“Journey of Plastics in the Barents Region”

macon

macon.fi

Study background

- The Ministry of Economic Affairs and Employment of Finland 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 project was 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.
- Project duration: 04/2023-10/2023

Journey of plastic - study

- The aim of the survey was to get a comprehensive picture of the cycle of plastic wastes generated in companies:
- Study questions were:
  - What kind of plastic waste is generated in the area?
  - What kind of service provider network exists in the area?
  - What kind of infrastructure is supporting collection?
  - Where the recycled material is transported and further processed into new raw materials?
  - Are the plastics transported between the countries?

Map: https://www.arcticcentre.org/EN/arcticregion/Maps/Barents

Plastic leakage

Plastics are very durable, so they accumulate in nature, damaging ecosystems we rely on. In the oceans they break down into tiny fragments, which enter the food chain. The microplastics are eaten by plankton, which are eaten by fish, which are eaten by... us.

Source: IP-13-1017

Many of these items are packaging for food and drink and most were designed to be used only once ("single-use plastics"). That's a waste of valuable resources.

https://www.europarc.org/news/2018/01/european-strategy-on-plastic-waste/

Plastic legislation and strategies

EU

- Circular economy action plan
- Plastics Strategy
- Waste Framework directive
- Packaging directive (+ WEEE, ELV…)
- SUP directive

National – regional

- EU legislation implemented
- Own national legislation
- Green Deals
- Plastics Roadmaps, National action plans on plastics, Plastic Strategies, National waste plans

Company

- Corporate Social Responsibility

Plastics strategy

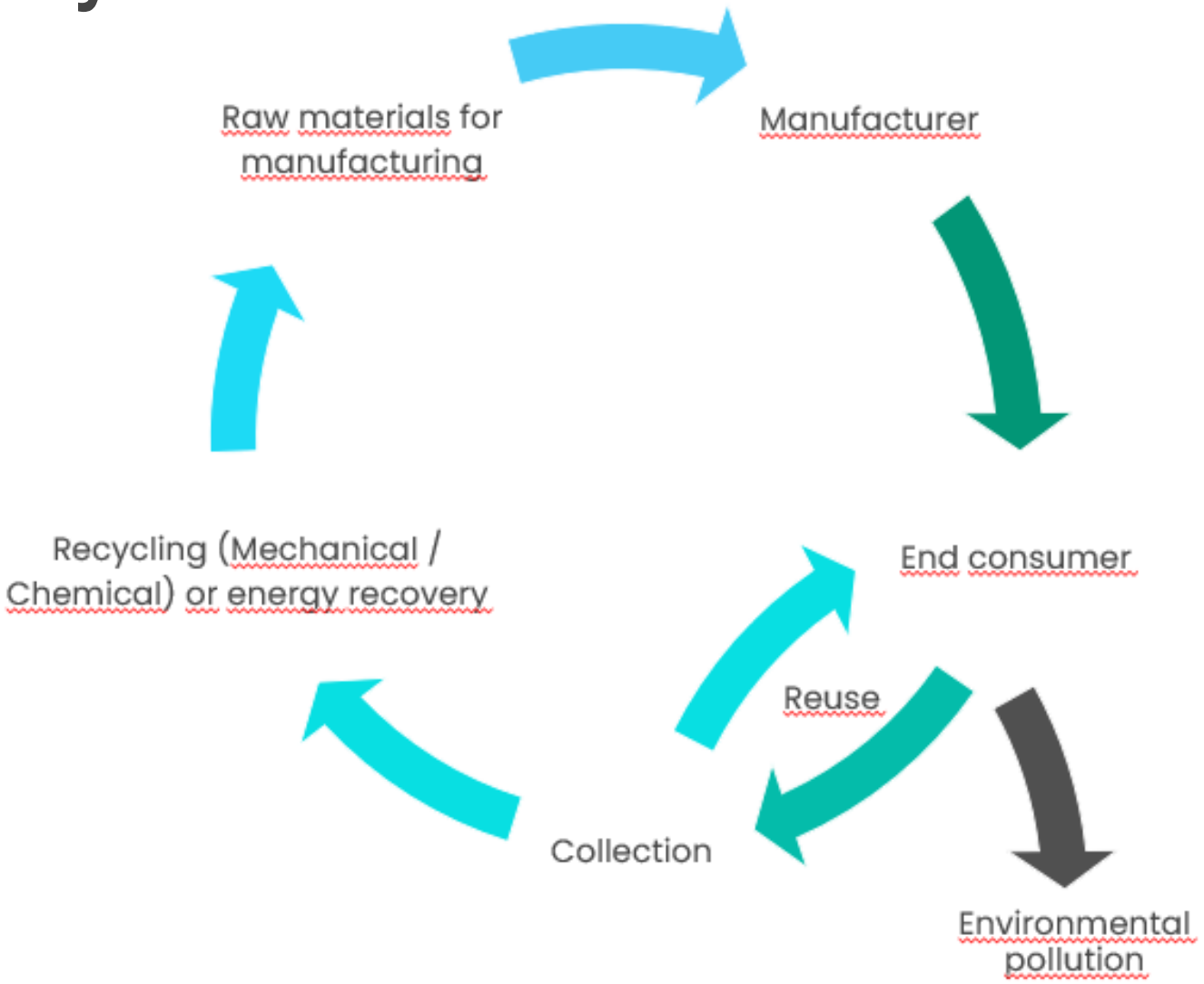
1. **Improve the economy and quality of plastic recycling.**
   a. Design for recyclability
   b. Boost demand for recycled plastics.
   c. Better and more harmonized separate collection and sorting.

