circnets

WP1 REPORT

D.1.3.1 Review of EOL fishing gear collection volumes and responsible parties in the NPA region

Interreg Co-funded by the European Union | CIRCNETS

Northern Periphery and Arctic

Contents

GLOSSARY

Fishing port. A port that is mainly used by fishing vessels, i.e. vessels that are used to catch fish or other living natural resources mainly commercially.

Ghost Nets. Ghost nets are runaway or abandoned nets, trolls or other scammers. They are part of the plastic garbage problem of the oceans. They cause harm to the fishing industry, the environment and shipping. In addition, they continue their task, i.e. fishing, for a long time after they have been abandoned. Fish, but also other animals, such as birds and marine mammals, can get stuck in the nets. (Finnish Environment Institute, 2022)

Plastic containing fishing gear; “means any item or piece of equipment that is used in fishing or aquaculture to target, capture or rear marine biological resources or that is floating on the sea surface and is deployed with the objective of attracting and capturing or of rearing such marine biological resources”. (Directive (EU) 2019/904)

ACRONYMS AND ABBREVIATIONS

EEA	European Economic Area
EU	European Union
LUKE	Natural Resources Institute Finland
WFD	Waste Framework Directive (2008/98/EC)
SUP	Single-use plastics
SUPD	Single-use plastics directive (2019/904/EC)
EPR	Extended producer responsibility
NPA	Northern Periphery and Arctic
CIRCNETS	Blue Circular Nets project
EOL	End-of-life
MARPOL	International Convention for Prevention of Pollution from Ships
ALDFG	Abandoned, lost or discarded fishing gear

1 INTRODUCTION

Blue Circular Nets (CIRCNETS) is an INTERREG project funded by Northern Periphery and Arctic 2021–2027 (NPA) programme, which addresses marine litter issues. Single-use plastics and fishing gear are the most significant sources of marine plastic litter also in Europe, and the European Union has taken substantial steps in tackling these threats to the marine environment. Many single-use plastic (SUP) items have been banned and replaced with items made from more sustainable materials, but a similar approach is not yet possible with plastic containing fishing gear. Therefore, a different kind of approach has been taken. End-of-life (EOL) fishing gear, nets and other fishing gears, which are approaching their best before date, should be collected separately and recycled in order to prevent them from ending up in oceans and contributing to the marine plastic pollution.

The more specific aim of CIRCNETS is to support the setting up of a collection system for EOL fishing gear in the NPA region. EU's SUP directive requires that producers and importers of plastic containing fishing gear in all EU member countries organise collection of EOL fishing gear based on the extended producer responsibility (EPR) principle. Finding out how collection can be organised regionally in a most efficient and economical way, which also adheres to the "do no significant harm" principle, requires solutions to be looked at from other regions, which have already taken steps towards this. However, the collection of fishing gear opens a possibility to proceed towards a more circular economy, and find out ways, how the collected materials can be recycled regionally.

The aim of this deliverable report D.1.3.1 of CIRCNETS is to find out how much EOL fishing gear waste is collected in the NPA countries and by whom, and what happens to it next. This forms the central part of the report and is described in detail in Chapter 3. The life cycle of fishing gear, the life span of them, is addressed in Chapter 2, which forms a basis for the subsequent chapters. What is the average life expectancy of various kinds of fishing gears, before they become trash and waste? In Chapter 4, on the other hand, we will take a step forward from the collected waste volumes and look at the treatment methods and recycling capacity of those material segments, which are found in the EOL fishing gear waste in the NPA countries. As separate collection of EOL fishing gear will become mandatory in the NPA countries due to the introduction of EPR for this waste stream, the collected fishing gear waste volumes will increase. What happens to them next, do we have recycling capacity for this material in the NPA countries? If not, do we ship this abroad to be recycled, or do we increase our own recycling capacity? In Chapter 4 we will systematically go through the main recycling options for the various material waste streams of fishing gear waste and the existing facilities that could potentially receive these in the NPA countries.

For more information about the project, visit the website of the project at
https://www.interreg-npa.eu/projects/CIRCNETS/home/

2

LIFE CYCLES OF FISHING GEAR

2 LIFE CYCLES OF FISHING GEAR

2.1 The circle of life of fishing gear

Nets, pots and rods are among those tools which are used nowadays by spare time fishers, professional fishers or fish farmers in fishing and aquaculture. Just like any other item that we use, they are liable to tear and wear. A small defect in the gear does not necessarily mean that the gear has passed its best before day and it should be binned. Repairing the fishing gear can extend their useful life span. Depending on the gear and the scale of the damage to it, the user might be able to fix the gear by themselves, or they might return it to a manufacturer, who can repair it. This is the sensible thing to do from the point of environmental sustainability. However, all items will eventually reach a point when they are beyond repair.

Old gear that is not lost while fishing is called end-of-life fishing gear or EOLFG. This gear may be worn out, damaged or just too old for continued use. When a gear reaches this point, it is important that it is disposed accordingly and is not left out in the environment. Collection systems for EOLFG such as bins may help prevent accumulation of lost, abandoned or discarded fishing gear. (Sala & Richardson, 2023)

”Abandoned fishing gear” is fishing gear that has been deliberately left at sea due to unforeseen circumstances. “Discarded fishing gear” refers to fishing gear that has been released at sea without any recovery attempts, and “lost fishing gear” is gear that has been accidently lost. A common name for all of these is ALDFG, abandoned, lost or discarded fishing gear. They are more commonly referred as “ghost gear”, which is a significant source of marine litter (Sala & Richardson, 2023). Extreme weather, human errors, mechanical failure, economic reasons, vandalism, collision with other vessels and uncertain regulations are some reasons for the generation of ghost gear and fishing debris. Abandoned fishing gear can carry out unintentional ghost fishing in the oceans, they can capture and kill marine animals. Another aspect is the marine plastic pollution, that they can contribute to. As the gear decomposes, they release plastic and microplastics into the marine environment. (Hoang et al., 2024).

By taking EOLFG out of use, as the gear is deteriorating and is not up to the job, the gear can be prevented from becoming ALDFG. However, even the newest and best fishing gear can become ALDFG due to the above-mentioned causes. Professional fishers are required in many countries to take actions to recover lost gear, but these attempts are not always successful. There are also various voluntary organisations in many countries, which are searching for ALDFGs and recover these. Once these are found and removed from the ocean, the first aim has been reached, they are no longer contributing to marine pollution and ghost fishing. However, what happens to them next, is more difficult. Some gear might be returned to use after repairs, but if the gear has spent longer time in ocean, it’s days might be done. However, recycling ALDFGs is not as simple as recycling EOLFGs. The gear can contain many different materials, which need to be separated and sent to various recycling facilities, but the ALDFGs carry extra baggage. ALDFGs might have spent many years in the ocean, collecting various contaminants, organic growth, etc., and the gear might have deteriorated in the process. All these aspects have to be addressed first, if recycling of the gear is considered. In some cases, the only real "recycling" option that is available for these ALDFGs, is incineration, energy recovery. (Sala & Richardson, 2023)

Not all gear can be recycled due to extensive wear or due to the contaminants which they have collected in the ocean. Some gear, on the other hand, are subject to coating treatments, which improve their durability, but make them harder to recycle. Previously, these coating materials included chemicals, such as heavy metals, which have been banned since. Recycling this kind of gear, which has traces of heavy metals, is especially challenging. They have extended the life span of the gear, but this has been reached at the expense of their recyclability. (Grimstad, Ottosen & James, 2023). UV radiation and saltwater may also affect the properties of plastics, making them not as feasible for mechanical recycling anymore. (Hoang et al., 2024)

2.2 Average life cycles of various fishing gear types

The average life of fishing gear depends on multiple aspects. The gear type, size, use conditions and total fishing hours are some of the important factors. Some gear types last for years and even decades, while some are worn out in just a year or less. It is important to replace gear once it is not working well anymore, to ensure both efficiency and the correct discarding of old gear. Environmental and weather conditions can also affect the degradation of gear.

One key factor, which affects the durability of the plastic materials, is whether the gear is used close to the surface or deeper. The disintegration of plastic is most effective on the surface levels due to wider ranging temperature changes, sunlight and mechanical wear, compared to deep water levels. Passive fishing nets that are used close to the surface are also more prone to damage caused by vessels and other seafarers, but also by waves. (Seppänen & Lappalainen, 2019)

There are several studies about the average life of fishing gear. In a study by Basurko et al. (2023), different types of end-of-life fishing gear were collected from Spanish ports, and their chemical structure and mechanical properties were analyzed. In Spain, fishing gear is in use seasonally depending on the target catch. Samples of purse seiner net, gill net, longline, trawling net and pots were subject of the study. Based on the analyses, gillnets had high potential for mechanical recycling, but there were also some drawbacks. As they consisted of multiple polymers and had been chemically degraded, mechanical recycling did not seem to be the prime option after all. From the tested gear, 56 % were said to have potential to be mechanically recycled, especially purse seine nets. The study revealed that gear was usually discarded only when it was in bad or very bad condition. Due to the degradation, energy recovery did seem to be the most suitable option, while some gear seemed to have enough potential for mechanical recycling (Basurko et al., 2023). The study did not study the average life of the gear, but it seemed that at least the studied gear had been in use as long as possible and they had been discarded only when they were broken down. Using significantly degraded gear of course increases the risk of accidents and the chance of gear becoming lost in sea.

In Barents Sea, it is compulsory to use a size-sorting grid in front of the codend for gadoid trawl fishery. This sort of minimum catch size requirement is common all around the world. Some mesh panels may lose their shape with time, resulting in changes to their size selection properties. In a study by Sistiaga et al. (2024), both a new and a well-used flexi-grid were compared. The well-used trawl had about 20 000 commercial fishing hours. After comparison, the new gear seemed to retain significantly less of the small fish than used gear. However, when grid sections were combined with size selective codends, the difference disappeared. It seems that with time, the meshes in the grid section stretch wider. For successful size selection, which is often mandatory, using newer gear or adding size selective codends is important. (Sistiaga et al., 2024)

Many single use plastics have been replaced also with biodegradable materials, but are they a solution for fishing gear? Biodegradable materials do not necessarily perform as well in fishing gear, as has been found out for instance in the case of gillnets. This may have significant impacts on the profitability of fishing, as the gears are more expensive and the catch might be lower. But they have some useful applications, especially for gear, which are more prone to become ALDFG. For instance, some countries require that lobster pots must have biodegradable escape systems. If a pot is lost and it stays in water for longer than it has been intended to be, the thread of the escape mechanism will biodegrade and release its captive. These don't seem to have an impact on the performance of the pot itself, and they can be lifesaver, if the pot becomes a ghost gear. However, they have been also criticized due to their more expensive cost when compared to normal pots. Weakened strength, shortage of elasticity are other factors, which biodegradable materials still have to overcome if they are to become mainstream fishing gear material. (Drakeford, Forse & Failler, 2023).

