

macon

Journey of Plastics in the Barents Region

Material flows, collection and
recycling of corporate plastics
in the Barents Region

This report is commissioned by the Ministry of Economic Affairs and Employment of Finland and it concerns the collection, recycling and further processing of plastic waste generated by companies in the Barents region in Finland, Sweden and Norway.

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Introduction

Plastic pollution has become one of the major environmental challenges of the 21st century. The ever-growing consumption of plastics, the leakage of microplastics and the inadequate collection and treatment of plastic waste are causing wide-ranging negative impacts to our ecosystems. Eliminating plastic pollution requires shared targets, policy incentives, and coordinated efforts at the national and international levels. Tools to achieve the goals are numerous and include sustainable product design and increased product lifespans, environmentally friendly alternatives, recycling innovations, and efforts to improve waste management and increase recycling.

The Ministry of Economic Affairs and Employment of Finland has ordered a study of the corporate plastics in the Barents Region to get a comprehensive picture of the collection, recycling, and processing of companies' plastic waste in the Barents region in Finland, Sweden, and Norway. The Barents Region covers Norrbotten and Västerbotten in Sweden, Troms og Finnmark and Nordland in Norway and Lapland, North Ostrobothnia, Kainuu and North Karelia in Finland. The project is funded by the Baltic Sea, Barents, and Arctic Region (IBA) financial instrument of the Ministry of Foreign Affairs of Finland to support Finland's presidency (2021–2023) of the Barents Euro-Arctic Council.

Plastic waste generated from companies located or operating in the area has been chosen to be examined in the project. This study focuses on post-consumer plastic waste of industrial and commercial origin, which is quite diverse in type, composition, and level of contamination.

Through the selected example sites, the survey compiles a comprehensive snapshot of the cycle of company plastic waste: how and to what extent the material is recycled, what kind of infrastructure in terms of service provider network and collection is found in the area, and where the plastic waste is further processed into new raw materials.

The result of the survey is an updated overall picture of the circular economy of the companies' plastic waste in the region. The report also presents recommendations for companies, regional authorities, and cross-border cooperation organizations to promote the circular economy of plastics.

The survey is conducted by Macon Oy.

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1. Data and methods

Information for this study was collected through literature, reports, internet pages, online survey and interviews with experts. The project employed a largely qualitative approach, but where feasible, in the survey and in the interviewees, numerical data of the plastic waste was gathered. For each country, a list of companies was gathered based on their industry sector and their probability to produce plastic waste. They were all sent a uniform online survey (Table 1). The study used statistical information on the amounts of plastic waste and exports and imports of plastic waste, available from the official public databases in Sweden, Norway and Finland.

Table 1. Online survey was sent to numerous companies in the Barents region that represent different industry sectors:

Industry sector	Norway	Sweden	Finland
Construction	21	43	43
Mining	2	6	9
Metal industry	3	3	-
Manufacturing industry	49	44	30
Retail	4	5	14
Fish industry	18	-	-
Amount of answers	13	11	11

2. Corporate plastics in the Barents Region

Cheap and durable plastics are widely used, but their popularity has side effects like ever-growing amounts of plastic waste and marine litter, which affect the environment and people's health.

In Finland, Sweden, and Norway, energy recovery has been the most used way to dispose of plastic waste, followed by recycling. The low share of plastic recycling means significant losses for the economy as well as for the environment. It is estimated that 95% of the value of plastic packaging material is lost to the economy after a short first-use cycle.¹ (Figure 1)

Plastic's properties can be varied and so are its many areas of use. The biggest consumer of plastic is the packaging industry followed by the construction industry. Other applications of different plastic types are vehicles, tyres, electric equipments, agriculture, fisheries, aquaculture, and textiles (Figure 2).

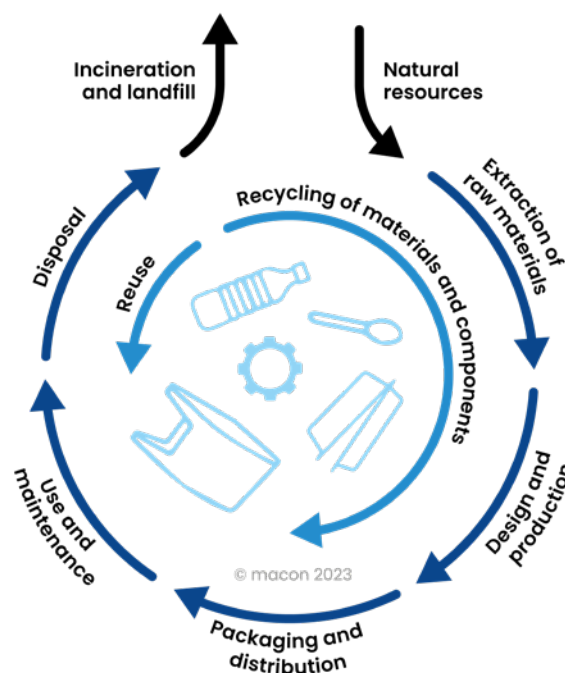


Figure 1: Life-cycle of plastics

SOURCE: PlasticsEurope
Market Research Group
(PEMRG) and Conversio
Market & Strategy GmbH

PLASTICS DEMAND BY SEGMENT AND POLYMER TYPE IN 2019

Data for EU28+NO/CH.

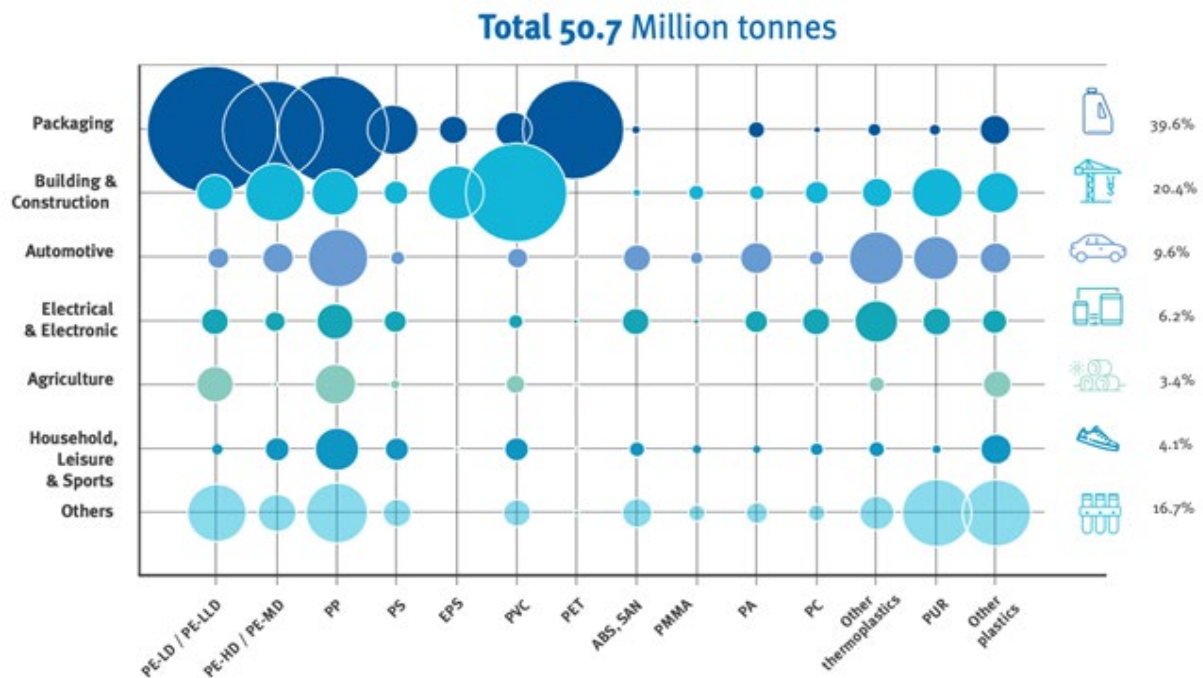


Figure 2: The applications of different types of plastic in Europe (Plastics Europe, 2020) ²

Plastic film is widely used in business. It is soft and elastic, with a smooth surface and can be coloured or transparent. There are several types of films, but the most common is LDPE because it can withstand a lot of stretching before it cracks. The PP film can be recognized by the fact that it crackles and cracks easily. HDPE film is similar to LDPE film but is stiffer and thicker. The film is used, among other things, for carrier bags, shrink wrap/transport foil, bubble wrap, and round bale wrap in agriculture. Plastic film is often clean and uniform and is therefore well suited for material recycling.

HDPE, High-Density Polyethylene is an incredible resistant plastic that is used for grocery bags, recycling bins, agricultural pipe, but also in playground equipment and shampoo bottles.

Polypropylene, PP, is the second-most widely produced commodity plastic and its market is forecasted to grow in the following years. It is hard and can withstand high temperatures and is found for example in car parts and construction products.

PS, or Polystyrene can be solid or foamed. It is a very inexpensive resin per unit weight and easy to create, for these reasons it can be found everywhere: beverage cups, insulation, packing materials and disposable dinnerware. It is often better known by its commercial name – Styrofoam.

EPS is short for expanded polystyrene. The packaging is very light and bulky and consists of approximately 98 percent air. EPS is a popular packaging both within private trade and industry. In business, it is mainly used as packaging for fish boxes in the fishing industry, but it is also used as moulded transport protection for electronic products and furniture. EPS is very well suited for material recycling.

PET is often used in drink packaging purposes due to its strong ability to prevent oxygen

from getting in and spoiling the product inside. PET bottles can have their own collection and recycling system that is based on deposit system and they are well recycled.

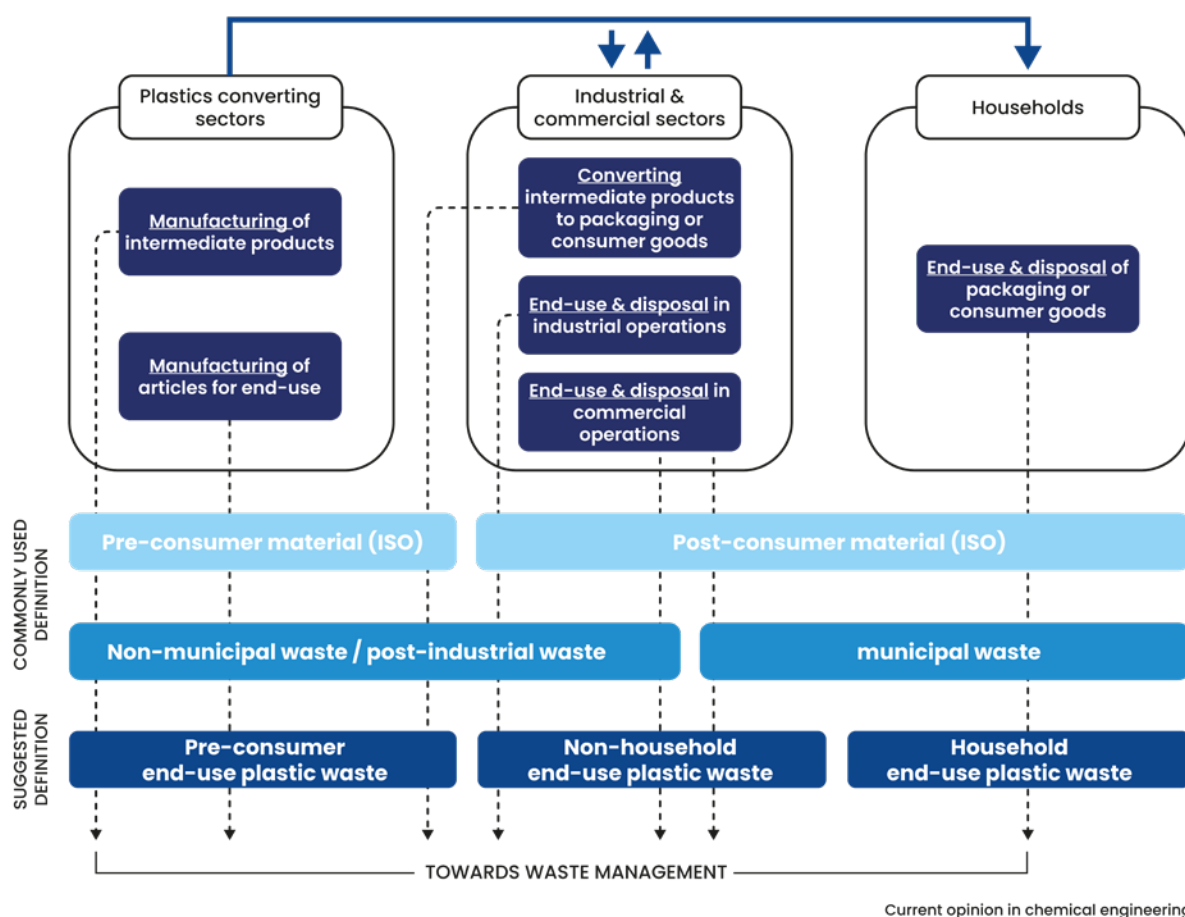
A laminate is packaging that is composed of several different types of plastic, to create the properties necessary to protect the product. How many layers of plastic a laminate contains, and the types of plastic used vary from packaging to packaging.

PP bags are a strong and practical packaging, and they are widely used in agriculture. PP is also used in the farming industry, for the import of food, in mining operations, processing industry, and construction operations. The bag often consists of an inner and outer bag. PP bags are well suited for recycling.

The plastic waste can be divided into pre-consumer material and post-consumer material or to non-municipal waste and municipal waste (Figure 3).³

- Pre-consumer material consists of plastic waste originating from the manufacturing of intermediate products and manufacturing of plastic products for end-use
- Post-consumer material includes plastic waste from industrial and commercial origin and from households

The new definitions are also suggested³ and they describe the different plastic waste flows even better: non-household plastic waste is produced in industrial and commercial sectors and household plastic waste is produced in households. In this study, we concentrate on mainly non-household plastic waste.



