explore the economic feasibility and possible solutions supported by the sector.

4.5 Implementing the various solutions by strengthening cooperation among the different institutional stakeholders

4.5.1 Context

During the workshop, the vast majority of participants were in favour of a system covering (at least) the Belgian territory. In addition, various governments and other priority stakeholders can play a role within a future CE strategy for recreational craft. Therefore, developing an effective and efficient customer-friendly solution will require cooperation between different stakeholders.

4.5.2 Examples of contributions from the main parties

For example, the **federal government** can contribute to a solution in the following areas:

- Access to the registration system for recreational craft and better identification of the owners of recreational craft;
- Adapting the legislative framework following the analysis of the three questions on neglected and orphaned recreational craft;
- Introducing a recycled content obligation whereby selected products must consist of a certain amount of recycled polyester (product standard). The wording of the recycled content obligation may also be a. A number of responsibilities (e.g. calculating recycled content; labelling of products, etc.), cease to exist
- Using fiscal powers to incentivize or discourage certain practices or products and/or to fund CE policies;
- Innovative support directly via subsidies, for example, to expand the applications of the recycle and/or improve the recyclability of polyester, or develop alternative materials to polyester. Support can also be provided via innovative procurement, with innovative approaches to a given problem/challenge.

In addition, via suitable procurement, the federal government can use its purchasing power to support the recycled polyester market. It can do this by giving preference - where relevant - in its specifications to products produced at least in part from recycled polyester.

The **regional governments** have broad powers which, among other things, are consistent with the general regional authority for the environment, and waste and materials in particular. For example:

- Putting in place extended producer responsibility, for example in the form of an acceptance obligation linked to a given recycling obligation
- Encouraging suitable recycling capacity (permit policy)
- Incentivising reuse and maintenance/repairs of recreational craft
- Of course, regional governments can also use their purchasing power to stimulate innovation so, for example, reference can be made to the Innovative Public Procurement programme (PIO in Dutch) of the Flemish region, which is intended to develop, test and procure innovative products and services (www.innovatieveoverheidsopdrachten.be).

Other **actors** can also contribute to the system - for example, port managers can exchange information with federal or regional authorities, for example, in the context of removing orphaned/neglected vessels.

4.5.3 Cooperation framework

Federal Circular Economy Action Plan

In sketching out the collaboration, it is important to take into account the federal circular economy action plan which lays down a number of priorities for the period 2021-2024, and the work of the intra-Belgian platform on circular economy set up by the federal and regional administrations.

In this regard, the Federal Circular Economy Action Plan states (freely translated), "The Federal Ministers of Environment and Economy, in the framework of the Interministerial Conference for the Environment (ICL) expanded to include economics, will take the initiative to transform the current intra-Belgian platform for the circular economy into a structural scheme with a political dimension, for coordinating circular economy policies more effectively."

It therefore seems relevant to work out a solution for recreational craft (or at least involve this forum in it) in the first instance via this forum or its successor, rather than starting a separate initiative in parallel.

Federal Action Plan on Marine Litter

The development of a waste management plan for "end-of-life recreational craft" was also included in the Federal Action Plan on Marine Litter (2022-2027). In the context of this measure, for example, OSPAR will implement three initiatives by the end of 2024:

- It will devise a methodology so that contracting parties can estimate the quantity, distribution and material composition of EOL recreational craft
- It will develop guidelines to support waste management of EOL recreational craft
- It will collect inventory data of EOL recreational craft to give an estimate for the OSPAR region.

It is also recommended here to align any further steps and initiatives with the above.

European Stakeholders Group on end-of-life recreational boats

Finally, any European recommendations should also be taken into account. Indeed, the European Commission decided in 2018 to put together a stakeholder group led by DG MARE to discuss this issue and eventually offer recommendations on how to address End-Of-Life recreational craft by February 2023.

5 Benchmark & comparative analysis

5.1 France

5.1.1 Registration obligation

Maritime navigation - registration of recreational craft is only mandatory if it has a length of at least 2.5 metres or has an engine with a power equal to or greater than 4.5 kW.

Inland navigation - registration is mandatory regardless of the type of recreational craft (Ministère de la mer, 2022).

5.1.2 Legislation

The Law on energy transition for green growth (La loi de transition énergétique pour la croissance verte) of 17 August 2015 ensured the implementation of Extended Producer Responsibility (EPR) in various sectors (Code de l'environnement Section 2: Conception, production et distribution de produits générateurs de déchets Article L541-10, 2017). Since 1 January 2019, the EPR regulation has also been in effect for the recreational craft industry. More specifically, Section 22 of the Code de l'environnement (2020) states that manufacturers, distributors and owners of recreational craft must take preventive measures (according to their means) to reduce the quantity and harmfulness of recreational craft and to promote reuse of parts or waste. In this regard, manufacturers of recreational craft would have to either provide for the processing (including recycling) of recreational craft, taking into account the conditions, or contribute to their processing by joining a recognised eco-organisation

by paying a financial contribution. This organisation then takes care of processing the vessel for its members (Code de l'environnement Section 22: R543-298 + R543-299, 2020).