Biodegradable fishing gear has been studied and is currently being studied across the world, and one such initiative is the INdIGO project. The aim of the project was to create a biodegradable fishing net with a planned lifetime of 2 years, but even this project faced serious challenges. (INdiGO Innovative Fishing gear for Ocean, 2023) A further aspect, which works against the use of biodegradable materials in fishing gear, is the life span of such gear. The materials have shorter life expectancy, so the fishers would have to renew their gear more often than they would need to do with normal gear. If the unit price of biodegradable gear is higher, efficiency is lower and the gear should be renewed more often, this can be hardly considered as a winning combination.

In the NPA region there is a huge variation in the fishing methods, their seasonality and other aspects related to fishing between the countries, as has been described in detail in the report D.1.1.1. The main difference is between the regions in the Atlantic seaboard and the Baltic Sea. Sweden and Finland have a lot of freshwaters, which have ice cover during winter, as does the coastal areas of Baltic Sea, especially in the north. There is a lot of leisure fishing in Finland and Sweden even during winter, when specific ice fishing gear is used (Hentinen, 2022). Regular gear is used when the freshwater is free from ice. Ice conditions limit commercial fishing in wintertime in the Baltic Sea area, where spring and autumn are generally the most active fishing times. Fishing of certain kinds of fish species is very regulated in the Baltic Sea with individual species having designated fishing times and, in many cases, also specific fishing gear. (Kalaneuvos, 2020) On the Atlantic seaboard winter and ice in particular do not constitute a similar obstacle for fishing as it does on the Baltic Sea and commercial fishing is more or less round the year business. The same gear might be in use around the year, continuously, in Ireland, Iceland or Norway, whereas in Finland and Sweden, for example, a fyke net might be used only for couple months in a year, when salmon fishing is allowed. Assessing the life span of fishing gear is challenging from this point alone.

2.2.1 Aquaculture gear

Cage nets used in aquaculture were discussed thoroughly in the report D.1.2.1. Data was collected from couple aquaculture companies about the sizes and weights of the cage nets that were used, among other data. Unlike fishing gear, cage nets are left in water for months, exposing them to water, sun and other elements for long periods of time. Antifouling agents are used to increase the durability of the nets, but naturally, these will only slow down the degradation process. Based on the information received from companies, the average life span of the cage net systems used by them ranged from 5 to 15 years, the average age being about 10 years. Natural Resources Institute Finland (Luke) has also studied the life span of the cage nets systems. The life span of the mesh nets, which are made of nylon, was estimated to be 4 to 7 years. The average age of the framing pipes, which are made of PE, was not studied in this research. (Seppänen & Lappalainen, 2019)

The cage net systems used in Finland were considerably smaller than the ones used in Norway, as was mentioned in report D.1.2.1. The salinity level is higher in the Atlantic than in the Baltic Sea or in the Finnish and Swedish freshwaters. The mesh nets used in the Norwegian aquaculture companies might be also thicker than the ones used by Finnish and Swedish aquaculture companies, but most likely there is not as big difference in the life span of cage nets as there is in fishing gear between Baltic Sea and Atlantic seaboard. However, more research into the topic is needed.

2.2.2 Professional fishing gear

The life span of commercial fishing gear has been researched in many studies. According to one about the end-of-life fishing gear in Namibia, fishing nets lasted for about three years, while lines lasted only for about two years before they became too worn down. Similar figures have been established in research done in England. The estimated life span for demersal trawl netting and fishing lines was three to five years, three years for large and five years for small. It is important to note that fishing gear components of the same gear might have different life expectancy. Pelagic trawls last 3-8 years, with nylon pelagic nets being the longest lasting component that might last even up to 8 years. Beam trawl gear seems to have the shortest life span, as most components such as netting and fishing line have a life span of less than one year. Polyethylene beam travel nets and nylon gill nets both last about half a year. With long lines, the life span of the main line is also under one year. For gill nets, the head rope has a longer life span of 7 years while the netting only lasts half a year. Pots and traps seem to last years, even decades. In Norway, it was estimated that trawl lasts 2.8 years, gillnets 2.1 years, Danish seine for 3.9 years and purse seine for 10.2 years. (Erasmus et al., 2024; Chambers, Jarvis & Powell, 2021)

According to another study (Syversen et al., 2022), the average lifetime of Danish seine gear in Norway is about 18 months. This depends on vessel size, fishing strategies and the number of fishing days in a year, for example. It's said that the net lasts longer than the ropes. (Syversen et al., 2022) But as has been stated above already, the life spans of commercial fishing gear are estimates. There are many different factors that contribute to the durability of gear, such as size, maintenance, fishing style, material, total fishing hours and the climate where it's used.

2.2.3 Leisure fishing gear

Plastic containing leisure fishing gear is also subject to EPR and a separate collection for EOL gear must be provided. Some spare time fishers use similar fishing gear, such as nets and pots, which are used also by professional fishers. Their life span can vary greatly, depending on whether they are used almost daily or only once in the summer.

Fishing rods are another popular gear type. According to some sources online, one in three fly rods end up breaking. Some companies have offered even full lifetime warranties in the past, but due to increased demand for fly rods, they have slowly changed the policies to just a one-year warranty. (Deeter, 2002; Due West Anglers, 2023) The estimated life span of a rod can be up to 10 years, but this depends on the quality of the rod. Exact estimates for the life span of leisure fishing gear are difficult to find, as these are affected by the gear type and its material as well as fishing hours and correct use and management of the gear.

3

COLLECTED EOL FISHING GEAR AMOUNTS

3 COLLECTED EOL FISHING GEAR AMOUNTS

The SUP directive, as was mentioned in the previous project report of the project (D.1.1.1), requires that EU member countries must extend EPR to cover also EOL fishing gear. Each country decides about the national implementation of the EPR and how to organise the separate collection of the fishing gear (including plastic containing aquaculture gear) and the collection targets. The manufacturers and importers must form a PRO, which will organise this based on the EPR principles. Norway and Iceland are not part of EU, but in Iceland there has been a “voluntary” EPR in place for EOL fishing gear for many years already. Norway is also expected to decide on the national implementation of EPR for fishing gear, but there has been already quite significant collection activities also in Norway.

3.1 Finland – no separate collection so far

As was mentioned in the report D.1.1.1, there has not been a separate collection for fishing gear in the country, one is only being set up and put into action by the PRO. Smaller collection pilot was initiated by the PRO in November 2024, which has expanded to cover whole of the country in the spring 2025. As there has not been a separate collection of fishing gear previously, it is safe to assume that there is a lot of historical fishing gear waste in the country, as was also observed during some of the port visits conducted in the project in autumn 2023. The minimum target that has been set for the collected volumes is ten percent of the fishing gear annually put on the market in the country. The producers reported that 361.84 tons of fishing gear was put to the Finnish market in 2024. (M. Heinonen, personal communication, June 10, 2025)

3.2 Iceland – detailed figures about collected amounts

There has been a centralized collection scheme for EOL fishing gear in Iceland since 2005, and the collected volumes of fishing gear have been quite significant. One thousand tons of fishing gear waste was collected in 2012, and after some minor drops in the collection volumes, it peaked in 2023 with 2,172 tons of fishing gear being collected. (Fisheries Iceland, 2025) All Icelandic fishing companies, who are involved in the collection scheme, can return their fishing gear waste free of charge at the collection points, if the waste meets certain requirements regarding its condition. The collection rate is high among the local fishing companies, but foreign vessels must pay for the service. For more information about the Icelandic collection scheme, see report D.2.1.1.

3.3 Ireland – only estimates about collected amounts from Fishing for Litter project (FFL)

In Ireland there has not been a systematic collection scheme in place for EOL fishing gear, but there have been some initiatives, such as Fishing for Litter (FFL) project, which have collected fishing gear. However, as the name states, this targets mainly litter at sea, it is not a collection scheme for EOL fishing gear. There are some figures about the collected volumes of fishing gear in Ireland, this is estimated to be around a hundred tons a year (see D.2.1.1 for details). As the Irish PRO is expected to start the separate collection of EOL fishing gear in 2025, the collection volumes should increase significantly. Since there has not been a systematic collection scheme earlier, there is also most likely a lot of historical waste in the country as well. It will take some time for the collection volumes to set on a normal level as the historical waste is taken out of circulation.

3.4 Norway – gear is being recycled, no information about the collected volumes

Judging by the monetary value, production and catchment tons, Norway is number one commercial fisher and aquaculture producer among the NPA countries without a doubt (for the key figures about this, see D.1.1.1). There is no systematic collection scheme in the country, but fishing gear waste has been collected and either recycled in the country or sent abroad to be recycled. The recycling companies have not published the figures about the fishing gear waste that they receive annually, so even the estimates about the collected gear volumes are based on the national Fishing for Litter initiative. This is estimated to be about 200 tons a year (see D.2.1.1. for details). One company though, Oceanize Ltd, is processing mainly gear from aquaculture and the annual volumes that they process are up to 25 000 tons. The company has a contract with companies working in this sector who send their old gear to Oceanize.

One Norwegian waste management company, which was interviewed in the project, informed that fishing gear waste was commonly delivered to landfills and collected by recycling companies from there. However, this is not done anymore, at least not at this landfill. The recycling companies, which are using gear waste, seem to have their own collection schemes or they are collecting gear waste from other landfills. In this landfill in question, the amount of fishing gear waste was estimated to be around 80 000–90 000 tons. The landfill has not been taking fishing gear waste since 2021 due to lack of space, as recycling companies have not collected gear waste from this site anymore. Based on this, it seems that there are quite significant amounts of fishing gear waste in Norwegian landfills, but EOL fishing gear is maybe also stored at ports and other facilities in addition to this.

3.5. Sweden – collection volumes are known

There has been a centralized collection scheme for EOL fishing gear in Sweden called Fiskereturen. A key part of the scheme has been the marine recycling center, established in the municipality of Sotenäs, where the collected gear is delivered and is sorted in into material mono fractions before being sent to recycling facilities. This has been a national initiative, funded by the Swedish Marine and Water Management, but gear has been mainly collected from the west coast of Sweden, which is the predominant fishing region when compared to the other regions of Sweden. During 2023, approximately 177 tons of waste was collected from the west coast and approximately 29 tons from the east coast, the average annual collection volume being around 200 tons of discarded fishing gear. Fiskereturen has not collected fishing gear from Northern Sweden – from the NPA part of the country – but according to an interview with an aquaculture company, some aquaculture gear is being collected even in the NPA region. It was not clear though, to which company the EOL gear is being sent to. (Pettersson, 2024)

As there has been a centralized collection scheme in place already for several years, there should not be as much historical waste in Sweden, as in those countries, where gear has not been collected. On the other hand, as the collection has not reached the Swedish NPA region yet, there the situation might differ from the rest of the country.