2. **Stop plastic waste and littering**
   a. Prevention of plastic waste in our environment.
   b. Establish a clear regulatory framework for plastics with biodegradable properties.
   c. The growing problem of microplastics.

3. **Promote investment and innovation towards circular solutions**.
   a. Innovation is a key enabler for the transformation of the plastics value chain.
   b. EU research funding will support all these efforts

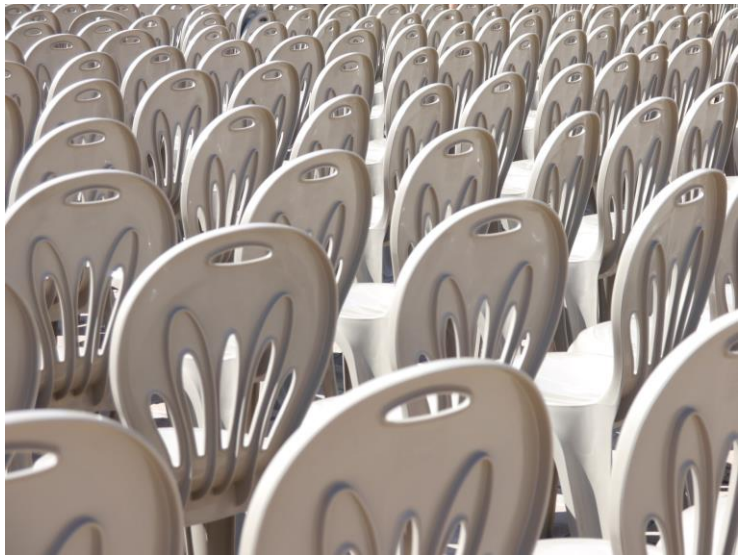
4. **Leveraging global action**
   a. The EU will continue to support international action.

Plastic life-cycle



Why plastics ?