5.1.3 Dismantling and scrapyards

Following the above regulations, the French Federation for the Nautical Industry (FIN) decided to set up a non-profit eco-organisation to manage and finance the dismantling and waste treatment of all recreational craft in France. To this end, the "Association Pour la Plaisance Eco-Responsable (APER)" was recognised by the Ministry for the Ecological Transition in 2019. There are currently 26 recognised dismantling centres in France that are reimbursed by APER when a recreational craft is processed. Only registered recreational craft between 2.5 and 24 metres are eligible for processing at the dismantling centres (APER, 2021).

Figure 14: Dismantling centres in France (map)



5.1.4 Financing

- *Owner*

The system is based on the general principle that when a recreational craft is brought for recycling, there is no charge for the owners. That way, they want to make sure that not only the last owner has to pay for these costs but all previous owners of the vessel (see DAFN below). The only costs to be borne by the owners of the recreational craft are the costs for transporting it to the designated recycling centre (La fillière de déconstruction des bateaux de plaisance, 2022).

The recycling costs are borne entirely by APER, whose budget is funded from the two sources below:

- *Droit annuel de francisation et de navigation (DAFN)*

On the one hand, the State transfers a portion of the DAFN to APER. This tax on recreational craft is payable every year by the owners of a recreational craft that meets one of the following conditions:

- A vessel with a length of 7 metres or more;

- A vessel with a hull length of less than 7 metres and an engine power of 22 HP or more;
- Motorised vessels (jet skis, etc.) with engine power of 90 kW or more (Secrétariat d'État chargé de la Mer, 2022).

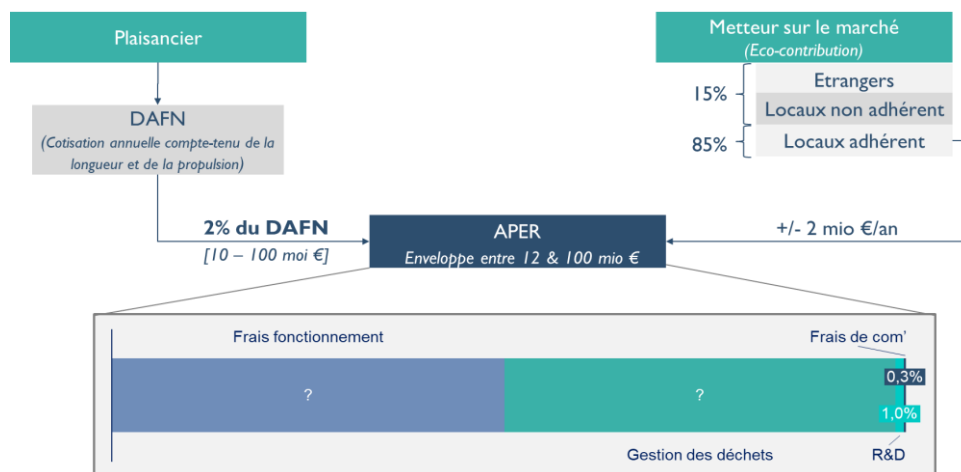
For vessels over 7 metres in length, the tax is calculated based on the length of the hull of the vessel and the power of the engines. For motorised vessels, the tax is calculated based on the power of the engine.

- *Eco-contribution by dealers*

On the other hand, since 1 January 2019, the cost of scrapping recreational craft has been partially financed by an eco-contribution paid by manufacturers and importers when new recreational craft are sold. This contribution is calculated based on the type and length of the vessel. The value of the vessel has no influence on the amount. The contribution for a 7-meter motorboat, for example, will therefore be the same for everyone regardless of the make and therefore the selling price. (La filière de déconstruction des bateaux de plaisance, 2022; APER, 2020).

Approximately 2% of the DAFN contribution is allocated to finance APER and approximately €2 million of the eco-contribution. As regards the allocation of this funding, 0.3% goes towards communication costs, 1% towards research and development costs and 98.7% towards waste management and operating costs.

Figure 15: Funding of the APER



5.1.5 Dismantling procedure

- Dismantling - first stage - removal of various materials and the navigation equipment;

- Decontamination - removing various liquids and batteries;
- Removing hazardous waste;
- Dismantling - second stage - removing the various remaining parts of the boat;
- Shredding of the hull and deck;
- Recovery of waste materials in various suitable channels;
- Deregistration and de-flagging of the vessel (La filière de déconstruction des navires de plaisance, 2022).