4

EOL FISHING GEAR TREATMENT METHODS AND PROCESSING CAPACITY IN THE NPA COUNTRIES

4 EOL FISHING GEAR TREATMENT METHODS AND PROCESSING CAPACITY IN THE NPA COUNTRIES

4.1. Overview of recycling methods

Collection is naturally only the first step on the long journey of recycling EOL fishing gear and of using these materials eventually in making new products. Fishing gear is a “complex waste fraction”, they consist mostly of different plastics, metals and rubber. Separating these materials is the first challenge, especially for those countries which do not have existing sorting or so-called pre-processing facilities or marine recycling centers. Pre-processing includes multiple steps from sorting and separation to cleaning of the components. Different polymers and metals need to be separated. Removal of lead is especially important. Separated fractions should be cut or squeezed into smaller volumes for transportation (Sala & Richardson, 2023). Long distances in the NPA areas can make transportation of waste fractions to recycling centers uneconomic. Minimization of distances can be recommended, but this can be difficult to achieve in remote locations (Grimstad, Ottosen & James, 2023).

The fishing gear waste facility can be either centralized or decentralized. In a centralized facility, the gear is first collected from collection points and taken to the facility where all pre-processing steps are executed. For a decentralized facility, some of the preprocessing steps are done in the harbors or collection points already. Essentially for a centralized center, infrastructure to pre-process exists only in a centralized location, and for a decentralized facility, some pre-processing infrastructure exists in the collection locations as well. For the collection and recycling of fishing gear, a combination of both is often the most cost-effective option. (Sala & Richardson, 2023)

In pre-processing, the separation of different materials may need a lot of manual labor to separate materials and especially intertwined compounds such as lead in some nets. Shredding of components may require specialized technologies, and not having standardized facilities may make the recycling of fishing gear more difficult both technically and economically. Gear that is too degraded may not be potentially suitable for recycling anymore, and assessing the quality, type and condition of the materials is important for finding the best recycling practices. Both sorting and cleaning are usually necessary before the chosen recycling process, adding to costs. (Hoang et al., 2024)

There are three methods to recycle plastics, mechanical recycling, chemical recycling and energy recovery. Different plastics in fishing gear include plastics such as nylon (PA), polyethylene (PE, HDPE or LDPE), polypropylene (PP), polyethylene terephthalate (PET), polyester (PES), polystyrene (PS) and polyurethane (PU). (Sala & Richardson, 2023) These methods and their suitability for different plastic types will be discussed in detail next.

4.1.1 Mechanical recycling of plastics

Mechanical recycling is divided into primary and secondary recycling. In primary recycling, single-type plastic is degraded and melted into granulates which possess equivalent characteristics compared to the original. Primary recycling includes recycling of production waste or leftover material from the production line. Secondary recycling deals with materials that have been in use already. These contain some impurities, mixed plastics or other materials, etc., which are also made into granulates, but they are of lower quality than the original material. When EOL fishing gear waste is being recycled, we are dealing with secondary recycling. Mechanical recycling includes the steps of shredding, washing, drying, and melting and processing into new granulate. (Sala & Richardson, 2023).

Mechanical recycling is much more common in Europe than chemical recycling. The downsides of mechanical recycling are accumulating additives and thermal-mechanical degradation and the fact that plastics with heterogeneous composition are not suitable for mechanical recycling. (Lase et al., 2023)

When mechanical recycling is compared as an end-of-life treatment method to landfilling or incineration, it is obvious that the first mentioned results in lower emissions. In a life cycle analysis of recycling PP or PE fishing rope into PP or PE plastic granulate, it was found that the carbon footprint depends largely on transportation methods. When comparing production of virgin PP or virgin HDPE and the production of recycled PP or PE granulates from fishing/aquaculture gear (see Figure 1 below), the recycled option has much less CO_2 equivalent emissions. (Grimstad, Ottosen & James, 2023)

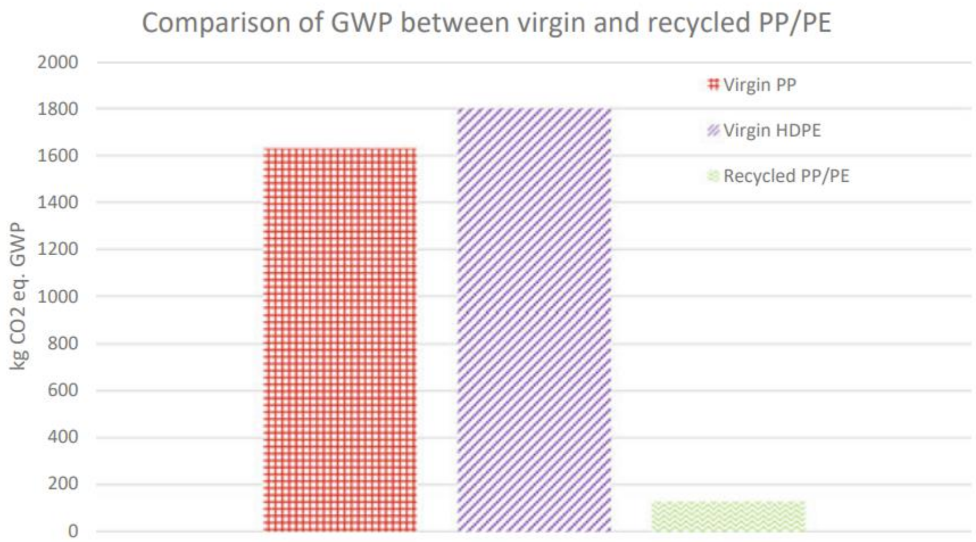


Fig. 1. CO2 equivalent emissions of virgin and recycled plastics. (Grimstad, Ottosen & James, 2023)

4.1.2 Chemical recycling of plastics

Chemical recycling, also called tertiary recycling, changes the chemical structure of plastic, and chemical constituents (monomers, polymers) are recovered from polymer waste. Chemical recycling includes thermal conversion methods such as *pyrolysis* and *gasification* and other chemical recovery processes. The resulting gaseous or liquid fuels from thermal conversion are of lower quality than the original products but can be used as feedstock for higher quality end-products (Sala & Richardson, 2023). Pre-treatment before chemical recycling would include shredding, washing and removal of contaminants (Lase et al., 2023). Non-polyolefin plastics such as PET, PVC, and acrylonitrile butadiene styrene should be removed from the waste before pyrolysis. Pre-treatment is essential for chemical recycling such as pyrolysis, but slightly polluted mixed plastics such as different polyolefins are suitable for the process. (Zou et al., 2023)

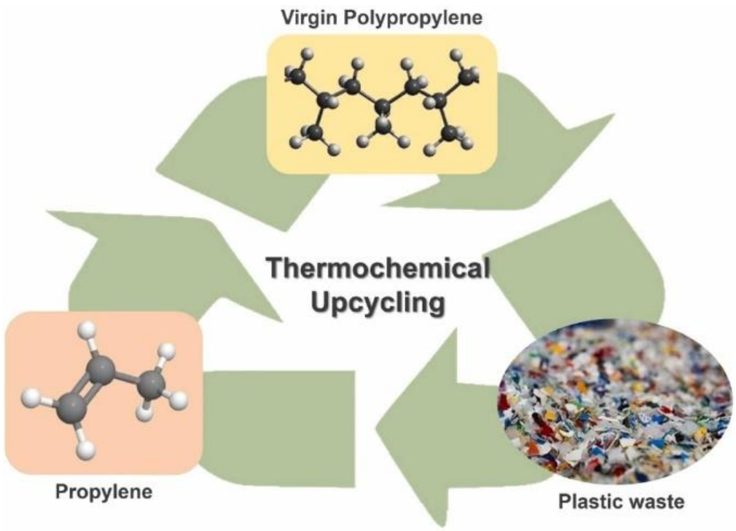


Fig. 2. Thermochemical upcycling of PP. (Kim, Kim & Lee, 2024)

Another chemical recycling method is *depolymerization*, which breaks single polymer plastic down to monomers which can be used as raw materials in plastic production. Depolymerization is limited to pre-sorted, single polymer fishing gears. Depolymerization products are high value but may need additives. Depolymerization is the only chemical recycling method used on a large scale so far for fishing gear (Sala & Richardson, 2023). Aquafil has a commercialized hydrolysis process to recover nylon from fishing nets (Minor et al., 2023). It seems that depolymerization methods are especially suitable for PA, and not so much for LDPE, PET, and PP due to their branched structure. (Hoang et al., 2024)

Advantages of chemical recycling are high-quality products. Thermal conversion processes need less pre-processing compared to mechanical recycling, as mixed plastics are generally suitable. However, thermal conversion processes face criticism for being energy intensive, creating hazardous waste and having a large carbon footprint (Sala & Richardson, 2023). Pyrolysis oil’s composition depends largely on the feedstock and one issue with pyrolysis of plastics is the availability of consistent plastic waste which needs to be of good quality.

Feedstock also requires pre-processing. Another issue is the refining of the oil. Overall logistics, densification of plastic, location of the plant itself, the location of the post-processing plant and small demand of pyrolysis oil all add to the economic feasibility of plastics pyrolysis. From VTT Technical Research Centre of Finland’s report in 2019, life cycle assessments showed that thermolysis of plastics could have a significantly lower carbon footprint impact than incineration of plastics, but more research into this is needed (Oasmaa et al., 2019). Due to the low yield of suitable monomers for new plastic production, pyrolysis and gasification are said to have 10-100 times higher environmental and economic metrics than virgin plastic production. It is said that pyrolysis of plastics would be economically and environmentally more suited for production of fuels and chemicals, but this depends on policies and technologies. (Uekert et al., 2023)

4.1.3 Energy recovery

Quaternary recycling means processing waste to energy. Energy recovery processes use incineration to convert gear into energy, heat and steam. Incineration produces ash, which is usually taken to landfill or to end-of-life storage. Plastics such as PE, PP and PS have approximately as good heating value as does gas, oil and petroleum. Incineration plants are expensive to operate and need to stay within their emission limits. Quaternary recycling is considered reasonable when primary, secondary and tertiary recycling isn’t feasible (Sala & Richardson, 2023).