- Plastics are used in a wide variety of products and have displaced other materials -such as wood, metal, and glass
- Plastics have many good properties, which is why their use has increased 20-fold globally in the last 50 years
- Plastic consumption has also led to a challenges: large amounts of plastic waste is generated and material value is lost as a result of single use and low recycling rates.
- In particular, ocean littering and microplastics have made people aware also of the harmful effects of plastics.
- The production of plastic requires four basic steps: the acquirement of raw material, synthesizing a basic polymer, compounding the polymer into a usable fraction, and lastly, molding or shaping the plastic



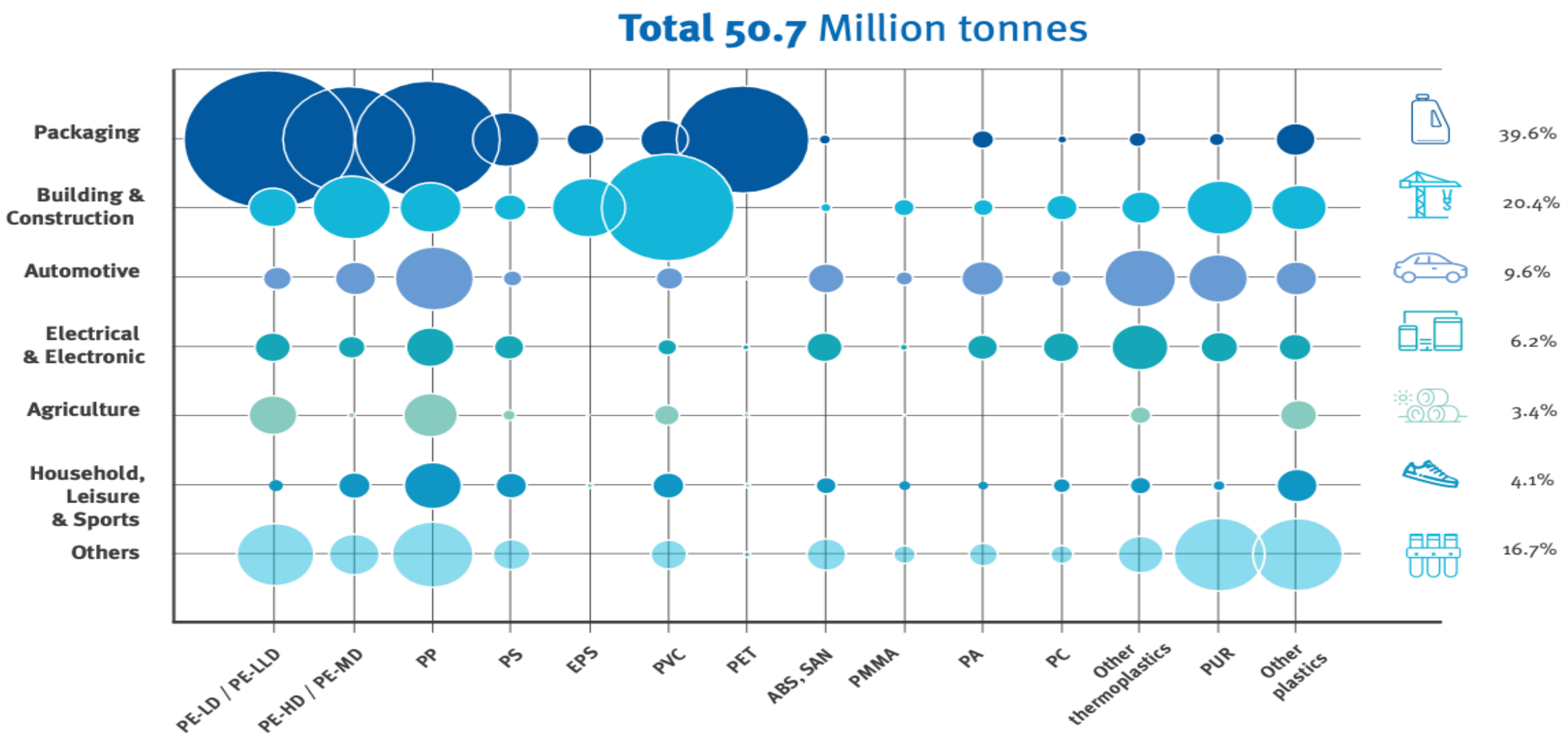
Use of plastics

- The general distribution of Western Europe – use of plastics:
  - packaging (40%)
  - construction industry (24%)
  - electrical and electronic industry (6%)
  - agriculture (6%)
  - cars and means of transport (3%).
  - For other uses, such as household items, healtscare, clothes and furniture (21%)
- Plastic waste is generated in all sectors of the economy
  - Companies = trade, logistics, manufacturing industry, construction, agriculture, fish industry and other service sectors
  - Consumer = Generated in households – packaging waste, plastic products

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.