5.2 The Netherlands

5.2.1 Registration obligation

Registering recreational craft is not mandatory in the Netherlands. However, it is mandatory for high-speed motorboats on almost all inland waterways (except the Eems/Dollard; the Western Scheldt; the Ghent-Terneuzen Canal and the Grensmaas). High-speed motor boats include those smaller than 20 metres and capable of travelling faster than 20 km/h. This includes water scooters. (De Rijksoverheid, sd).

5.2.2 Legislation

Before vessels can be removed, a legal procedure must first be followed by the Department of Public Works (Rijkswaterstaat). There are two legal procedures:

- Under the Wrecks Act, a vessel can be declared a wreck if it is sinking or has already sunk, or;
- Imposition of an Administrative Enforcement Order.

If the vessel's owner has not removed the vessel, the Department of Public Works can dispose of the vessel after the legal procedure is completed (Woudenberg, e-mail, 2022).

5.2.3 Dismantling and scrapyards

There are already several dismantling and scrapyards in the Netherlands, but after consulting several sources, we found out that these are not organised centrally like in France. Anyone can therefore set up a dismantling yard if they so wish.

5.2.4 Financing

Since recycling is not centrally organised, there are also no rules or provisions regarding the costs for recycling. Essentially, each company sets its own price, and this is then paid for entirely by the owner who brings the vessel.

5.3 Sweden

5.3.1 Registration obligation

Vessels rented to the public must be registered if the hull is longer than 5 metres. At the request of the owner, vessels of up to 15 metres in length used for private purposes can be registered (Eklund, Syversen, Eisted, & Hanna, 2013; Transport Styrelsen, 2021).

5.3.2 Legislation

Chapter 15, paragraph 6 of the Environmental Law stipulates that the government may issue regulations regarding the obligation of producers (EPR) to ensure that waste is collected, removed, recycled, reused or disposed of in a manner that ensures environmentally-friendly treatment of waste (Miljöbalk: 15 kap. Avfall, 6 §, 1998; NATURVÅRDSVERKET, 2019).

5.3.3 Dismantling and scrapyards

Båttretur is a national network for the collection and recycling of recreational craft. This service is available to individuals, yacht clubs, insurance companies, shipyards, municipalities or other interested parties. The network's members include SweBoat, an industry organisation for boat manufacturers, shipyards, importers, manufacturers, suppliers of accessories, etc. Among other things, Båttretur has contracted Båtskroten Sverige AB and Stena Recycling to operate a national boat recycling system (Yuqing, Steve, Mia, Bengt, & Magnus, 2021; Batretur, sd). The network consists of transporters and around 25 recycling firms spread across the country (Bredahl Nerdal & Batskroten, 2022).

5.3.4 Financing

- Owner

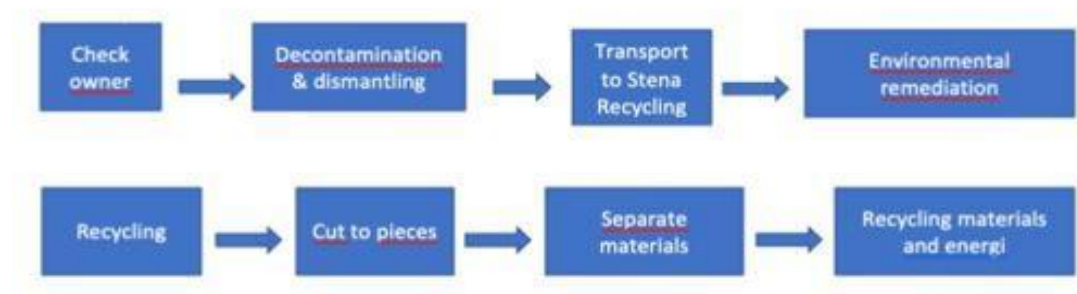
The costs to be borne by the owners of the recreational craft are the costs for transporting it to the designated recycling centre.

- Scrapping subsidy

The scrapping subsidy, which amounts to 3 million Swedish kronor (\pm €275,000) for 2022, is made available by the Swedish Maritime Administration and is intended to encourage boat owners to clean up wrecks and abandoned recreational craft instead of abandoning them in the water and in nature. The boat must be at least 3 metres long and weigh 200 kilograms. Maximum length and weight are 12 metres and 3 tons. The scrapping subsidy is SEK 3,000 (\pm €275) per boat plus SEK 5 (\pm €0.50) for each kilogram the boat weighs, with a ceiling of SEK 10,000 (\pm €915) per boat (Havs och Vatten Myndigheten, 2022).