To summarize, using recycled plastic can reduce CO_2 emissions when compared to using virgin plastic, at least in the case of mechanical recycling. However, the emissions depend largely on the infrastructure and other factors, and only certain single-plastic types can be recycled mechanically. Chemical recycling of plastic seems to lead to higher environmental and economic costs when compared to virgin plastic production, but can be helpful in reaching recycling rate demands, as mixed plastics are suited for these processes. However, the success of plastics pyrolysis depends on many factors, such as constant feedstock, which still needs to be preprocessed and composition of pyrolysis oil and its valorization possibilities.

4.1.4 Recycling of other EOLFG materials

Fishing gear contains also other materials than just different kinds of plastics. The fishing gear that was delivered to the Sotenäs Marine Recycling Center in 2023 contained mixed metal, lead, aluminum, copper, lead ropes and stainless steel. Mixed metals and lead were the most significant metal types by weight. Other than that, the gear contained also rubber and floats as well as wood, stone and electronics (Pettersson, 2024). As the demand for metals like copper, steel, lead and aluminum is likely to grow in the future (Watari, Nansai & Nakajima, 2021), a high recycling rate for these materials is essential.

Pyrometallurgic processes are needed to recycle lead. Furnaces are used to melt down aluminum, steel and copper. Generally, metals are well recyclable (Hoang et al., 2024; Melanen et al., 2000). Separated metals that are ready to be recycled are often cut into pieces for transportation, whereas mixed metals are often pressed down before transportation. Heterogeneous metals are crushed, and the magnetic fraction can be sent to a steel mill while the non-magnetic fraction is separated further. (Melanen et al., 2000) EU has been working on a ban of lead in fishing gear and sports shooting, but this process is still ongoing. (European Commission, 2025) Some producers have already replaced lead in their fishing gear and adopted for instance zinc, which is also a recyclable metal and has a longer lifespan in fishing gear than lead. (Linimatic, 2025)

4.2 Finland

4.2.1 Collection options

In Finland there has not been separate collection for EOL fishing gear, but this will be now organised by a PRO, producer responsibility organization. Suomen SUP-Tuottajayhteisö Oy, The Finnish SUP Producer Group Ltd, was granted the PRO status for fishing gear in 2024. According to The Government Decree, the collection networks are mandated for different gears, for example a network of at least 150 fixed collection points must be provided for stationery and other trap-type gear, some of which can be replaced by mobile collection points. For aquaculture gear there is no fixed collection network required, and that collection could be handled as a service between businesses, for example. For angling gear, there are no requirements for fixed collection points, making the collection options more flexible, such as providing seasonal in-store collection. The set target value, which PRO must reach, is ten percent of the weight of the fishing gear that is annually brought to the market. (Suomen SUP-Tuottajayhteisö, n.d.; Valtioneuvoston asetus muovia sisältävistä kalastusvälineistä 1319/2022)

Suomen SUP-tuottajayhteisö Oy will be buying a separate collection of old fishing gear materials from Rinki Oy, Finnish Packaging Recycling RINKI Ltd. A pilot collection was organised in autumn 2024 and the collection has expanded to cover the whole of the country in spring 2025. (Suomen Pakkauskierrätys RINKI Oy, 2025)

4.2.2 Pretreatment and sorting

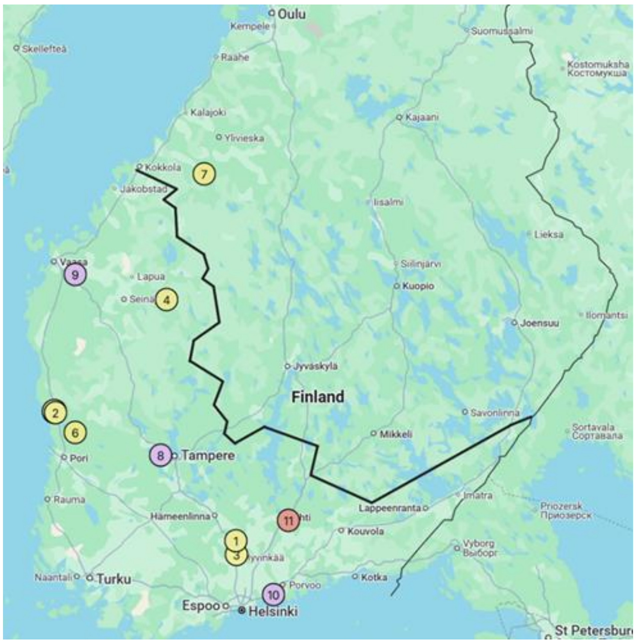
After collecting the gear, sorting and pre-treatment of the gear is required so that different materials can be separated into recycling. Finland does not have a sorting and pre-treatment facility for fishing gear, such as the Sotenäs Marine Recycling Centre. Currently, the collected stationery and other trap-type gear is transported to terminals, where some kind of separation is done (gear that can be repaired for reuse, gear that can be recycled or gear that goes to incineration). With angling gear that is collected in fishing gear stores, the store employees are the ones who do the separation and decide if the gear can be repaired for reuse or if it is sorted to mixed waste (incineration) (T. Lumiaro, personal communication, June 10, 2025).

Effective sorting and pre-treatment of fishing gear would require a designated center with professionals and advanced techniques. As of now, this is still missing in Finland, which is a challenge for the recycling of materials.

4.2.3 Plastic recycling

All post-consumer plastic packaging waste, which is collected separately in Finland (except for plastic deposit return bottles), is sent to Riihimäki for mechanical recycling. However, all the collected waste is not processed at the plant, as some of the waste is exported. There is also significant amount of recycling reject, which is not suitable for feedstock for new products. In 2019, the mechanical recycling recovery rate at the Riihimäki plant was 37 %, and the reject, 63 %, was incinerated (Judl, Horn & Karppinen, 2024).

Besides the above mentioned Riihimäki facility, which is run by NG Nordic (previously Fortum), there is another larger scale plastic mechanical recycling plant in the country, which is operated by Lassila & Tikanoja in Merikarvia. NG Nordic is currently planning to expand their operations. A third large mechanical recycling plant, run by Syklo, will be operational from 2025 onwards in Hyvinkää. This plant is supposed to use a new technology, which will separate different plastic grades better. There are also some smaller mechanical recycling plants, such as Kesrec (Keskinen Recycling) in Kuortane. Clean Plastic Finland recycles agricultural plastic in Tuorila. Suomen Käyttömuovi in Pomarkku has mechanical recycling as well, and Pramia Plastic recycles PET bottles into granulate in Toholampi. This is the only plastic recycler that is actually located in the NPA part of the country, the rest of the mechanical recyclers (and chemical ones) are situated in the Southern and Western Finland (see Map 1).



Plastic recyclers in Finland
1. NG Group, Riihimäki 2. Lassila & Tikanoja, Merikarvia 3. Syklo, Hyvinkää 4. Keskinen Recycling, Kuortane 5. Clean Plastic Finland, Tuorila (behind number 2) 6. Suomen Käyttömuovi, Pomarkku 7. Pramia Plastic Oy, Toholampi 8. WasteWise Group, Nokia 9. Pohjanmaan hyötyjätekuljetus, Laihia 10. Lamor Recycling, Porvoo 11. PlastEco, Lahti

Map 1. Plastic recycling sites in Finland. Yellow = mechanical recycling, purple = chemical recycling, red = start-ups, black line represents the NPA border in Finland.

There are two operational chemical recyclers utilizing pyrolysis: WasteWise Group in Nokia and Pohjanmaan Hyötyjätekuljetus in Laihia. WasteWise is expanding their production in the future. Lamor Recycling is also building a larger chemical recycling facility in Porvoo, which will be the largest plastics chemical recycling facility in Finland once it is fully operational. There are also smaller startups/trials, such as PlastEco with their pyrolysis operations in Lahti.

In 2022, 123 970 tons of deposit-free plastic packaging was brought to the market, and Sumi (Suomen Uusiomuovi Oy) collected 53 294 tons for recycling, which is 44.97 % from the packaging they are responsible for. They estimate, that in total, the recycling rate of plastic packaging in Finland is 33-35%, whereas the target rate is going to be 50 % from 2025. (Sumi, 2023) As these are sent to Riihimäki for NG Nordic to be recycled, NG Nordic's plans of expanding their capacity from 18 000 to 50 000 tons is good news for Sumi. The current mechanical recycling capacity is little short of 40 000 tons (Lassila&Tikanoja n.d., Uusiouutiset, 2021), but as Syklo's new facility will have a capacity of 50 000 tons, (Syklo, 2025) the total mechanical plastic recycling capacity should reach 120 000 tons in the near future. Lassila&Tikanoja has currently the biggest recycling capacity of these three, but will fall on the third place as these investments have been completed.

Lassila & Tikanoja and Syklo seem to target other plastics than packaging (70 000 tons), while Sumi delivers plastic packaging to NG Nordic's facility. In addition to these three big ones there are also smaller mechanical recyclers in the country whose capacity is unknown.

The current chemical recycling capacity is about 18 000 tons. The capacity of Pohjanmaan Hyötyjätekuljetus is 10 000 tons, whereas WasteWise Group plans to increase their uptake from 8000 to 24 000 tons (A. Åke, personal communication, summer 2024). The chemical recycling capacity will increase as Lamor Recycling will open their new plant. This facility will process 10 000 tons at first, but the capacity should increase to 40 000 tons in 2026. (Lamor, 2022) These additions should increase the chemical recycling capacity to 74 000 tons in coming years. This figure does not include smaller start-ups or pilots, which are currently exploring expanding their operations.

Table 1. Capacities of plastic recycling plants in Finland and the recycled plastic types.

Company	Technology	Capacity in tons (in future)	Plastic types recycled
NG Group	Mechanical	18 000 (50 000)	Plastic packaging
Lassila & Tikanoja	Mechanical	20 000	PP, PE
Syklo	Mechanical	0 (50 000)	
KesRec Finland	Mechanical		PP, HDPE, LDPE, LLDPE
Clean Plastic Finland	Mechanical		Agriculture plastics
Suomen Käyttömuovi Oy	Mechanical		
Pramia Plastic	Mechanical		PET bottles

Wastewise Group	Chemical	8 000 (24 000)	Various types
Pohjanmaan Hyötyjätekuljetus	Chemical	10 000	LDPE, HDPE, PP, PS, PET, ABS, PVC
Lamor recycling	Chemical	0 (40 000)	
Total		56 000 (194 000)	

Information about the above-mentioned plastic recycling companies and their processing capacity has been collected to Table 1. As can be seen from the table, the plastic recycling capacity in Finland is set to multiply within few years. This is sorely needed, as collected plastic waste is still being sent to other countries for recycling. (Parhiala, 2024; VTT, 2023; Kemiamedia, 2023; Lampinen, 2024) About half of the plastic packaging waste was sent to other Nordic countries for recycling in 2024 and the other half was recycled in Finland. (Hankivaara, 2024)

As the overall plastic recycling capacity in the country is increasing, plastics from collected fishing gear could also be recycled in Finland. However, there are certain issues that need to be addressed first. For mechanical recycling single plastic material, such as PP or PE, can be used, but thus should be first sorted and washed. For chemical recycling of fishing gear, the pretreatment requirements are not as extensive, but knowledge of feedstock composition and pre-processing such as grinding is necessary. Another option would be to send fishing gear waste to outside of Finland to be handled.