Overview of used definitions on the example of plastic waste. Bold arrows represent material flows and dashed arrows waste flows.

Figure 3. Classification of plastic wastes³

Depending on the sector, different kind of plastic wastes are generated. To get an overall picture of the different business sectors and to understand the plastic waste generation in the Barents area, we studied the economic statistics of the Barents region in Norway, Sweden, and Finland. The size of industries is measured as the number of local jobs. (Figure 4). The main industry sectors in the Barents that produce corporate plastic wastes are mining and manufacturing, construction, agriculture and fishing, trade, hotels and restaurants, and human health.

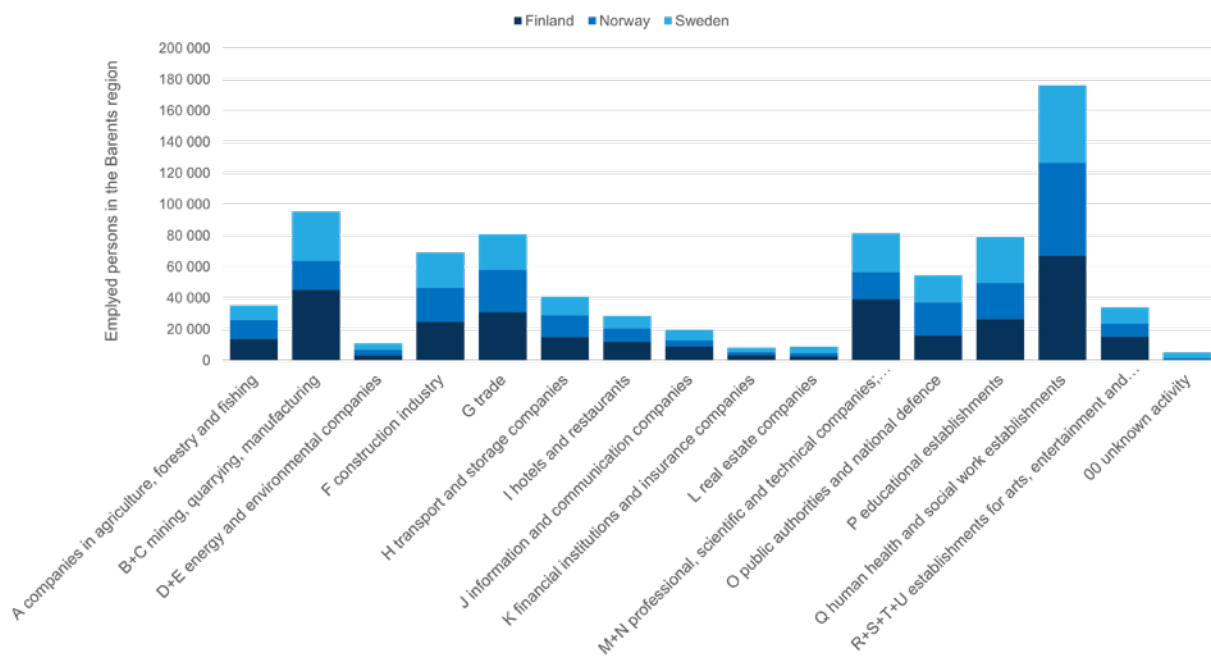


Figure 4. Economic statistic of Baltic Sea Region.

Mining and manufacturing: In mining, plastic is used in tractors, trucks and excavators' windows, sheaves and gears and pipes. Acrylic plastic's glass-like clarity and great impact resistance make it very suitable for mining applications like safety windows and windshields in tractors, trucks, and excavators. High density polyethylene (HDPE) is used for pipes and fittings to transfer waste materials away from work sites given its resistance to chemicals and abrasion and leak-free features. Polycarbonates (PC) are used in heavy equipment glazing to reinforce the windows and windshields of mining vehicles to protect against rocks and debris. Polyvinyl chloride (PVC) are used in piping systems for waste transfer and air reticulation and in wire and cable insulation, protecting electronic components from changing temperatures, dampness and other tough conditions. Ultra-High molecular weight polyethylene (UHMW-PE) is used in gears, sheaves and other components that need to be extra resistant to daily wear and tear. Polyethylene (PE) pipe's flexibility, abrasion resistance, and leak-free joints have made it mining sector. ⁴

Construction: The durability of plastics makes them ideal for a wide range of building and construction applications, like in interior design, insulation, piping, and window frames. Plastic packaging like plastic films are also used to protect construction materials and products when transporting them to construction sides. Plastic pipes account for most of all new pipe installations and this share continues to grow. PVC, ABS, and PE are the most common materials used in pipes and polyurethane or polystyrene are used for insulation of doors and walls. Polycarbonate is a popular glazing material used for windows. Plastic films are used to protect construction materials. ⁵

Agriculture: A wide range of plastic packaging and other plastic is used in agriculture. Typical plastic packaging used in agriculture includes various wraps, fertilizer sacks, seeding trays, planting pots, and a wide selection of different plastic sale packages. Other plastics than plastic packaging are plastic films used to store fodder, plastic reservoirs, and plastic irrigation systems to make an essential contribution to water management, mulching or covering the ground with plastic film to help maintain humidity as evaporation is reduced, plastic tunnels, and greenhouses. Other plastic applications include boxes used for crop collecting, handling, and transport and components for irrigation systems like fittings and spray cones. Different plastic types used in agriculture are polyolefins (polyethylenes (PE), Polypropylene (PP), Ethylene-Vinyl Acetate Copolymer (EVA)) and less frequently, Polyvinyl chloride (PVC), Polycarbonate (PC), and poly-methyl-methacrylate (PMMA).⁵

Fishing and aquaculture: In fisheries and aquaculture fishing gears are one of the main plastic wastes as well as plastic and polystyrene boxes and other plastic packaging. Fishing gear is used in fishing or aquaculture to target, capture, or rear marine biological resources. Fishing gears are mainly made of modern plastic, which lasts in the sea for several tens or hundreds of years. Most of the fishing gears are made of material suitable for recycling like polyamide/nylon, polyethylene, or polypropylene. Fishermen may lose some of their gear into the sea resulting in environmental harm to aquatic ecosystems and beaches.

Retail: In retail, several plastic streams are derived from the manufacturing and distribution processes of products. Retail offers customers products that are packed and provide plastic bags to pack their shopping. On the other hand, products are delivered to the stores using transport packaging to secure the transport of goods and protect them against damage. Transport packaging can be made of different materials, such as films, bubble wrap, boxes, pallets and straps and it is often accompanied by packing materials. Retail use also plastic as construction materials of stores and many of them serve as collection points for consumer plastic waste and recyclable bottles. In that sense retail can be said to be a crossroad for different plastics.⁵

Healthcare: Healthcare waste is generated in hospitals, health centres, medical clinics, dental clinics, research centres, laboratories, consulting rooms, home hospitals, as well as in-home care and home nursing care. Personal protection equipment like plastic gloves, testing kits, vaccine packaging, and containers are typical plastic wastes that are generated in the healthcare sector. Plastic has significant benefits that include sterility, quality, durability, and most significantly, patient and healthcare worker safety therefore modern healthcare needs plastic. Areas generating the most plastic waste include operating theatres, ambulatory surgery, cardiac cath labs, and interventional radiology, pre- and post-anaesthesia, pharmacy, and radiology.⁵

3. Plastic legislation

The EU is taking many actions to tackle plastic pollution and marine litter to accelerate the transition to a circular and resource-efficient plastics economy. Specific rules and targets apply to certain areas, including single-use plastics, plastic packaging, waste shipments, microplastics, plastic bags, and soon bio-based, biodegradable, and compostable plastics. The EU's plastics strategy, as part of the circular economy action plan, outlines specific actions in more detail.

Countries in the Barents area have implemented EU legislation and also have their own strategies, regulations, voluntary agreements, and initiatives to promote plastic waste collection and recycling to improve plastic's circular economy.

3.1. Plastics strategy

The EU adopted a European strategy for plastics in January 2018. The plastics strategy is a key element of Europe's transition towards a carbon-neutral and circular economy and its goal is to change the way plastic products are designed, produced, used, and recycled in the EU. It is part of the EU's circular economy action plan and it will contribute to reaching the 2030 Sustainable Development Goals, the Paris Climate Agreement objectives, and the EU's industrial policy objectives. ⁶

Action of the strategy includes ⁶:

Making recycling profitable for business

- new rules on packaging to improve the recyclability of plastics and increase the demand for recycled plastic content
- improving the separate collection of plastic waste
- launching an EU-wide pledging campaign targeting industry and public authorities

Curbing plastic waste

- a Directive on single-use plastic products and fishing gear
- measures to restrict the use of microplastics in products and address and reduce the unintentional release of microplastics into the environment
- measures on bio-based, biodegradable, and compostable plastics
- new rules on port reception facilities to tackle sea-based marine litter

Driving innovation and investment

- scaling up support for innovation, with an additional €100 million to develop smarter and more recyclable plastic materials, to make recycling processes more efficient, and to trace and remove hazardous substances and contaminants from recycled plastics

Spurring global change

- working with our international partners to devise global solutions and develop international standards on plastic

3.2. Packaging and Packaging Waste Directive

The Packaging and Packaging Waste Directive (PPWD Directive 94/62/EC)⁷ lays down measures to prevent the production of packaging waste and to promote reuse, recycling, and recovery of packaging waste. Today, the diversity of packaging items and packaging materials is considerable, and the amount of packaging waste has increased 20 % between 2009 and 2020 in Europe. In fact, packaging is one of the main users of virgin materials, as 40% of plastics and 50% of paper is destined for packaging.

Packaging is defined as 'products made of any materials of any nature to be used for the containment, protection, handling, delivery, and presentation of goods, from raw materials to processed goods, from the producer to the user or the consumer. Packaging items are numerous ranging from tubes, boxes, films to bags and they can be classified into sales packaging, primary packaging, grouped packaging, secondary packaging, transport packaging or tertiary packaging.^{7 8}

In 2022, the EU Commission proposed new EU-wide rules on packaging, including proposals to improve packaging design, such as clear labelling, to promote reuse and recycling, and calls for a transition to bio-based, biodegradable, and compostable plastics⁸ (Table 2). The Packaging and Packaging Waste Directive sets a 50 % recycling target for plastic packaging waste by December 2025 and it will rise to 55 % by 2030.

Table 2. Recycling targets set up in the proposal.⁸

	Recycling target deadlines		
	31 December 2008	31 December 2025	31 December 2030
All packaging waste	Between 55 % and 80 %	65 %	70 %
Glass	60 %	70 %	75 %
Paper and cardboard	60 %	75 %	85 %
Metals	50 %	70 % (ferrous metals) 50 % (aluminium)	80 % (ferrous metals) 60 % (aluminium)
Wood	15 %	25 %	30 %
Plastic	22.5 % (counting exclusively material recycled back into plastics)	50 %	55 %

The directive includes a requirement for an extended producer responsibility for all packaging waste by the end of the year 2024. Member States will have to set up systems for the return and separate collection of all packaging waste to facilitate its preparation for re-use and high-quality recycling.

Extended producer responsibility is defined to be a set of measures taken by Member States to ensure that producers of products bear financial responsibility or financial and organisational responsibility for the management of the waste stage of a product's life cycle.

It obliges companies that pack, import packed products or distance sell packed products to users to organize the waste management of packaging and pay for the recycling of the packaging that they place on the market. The aim of the producer's responsibility is to reduce the amount of waste and ensure that packaging is reused and recycled to the greatest extent possible and used to make new products.⁸

For the industry, this new regulation means new business opportunities, especially for smaller companies, boosting recycling capacity and decreasing the need for virgin materials. For consumers, new rules will ensure reusable packaging options, less unnecessary packaging, and clear labels to support correct recycling.

3.3. Single-use plastics Directive (SUP)

EU has approved a Single-Use Plastics Directive (SUP) to ban single-use plastic by 2021 in the EU. The law puts in place more responsibility for plastic producers and new recycling targets for EU Member States.⁹

It is estimated that 80 to 85 percent of marine litter is plastics. Single-use plastics represent 50 percent and fishing-related items represent 27 percent of the total marine plastic waste. The plastic products covered under the new SUP directive represent 70 percent of all marine litter.⁹

Single-use plastic products include a diverse range of commonly used fast-moving consumer products that are discarded after having been used once for the purpose for which they were provided. Since they are rarely recycled, they are prone to becoming litter and cause plastic pollution.⁹

The following single-use plastic products will be banned in the EU to fight against marine litter and plastic pollution:

- Plastic cutlery (forks, knives, spoons, and chopsticks)
- Plastic plates
- Plastic straws
- Cotton bud sticks made of plastic
- Plastic balloon sticks
- Oxo degradable plastics and food containers and expanded polystyrene cups

Compared to previous SUP products, fishing gears are not normally single-used, and they are also widely used in companies. Despite that, they were included in this regulation, because a significant proportion of fishing gear placed on the market is not collected for treatment and they cause a problem in the context of marine litter. The directive introduces the extended producer responsibility (EPR) for fishing gear to ensure that manufacturers of the gear, and not fishermen, bear the costs of collecting and organizing the waste management for the fishing gear.