5.3.5 Dismantling procedure

Sweden's priority is to inform, assist and support municipalities in tracing and disposing of end-of-life recreational craft. The current method of identifying and reporting abandoned vessels on different waterways consists of taking photos and geolocating them using an app. In addition, various surveys on abandoned recreational craft are sent to partners in the boat industry and boating unions, to have a better overview of the situation (Bredahl Nerdal & Batskroten, 2022).



Source: Bredahl Nerdal & Batskroten, interview, 2022.

5.4 Norway

5.4.1 Registration obligation

Norway defines recreational craft as vessels for sporting or recreational use with a hull length of up to 15 metres (Klima- og miljødepartementet, 2017). There is therefore no registration obligation for recreational craft. However, recreational craft between 7 and 15 metres can be voluntarily registered. All recreational craft over 15 metres therefore no longer fall under the recreational craft category and must be registered (e-mail, 2022 (Sjofartsdirektoratet, sd)).

5.4.2 Legislation

The regulations for facilities that accept and handle boats up to 15 metres came into force on 1 October 2017 (Miljødirektoratet, 2017; Miljødirektoratet, 2017). The scheme is anchored in Chapter 2 of the Norwegian Waste Regulations (Klima- og miljødepartementet, sd).

5.4.3 Dismantling and scrapyards

There are several dismantling and scrapyards scattered throughout Norway which are recognised by the Norwegian Environmental Agency. There are 264 yards in total, processing all small recreational craft up to 4.57 metres (15 feet). 74 of these yards process large recreational craft without inboard

motors from 4.57 metres to 15 metres. Recreational craft with inboard motors up to 15 metres can be dismantled at 64 facilities in Norway (Sortere, 2022).

5.4.4 Financing

- *Owner*

Boat owners or people who bring abandoned recreational craft with a hull length of up to 15 metres to the recycling or waste management company can apply for a grant of NOK 1,000 (\pm €98) per boat, made available by the Norwegian Environment Agency (ELEKTRONISK SØKNADSSENTER, 2022; Sortere, 2022). Boat owners can bring in boats less than 1 ton for free. For boats heavier than 1 ton, the recipients of subsidies, described in more detail below, can take advantage of various incentives to cover the additional costs to be paid by boat owners (Miljodirektoratet, 2017).

- *Subsidies from the Norwegian Environmental Agency*

The following actors can apply for subsidies:

- pre-approved facilities for environmental remediation and (pre-)processing of end-of-life recreational craft
- pre-approved (inter)municipal waste companies authorised to dispose of recreational craft (ELEKTRONISK SØKNADSSENTER, 2022).

Recipients of subsidies may apply for subsidies that cover all or part of the costs of receiving, transporting to the processing yard, cleaning and definitive processing of end-of-life recreational craft. To this end, the recipient of the subsidy must have entered into the necessary agreements with the reception facilities, transporters and, if necessary, other approved processing yards with the necessary permits from environmental authorities. The subsidy is NOK 11 (\pm €1.10) per kilogram of hull and other waste from end-of-life recreational craft brought in with the hull (Miljodirektoratet, 2017).

5.5 Other European countries

5.5.1 Finland

In Finland, a similar model to Sweden was used for the collection, removal, dismantling and recycling of end-of-life recreational craft using the recycling company Kuusakoski Oy, which had various collection points throughout Finland (Experimental campaign for recycling boats continues in south-western Finland until the end of August, 2005). However, this was discontinued owing to the limited number of abandoned recreational craft and because the remaining FRP material was too contaminated to be reused. Currently, it is the responsibility of municipal waste companies to receive waste material (Baltic Marine Environment Protection Commission, 2019, p. 13; e-mail, 2022; Eklund, Syversen, Eisted, & Hanna, 2013, p. 43).

5.5.2 Croatia, Ireland, Germany and Spain

By contacting government agencies and through further benchmarking, no specific schemes, mechanisms or national initiatives were found to promote the circular economy in the recreational craft sector in these countries (e-mail, 2022; Croatian Ministry of Economy and Sustainable Development, e-mail, 2022)

6 Annex

6.1 List of participants in the workshop

Participants in the "technical" workshop	Participants in the "systemic" workshop
<ul style="list-style-type: none"> ● Reprocover ● Denuo ● West diep yachting ● Boot Gent ● OVAM ● FPS Public Health, DG Environment. ● FPS Mobility and Transport, DG Maritime Affairs - Recreational craft department 	<ul style="list-style-type: none"> ● Denuo ● West diep yachting ● Boot Gent ● OVAM ● FPS Public Health, DG Environment. ● Fédération Francophone de Yachting Belge ● Flemish Marina Nieuwpoort ● Flemish Waterways ● Inter-environment Wallonie ● Yachting Sud ● Bruxelles Royal Yacht Club ● FPS Mobility and Transport, DG Maritime Affairs - Recreational craft department

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