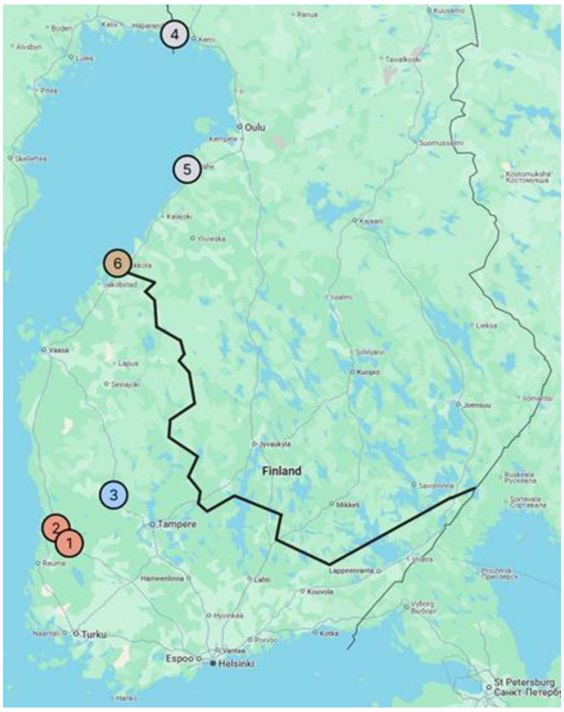
Logistics and the decision on how the collection and sorting facilities will be set up will affect how plastic fishing gear can be recycled in Finland. Seems that the quality and quantity of plastic waste and source separation are some of the bottle necks of plastics recycling, as for example L&T has some capacity left, even when collected plastic waste is currently exported from Finland. Overall, some of the collected plastic waste is sent abroad, and this might still be the case in the near future even though the recycling capacity is set to increase significantly. Some plastics still require specialised recycling methods, and some are just not recyclable due to their quality, etc. and will end up being incinerated. Finland has quite extensive incineration plant network, so mixed waste is incinerated, and heat is collected as a by-product and used for district heating.

4.2.3 Other materials – rubber and metals

Rubber and metal are the other, most significant materials – especially by weight – that are found in fishing gear. Rubber is used especially in professional gears, such as bottom trawls, whereas metal is found even in the simplest fishing net. As for rubber recycling, there is only one facility in Finland, which is run by a PRO, Suomen Rengaskierrätys Oy, Finnish Tyre Recycling Ltd. Their facility processes only rubber waste, old car tires collected by the PRO (N. Korpi, personal communication, summer 2024). What happens to other rubber waste, that is not recorded, but general assumption is that this ends up at the incineration plants.

WasteWise Group Oy started their pyrolysis operations with rubber as feedstock, but since then they have shifted their focus on plastics pyrolysis. The company has informed that they currently only accept (plastic) waste which cannot be mechanically recycled. (A. Sillanpää, personal communication, September 11, 2025) However, rubber seems to have returned to their feedstock, as they are known to make pyrolysis oil from old tennis balls. (Riihentupa, 2025)

Unlike rubber, collection of metal is widespread in Finland and there are many industrial production plants in the country that use recycled aluminum, copper and stainless steel in their production. As the overall volumes of the metals in fishing gear are quite small, these facilities should have enough capacity to receive and process even fishing gear metal waste streams. Zinc production was also looked at in case zinc is used to replace lead. The facilities using recycled metals in their processes have been added to Map 2 and are listed below:



Metal smelting mills in Finland using recycled metals
1. Boliden, Harjavalta - copper and nickel smelters
2. Aurubi, Pori - copper smelter
3. Purso, Siuro - aluminium smelter
4. Outokumpu Ltd, Tornio - stainless steel production from recycled steel
5. SSAB, Raahe - stainless steel production from cast iron and recycled steel
6. Boliden, Kokkola - zinc smelter

Map 2. Metal smelting mills in Finland that use recycled material. Red = copper, blue = aluminium, grey = stainless steel, beige = zinc, black line represents the NPA border in Finland.

Lead seems to be the only metal type found in fishing gear, which cannot be recycled in Finland. Suomen Akkukeräys Oy has a lead recycling plant in Rauma, but they seem to accept only lead batteries, which they crush and then send the lead fractions to be further refined at lead smelters. (Suomen Akkukeräys, n.d.) The closest lead recycling smelter to Finland seems to be in Bergsöe, Sweden, which is operated by Boliden.

4.2. Iceland

4.2.1 Collection, pretreatment and sorting

When fishing gear is sent from Iceland to abroad to be recycled, the gear usually starts this final journey after a long and fruitful life at the service of the fishing industry. When a new agreement was made in 2021 by the Fisheries Iceland (SFS) and the Icelandic authorities about the collection of EOL fishing gear, the major Icelandic fishing gear manufactures were also brought in. The aim of the new agreement was to meet also the goals of the Circular Economy Act and to emphasize the social responsibility policies of the industry. This has increased the role of the manufacturers in this overall setting.

The Icelandic fishing gear production is tailored to the needs of the customers, and the gear can be designed and produced to the requirements of the individual customer. Another feature is that the purchase can include also a service agreement of the gear. This means that the fisher can return the gear to the producer, who will maintain and fix it, after it has been subject to tear and wear. This increases the lifespan of the fishing gear, as the broken parts of the gear are either removed or fixed and the gear is put back in the use.

Each gear has an expiration date, and when the gear is beyond the point of repair the whole gear needs to be recycled and replaced with new equipment. SFS has hired a third party to organise the collection of fishing gear waste from the participating major fishing ports. If the gear owner has a service contract with a manufacturer, the gear can be returned to the factory. The easily removed parts of the gear can be removed and can be used in making new gear or fixing a broken one. The broken bits are loaded into containers and shipped abroad to recycling facilities, where the separation of different material segments is usually done. (Fisheries Iceland, 2025)

4.2.2 Recycling of materials

Even Finland, with population of about 5.5 million, struggles to provide processing facilities for all possible waste fractions, which should be recycled. Therefore, it should not come as a surprise that Iceland, with even smaller population (about 350 000), struggles even harder with this. Significant amounts of recyclable waste – such as fishing gear waste – is shipped abroad to be recycled. Plastic is one of such waste fractions. There are only a couple of small plastic recycling facilities in the country, such as Pure North ehf (https://www.purenorth.is/en), which has a mechanical plastic recycling plant in Hveragerði, in south-west of the country. The plant receives plastics from agriculture and processes the materials into granulates.

The Icelandic fishing gear recycling relies thus on European recycling facilities. The recycling rates are high, as out of the 2170 tons of fishing gear waste, which was shipped out to be recycled in 2023, only 101 tons were incinerated or landfilled abroad. About 67 % (1463 tons) of the collected waste was recycled as plastic, 20 % (425 tons) as rubber, 8 % (167 tons) as metal and less than one percent (16 tons) could be reused. (Fisheries Iceland, 2025)

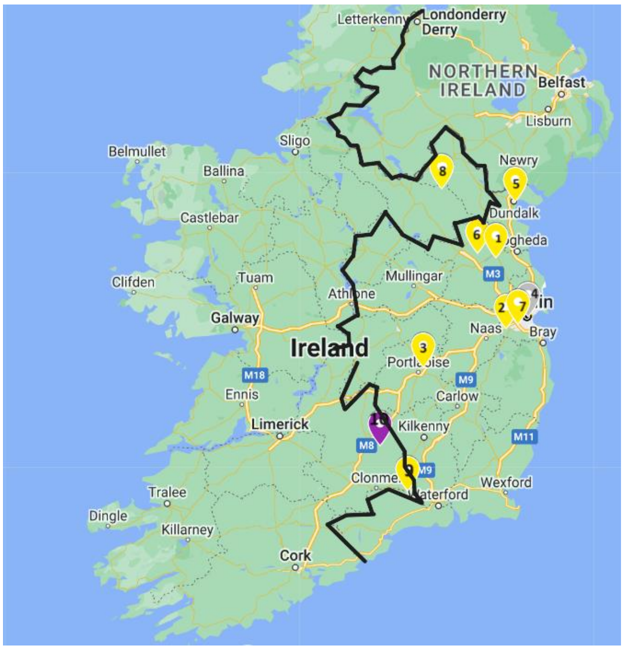
4.3 Ireland

4.3.1 Collection, pretreatment and sorting

In Ireland, there has not been a national collection scheme previously and the collection of EOL fishing gear is still in its early stages. A temporary PRO, Haul It Back, has been set up by the producers in the spring of 2025. This temporary PRO will conduct trials regarding the collection and recycling of fishing gear to see how the national collection scheme should be set up. Haul It Back has also applied to be the permanent PRO, and if the application is approved, this will start in the beginning of 2026. (P. Foster, personal communication, May 21, 2025).

4.3.2 Plastic recycling

As in Finland, mechanical plastic recycling is the predominant technology used in Ireland by the local plastic recyclers. There are at least 4 major plastic recyclers in the country, with an annual capacity of 10 000–35 000 tons each. There are also smaller operators, whose capacity is not known, and one chemical recycler, TRIFOL Resources Ltd, with an annual processing capacity of 24 000 tons of plastic. The technology used by TRIFOL Resources is pyrolysis. The more detailed descriptions of these facilities are on the table below and the location of the facilities is marked in Map 3.



Plastic recyclers in Ireland
1. Beauparc, Beauparc, Co. Meath **2. Davis Recycling, Rathcode, Co. Dublin** **3. Enva, Portaloise, Co. Laois** **(4. Irish Farm Plastics Recycling, nationwide)** **5. Leinster Environmentals, Dundalk Co. Louth** **6. NovelPlast, Gibstown, Co. Meath** **7. Panda Waste Services, Ballymouth, Co. Dublin** **8. Polyfab Plastics Ltd., Cootehill, Co Cavan** **9. Quality Recycling Ltd, Carrick On Suir, Co. Tipperary** **10. TRIFOL Resources Ltd, Littleton, Co. Tipperary**

Map 3. Plastic recycling facilities in Ireland. Yellow = mechanical recycling, purple = chemical recycling, grey = several locations with different technologies, black line represents the NPA border in Ireland.