EU member states must implement the measures by July 3, 2021, with the exception of the product-design requirements for bottles, which will apply from July 3, 2024.⁹

3.4. Waste Framework Directive (WFD)

The main EU regulation considering waste is the Waste Framework Directive (WFD). The directive sets the basic concepts and definitions related to waste management, including definitions of waste, recycling, and recovery. It explains when waste ceases to be waste and becomes a secondary raw material, and how to distinguish between waste and by-products. The Directive introduces the extended producer responsibility.¹⁰

According to WFD, where necessary to facilitate or improve preparation for re-use, recycling, and other recovery operations, waste shall be subject to separate collection and shall not be mixed with other waste or other materials with different properties.¹⁰

To comply with the objectives of this Directive, EU countries shall take the necessary measures to achieve the Directive targets by 2020: Preparation for re-use, recycling, and other material recovery, including backfilling operations using waste to substitute other materials, of non-hazardous construction and demolition waste shall be increased to a minimum of 70 % by weight.¹⁰

Member States shall take measures to promote selective demolition to enable removal and safe handling of hazardous substances and facilitate re-use and high-quality recycling by selective removal of materials and ensure the establishment of sorting systems for construction and demolition waste at least for wood, mineral fractions (concrete, bricks, tiles and ceramics, stones), metal, glass, plastic, and plaster.¹⁰

The Directive sets also targets for household waste: the preparing for re-use and the recycling of waste materials (such as paper, metal, plastic, and glass) from households shall be increased to a minimum of overall 50 % by weight by 2020 and the preparation for re-use and the recycling of municipal waste shall be increased to a minimum of 55 %, 60% and 65% by weight by 2025, 2030 and 2035 respectively.¹⁰

3.5. Fishing policy act

The goal of the EU Fishing Policy Act is to reduce the plastic litter in the oceans. The regulation has been adopted in Finland and Sweden. The act includes rules for the retrieval of lost fishing gear. A Union fishing vessel shall have the equipment on board to retrieve lost gear and the master of a Union fishing vessel that has lost gear or part of it shall attempt to retrieve it as soon as possible.

If the lost gear cannot be retrieved, the master of the vessel shall inform the competent authority of its flag Member State, which shall then inform the competent authority of the coastal Member State, within 24 hours, the following information: the type of lost gear, the time when the gear was lost, the position where the gear was lost and the measures undertaken to retrieve the gear.¹¹

3.6. Country specific plastic strategies and legislation

3.6.1. Norway

Norway's ambition is to be a leading maritime nation. This includes efforts to prevent and reduce marine plastic litter and plastic pollution through regulation, voluntary agreements, and strategies. Norwegian Plastic Strategy relies on the Norwegian Government's plastics policy and describes the measures that have been implemented or are being implemented to reduce plastic litter and plastic pollution covering the entire lifecycle of plastics. The strategy promotes measures against the loss of commercial and recreational fishing gear, against plastic pollution from aquaculture and shipping, and addresses challenges regarding the port reception facilities for the delivery of waste from ships. The strategy covers also plastic pollution from transport and agriculture sectors.¹²

Like other countries, The Norwegian Waste Act includes the main rules for waste management. According to the Act, businesses that generate household-like waste must ensure that recyclable household-like plastic waste is sorted out. In the same manner, businesses using agricultural plastic must ensure that agricultural plastic waste that can be materially recycled is sorted out by source sorting. The sorted agricultural plastic waste needs to be delivered for material recycling.

“Plastic has many uses with positive benefits in agriculture but is often used for a single season only and is heavily exposed to weather. Hence, there is a risk of littering from agricultural plastic.”¹²

Norway has producer responsibility for many products: packaging waste, return systems for beverage containers, electrical and electronic waste, end-of-life vehicles, and tyres. Extended producer responsibility aims to promote separate sorting, collection, and treatment of waste to prevent pollution and other environmental problems from waste. In the case of packaging waste, the producer of the packages is responsible for the collection of packaging waste from businesses and municipalities, sorting, material recycling, and other treatment of packaging waste, and this responsibility is shifted usually to the producer scheme. The sorted and separately collected packaging waste should primarily be recycled and not to be used for energy or landfilled.

Norway has higher standards for lost fishing gear than other countries in this study. The Norwegian Marine Resources Act includes rules for lost fishing gear, which is a significant source of plastic waste. According to this, any person who loses gear or cuts it adrift has a duty to search for the gear. If the search fails, the lost fishing gear must be reported to the Norwegian Coast Guard.

Norway has implemented the SUP directive with several plastic bans, banning those single-use plastic items that are mentioned in the SUP directive and those extended producer responsibility schemes required in SUP-directive covering wet wipes, balloons, and tobacco products. The Norwegian government is also considering other measures to reduce the consumption of single-use plastic items. In 2019, the Norwegian Ministry of Climate and Environment challenged the private sector to propose voluntary measures to reduce consumption and the environmental impacts of single-use plastic items.

Norway has made green deals for many packaging waste. The content of the deal is to set waste reduction targets for industries. All major packaging materials except glass are within the agreement. In Norway, several cities have their own "green deals", meaning voluntary agreements between the private sector and the city aiming to reduce plastic waste in the environment.

In Norway, there is a tax for waste incineration, which is based on CO₂ emissions. The tax is NOK 238 per ton of CO₂, which is currently around 20 euros.

3.6.2. Sweden

The Government of Sweden launched a national action plan on plastics in February 2022. The action plan presents how work should be carried out to achieve a sustainable use of plastics. The action plan includes 55 different measures throughout the whole lifecycle of plastics to implement the goals and many of them are related to consumer plastics. For example by 2025, consumption of plastic bags should be maximum of 40 plastic bags per person and year. By 2026, there should be 50% reduction in the consumption of single-use plastic cups and food containers and a 20 % increase of reusable packaging in the market. There are also sector-specific goals like: by 2027, at least 20 % of the waste from fishing gear is collected. Plastic recycling targets include a goal that by 2030 plastic packaging must include on average at least 30 % recycled raw material.¹³

The Swedish Environmental Code (2000:61) includes the main rules for waste management. The municipality is responsible for recycling and disposing of household waste. The municipality is only responsible for other waste if that is necessary for the environment or human health. In other cases, the waste holder or producer of the product that is covered by the producer's responsibility, is responsible for organising waste management. The Swedish Waste Act (2020:614) sets the requirement that all packaging waste must be separated and collected separately, and the producer of construction or demolition waste must separate different materials, including plastic.

The Swedish government introduced producer responsibility for packaging in 1994. The nationwide collection scheme is now accessible to a total of two million households via approximately 5,000 recycling stations and curbside collection services. In June 2022, the Swedish government adopted a new ordinance and will transfer the responsibility for the collection to municipalities at the beginning of 2024.

Prohibition on some single-use plastic (SUP) products was introduced on 1 January 2022, along with requirements for marking, collection, information, and targets for reduced use. This prohibition covers items such as cotton buds, cutlery, plates, drink stirrers, and straws. This SUP regulation (2021:996) is based on the SUP directive and covers products mentioned in the SUP directive. Sweden also have regulation on extended producer responsibility on certain tobacco products (2021:998), balloons (2021:999), and wet wipes (2021:1000).¹⁴

In 2020, Sweden introduced a plastic bag tax of 3 SEK for standard plastic bags and 0.3 SEK per smaller plastic bag. The regulation is Lag (2020:32) om skatt på plastbärkassar. The tax has been effective in reducing the amount of plastic bags, but it has faced significant political resistance, and might be abolished in the near future.¹⁴

The country has a voluntary agreement in plastic recycling in the agricultural sector. The goal of the agreement is to increase the recycling rate in agriculture plastics and it has led to collecting 14 000 tons of agricultural plastic in 2020.¹⁴

There is also a prohibition against using microplastics in cosmetic products and it is based on the regulation on Prohibition in Certain Cases in Connection with the Handling, Import and Export of Chemical Products Ordinance (1998:944).

Sweden has a very similar waste regulation to Finland with separate collection, producer responsibility, and municipality-led waste collection. The only major difference was the plastic bag tax, which was aimed more at consumers.

3.6.3. Finland

The Plastic Roadmap for Finland 2.0 is a national program, that aims for the circular economy of plastics by 2030. The Plastic Roadmap is a package of actions that reduce the harmful effects of plastic and plastic waste. It has more general targets like reducing littering of the environment, avoiding unnecessary consumption of plastics, and promoting the reuse of plastics as well as enhancing the recycling of plastics and recyclability of plastic products. It has also more industry sector-specific targets like boosting the circular plastics economy in construction and promoting the recycling and replacement of plastics in agriculture and horticulture. The roadmap aims to develop international cooperation and promote solutions to the plastics challenge together and exporting expertise and solutions. The first phase of the program started in 2018 and the Plastic Roadmap was updated in 2022.¹⁵

The Finnish waste legislation is largely based on EU legislation. The waste legislation covers all wastes except certain special types of waste such as radioactive wastes, which are covered by separate laws. The Waste Act (646/2011) includes the main rules for waste management in Finland. In general, the municipality is responsible for the waste management of household waste and companies need to organize their own waste management.

The packaging producer responsibility applies to the companies that pack, import packed products, or distance sell packed products to users in Finland and that have a turnover of at least one million euros. According to the producer responsibility they are responsible of organizing the waste management of their own products and are responsible for the entire process of collection and recycling of their packaging waste as well as all the related costs. Consumer plastic packaging waste is collected in cooperation with the producers and municipalities and producers are responsible for paying reimbursement to municipalities for organising separate collection and transport. Packaging producer responsibility is based on the Waste Act and The Packaging Waste Decree.¹⁶

The producer's responsibility applies to six different plastic categories:

- Plastic packaging
- Single-use plastic containers and lids
- Single-use personal hygiene products
- Single-use consumer balloons
- Single-use smoking products
- Fishing products

A new regulation for the separate collection of corporate plastic waste was given in the Government Decree on Waste (978/2021). It requires the waste holder to organize the separate collection of plastic packaging waste from every company situated in a locality or in a service, tourism, or workplace zone covered by a local detailed plan or a local master plan if the quantity of plastic packaging waste generated in a week is at least five kilograms. The same Decree obligates the holder of construction and demolition waste to organise a separate collection of the plastic.¹⁶

The EU directive on reducing the environmental impact of certain plastic products (2019/904/EU) has been implemented in Finland by the changes to the Waste Act and regulations that entered into force on January 1, 2023, and by the Green Deal agreement on single-use dose packages. The scope of the directive includes certain single-use plastic products, all plastic products made from oxo-degradable plastic, and all fishing gears containing plastic.¹⁶

In Finland there are some voluntary agreements, so-called Green Deals, between the State and the Federation of Finnish Commerce in order to decrease the consumption of plastic carrier bags, use of single plastics and plastic construction waste and increase construction waste recycling.

The Green Deal agreement for single-use plastic portion packs has been signed by the Ministry of the Environment and the Finnish Food Industry Association, the MaRa Association of Tourism and Restaurant Services, the Food and Beverage Association, and the Suomen Pakkausyhdistys Association in 2022. . The aim of the agreement is to reduce the numbers of single-use cups for beverages and certain food packets made wholly or partly from plastic.

Green Deal on plastics in construction is valid during 2020–2027. The aim of the contract is to increase the separate collection of plastics and increase the use of plastics made from recycled materials in construction and its supply chain. Another aim is to optimise and minimise the use of plastic film and increase the use of recycled plastic film in the production of plastic film. The agreement is between the Ministry of the Environment and the Confederation of Finnish Construction Industries RT, the Finnish Plastics Industries Federation, Association of Finnish Local and Regional Authorities, the Finnish Hardware Association RASI, the Finnish Electrotechnical Trade Association STK, the Association of Finnish Technical Traders TKL, Chemical Industry Federation of Finland and Finnish Environmental Industries YTP.¹⁷

4. Statistics

Most plastic waste arose in the product groups of plastic packaging, construction products, vehicles and tyres (Table 3). Plastic in waste flows, that cannot be traced back to specific product groups, come from mixed commercial and post-sorting waste and from sorted plastic waste origin from the manufacturing industry. Municipal mixed waste contains still much plastic waste. In Sweden the amount was over 280,000 tons in 2020. ¹⁴

Table 3. Plastic waste generation in the Barents area in tons ^{12 14 54 55 56}

	Norway	Barents area *	Sweden	Barents area *	Finland	Barents area *
Packaging	209 000	16 720	320 000	16 000	133 320	20 000
Construction	40 000	3 200	120 000	6 000	120 000**	18 000
Agriculture	20 000	1 600	14 000	700	12 000	1 800
Tyres	60 000	4 800			27 950***	4 190
Vehicles	20 000	1 600	94 000 ****	4 700 ****	17 890	2 680
Fisheries and aquaculture	30 000	15 000 **	-		-	
Healthcare	-		12 000		12 000 **	

* Proportional to the number of inhabitants

** Estimated

*** Tyres contain 43 % rubber

**** Includes vehicles and tyres

Most of the plastic waste still ends up to the energy recovery. In Norway plastic packaging recycling rate was 29 % (2021) ¹⁸ and in Finland it was 26 % in (2022) ³². One reason is that plastic waste is still poorly separated from other waste and all the separately collected plastic waste cannot be recycled yet. In the material recycling facility plastic waste is processed so that it can be used as material in new products, in either equivalent or new areas of use. There are several steps in the process of recycling plastics like sorting, shredding, washing, milling and granulating. Chemical recycling of plastics is being developed and it means that the plastic is broken down into smaller molecules, which can then be used to make new plastic products.