Statistics – plastic waste (tons)

	Norway	Barents area *	Sweden	Barents area *	Finland	Barents area *
Packaging	209 000	16 720	320 000	16 000	133 320	20 000
Construc-tion	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	30 000	15 000 **				
Healthcare			12 000			

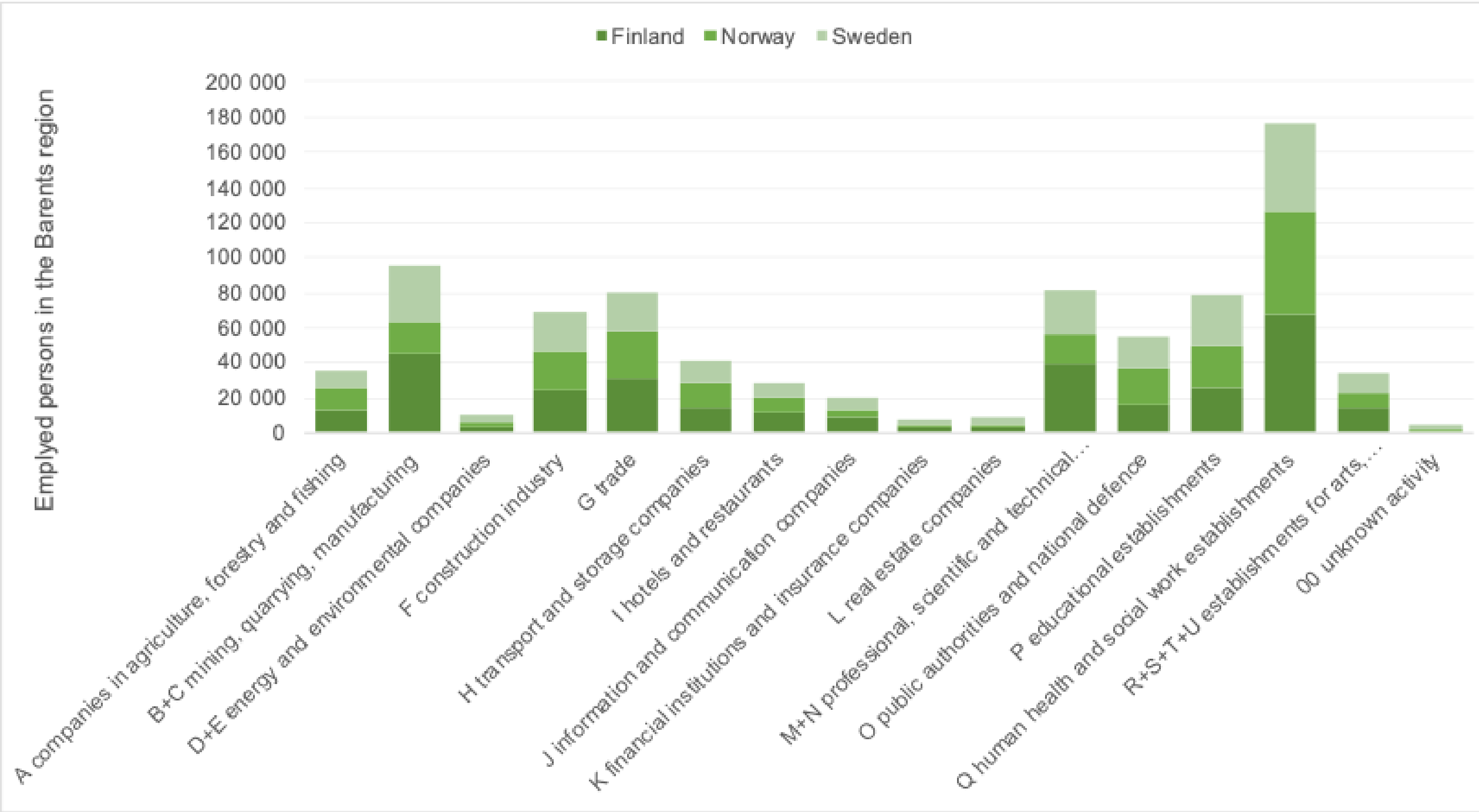
* Proportional to the number of inhabitants
** Estimated
*** Tyres contain 43 % rubber
**** Includes vehicles and tyres