As can be noticed from the map, three of the plastic recyclers (8, 9, 10) are located in the NPA area of Ireland, others are located to the east of the country. Significant amounts of sorted and cleaned plastic waste is also processed in the country, which is then pressed into bales and sent abroad for recycling. The volumes are quite high as well, about 100 000 tons annually and they consist of mixed plastic packaging, PET, HDPE, etc. As significant amounts of plastic waste are sent abroad already, and the survey that was sent to the plastic recyclers did not reveal any significant expansion plans of current facilities, it is doubtful if the local capacity would be able to process plastics from collected fishing gear. Some recyclers did express their interest in receiving fishing gear plastic waste, and some had already processed it, but as a systematic collection scheme for fishing gear is set up, the volumes that are collected are expected to increase significantly as well.

Table 2. Capacities of plastic recycling plants in Ireland and the recycled plastic types.

Company	Technology	Capacity tons	Plastic types recycled
Beauparc	Mechanical recycling		
Davis Recycling	Mechanical recycling		Mixed plastic and WEEE
Enva	Mechanical recycling	1 000	Mixed plastic and WEEE
Irish Farm Plastics Recycling	Depending on the plant used	35 000	Agriculture plastics
Leinster Environmentals	Mechanical recycling	20 000	Waste plastics
NovelPlast	Mechanical recycling	25 000	PET bottles
Panda Waste Services	Mechanical recycling		Mixed plastics
Polyfab Plastics Ltd.	Probably mechanical recycling	10 000	PP, PE, PS, ABS, PC/ABS, PC, PVC, Nylon, Acetel, PET, TPE
Quality Recycling Ltd	Mechanical recycling		
TRIFOL Resources Ltd	Pyrolysis	24 000	HDPE, LDPE, LLDPE, PP, PS
Total		145 000	

4.3.3 Other materials – rubber and metals

In terms of metals, there are several smelters across the country – a few of them even located on the NPA area, which process diverse metals, not just focusing on one type. As the metal recyclers are more spread out, they might be better positioned also to receive metal waste from collected fishing gear, depending on the location of potential pre-sorting facilities. These have been listed below, and their location is also marked in Map 4. It seems that all metal types that are found in fishing gear could be recycled domestically in Ireland.

Regarding rubber, there are also at least four recycling facilities in the country involved in rubber recycling. These are located on the east coast and receive rubber tires.

Metal recyclers in Ireland
1. Barna Recycling in Galway, Co. Galway – aluminium smelter **2. Cork Metal Company Cork, Co. Cork** - steel, cast iron, copper, lead, aluminium, cobalt, stainless steel smelter **3. Davis Recycling Rathcoole, Co. Dublin** - copper, nickel, aluminium, brass, lead, stainless steel, iron smelter **4. Enva, Portlaoise, Co. Laois** - iron, steel, aluminium, stainless steel, copper, brass, lead, nickel, tin, bronze smelter **5. Irish Metal Refineries, Duleek, Co. Meath** - copper, cables, lead, bronze, brass, nickel, stainless steel, aluminium, tin, cobalt, tungsten, antimony, steel, iron smelter **6. KMK Metals Recycling, Tullamore, Co. Offaly** - copper, tin, zinc, lead, aluminium, steel, nickel smelter **7.Oran Metal Group, Ballysimon, Co. Limerick** - copper, aluminium, steel, brass, stainless steel – shredding and granulating

Map 4. Metal recyclers in Ireland. Black line represents the NPA border in Ireland.

4.4 Norway

4.4.1. Collection options

Norway has not enforced the EPR for EOL fishing gear but is expected to do it within couple years. Therefore, there is no national collection scheme yet in place for fishing gear waste. However, as both fishing and aquaculture are both significant industries in the country, and producers of waste, there are some collection schemes in place which feed the small recycling businesses, which utilise EOL fishing gear. These companies have contracts with fishing gear waste collectors, who provide them with raw material. One of these companies, Nofir, has already expressed their willingness to become the PRO for fishing gear when EPR for fishing gear is enforced in Norway.

4.4.2. Plastic recycling

As was mentioned in the previous chapter about the collection volumes of EOL fishing gear, there are recycling companies in the country, which receive and process fishing gear. Gear is also being collected and sent abroad, but significant amounts have been placed also in landfills. There are only a few recycling companies in Norway, that recycle plastics. There are also other recycling companies, which only pre-treat plastics and ship them abroad to be recycled. Both

Oceanize Ltd and Replast utilise chemical and mechanical recycling and both companies have annual capacity of about 20 000–30 000 tons. Nofir, with a smaller capacity of about 10 000 tons/year, is also recycling fishing gear waste. The company employs both technologies, but it seems that Nofir also does pre-treatment, and a lot of actual recycling is done abroad. Agricultural plastic waste is processed by Norfolier Green Tec, but their capacity is not known.

4.4.3. Metal and rubber recycling

Metal industry is one of Norway's largest export industries. There are about 15 metallurgical companies in the country, which operate close to 30 facilities that produce aluminium, steel, zinc, etc. Some of these are located in the NPA part of the country (Kristiansen & van der Eijk, 2020), but it is not known how many of these companies and smelters actually use recycled metals. There are also many scrap metal companies throughout the country – including the northern counties – which recycle metals. There might not be domestic recycling facilities for all kinds of metals, which are found in the fishing gear, but in general the recycling opportunities are better than with plastics.

Norway has also a PRO for end-of life tyres, Norsk Dekkretur, which has two processing facilities in the country. One of these is located in Narvik, in the NPA region. The rubber waste that is transported to Narvik is used in the energy production of a local cement manufacturer. However, majority of the all rubber waste that is collected in the country is exported overseas (Dekkretur, 2024). It is very likely that other kinds of rubber waste end up either on landfills or are incinerated or might even be exported.

4.5 Sweden

4.5.1 Collection options

As mentioned previously, a centralized scheme for EOL fishing gear called the Fiskereturen started operating in Sweden in 2020 and the project was operational until 2024. As from 2025 there is a PRO for fishing gear, but building of a national collection scheme is still in progress. (C. Berg, personal communication, summer 2025) Fiskekretsen AB was accepted as PRO for fishing gear in the fall of 2024 and will work together with Stena Recycling, which will provide containers for municipalities, which will provide the collection points. Organizing the collection is still under development. It is worth noting that the Swedish municipalities have a bigger role in the collection of waste that is subject to EPR, when compared to many other EU countries.

4.5.2 Sorting and pre-treatment

Sotenäs municipality established the Sotenäs Marine Recycling Centre in 2018 where EOL fishing gear from the Fiskereturen project has been sent to for sorting. Fiskereturen, funded by the Swedish Agency for Marine and Water Management, was a collaboration between the Sotenäs municipality, Keep Sweden Tidy, Fiskarföreningen Norden and Båtskroten. The fisher association Fiskarföreningen Norden and the boat scraping association Båtskroten collected fishing gear from ports which were then transported to Sotenäs. Besides Fiskereturen, the center also received EOL fishing gear from ghost gear retrieval and beach cleaning activities. (C. Berg, personal communication, summer 2025)

In Sotenäs, the collected fishing gear can be sorted into individual material mono fractions. The plastic types sorted are PP, PE, PET and PA and the sorted metal types are lead, aluminum, copper, lead ropes, and stainless steel. Rubber and floats are also sorted. The center has a material map and a handhold NIR (near infrared) reader to help the workers with identifying of the materials in the sorting process.

The sorted materials from Sotenäs can be sent to reuse, material recycling and energy recovery. Some material has been also supplied as raw material for testbeds. The center itself does not recycle received materials; they do the sorting and pre-treatment. Out of the sorted material, approximately 60-80 % is recyclable, 20-40 % goes to incineration and 5 % goes to reuse. Fractions going to incineration are mixed polymers or plastic that are too dirty or degraded to be sent for recycling (most of this is from ghost gear retrieval). Recycling requires pre-treatment of the material such as washing it from impurities and there are no facilities for this in the center. During the operation of the Fiskekretsen, the center could not find recipients for rubber and PET. There is demand for PA, for instance, but separating this from other materials is very labour intensive. (C Berg, personal communication, summer 2025)

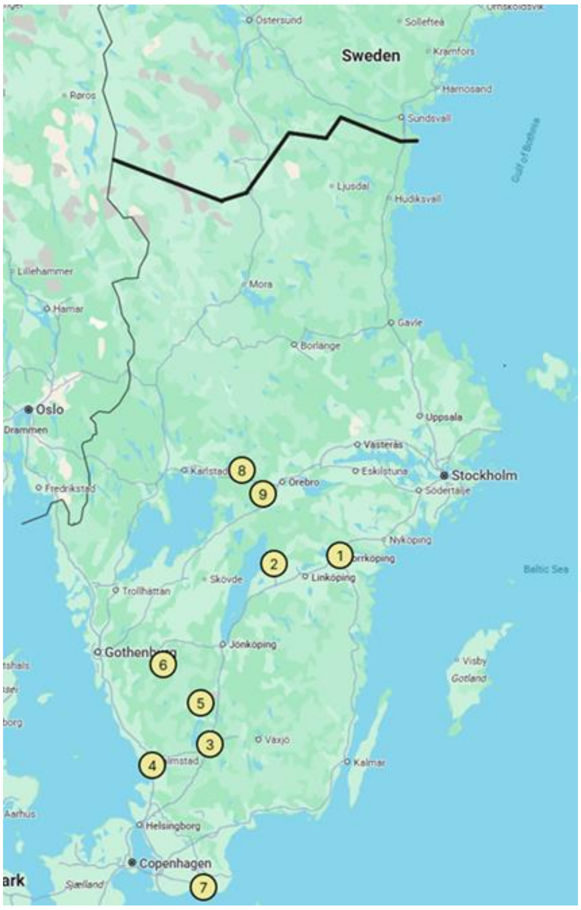
4.5.3 Plastic recycling

Sweden is the country among the NPA countries with the highest capacity for plastic recycling. There are at least six companies in the country with a capacity to process at least 10 000 tons of plastic in a year. Some of the companies have several facilities. The jewel in the crown of the Swedish plastic recycling must be the Stena Nordic Recycling Center in Halmstad. The facility processes over 100 000 tons of various waste, including plastic and metal, annually. There are also some operators, such as Ragn-Sells, with several locations countrywide, which pre-process collected materials – screen, shred, crush & weigh – which are then sent to recycling or energy recovery. Detailed information about the Swedish plastic recycling facilities have been collected to Table 3.