Plastics recycling methods can be grouped into four broad categories:

- **Recovery in own processes:** manufacturing side streams are returned to the manufacturing process
- **Mechanical recycling in closed loops:** this method maintains the quality of materials but requires materials of like quality. For example recycling of PET bottles into PET bottles
- **Mechanical recycling in open loops:** this method uses wide variety of plastic wastes and is currently the most commonly used method. For example turning plastic packaging into plastic bags
- **Chemical recycling:** these methods involve breaking polymers down into monomers that can serve to produce new polymers

5. Corporate plastic waste collection

5.1. Norway

5.1.1. New rules for the collection of household-like waste

Changes in the waste regulations on source sorting came into force on 1 January 2023 in Norway. Now all the companies that have household-like waste, must also sort food waste, park, and garden waste, and household-like plastic packaging waste (Figure 5). Household-like waste means waste in its composition and articles similar to the waste generated at home. It is also new that the company has an obligation to have both knowledge of and documentation of the annual amount of waste that is sorted and delivered for material recycling. The biggest changes come to the grocery industry, as all the packaged food products must be separated from their contents to meet both requirements for sorting out food products and the plastic packaging, and where the packaging must be delivered clean.¹⁹

Companies can pack their household-like plastic waste into pink/purple spot bags, similar to the ones that are used in private households. Bags can be put out on the emptying day, or they can be delivered at the environmental stations. The household-like plastic that is collected is sent for material recycling through Grønt Punkt.¹⁸

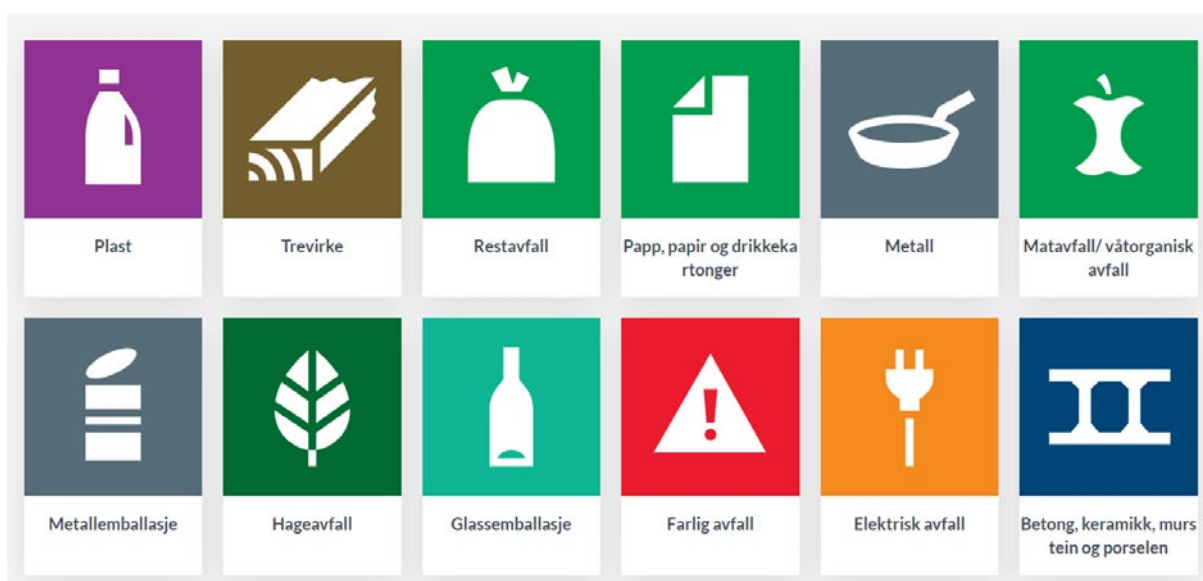


Figure 5: Different separately collected waste fractions.²⁰

5.1.2. Collection of plastic waste

In Norway, Sweden, and Finland, plastic packaging is subject to producer responsibility. In practice, the collection of packaging is organized by producer schemes. There is a wider collection network for consumer plastic packaging than for companies' plastic packaging. Companies' plastic packaging has its own terminal network, where companies can deliver their own plastic packaging waste (Figure 6).

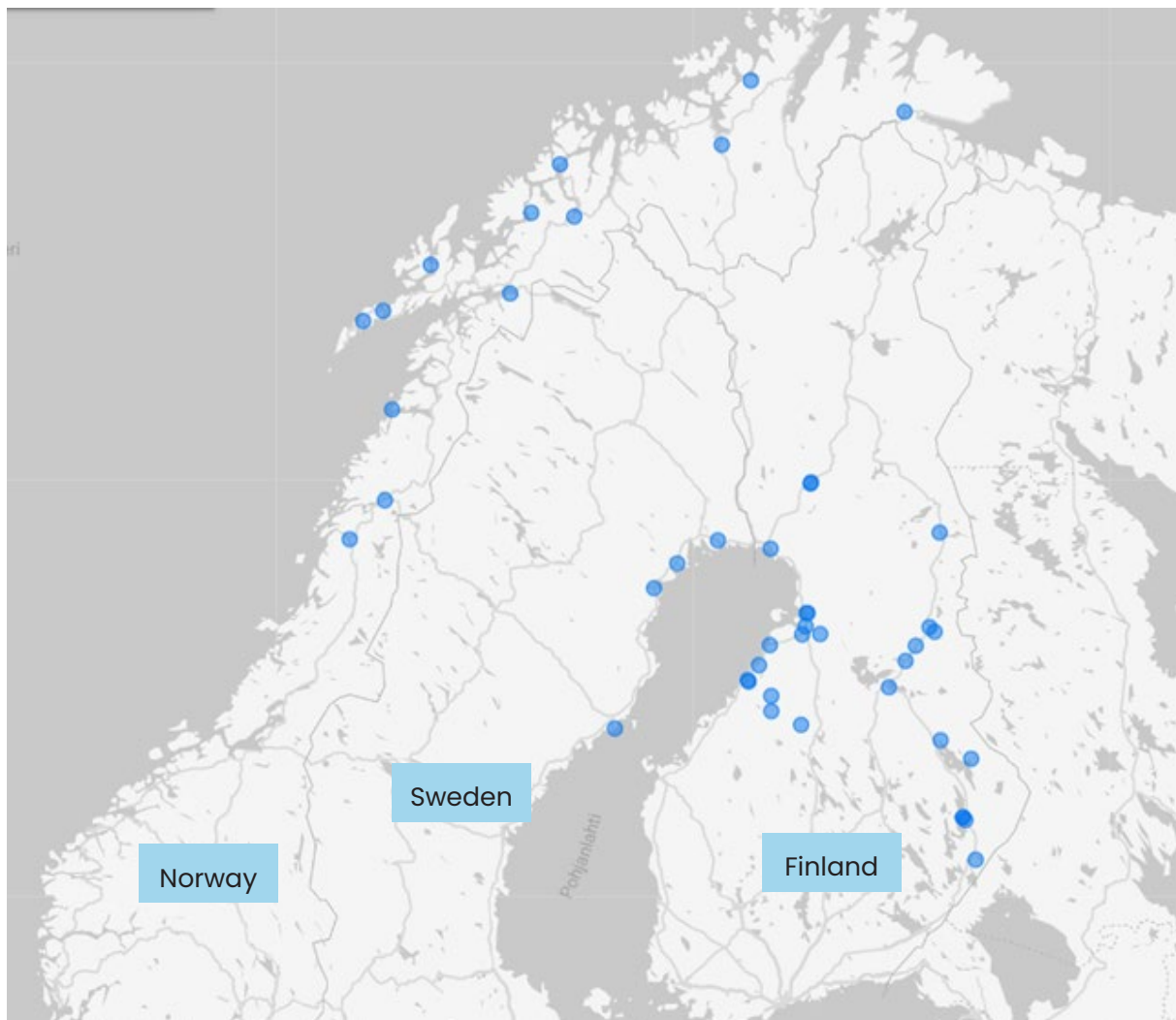


Figure 6. Corporate plastic packaging collection points in Barents area

There are two producer organisations that take care of packaging producer responsibility in Norway: Grønt Punkt Norge and Norsirk. Grønt Punkt Norge is a non-profit company owned by producer organisations that are responsible for the collection, transport, and recycling system for packaging waste. Producer organisations include Norsk Returkartong, Plastretur, Norsk Metallgjenvinning, Norsk Resy, Sirkel Glass, and Treretur.²⁵ Plastic packaging waste collected in Northern Norway is delivered to Grønt Punkt (Plastretur AS), which takes care of the plastic packaging recycling and utilization.¹⁸

Grønt Punkt Norge (Plastretur) has organized collection points for companies' plastic packaging. In addition to that, municipal recycling stations accept different types of plastic waste. Return arrangements vary from municipality to municipality, but Grønt Punkt Norge ensures that all packaging collected under producer responsibility is delivered to material recycling.¹⁸

In Norway, plastic waste from business is separated into different fractions:¹⁸

- Hard plastic
- Laminates and PP film
- Plastic films
- PP bags
- EPS (stryrox)
- Agricultural plastics

The collection of agricultural plastic is organized locally by farmers in cooperation with local collectors. All collectors who have a trade agreement with Plastretur for agricultural plastics are obliged to accept ready-sorted agricultural plastics free of charge. Today, it is possible to deliver plastic packaging to around 100 collectors. In some places, local collectors have introduced the collection of plastic packaging from farmers, but these are local measures where the collector often charges himself.

Plastic waste from the Grønt Punkt Norge system is sent for fine sorting to three facilities in Germany¹⁸:

- Hubert Eing Kunststoffverwertung GmbH in Gesher
- Umweltdienste Kedenburg GmbH in Beckum
- Vogt Plastic GmbH, Premnitz

After sorting, it is sent to several recycling points for material recycling. In 2021, the material was recycled into new products in the following countries¹⁸:

Germany 61.7%, Lithuania 22.1%, Netherlands 4.7%, Norway 2.1%, Belgium 1.5%, Estonia 1.1%, Latvia 1.1, Poland 1, Spain 0.7%, Great Britain 0.3%, Austria 0.2, Denmark 0.1%, Finland 0.1%. Construction plastic waste is still rarely separately collected from construction sites and film plastics had mainly ended up in energy waste, i.e., incineration together with other plastic packaging and plastic products. Construction waste can be delivered to the municipalities' waste stations but there are often also companies that specialize in construction waste sorting and utilization.

5.1.3. Service providers in municipalities

Different municipalities have their own waste management organisations, that take care of municipal waste management, and in many cases, they also offer companies waste management services.

This list is not necessarily all-inclusive.

- In Lofoten operates Lofoten Avfallsselskap IKS (LAS) which was founded in 1990 and owned by the municipalities Flakstad, Moskenes, Vestvågøy and Vågan. LAS accepts and processes all types of waste, both from households and businesses. Companies can deliver the plastic waste to the LAS facilities, or via waste disposal operators such as Østbø and Lofoten Avfall. Different separately collected plastic wastes are household-like plastic waste, round bale plastic that is used for round bales in agriculture, Styrofoam/EPS, Plastic foil and PP bags.¹⁹
- Reno-Vest IKS is an inter-municipal company that was established in 1974 and has its head office in Sortland. The company is owned by the six municipalities (in Nordland): Sortland, Hadsel, Andøy, Øksnes, Bø and Lødingen. The subsidiary Reno-Vest beritt AS has been established for business development and this company provides environmental advice and sells waste management services to the private and public sectors.²¹
- Remiks operates in Tromsø and Karlsøy and it offers waste management services to municipalities and companies. Different plastic wastes that are separately collected are clear plastic foil, colored plastic foil, bumpers, and other hard plastic, but Remiks is in the process of expanding the types of plastic that are collected. (Remiks, Ivar Sture Handeland, 2023)
- Vefas IKS in Alta offer services for business in Alta, Kautokeino, Loppa and Hasvik.

- Iris Salten IKS is an inter-municipal waste management company owned by nine municipalities in Salten. Salten extends from Saltfjellet in the south to Hamarøy in the north, with Bodø municipality as a regional centre. The company collects and receives waste both from households and businesses.²⁰
- Finnmark Miljøtjeneste AS has the Gairasmoen waste facility and 5 waste stations in different municipalities. From the recycling plant, the waste is transported to the Vefas sorting centre in Alta.²²
- Finnmark Ressurselskap AS is owned by the Hammerfest municipality. The company was established in 1987 and it receives most types of waste from commercial activities and households. The company handles sorted and unsorted waste for further recycling.²³
- SHMIL is an inter-municipal recycling company for the municipalities; Alstahaug, Brønnøy, Dønna, Grane, Hattfjelldal, Herøy, Leirfjord, Sømna, Vefsn, Vega, and Vevelstad. The company offers services for households, and public and private enterprises.²⁴
- HRS operates in Nordland, the Southern part of Troms.
- ØSTBØ operates in Northern Norway and offers services to business and private customers

5.1.4. Plastic recycling facilities Norway

Norfolier GreenTec is the leading recycler of plastic film waste. Their factory is located in Follidal in Hedmark. The plastic packaging is collected from industry and agriculture through a nationwide system. They receive plastic from all over the country from Nordkapp to Lindesnes. The company is also one of Northern Europe's largest and leading manufacturers of refuse sacks. The sacks are manufactured from 100% recycled plastic packaging.¹⁸

Quantafuel opened in 2020 the world's first plastic-to-liquid plant in Skive, Denmark. The plant will process over 20 000 metric tons of mixed plastic waste from Norway and Denmark and will produce about 16 000 metric tons of recycled feedstock. This will then be transported to Germany to BASF for the raw materials to produce plastic products. The process is based on chemical recycling. Quantafuel has also a pilot plant in Kristiansund Norway and it is part of the next-generation PTL plants. The plant is co-located with Replast's facilities, where mechanical recycling of plastic waste has been done. Results from this pilot plant will be used as the basis for the full-scale plant to be built on the same premises.²⁵

In 2021, 61 per cent of all the sorted plastic waste was sent to material recovery. Instead most of the plastic in the mixed waste end up to incineration (Table 4).

Table 4. Treatment of plastic waste in Norway in 2021.⁶¹

Treatment	Plastic - sorted out [tonnes]	Plastic in the mixed waste [tonnes]	Total [tonnes]	Per cent of total	Per cent of sorted out
Treatment, total	248 000	371 000	619 000	100 %	100 %
Sent to material recovery	151 000	29 000	180 000	29 %	61 %
Biogas production	0	0	0	0 %	0 %
Composting	0	0	0	0 %	0 %
Filling compound and cover material	0	0	0	0 %	0 %
Incineration	80 000	270 000	350 000	57 %	32 %
Landfill	13 000	40 000	53 000	9 %	5 %
Other disposal	0	0	0	0 %	0 %
Unknown	4 000	32 000	36 000	6 %	2 %

Source: Statistics Norway, Waste accounts

5.2. Sweden

5.2.1. Collection of household-like waste

In Sweden, the municipality is responsible for ensuring that municipal waste within the municipality is transported and recycled or disposed of. Municipal waste refers to the waste from households and waste that is similar in nature and composition to waste from households, such as waste from restaurants, shops, offices, and other companies. In 2020 4.5 million tonnes of municipal waste were generated and it contains mainly waste from households (3.8 million tonnes), but also waste from businesses (0.7 million tonnes) like food waste from restaurants and residual waste and packaging from shops. Many municipalities provide the collection of hard plastic that is not considered as packaging. In 2022 10,340 tonnes of hard plastic were collected for recycling. Similar to examples from Finland, businesses in Sweden are responsible for disposing of non-household waste and waste that does not fall under municipal or producer responsibility.²⁶

5.2.2. Collection of plastic waste

In Sweden, producer organizations FTI and TMR collect packaging waste. FTI is a non-profit organisation, and founded by four materials companies – Svensk Plaståtervinning, Returkartong, Svensk Glasåtervinning, and Svenska Metallkretsen – that take care of the recycling of packaging waste (Figure 7). It's free of charge to leave the company's used paper, plastic, and metal packaging at FTI's drop-off points. One cubic meter of each type of material each time can be delivered to the point.²⁷ TMR runs a facility in Helsingborg that manages the sorting and baling of newspapers, plastic packaging and various other waste qualities before further transporting them to material recycling.

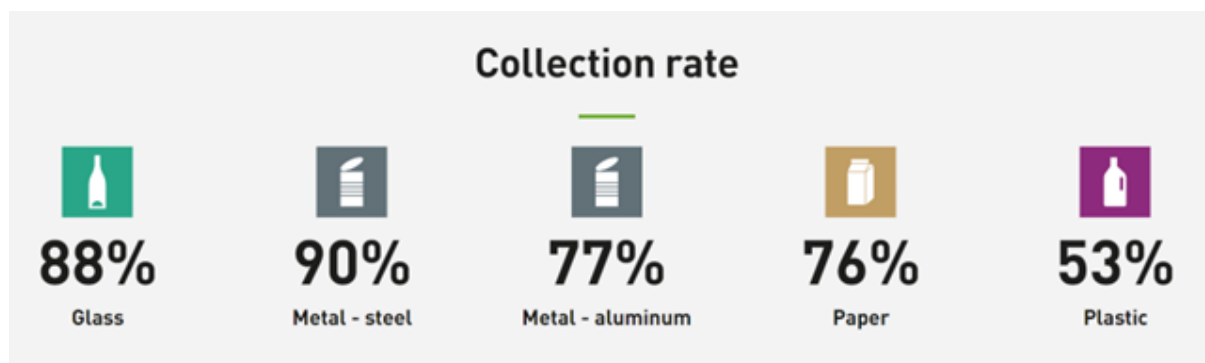


Figure 7. Collection rate of different packages in Sweden.²⁷

There will be some changes to the collection of packaging waste, because according to the new legislation, the municipalities are responsible for collecting packaging waste from 1 January 2024 and provide curbside collection for paper, plastic, glass, and metal packaging from 2027. A new company named Näringslivets Producentansvar is formed to meet the producer responsibility of the future and FTI's current operations will be phased out when collection responsibility passes to the municipalities on 1 January 2024.²⁷

Other companies that provide plastic collection services in the Barents area are Kuusakoski Ab, Stena Recycling Ab, Ragn-Sells, and Lycksele avfall & vatten AB. For example, Ragn-Sells collects, processes, and sells plastic for recycling. Plastic mainly comes from grocery stores and

industries. The collected plastic is taken care of in one of their own treatment facilities. Collected plastic includes hard and soft plastic, like LDPE, PP, EPS, HDPE, PVC, and plastic packaging.

5.2.3. Service providers in municipalities

Each municipality in Sweden is obligated to ensure that household type of waste is transported and recycled or disposed of. This includes wastes such as residual waste, organic waste, food waste, bulky waste, and household hazardous waste.²⁸

Municipalities organize their waste management within the municipal organization and 60 % collaborate with other municipalities. The collaboration is done in various forms through municipal associations, joint political boards, and municipal enterprises. In some municipalities, the collection and treatment of waste is primarily carried out by private contractors.²⁸

Municipalities take care of municipal waste management and can accept also waste from companies. This list of municipalities' waste management operators and systems is not necessarily all-inclusive:

- Brännkläppens återvinningscentral i Boden accepts wood, plastic, batteries, corrugated cardboard, gypsum, glass, garden waste, hazardous waste, and packaging waste.
- Haparanda Renhållning AB's Haparanda waste station receives waste from municipalities
- Kalix återvinningcentral is for households and companies' waste. Companies must pay a fee for leaving waste.
- Lumire offers waste station services for households and they receive e.g. plastic packaging and other packaging materials.
- Pajala Municipality is responsible for and manages the operation of five Recycling Centres in the municipality. They have facilities in Muodoslompolo, Junosuando, Tärendö, Korpilombolo and in Pajala
- Pireva in Bredviksberget offers recycling services for private households and companies
- Älvsby Recycling Centre offers recycling services for private households and companies
- The municipality is responsible for the collection of all household waste in Övertorneå municipality, and the operation of the Orjasjärvi Recycling Centre.

RAGN-SELLS

- Company collects, treats and recycles waste and residual products from businesses, organisations and households.
- Markets: Sweden, Norway, Estonia, Denmark
- Number of sites: 100
- Ragn-Sells collects plastic waste from households, shops and companies.
- Collected plastics is sold to recyclers in Europe and Asia.



<https://www.ragnsells.com/>

- The Furunäset's Environmental Centre & Recycling Market at Överkalix, receive residual waste and metal scrap, as well as sorted recyclable waste, such as wood, plastic and cardboard.
- Gimonäs Recycling Centre is located in Umeå
- Vännäs municipality's recycling Centre is at Starrberget.
- Boliden, Bureå, Burträsk, Byske, Jörn, Lövonger, Skellefteå, and Ursviken have their own recycling Centres.
- In Norsjö two recycling Centres serve customers
- Robertsfors municipality's Recycling Centre is called Fagerliden and it accepts almost all waste generated at home

5.2.4. Plastic recycling facilities Sweden

Most of the collected plastic waste is transported from the Barents area to the southern parts of Sweden to be treated and recycled.

In the recycling plant Site Zero in Motola one-third of all plastic packaging that is sent for recycling can be recycled today. The rest is burned up because certain types of plastics are very difficult to detect and identify correctly with their equipment. All packaging that can ultimately be recycled is sorted out and packed into trucks. Then they are driven down to the Netherlands or Germany to be washed and chipped down before they can be melted down into pellets and become a new plastic product. This means over 20,000 tonnes of plastic packaging is transported each year.²⁸

In Ängelholm, Sweden, Omni Polymers produces high-quality raw material in the form of a homogeneous polyolefin granule made with flexible plastic packaging from Swedish households. It has an annual capacity of 15,000 tonnes of polyolefin granules and it is authorized to receive 30,000 tonnes of incoming plastic material annually. The goal for a recycling rate is 80% of incoming plastic. Production rejects are mostly food scraps, fibres from packaging labels, and heavier rigid plastics that can be recycled with external partners. Omni Polymers is owned by TMR Group and Plastonomy. TMR handles everything related to producer responsibility for paper, metal, and plastic packaging.²⁹

In 2022, Stena Recycling Sweden expanded its capacity in plastic recycling by acquiring Swerec's plastic recycling plant in Lanna, Sweden. Yearly 25,000 tonnes of plastic, mainly packaging plastic, are processed via a new fully automated sorting system. 68 Stena has also a large plastic recycling plant in Hamstad – Stena Nordic Recycling Centre – which uses new technologies to recycle different plastic qualities. One of their recycling processes uses a technique that converts soft plastic (LDPE) into pellets, which can then be used to make plastic bags and garbage bags. Another process cleans and atomizes plastic from used electronics so that it can be used for new products.³⁰

Sörab and Stockholm Exergi opened Sweden's first automated pre-treatment plant for residual waste in 2021. The plant sorts out the recyclable material that has ended up in the residual waste, so that it can be recycled. This aims to reduce the amount of plastic sent for incineration.

Van Werven has a facility in Sexdrega in Sweden, where rigid mixed plastics originating from recycling centres, waste sorting companies, as well as waste from the manufacturing industry, are sorted and processed.³¹

5.3. Finland

5.3.1. New rules for the collection of household-like waste

The Finnish Waste Act was renewed in July 2021 and it changed sorting, recycling, and reporting. The obligations regarding the sorting of the new waste act entered into force on July 1, 2022. According to the new waste law, companies must start sorting different waste fractions even more widely.¹⁶

Under the new legislation, waste sorting must be arranged at the company's premises when they meet certain weekly weight amounts in terms of waste. The sorting obligation comes into effect when the company accumulates at least 10 kg of biowaste per week, at least 5 kg of fiber and plastic packaging per week, and 2 kg of glass packaging per week.¹⁶

According to the new law, the companies have to keep a record of the waste and take care of the waste reports, e.g. when:¹⁶

- at least 100 tons of waste is generated per year
- hazardous waste or POP waste is generated from the operation
- the activity is subject to a permit according to the Environmental Protection Act
- it is an activity in the food industry that is subject to notification according to the Environmental Protection Act

5.3.2. Collection of plastic waste

Also in Finland, plastic packaging is subject to producer responsibility. In practice, the collection of packaging is organized by producer schemes.

There are two packaging producer organisations in Finland: Finnish Packaging Producers Ltd and Finnish Plastics Recycling Ltd Sumi. Both are responsible for the collection and recycling of cardboard and paper, glass, metal, plastic, and wooden packaging in Finland.^{32,33}

Producer organisations have set up more than 60 terminals, where companies can deliver plastic packaging free of charge and they have more than 20 contract partners who report the plastic packaging they recycle to producer organisation for compensation. Terminals in the Barents area are running for example L&T Ympäristöpalvelut Oy.^{32,33}

In the agricultural sector packaging producer's responsibility includes both packaging related to own purchases and transport and sales packaging for products sold to consumers or other companies. Usual packaging includes

Hettula Oy
- Since 1959

- Hettula Oy is offering waste management services, pallet and pallet transport, towing service, wheeled machine and excavator work and passenger transport.
- The company operates mainly in Kittilä municipality and the Tunturi Lapland region.
- The customer base consists of private people, companies, municipalities and government institutions.
- The company has its own waste utilization and recycling station, where many plastic waste fractions can be delivered.
- Company offers waste collection and transport services for bio, glass, metal, cardboard, plastic and paper waste.



<https://hettula.fi/>

e.g. various wraps, fertilizer sacks, seedling trays, planting pots, and a wide selection of different plastic sales packages. Plastics other than packaging are not covered by producer responsibility. For example, bale or bale wraps or pipes are not packaged.

There is some variations between countries which plastics are suitable for collection. In Finland construction plastics, agricultural bale plastic and production plastic waste cannot be delivered to ERP systems' collection points^{32,33} but there are separate collection points for fertilizer bags and own collectors for agricultural waste.

Some of the municipal waste stations in the Barents area collect separate plastic waste (like Ekokymppi and Jätekukko). Also, PE pipes are separately collected in many of the municipal waste stations. Part of the separately collected PE pipes will be sold to Estonia for material recovery and part of them will be utilized in Finland.

Most of the corporate plastic waste is collected direct from the companies. Private waste companies that operate in Barents area and who offer plastic collection and recycling for companies are L&T, Revisol, Hettula, Ecomurske, Esa ja Pojat (Pohjanmaan hyötykäyttö), MP roskaton, Kempeleen jätekuljetus and Itä-Suomen murskauskeskus.

5.3.3. Service providers in municipalities

Municipalities have their own waste management organisations, that take care of municipal waste management but in many cases, they also offer companies waste management services.

According to § 32 of the Waste Act (646/2011), the municipality is obliged to organise the waste management of the waste generated in housing as well as the municipal waste generated in the administration and service activities of the municipality.

According to § 33 of the Waste Act, the municipality is obliged to organise waste management secondarily also for waste other than that for which it is primarily responsible which is non-household wastes. However, the condition of this secondary waste management service is that the owner of the waste requests it due to the lack of private service provision and that the quality and quantity of the waste are suitable to be transported or processed in the municipal waste management system. The municipality's secondary waste management service aims to secure functional waste management and the availability of waste management services even when no other service offering is available.⁵³

The procedures related to the municipality's secondary waste management service were specified with the amendment to the Waste Act (438/2019) that entered into force at the beginning of 2020. The change in the law requires that the holder of the waste must use the Material Market to demonstrate the lack of other service offerings when the value of the required municipal secondary waste management service is at least 2,000 euros per year. In this case, the request for the municipality's service is also made through Materialitor. A company offering a waste management service can also submit a request to the holder of the waste.