As can be seen also from the Map 5, all major Swedish recycling facilities, which recycle plastic waste, are located in the southern part of the country, outside of the Swedish NPA region. Kuusakoski has several locations from Northern Sweden to south, but it is not clear, which of their facilities actually recycle construction plastic, granulate plastic waste into new material.

Table 3. Capacities of plastic recycling plants in Sweden and the recycled plastic types.

Company	Technology	Capacity in tons	Plastic types recycled
Veolia PET Svenska	Mechanical recycling	30 000	PET
Impossible Plastics	Mechanical recycling		Municipal plastic waste
Stena Nordic Recycling	Mechanical recycling	(100 000 in total all waste segments)	
Swerec AB	Mechanical recycling	50 000	
Van Werven	Mechanical recycling	20 000	Hard plastics
Rondo Plast	Mechanical recycling	15 000	
Novo Plast	Mechanical recycling	10 000	
Kuusakoski (several locations nationwide)	Mechanical recycling	2 000	Construction plastic
Total		c. 125000 +	



Plastic recyclers in Sweden
1. Veolia PET Svenska
2. Impossible Plastics Motala
3. Impossible Plastics Ljungby
4. Stena Nordic Recycling
5. Swerec AB
6. Van Werven
7. Rondo Plast
8. Novo Plast Karlskoga
9. Novo Plast Fjugesta

Map 5. Plastic recycling facilities in Sweden. Black line represents the NPA Border in Sweden.

4.5.4 Metal and rubber recycling

Metal industry is a significant industry in Sweden, so as in Finland, there is no shortage of potential waste metal recyclers. Boliden, which had smelters also in Finland, has several facilities in Sweden. Some of them are located in the NPA part of the country, for instance Rönnskar in Skelleftehamn (copper). Boliden’s Bergsoe in Landskrona is the only Nordic lead recycling plant. SSAB, which also has a facility in Northern Finland in Raahe, has a stainless steel smelter in Luleå, on the other side of the Bothnian Bay. Besides these major industries, there are also smaller recycling companies, such as Kuusakoski, Ragn-Sells and Stena Recycling Nordic, which have metal recycling facilities.

Regarding rubber recycling in Sweden, the PRO for this, Sveriges Däckåtervinning, recycles rubber from tyres, but does not receive other kind of rubber waste. Sotenäs Marine Recycling Center has not been able to find domestic recycling companies, which would be able to recycle rubber from fishing gear. (C. Berg, personal communication, summer 2025)

5

CONCLUSIONS

5 CONCLUSIONS

The aim of this report was to provide concrete figures about the collected volumes of EOL fishing gear and to review also the life cycle of various fishing gears. If the aim is to recycle materials from collected EOL fishing gear and put them on the markets, any business that would want to use these materials in their products, must be sure of a steady supply of the raw material. Unfortunately, there is only comprehensive figures available from Iceland and Sweden about the collected volumes. These two countries have had centralized collection schemes in place, but the figures from the other NPA countries are sporadic. However, as both Finland and Ireland have started to implement the EPR for EOL fishing gear, official collection figures will be coming up from these countries as well as the collection progresses.

Finland and Sweden have set collection targets, which are 10 and 20 percent respectively of the annual fishing gear put on the market. Ireland is also expected to set a target level but has not done that yet. Ten percent of annual put to market volume means, that the average life span of the gear in Finland is estimated to be ten years and similarly five years in Sweden. However, as has been discussed in the report, the life spans of fishing gear differ greatly between different gear types. Still, the Swedish and Finnish authorities have had to set a fixed goal for the collection and have selected these figures.

As was discovered in the port surveys in the NPA countries, there are also significant amounts of historical waste in ports. These will most likely be overrepresented in the collection during the first years of operations. After the historical waste has been dealt with, the annual collection volumes should be settled on a normal level.

By making these volumes visible, how much potential recyclable material this waste segment contains is another aspect of the big picture. Over 2000 tons of fishing gear is annually collected in Iceland and less than 5 percent of this is incinerated or landfilled, the rest is recycled. The collection volumes in other countries are at most in hundreds of tons, but as a more systematic, centralized collection is being implemented in Finland, Ireland and Sweden, the figures are expected to increase. Norway is the fishing and aquaculture nation of the NPA region, but implementation of EPR is still being discussed. There is also a lot of historical waste in the country, part of which has been landfilled, is stored at ports, etc., and these volumes in tons can even be six figure numbers.

As collected volumes are expected to increase in the NPA region due to the implementation of EPR, the next logical question is, what happens to this waste. Collection for the sake of collection is not enough; the materials should be separated and sent forward to be recycled and used as raw materials for new products. There is a recycling capacity in the existing facilities, especially in plastics and metals, and plastic recycling capacity seems to be increasing in some countries. This increase is urgently needed, as some countries still prefer to send materials abroad to be recycled, including fishing and aquaculture waste. As the EU requirements for plastic recycling rates are set to get higher, more plastic recycling capacity in general is needed.

In a similar way, as the collection volumes of EOL fishing gear are expected to increase, these specialized fishing gear plastic recyclers might not be able to tackle the increasing material flows. If the whole of Europe wants to send their fishing gear waste to these facilities, they won't be able to receive and process everything. If the waste on offer exceeds the recycling capacity, then the recyclers can select only the best kind of waste, which is of highest quality and which has highest resale value. "Cream skimming" is a logical business move for a recycling company, when the supply of feedstock exceeds their demand, but it can leave the fishing gear waste collectors in a bad spot. Other solutions might have to be found.

The local, national recycling facilities might have a role to play here. NPA countries have both mechanical and chemical plastic recycling facilities, which are processing plastic types that are commonly used in fishing gear. There are facilities in many NPA countries, which could in principle receive plastic fishing gear waste, but the quality and cleanliness of the waste might be an issue. As the aim is to increase the level of plastic recycling in general on the European level, the recycling facilities might want to focus on bigger plastic waste streams. For them, the plastic waste from fishing gear is not necessarily the most interesting waste segment, maybe not even a practical one.

The fundamental obstacle can be the lack of treatment facilities, where materials would be separated from fishing gear, cut into smaller pieces, etc. before being sent to a recycling facility. Fishing gears are not products that are made from monomaterials, material separation is an essential step in the process of getting them recycled. Sotenäs Marine Recycling Center has been doing precisely this job in Sweden, but there are no similar facilities in Finland and Ireland, at least not yet. Fishing gear collected in Iceland has been sent to recycling facilities abroad, which have taken care of the material separation as well, and also Norwegian Nofir has employed this method. If a treatment facility is built from the scratch, it should be built by taking into account the requirements of the potential recycling facilities, which are to utilise the collected materials. What plastic types can be received at the plant, how clean do they have to be, what is the size of the items, etc.? This will require close cooperation between the different stakeholders, both PROs and recycling companies. Building a new system for the right settings from the beginning is easier than adapting and changing an existing system to new requirements.

There are several metal recyclers across the NPA region, so finding a recipient for metal waste from the fishing gear should not be an issue. Recycling of rubber waste, on the other hand, is not as easily solved. The rubber recycling schemes in many NPA countries are linked to the recycling of car tires, and in Finland for example this is run by the PRO for car tires, which is not interested in taking rubber waste from outsiders.

The fishing gear waste streams in the NPA region might not be very substantial in volume in either plastic or rubber material segment. However, the closeness of the regions, especially in the North Calotte, the northern parts of Finland, Sweden and Norway, might be good reason to think about centralized recycling solutions for fishing gear waste in these regions. Combining waste streams across the region might make even certain recycling techniques viable, as waste streams from several regions are combined. A chemical recycling facility in the north, which would decrease the transportation distances significantly, could be worth considering.

6

REFERENCES

6 REFERENCES

Basurko, O. C., Markalain, G., Mateo, M., Peña-Rodriguez, C., Mondragon, G., Larruskain, A., Larreta, J., & Moalla Gil, N. (2023). End-of-life fishing gear in Spain: Quantity and recyclability. Environmental pollution, 316(Pt 2), 120545. https://doi.org/10.1016/j.envpol.2022.120545

C. Berg, (2025). Sotenäs Municipality. Sotenäs and the Swedish PRO. Email exchange between Charlotte Berg and Niko Hänninen [1.6.-18.6.2025]

Chambers, K., Jarvis, F., and Powell, K. (2021). Policy options for fishing and aquaculture gear, phase 1: gear inventory. Department for Environment Food & Rural Affairs (DEFRA) ME5240. Available at: https://randd.defra.gov.uk/ProjectDetails?ProjectID=20655

Deeter, K. (2022, September 8). Is it time to 'break up' with fly rod warranties? Trout Unlimited. https://www.tu.org/magazine/fishing/trout-talk/is-it-time-to-break-up-with-fly-rod-warranties/?ref=duewestanglers.com

Dekkretur. Årsrapport 2024. (2024).: https://dekk-cdn-fdgmg6hne7aufdbe.z01.azurefd.net/media/3nrpjvc1/dekkretur_a-rsrapport_2024.pdf

Drakeford, B. M., Forse, A., & Failler, P. (2023). The economic impacts of introducing biodegradable fishing gear as a ghost fishing mitigation in the English Channel static gear fishery. Marine Pollution Bulletin, 192, 114918. https://doi.org/10.1016/j.marpolbul.2023.114918

Due West Anglers. (2023, May 29). Let's Talk about Broken Gear and Lifetime Warranties. https://www.duewestanglers.com/broken-gear-and-warranties/

Erasmus, V. N., Johannes, F. N., Amutenya, N., & James, N. A. (2024). The potential contribution of end-of-life fishing nets, lines and ropes to a circular economy: The Namibian perspective. Frontiers in Sustainability, 5. https://doi.org/10.3389/frsus.2024.1356265

European Commission. (2025). COMMISSION REGULATION (EU) …/… of XXX amending Annex XVII to Regulation (EC) No 1907/2006 of the European Parliament and of the Council concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) as regards lead in ammunition and fishing tackle. D105447/01 (Draft Implementing Act). https://ec.europa.eu/transparency/comitology-register/screen/documents/105447/1/consult?lang=en

Fisheries Iceland, 2025. The Icelandic Fishing Industry at the Forefront. SFS Environmental Report 2024. https://sfs-web.cdn.prismic.io/sfs-web/Z08bSZbqstJ97_fg_SFS-Environmental_Report-2024.pdf