List of municipal waste organisations in the Barents area (the list is not necessarily all-inclusive):

- The municipalities and owners of the Kiertokaari are Hailuoto, Ii, Kempele, Lumijoki, Oulu, Pudasjärvi, Raahel and Siikajoki. The municipality of Simo is also covered by their services.³⁴
- Ylä-Savon jätehuolto is a waste management company owned by seven

municipalities, Iisalmi, Keitele, Kiuruvesi, Lapinlahti, Pielavesi, Sonkajärvi and Vieremä, whose task is to provide waste management services to the municipalities. The service network includes the Ylä-Savo waste centre, ecopoints and waste stations. ³⁵

- Kainuun jätehuollon kuntayhtymä Ekokymppi manages the waste management services of the municipalities of Kainuu and Vaala. ³⁶
- Puhas is a waste and circular economy company owned by the North Karelian municipalities. They take care of the waste management of the municipalities of Joensuu, Ilomantsi, Kontiolahti, Liperi and Polvijärvi, with approximately 112,000 inhabitants. ³⁷
- Jättekukko is a municipality-owned daily waste management service company, and their operating area covers 15 municipalities and approximately 215,000 inhabitants. ³⁸
- Lapeco is a waste management company owned by nine municipalities: Inari, Kittilä, Sodankylä, Kemijärvi, Salla, Savukoski, Pelkosenniemi, Enontekiö, Muonio. The company takes care of the organization of municipal waste management, waste advice and waste management official duties on behalf of its owner municipalities. ³⁹
- Napapiirin Residuum Oy operates in the area of three owner municipalities Rovaniemi, Ranua and Pello. ⁴¹
- Perämeren Jätehuolto Oy is a municipal company founded in 1998, and it is responsible for the waste management of the municipalities of Southwest Lapland. The region covers the municipalities of Kemi, Tornio, Keminmaa, Tervola and Ylitornio. ⁴²
- Waste management in Kolari is organized by the Kolari municipality. Non-recyclable mixed waste generated in households is used as energy at a waste incineration plant in Oulu.
- Kuusamo Waste Station serves the residents and holidaymakers of the Kuusamo city area as well as companies as a sorting and reception point for various types of waste. ⁴⁰

5.3.4. Plastic recycling and recovery in Finland

Finland has many plastic recycling plants where plastic waste is processed into granulate and new plastic products, but most of the recycling plants locate in southern Finland (Table 5).

Table 5. Plastic recycling companies in Finland (Survey of Macon Oy 2023).

Recycling company	Capacity t /year
Fortum Waste Management, Riihimäki	18 000
Lassila & Tikanoja, Merikarvia	20 000
Remeo, Vantaa	10 000
Clean Plastic Finland Oy, Tuorila	10 000
Keskinen Recycling Oy, Kuortane	10 000 (production 8 000)
FL Pipe Oy Ab, Kaustinen	5 000 (estimation)
Pramia, Toholampi	5 000–10 000
Total	88 000–93 000

Keskinen Recycling accepts various plastic materials like various plastic pipes, containers, and films from industry and construction contractors. They can handle all PP, LDPE, LLDPE, and HDPE materials. Production started in 2015, as a washing and granulation plant and they have made further investments for the second line and pipe production for Terrafame needs.⁴³

The plastic packaging collected from consumers is delivered to Fortum Waste Solutions Oy's plastic refinery in Riihimäki, or to Sweden to Site Zero, where the collected packaging waste is sorted and processed into recycled plastic or energy.^{32,33}

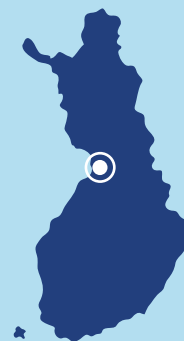
From the Finnish Barents area, most of the mixed construction waste will be delivered to Syklo (Oulu) or Riikinvoima and it will be incinerated. Syklo offers an excellent basis for the development of new circular economy solutions: a state-of-the-art sorting facility in Rusko already processes 100,000 tons of waste per year. The facility separates raw materials suitable for recycling and SRF recycling fuel from among the waste. Syklo offers its services widely outside Finland's borders as well, and it has clients in e.g., Norway.^{44 45}

Oulun Energia's Laanila biopower plant produces energy-efficient electricity, district heating, and process steam. About 70 percent of the energy sources used by the power plant are wood and the rest is high-quality SRF, i.e., recycled fuel, obtained from Syklo.

Riikinvoima's eco-power plant in Leppävirta produces environmentally friendly energy from non-recyclable, combustible waste. The facility processes 140,000 tons of waste per year. The waste delivered to the eco power plant is crushed and the metals are separated and directed to recycling. The crushed waste is then burned in a state-of-the-art boiler based on circulating bed technology.⁴⁵

Syklo

- Syklo receives and processes 100 000 tonnes of waste from corporate customers annually at the waste sorting plant in Rusko, Oulu.
- The waste is mainly construction and demolition waste, and commercial, industrial, and combustible waste.
- Accepted waste fractions:
 - plasterboard and other large loads of plaster
 - large HDPE, PVC and PP plastic pipes
 - agricultural plastics such as agricultural stretch films and silage wrap, and comparable plastic film
- Plastics of various grades are separated from the waste stream using advanced identification technology.
- Plastic grades suitable for recycling continue their journey through SYKLO's partners for further processing, and the non-recyclable remainder is made into Solid Recovered Fuel.



<https://syklo.fi/>

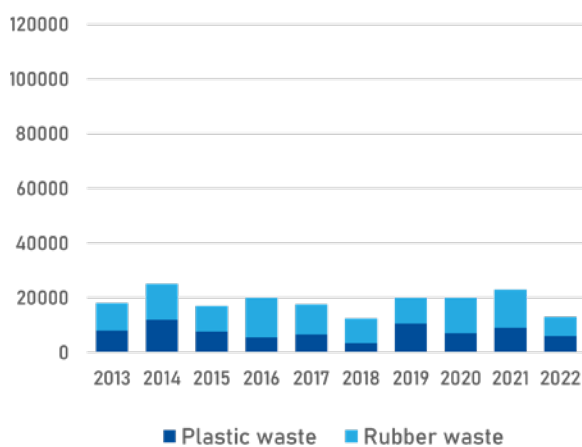
6. Import and export of the plastics

The EU introduced rules on the shipments of plastic waste in 2021, implementing the decision taken by 187 countries in May 2019 at the 14th Conference of the Parties of the Basel Convention. From January 1, 2021, plastic waste that cannot be recycled, or is difficult to recycle, may no longer be exported to non-OECD (Organisation for Economic Co-operation and Development) countries, i.e., to less developed countries. Before this new regulation, in 2020, the EU exported 33 million tonnes of waste to third countries and imported 16 million tonnes of waste into the EU. Within the EU, the member countries ship about 70 million tonnes of plastic waste.

In Norway, most of the international trade in plastic waste is ethylene polymers, i.e. polyethylene (PE). There are also many unspecified qualities. Significantly more plastic waste is exported than imported (Figure 8). Rubber waste is imported slightly more than plastic waste. In exports, the quantities of rubber waste are smaller than the plastic waste. Almost all the imported plastic waste arrives from Sweden and the largest exporting countries are the Netherlands, Germany, and Lithuania

Norway

Import, tons



Export, tons

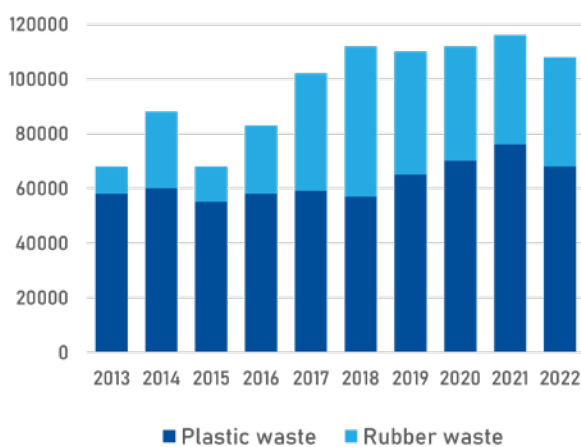
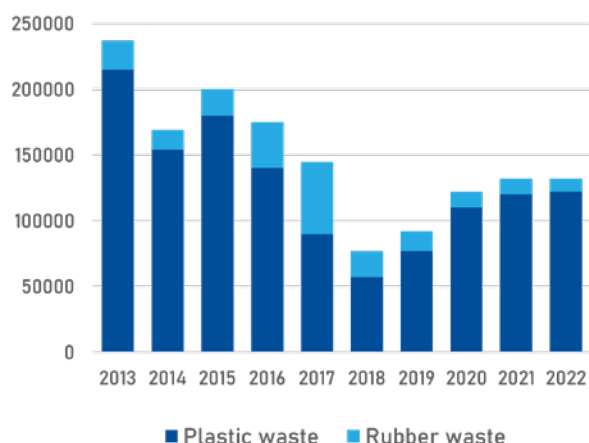


Figure 8. Plastic and rubber import and export – Norway.

In Sweden, almost the same amount of plastic waste is imported as exported (Figure 9). Almost all imported plastic waste comes from Norway and the largest exporting countries are Germany, Lithuania, and Poland. Rubber waste is imported and exported significantly less than plastic waste.

Sweden

Import, tons



Export, tons

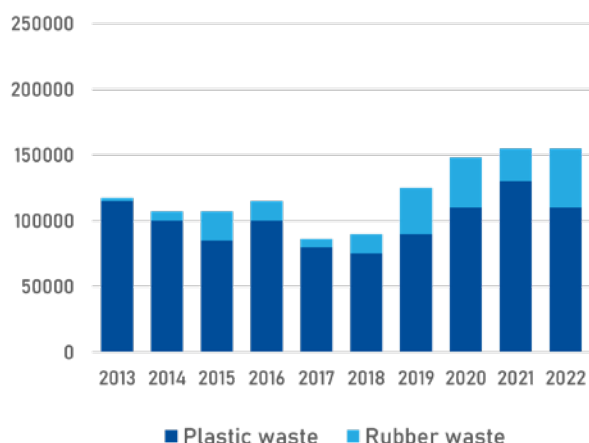
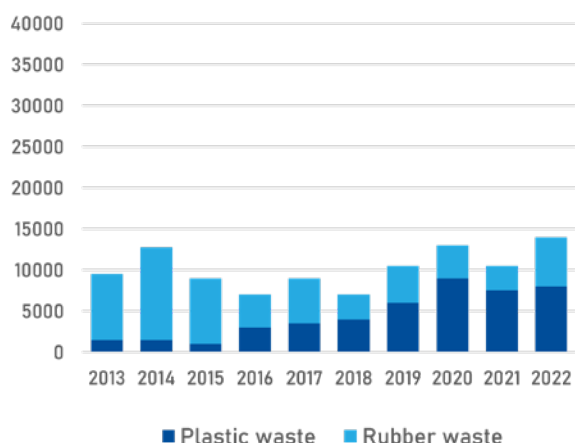


Figure 9. Plastic and rubber import and export – Sweden.

In Finland, most of the international trade in plastic waste is ethylene polymers, i.e., polyethylene (PE). There are also many unspecified qualities. More plastic waste is exported than imported (Figure 10). Roughly the same amount of rubber waste is imported as plastic waste, but almost no rubber waste is exported. Almost all plastic trade is with EU countries. There have also been exports to Asia, mainly to Malaysia and Hong Kong. The largest export countries are Latvia, Sweden, and the Netherlands. The largest importing countries are Estonia and Sweden.

Finland

Import, tons



Export, tons

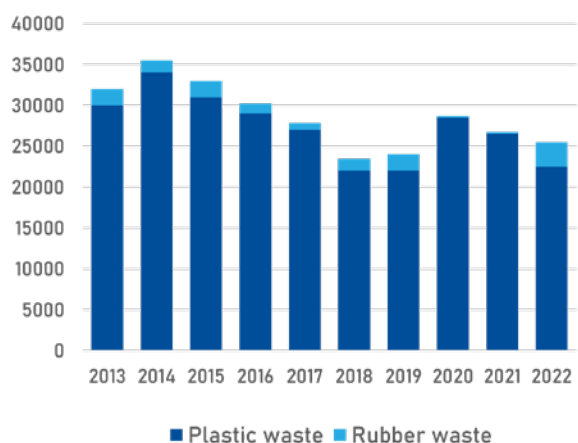


Figure 10. Plastic and rubber import and export – Finland.

7. Case examples

7.1. Agriculture

Plastic is an important commodity in farming, improving crop protection and performance. About 2 Mt polymers are converted to Agricultural Plastics annually in Europe. Between 3 and 4 Mt AP are currently in use in Europe, generating 1 Mt waste. Inventories of these materials' usage, composition, and handling are fragmentary.

A significant portion of agricultural plastic is baling plastic. Plastic films, wraps, containers, sacks, pipe cultivation films, greenhouses, tunnels, and strings represent other important applications. During the use and end-of-life, some agricultural plastic degrade and generate fragments including micro- and nanoplastics, that can accumulate in soil on a transitory or permanent basis. The long-term impacts of this pollution are unknown.⁴⁶

Separately collected dirty and incorrectly sorted agricultural plastic ends up in energy recovery, just like PVC plastic, because PVC is not suitable for plastic recycling. In Norway packaging producer organisations accept agricultural plastic in their collection points.⁴⁸ In the Barents Region, part of the agricultural plastic that is suitable for recycling ends up to the municipal waste stations and to energy recovery. This is especially the case in Finland, because the agricultural plastic collection service does not cover the entire Barents region at the moment.

In Norway, the research project called 'Sirklend' was launched in 2023 spring in a collaboration between the farmers' cooperative Felleskjøpet Agri and the recycling company Quantafuel Kristiansund. Felleskjøpet Agri is working with a pilot scheme for the collection of agricultural plastic from its member farmers and Quantafuel Kristiansund will be running tests on the plastic recovered from the farms to see whether it can be turned into materials that can be used to make new products in Norway.⁵⁰

7.2. Commercial fishing and aquaculture

Commercial fishing is an important sector in Norway, and it contributes to around one-third of the total catch of EU-EEA member states. The Norwegian fishing fleet consists of 6000 fishing

Nofir

- Nofiris a Norwegian company (operating since 2008) giving a new life to discarded fishing and fish farming equipment.
- Fish farming nets can be recycled through the Nofir system.
- Tarpaulins used in aquaculture are dismantled and recycled or reused after treatment in the Nofir production.
- Ropes are collected from net lofts, fish farmers, service stations and waste facilities.
- Discarded equipments are recycled into plastic granules that can be used in the production of garden furniture, automotive parts and much more.
- When recycling is not possible, materials are sent to energy recovery.



<https://nofir.no/>

vessels, which use fishing gears such as trawls and purse seines, some lines, nets, and pots. For the medium-sized fishing fleet and the coastal fishing fleet, fishing gears like trawls, purse seines, Danish seines, nets, pots, and lines in various forms are used. In recreational fishing guides, fishing gears that are used are hand lines, fishing rods and similar handheld equipment, machine-driven cheat or troll, nets with a total length of up to 210 m, lines with up to 300 anglers, and up to 20 pots or traps.⁴⁷

It is estimated that in the Norwegian commercial fishing sector, 4,381 tons of plastic in fishing gear enter the market and 18,413 tons are in use yearly (Figure 11). Loss of wear and tear is estimated to be 168 tons and 381 tonnes of gear is assumed to be lost during operation at sea. Over 4000 tons are collected and delivered for further end-of-life processing yearly and from this, 55% of the waste is sent to recycling abroad (Recycling RoW), 19-21% to incineration and 24-26% to landfill.⁴⁷

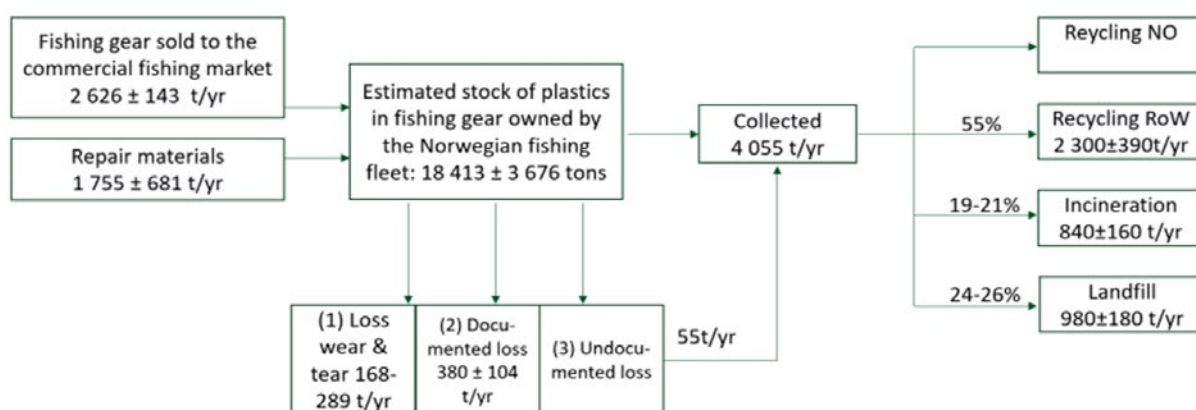


Figure 11. Plastic mass flows in fishing gear from the commercial Norwegian fishing fleet.

In Norway, the aquaculture industry is of increasing importance, both in terms of size and revenue. Aquaculture means the production of all aquatic organisms, i.e., both plants and animals living in water. The equipment used in aquaculture include ropes and buoys for mooring rings and feed rafts, floating rings, bottom rings, nets, and ropes.⁴⁷

The stock of plastic in the Norwegian aquaculture industry is estimated to be 192,000 tonnes, of which 16,000 to 29,000 tonnes are collected for waste management each year (Figure 12). These values include only data from salmon aquaculture, which represents 75% of the total aquaculture locations in Norway in 2019. In Norway, aquacultures also include facilities for other fish 5%, molluscs, crustaceans, and echinoderms 13% and algae 7%.⁴⁷

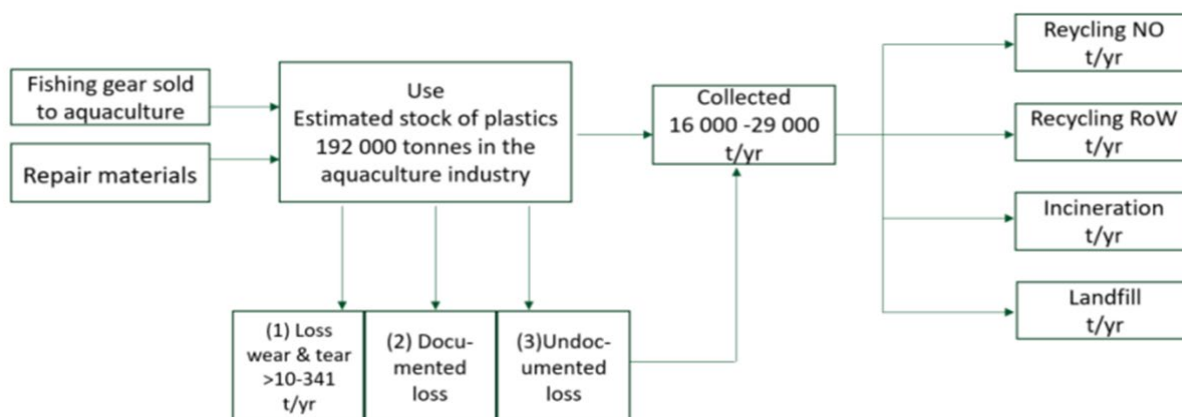


Figure 12. Plastic mass flows in the Norwegian aquaculture industry.

7.3. Fish industry

To produce fish products, the location of companies in the Northern parts of the Barents area is a significant advantage, as fish transport from Norwegian fish farms can be carried out by road transport. The salmon's journey from Norway to the fish factories takes only 8–12 hours.

Plastic waste is generated at many different stages of the value chain of fish processing: during fish farming and catching, fish transportation, production of fish products, and transportation of fish products to retail stores and professional kitchens as well as wholesalers.⁴⁸

Nets and fishing gear made of plastic are used to catch fish. Fish are delivered from fish farms to fish processors in polystyrene boxes or large vats. Used Polystyrene boxes can be further recycled as raw material for the plastics industry. Polystyrene boxes are processed so that they are crushed and baled and sold to plastic recycling companies in the Barents region or abroad. Polystyrene waste can be used to make for example car plastic bumpers.⁴⁸

When packaging fish, waste plastic is produced, such as cutting waste from the edges of packaging machines and residual materials from plastic rolls. These can be recovered and recycled as a new raw material for the plastics industry. Along with the raw materials, the companies also receive clear and coloured film plastic, plastic canisters, detergent bottles, and spice bags, which can be separately collected and delivered to plastic recycling and as recycled raw material for the plastics industry.⁴⁹

When delivering products to retail stores and professional kitchens as well as wholesalers, the use of plastic can be reduced by using fibre-based boxes such as Eco Fish Boxes, which are made from renewable wood fibres using a low-emission manufacturing process. Using Polystyrene boxes is still valid for certain processed products such as smoked and charred salmon, because these products cannot withstand freezing, and the efficiency of cold logistics still requires Polystyrene boxes for the interwoven and smoked products (Mikko Karvonen, 2023 interview).

In the Barents region of Finland, plastic waste generated in the production of fish products, such as packaging plastic waste and production plastic waste, can be delivered to a plastic recycling facility in Southern Finland, such as L&T's Merikarvia plastic recycling facility.⁴⁹ Ways to promote a circular economy for the fish industry are summarized in Table 6.

Table 6. Ways to promote the circular economy in the fish industry.

Reducing waste	Replacing styrofoam with reusable metal containers	Replacing plastic transport packaging with cardboard boxes
Promoting sorting	Providing good sorting instructions to personnel	Providing a sufficient number of collection containers and emptying them frequently enough
Promoting CE	Preferring one plastic type in packaging	Recycling the production waste

7.4. Tourism

Different sustainability certificates are in use in tourism sector to showcase the sustainability practices companies have in place, as well as their plans for continuous development. Certificates, such as Green Key, Green Globe and hotels own labels are found in hotels, hostels, small accommodations, campsites, holiday parks, conference centers, restaurants, and tourist attractions.

Sustainability certificate guides the companies' sustainability work and they cover different categories ranging from company policy, energy use, waste management, to social issues. Achieving an environmental certification may help a company to develop their waste management, achieve net zero carbon emissions, identify ways to improve internal management processes and set up targets for improving sustainability. It helps to determine more sustainable technologies and practices which can improve efficiency and reduce operating costs and to be aware of statutory and regulatory requirements.

Strawberry hotel -chain has many hotels in Barents region and they have developed their own We Care -certificate to improve and tell their sustainability work. Waste management is part of the We Care program and their sustainability work.

The circular economy of plastics is being developed in the Barents region as a part of developing sustainable tourism. Waste legislation also encourages companies to collect their plastic waste separately. Ways to promote circularity of plastic in the tourism sector are summarized in the Table 7.

Table 7. Ways to promote the circular economy in the tourism sector

Reducing waste	Selecting plastic-free packaging products	Selecting reused materials and products
Promoting sorting	Good sorting instructions for clients and personnel. Deposit system for returning plastic cups and bottles back to seller.	Providing good sorting possibilities and a sufficient number of collection containers and emptying them frequently enough
Promoting CE	The generated plastic waste should be as clean as possible and not mixed with other type of wastes	All plastic waste should be of recyclable quality, preferring one plastic type in plastic products such as plastic glasses

Norway

Northern Norway is famous for many tourist attractions like Lofoten, Tromsø and Hurtigruten. The legislation in Norway obligates companies to sort the plastic waste and plastic waste containers are found in public places. Hotels and restaurants are collecting separately their own the plastic waste and deliver it to recycling. Service providers such as Remiks, Reno-Vest, Iris-Salten and ØSTBØ take care of the plastic waste collection in the northern Norway.

Sweden

STF is a non-profit membership association that works to ensure that everyone has access to Sweden's nature and culture. STF operates 8 mountain stations that have hotels and restaurants and 44 mountain huts. Waste management and transportation are difficult in the mountains, since there are no roads to the huts. Therefore, no unsorted waste is accepted anymore and only sorted waste like plastic can be left to the huts since it can be stored and carried out in the wintertime. STF has used information campaigns for decreasing the single-use plastics and littering and offering free coffee for those who are picking up trash from the mountains. STF has Green Key and they have established a system for measuring the amount of waste. They have also set up special targets for food waste elimination and carbon emission reduction. (STF, interview 10.9.2023) In other hotels, like Tree hotel, wallpaper/paper, glass, metal, and plastic are separately collected and food waste is sent to the biogas plant. The company Rang-sells is collecting waste from the hotel. (Tree hotel email 3.9.2023).

Finland

Among the tourist destinations, Ylläs, Levi, Ruka, Pyhä, Koli, and Nurmes were selected as study destinations in Finland.

In Ylläs the collection of companies' plastic waste became possible in February 2023, when Lassila & Tikanoja started collecting plastic waste in the entire Lapland region. The following hotels and restaurants Ylläs started to collect plastic waste in the spring: Lapland Hotels Saaga, Lapland Hotels SnowVillage, Lapland Hotels Äkähotelli, Lapland Hotels Ylläskaltio, Restaurant Well, Restaurant Taiga, Restaurant complex Y1, Lapland Safaris Ylläs office. (Maria Astrén, interview, 2023)

In the past, glass and metal have been collected separately at all these Ylläs sites, as well as bio-waste at all sites except in Enontekiö. In April 2023, the collection of biowaste became



REMIKS

- Remiks serves 80 000 inhabitants in Tromsø and Karlsøy municipalities
- 77 000 tons of waste is processed annually
- Nearly 94% of all the waste is recovered
 - 42% to material recycling
 - 51% to waste to energy
- 179,9 tons of plastic was collected in 2022
 - Foil plastic, hard plastic, laminate and PP-foil plastic, bumpers
 - Plastic waste is delivered to Germany to the recycling plant through Grønt Punkt Norge (Plastretur AS)



<https://www.remiks.no/>

possible in Enontekiö's Heta as well, but this cannot yet be collected in Enontekiö's Kilpisjärvi. The plastic waste collection started in spring 2023 in Ylläs and until March 2023 a few hundred kilos of plastic waste had been collected at different sites in Ylläs. Before Lassila & Tikanoja started to collect plastic waste in Ylläs, there were no other service providers and therefore no plastic waste was collected separately. (Maria Astrén, 2023 interview)

Levi has more than 60 restaurants, more than 2.4 million overnight stays, and almost 900 residents. In Lapland, recyclable plastic waste generated by companies' own operations is accepted in Rovaniemi, Encore Environmental Services Oy's terminal. Waste transportation or transportation acquisition is the companies' own responsibility. The terminal accepts plastic free of charge. A plastic study was conducted in 2019 in Levi for several restaurants. Levi Restaurants Oy's Gondoli is a restaurant that serves both cafe products and standing table lunches. Levi Hotel Spa's restaurants Ahku, Kekäle, and Classic Pizza serve food for hotel breakfast, lunch and dinner. In the survey the restaurants collected all the generated packaging plastic waste for one autumn holiday week. The plastics were sorted by quality and weighed every other day. According to the study, 50 kg and 3,300 liters of packaging plastic waste accumulated in Spa's restaurants in one week. Around 25 kg and 1,500 liters of plastic waste were generated in the gondola restaurant in the same week. According to Spa, the annual amount of plastic waste is 11,000 kg and 740,000 litres. The amount of plastic waste from the gondola restaurant per year is approximately 1,500 kg and 90,000 litres. The share of plastic of all the waste was about 12%. Because there are more than 60 restaurants of various sizes in the Levi area, it can be estimated that packaging plastic waste accumulates every year a total of 350,000 kg in restaurants in the Levi area.⁶⁰

In Koli hotel plastic waste, such as plastic films (clear and coloured plastic films) and plastic packaging, are collected separately. A separate collection of films started before 2020 and a separate collection of plastic packaging on July 1, 2022. The amount of collected plastic waste has been a few hundred kilos per year. Plastic films and bags containing biowaste residues cannot be sorted and recycled. Plastic is transported to Itä-Suomen Murskauskeskus Oy and Suomen Uusiomuovi Oy. Plastic waste is collected separately in all the Sokos hotels which are Kimmel, Vaakuna, Koli (in the Barents area) and Bomba (in the Barents area). (Väisänen Noora, Interview, 2023)

In Ruka companies' plastic waste has been collected for 5 years (Mikko Hänninen, interview, 2023). Plastic waste is collected separately from hotels, restaurants, and stores and companies have shared waste room, where plastic waste like plastic films and other plastic packaging can be delivered. When going further from Ruka (30 km), the separate collection of plastics is no longer possible like in Oulanka Nature Centre or in BaseCamp of Oulanka.