Grimstad, S. M. F., Ottosen, L. M., & James, N. A. (Eds.) (2023). Marine Plastics: Innovative Solutions to Tackling Waste. Springer Cham. https://doi.org/10.1007/978-3-031-31058-4

Hankivaara, J. (2024, February 1). Muovin keräysastioihin päätyy paljon muovia, jota sinne ei pitäisi laittaa – iso osa vaivalla erotellusta muovista päätyy polttoon tai ulkomaille. Maaseudun tulevaisuus. https://www.maaseuduntulevaisuus.fi/lukemisto/bf24ca45-dd28-41cc-9c3f-69f34c2d1162

Hentinen A. (2022, February 19). Talvikalastuksen alkeet - Verkkopyynti onnistuu aloittelijaltakin. Metsästys ja Kalastus. https://metsastysjakalastus.fi/talvikalastuksen-alkeet-verkkopyynti-onnistuu-aloittelijaltakin/

Hoang, S., Ehleben, M., Potempa. T., & Henderson, J. (2024). Sustainable Approaches to Fishing Gear Debris in Europe: Effective Management, Reduction and Recycling Strategies. Ostfalia Hochschule für angewandte Wissenschaften Braunschweig/Wolfenbüttel. Wolfsburg. https://doi.org/10.26271/opus-1735

INdIGO Inovative Fishing Gear for Ocean. (2023, March). Newsletter 7. https://indigo-interregproject.eu/en/newsletter-7-2/

Judl, J., Horn, H., & Karppinen, T.K.M. (2024). Towards a Low-Carbon Plastic Waste Recycling in Finland: Evaluating the Impacts of Improvement Measures on GHG Emissions. Circular Economy and Sustainability, 4(1), 755-776. https://doi.org/10.1007/s43615-023-00306-w

Kalaneuvos. (2020, September 1). Kalan sesongit. https://kalaneuvos.fi/kalan-sesongit/

Kemiamedia. (2023, July 21). Sekajätteeseen heitetty muovi halutaan hyötykäyttöön – hyvä paikka kemialliselle kierrätykselle. https://www.kemiamedia.fi/sekajatteeseen-heitetty-muovi-halutaan-hyotykayttoon-hyva-paikka-kemialliselle-kierratykselle/

Kim, S.W., Kim, Y.T., & Lee, J. (2024). Thermochemical recovery of propylene from plastic waste: A review. Alexandria Engineering Journal 104, 1-11. https://doi.org/10.1016/j.aej.2024.06.044

Kristiansen, Linn-Maren & van Der Eijk, Casper (2020) https://www.ntnu.edu/documents/1263635097/1279861738/Student+report+2020+Part+1+Companies+and+Production+(1).pdf#:~:text=There%20are%2014%20different%20companies%20in%20the%20metallurgical,report%20presents%20an%20overview%20of%20the%20different%20plants

Lamor. (2022, June 22). Lamor on päättänyt käynnistää muovin kemiallisen kierrätyslaitoksen rakentamisen yhdessä Resiclon kanssa. https://www.lamor.com/fi/sijoittajat/tiedote?slug=lamor-on-paattanyt-kaynnistaa-muovin-kemiallisen-kierratyslaitoksen-rakentamisen-yhdessa-resiclon-kanssa-7f808477

Lampinen, T. (2024, October 31). Ajantasainen jätelaki – tämä sinun tulisi tietää. Molok. https://www.molok.com/fi/blogi/ajantasainen-jatelaki

Lase, I.S., Tonini, D., Caro, D., Albizzati, P.F., Cristóbal, J., Roosen, M., Kusenberg, M., Ragaert, K., Van Geem, K.M., Dewulf, J., & De Meester, S. (2023). How much can chemical recycling contribute to plastic waste recycling in Europe? An assessment using material flow analysis modeling. Resources, Conservation and Recycling, 192, 106916. https://doi.org/10.1016/j.resconrec.2023.106916

Lassila&Tikanoja. (n.d.). Merikarvialle uusi Muovinaattori. https://www.lt.fi/artikkelit/merikarvialle-uusi-muovinaattori

Linimatic, 2025. Zinc replaces environmentally hazardous lead in fishing gear https://linimatic.eu/zinc-replaces-environmentally-hazardous-lead-in-fishing-gear/

Melanen, M., Palperi, M., Viitanen, M., Dahlbo, H., Uusitalo, S., Juutinen, A., Lohi, T.K., Koskela, S. & Seppälä, J. 2000. Metallivirrat ja romun kierrätys Suomessa. Suomen Ympäristö 401. Suomen Ympäristökeskus. https://helda.helsinki.fi/items/4a878851-304e-4233-bdfe-c816fddbd7c6

Minor, A-J., Goldhahn, R., Rihko-Struckmann, L., & Sundmacher, K. (2023). Chemical Recycling Processes of Nylon 6 to Caprolactam: Review and Techno-Economic Assessment. Chemical Engineering Journal, 474(3), 145333. https://doi.org/10.1016/j.cej.2023.145333

Oasmaa, A., Qureshi, M. S., Pihkola, H., Ruohomäki, I., Raitila, J., Lindfors, C., Mannila, J., zu Castell-Rudenhausen, M., Deviatkin, I., & Korpijärvi, K. (2019). Fast pyrolysis of industrial waste residues to liquid intermediates - experimental and conceptual study. VTT Technical Research Centre of Finland. VTT Research Report No. VTT-R-512-19

Parhiala, M. (2024, February 27). Suomeen tuotiin ulkomailta yli 300 000 tonnia jätettä viime vuonna. Iisalmen sanomat. https://www.iisalmensanomat.fi/uutissuomalainen/6590085

Pettersson M. (2024). Case study A: Sotenäs Marine Recycling Center

Riihentupa, T. (2025, July 7). Miljoonien pallojen ongelma. Helsingin Sanomat. https://www.hs.fi/urheilu/art-2000011326113.html

Sala, A. & Richardson, K. (2023). Fishing gear recycling technologies and practices. Rome, FAO and IMO. https://doi.org/10.4060/cc8317en

Seppänen, E. & Lappalainen, A. 2019. Kalastus ja kalankasvatus muoviroskan lähteenä Itämerellä: RoskatPois!-hankkeen selvitys. Luonnonvara- ja biotalouden tutkimus 9/2019. Luonnonvarakeskus. Helsinki. 28 s.

Sistiaga, M., Jørgensen, T., Brinkhof, I., Herrmann, B., & Brinkhof, J. (2024). Used vs. new: Does it have consequences for the performance of fishing gear? Aquaculture and Fisheries, 9(6), 981-988. https://doi.org/10.1016/j.aaf.2023.03.003

Sumi Oy. (2023, June 20). Vuonna 2022 pantittomien muovipakkausten keräys- ja kierrätysaste kasvoivat maltillisesti. https://sumi.fi/2023/06/20/vuonna-2022-pantittomien-muovipakkausten-kerays-ja-kierratysaste-kasvoivat-maltillisesti/

Suomen Akkukeräys. (n.d.). FAQ. https://akkukerays.fi/?page_id=1195

Suomen Pakkauskierrätys RINKI Oy (2025, April 1). Muovia sisältävien kalastusvälineiden keräysverkosto laajenee pilottivaiheesta valtakunnalliseen keräykseen. https://rinkiin.fi/2025/04/01/muovia-sisaltavien-kalastusvalineiden-keraysverkosto-laajenee-pilottivaiheesta-valtakunnalliseen-keraykseen/

Suomen SUP-Tuottajayhteisö. (n.d.). Frequently asked questions. https://suptuottajat.fi/en/kysymykset/

Syklo. (2024, February 20). Syklo suunnittelee Suomen suurimman muovinkierrätyslaitoksen rakentamista Hyvinkäälle. https://syklo.fi/syklo-suunnittelee-suomen-suurimman-muovinkierratyslaitoksen-rakentamista-hyvinkaalle/

Syversen, T., Lilleng, G., Vollstad, J., Hanssen, B.J., & Sønvisen, S.A. (2022). Oceanic plastic pollution caused by Danish seine fishing in Norway. Marine Pollution Bulletin, 179, 113711. https://doi.org/10.1016/j.marpolbul.2022.113711

Uekert, T., Singh, A., DesVaux, J.S., Ghosh, T., Bhatt, A., Yadav, G., Afzal, S., Walzberg, J., Knauer, K.M., Nicholson, S.R., Beckham, G.T. & Carpenter, A.C. (2023). Technical, Economic, and Environmental Comparison of Closed-Loop Recycling Technologies for Common Plastics. ACS Sustainable Chemistry & Engineering, 11(3), 965–978. https://doi.org/10.1021/acssuschemeng.2c05497

Uusiouutiset. (2021, July 7). Fortum suunnittelee Riihimäelle uutta muovijalostamoa. https://uusiouutiset.fi/fortum-suunnittelee-riihimaelle-uutta-muovijalostamoa/

Uusitalo, K. (2023, April 24). Suomessa ei synny enää tarpeeksi jätettä, ja siksi meille raahataan nyt tonneittain italialaisten roskia poltettavaksi. Yle. https://yle.fi/a/74-20027904

Valtioneuvoston asetus muovia sisältävistä kalastusvälineistä, 29.12.2022/1319. https://www.finlex.fi/fi/lainsaadanto/saadoskokoelma/2022/1319

VTT. (2023, July 13). Yhteistutkimus ottaa sekajätteeseen heitetyn muovin hyötykäyttöön. https://www.vttresearch.com/fi/project_news/yhteistutkimus-ottaa-sekajatteeseen-heitetyn-muovin-hyotykayttoon

Watari, T., Nansai, K., & Nakajima, K. (2021). Major metals demand, supply, and environmental impacts to 2100: A critical review. Resources, Conservation and Recycling 164, 105107. https://doi.org/10.1016/j.resconrec.2020.105107

Zou, L., Xu, R., Wang, H., Wang, Z., Sun, Y., & Li, M. (2023). Chemical recycling of polyolefins: a closed-loop cycle of waste to olefins. National Science Review, 10(9), nwad207. https://doi.org/10.1093/nsr/nwad207

circnets

Improving the management of end-of-life fishing gear

Blue Circular Nets (CIRCNETS) supports collection, treatment and recycling of fishing gear, so that these end-of-life nets are disposed appropriately, and they will not end up in seas and degrade the marine environment.

interreg-npa.eu/projects/circnets/

UNIVERSITY OF OULU

Sotenäs kommun

NTNU
Norwegian University of Science and Technology

Mar Eco SOLUTIONS

WESTERN DEVELOPMENT COMMISSION

OLLSCOIL NA GAILLIMHE
UNIVERSITY OF GALWAY