In Pyhä, companies' plastic waste is not collected separately, but a separate collection would be needed for the area.

7.5. Events

Many festivals face the same challenge: sorting plastic waste is challenging, and it often ends up in mixed waste. Therefore, it is important to offer the visitors the possibility to sort their garbage into different fractions like cardboard, plastic, biowaste, and mixed waste and provide good guidance and innovative container solutions to improve sorting.^{51 52}

In Qstock's in Oulu over 16.6 tons of waste accumulated during the two-day festival (40 000 people) in 2021 but only 14 percent of all the collected waste was recycled. Of 16 000 kilos, there were over 14,000 kg of combustible waste, 2,000 kg of separately collected cardboard, 280 kg of bio-waste, and 150 kg of packaging plastic. In Qstock only 13 percent of the contents of the combustible waste collection containers were actually combustible waste. The rest of the content would need proper sorting. The plastic collection container contained impurities like bottles, cans, and bio-waste.^{51 52}

In previous years, the festival has faced the challenge of properly recycling difficult plastic waste, such as shot glasses and bundles.⁴⁴ There were also several different types of plastic in the plastic collection containers, of which biodegradable plastic is problematic because it cannot be recycled with other plastic. Good-quality hard plastic would be suitable for recycling if collected separately, but it is expensive and inefficient to sort it separately among combustible waste.⁵²

In the future, the event organizer could give instructions to the stall holders to use one and the same type of plastic instead of ten types of plastic when purchasing beverage packaging. The plastic collected in this way would be of high quality for recycling.⁵²

Also, a new smarter way of collecting waste can be experimented in the festivals. The waste transport company, Haurun Jäteauto Oy, has brought waste bins equipped with smart sensors to the Qstock festival area. Smart waste bins inform the waste company when they are full, and they can be emptied at the right time.⁵²

7.6. Healthcare

The amount of plastic used in healthcare is increasing and it transforms the health market (Table 8) when plastic medical products replace medical instruments originally fabricated with ceramics, steel, or glass where applicable. Plastic is cost-effective, durable, lightweight, and compatible with various manufacturing processes and therefore even a necessary raw material in healthcare, but at the same time, many organisations are concerned about the environment and climate effects.⁵⁶

Table 8. Typical plastic materials used in healthcare sector

Product ⁵⁶	Description ⁵⁶	Amount in waste ⁶²
Gloves	Gloves of various types of plastic and rubber such as vinyl, nitrile, polyisoprene, polyethylene, latex, etc.	18 % gloves
Jars, bottles, lids, test tubes, bowls	Plastic storage items	
Syringes, needles	Syringes and needles with or without needle, vein testing set.	
Aprons, jackets, hats, shoe covers, safety glasses	Suits and protection in operations and examinations.	13 % disposable textiles
Hoses, associated bags, taps, valves, tubes, ports, adapters, aggregates, nozzles, pumps	Hoses and valves with a quantity purposes and areas of use.	17 % waste bags
Plastic packaging, plastic film	Used as a packaging material	21 % packaging

Several plastic pilot projects have been running in hospitals and plastics marked with the numbers 01, 02, 04, 05, and 06 have been collected. Disinfectant and detergent bottles, for example, are made of 02 plastic, and similar products can be processed from them. Products marked with 04 is clear or coloured film plastic, which can be further processed into, for example, plastic bags. Products marked 05, and 06 can be used, for example, as a base for sterile instruments. The most challenging ones are PVC plastics, i.e., plastics marked with the number 03, for which no further processing use has been found so far. Likewise, plastics marked with 07, are usually mixed or multi-layer plastics. ⁵⁶

HUS, Helsinki University Hospital, has been a pioneer in plastic waste collection and their first plastic waste collection pilot started in 2016. However, the collection of plastic still appears to be marginal when the amounts are compared to the total amount of waste. In 2020, more than 68 tons of plastic were collected and sorted for recycling in HUS, while the total amount of waste collected through their own waste management was approximately 7,500 tons. This means that plastic waste was less than 1 % of the total waste amount. HUS is Finland's largest provider of healthcare services and a significant employer with 25 000 professionals. ⁵⁶

In the Barents area, at Länsi-Pohja Central Hospital in Kemi, over two hundred tons of waste is generated annually from various hospital functions. Wastes include disposable containers, textiles, hygiene products, and packaging materials. Waste is also generated from medical operations, such as surgeries. At Oulu University Hospital, the plastic collection of the central operating room has been started by the requested nurses. ⁵⁶

In Sweden Alingsås sjukhus and Mölndals sjukhus, that locates close to Göteborg, started their plastic waste collection pilot in 2019. In two months approx. 60 – 100 kg of plastic was collected. In some departments, like operating rooms and the reagent preparation, greater amounts of plastic waste were generated. ⁵⁷

A separate collection of plastic waste has also been developed in Terveystalo's offices and surgery units and some of them locate in the Barents area. The operating room departments produce the most film plastic, in which supplies and instruments are packed, as well as

bottles with saline solution and disinfectants. One operation room produces about one sack of plastic per day. Recycling plastic cups from coffee machines or replacing them with cardboard has also been added to the customer premises.⁵⁸

Pilots have proved that hospitals and healthcare organizations can reduce plastic consumption and increase recycling of plastic and they can look at the circularity of plastic from many perspectives purchasing, consumption, and waste perspectives.

7.7. Mining

For more than 30 years, polyethylene (PE) pipe's unique characteristics have made it the product of choice for numerous applications in the mining industry. PE pipe's flexibility, abrasion resistance, and leak-free joints have helped the product prove itself long-term in demanding environments and it has been proven product in rugged terrains, extreme climates, and changing site environments.⁵⁹

The mining company Terrafame Oy's operations generate a considerable amount of plastic waste, which is mainly polyethylene pipe and hose waste (PE). The waste is formed from the processes of bioleaching and water management, and most of it (about 2/3) is a 16 mm diameter irrigation hose, which is used to spread the solution and to regulate the amount on top of the bioleaching piles. The irrigation hose has to be changed regularly when the hoses become blocked and when the pile is disassembled and reassembled during operation. Irrigation hose consumption is approximately 2,200–2,500 tons per year. (Environmental permit, Dnro PSAVI/4399/2020)

The rest, about 30% of PE plastic waste, consists of trunk lines of leaching systems and pipelines related to water management. This pipe waste is typically PE100 pipe, and the pipes have a diameter of 63–400 mm. Depending on the different projects, this type of plastic waste accumulates around 1,000 tons per year.

Reusing pipes and hoses as such is challenging. Part of the material inevitably travels to the secondary leaching area and remains under the castings, but the area also has pipe and hose waste from previous years that could be put to use. The challenge of material recycling is the solution and mineral contact during the use of the materials, which is why the materials are not suitable for plastic recycling as such without pretreatment. (Environmental permit, Dnro PSAVI/4399/2020)

Terrafame Oy has been applied for an environmental permit in 2020, to pre-treat the plastic fractions formed in the operation, so that they can be delivered for material recycling or as energy fractions. The test operation was carried out together with Keskinen Recycling Oy, which can act as a recycler for plastic waste. (Environmental permit, Dnro PSAVI/4399/2020)

8. Conclusions

Plastic waste is typically collected separately from households and industry, trade, construction, agriculture, and aquaculture (Figure 13). Producer responsibility applies to plastic packaging and producers of packages are obligated to organize the wide collection network for plastic waste packaging. Producer responsibility applies also to tyres and WEEE.

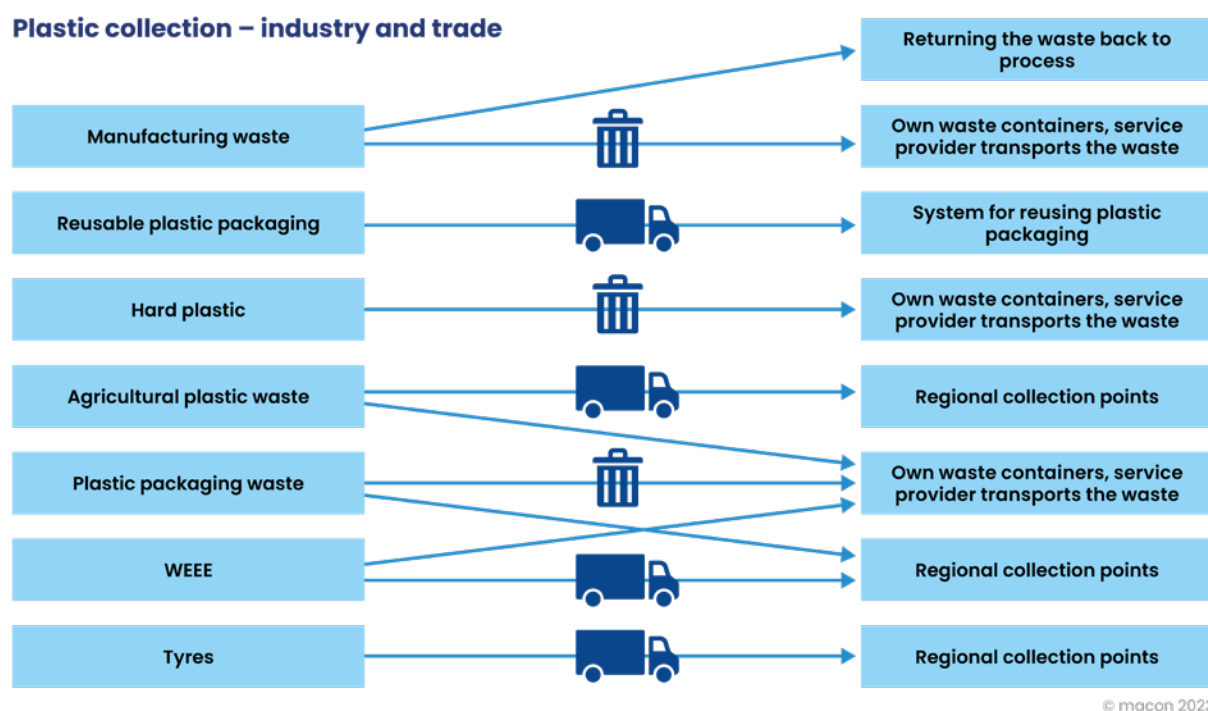


Figure 13. Plastic collection – industry and trade

The waste legislation is promoting the separate collection of plastic waste in all the Barents countries. The collected plastic waste is incinerated or sorted and processed into recycled plastic raw materials in many countries. The goal is that more than half of the plastic waste generated in the EU will be recycled by 2030. At the moment the recycling rate for plastic packaging is around 30%.

In the Barents area, a variety of local, national, and international waste management entities and municipalities provide services related to the management of plastic waste. These services encompass activities such as the separate collection and transportation of various types of plastic waste for businesses.

<p>Currently most plastic materials are fossil based and are produced from oil or gas</p> 	<p>Almost 26 million tonnes of plastic waste is generated in Europe every year</p> 	<p>In the future, more plastics are produced from alternative feedstocks, such as recycled oil, secondary plastics or biomass</p> 
<p>Plastic is used across almost every sector, including to produce packaging, in building and construction, in textiles, consumer products, transportation, electrical and electronics and industrial machinery.</p> 	<p>The EU's plastics strategy aims to transform the way plastic products are designed, produced, used and recycled</p> 	<p>EU and countries are taking actions to tackle plastic pollution and marine litter, and to accelerate the transition to a circular plastics economy.</p>
<p>Recycling rates of plastic packaging waste is around 30 %</p> 	<p>Specific rules and targets are set up to single-use plastics, plastic packaging, microplastics, and plastic waste management</p> 	<p>Producers of packaging have extended producer responsibility for the packaging.</p> 

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Ways to promote circular economy of plastics



Share best practises of plastic waste collection and recycling systems, campaigns and projects between countries and stakeholders



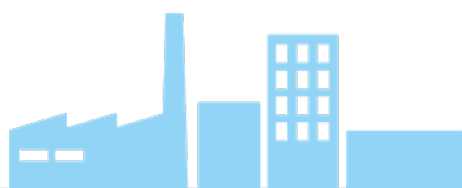
Make new cooperation initiatives across borders



Collect and share plastic data



Use plastic recycling knowhow from different countries to promote plastic waste recycling



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Ways to promote circular economy in a company level

- Join the voluntary agreements like green deals
- Be aware of the carbon footprint of your products and packaging material to be able compare the difference of using different materials
- Reduce your consumption of single-use plastic
- Prefer products made from recycled plastic
- Use recyclable plastic raw materials in your products
- Sort and recycle your own plastic waste
- Prevent littering



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