References:

Norwegian Plastics Strategy (regjeringen.no)
www.naturvardsverket.se/496fd7/globalassets/media/publikationer-pdf/8800/978-91-620-8888-0.pdf
Finnish statistics: Rinki, SPT, Rengaskierrätys, Autokierrätys

Use of plastics in Barents area

- 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 main industry sectors in Barents that could produce corporate plastic wastes are
  - human health
  - mining and manufacturing
  - trade
  - construction
  - agriculture and fishing
  - hotels and restaurants
- The size of industries is measured as the number of local jobs.


Finland
Norway
Sweden
Emplyed persons in the Barents region
200 000
180 000
160 000
140 000
120 000
100 000
80 000
60 000
40 000
20 000
0
A companies in agriculture, forestry and fishing
B+C mining, quarrying, manufacturing
D+E energy and environmental companies
F construction industry
G trade
H transport and storage companies
I hotels and restaurants
J information and communication companies
K financial institutions and insurance companies
L real estate companies
M+N professional, scientific and technical…
O public authorities and national defence
P educational establishments
Q human health and social work establishments
R+S+T+U establishments for arts,…
00 unknown activity

Mining

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.

Keskinen Recycling collects various plastic materials from industry and construction contractors, like different plastic pipes and plastic containers, films and bale wraps.

They accept plastic materials to their production facilities in Kuortane all year round and from all over Finland. They can pick up larger batches directly from the factories, construction sites or farm.

They also offer companies waste material granulation services.

Fish industry

In fisheries and aquaculture fishing gears are one of the main plastic wastes as well as plastic and EPS 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.

Nofir is a Norwegian company operating since 2008.

We're collecting discarded equipment from fishing and fish farming around the world. Our end product is a raw material for the recycling industry which is used in a wide variety of products.

Aquaculture

Fishery

Waste companies

Fishing gears

UNDER SUP DIRECTIVE

> THE DIRECTIVE INTRODUCES THE EXTENDED PRODUCER RESPONSIBILITY (EPR) FOR FISHING GEAR TO ENSURE THAT MANUFACTURERS OF THE GEARS, AND NOT FISHERMEN, BEAR THE COSTS OF COLLECTING AND ORGANIZING THE WASTE MANAGEMENT FOR THE FISHING GEARS

Manufacturing industry

At the moment, the manufacturing industry uses too many different types of plastic, both in packaging and in end products.

In order for plastic to be recycled effectively, plastics should be sorted correctly and this would require a separate collection container for each type of plastic > which would take up a lot of space and disrupt production processes.

3 TIPS FOR INDUSTRY
1. Use clear/colorless plastic - especially avoid black plastic.
2. Use different types of plastic as little as possible.
3.Control the types of plastic you use. Use only one type of plastic in all packaging materials.

RAGN SELLS

Collected plastics are processed at one of Ragn-Sells' own processing plants, where they are sorted, baled or packaged in some other way for onward delivery to customers for recycling. Plastics is sold to recyclers in Europe and Asia.

Ragn Sells sell the following types of plastic:

- Low-density polyethylene (LDPE)
- High-density polyethylene (HDPE) Polypropylene (PP)
- Polystyrene (PS)
- Expanded polystyrene (EPS)
- Polyethylene terephthalate (PET)
- Polymethyl methacrylate (PMMA)
- Polycarbonate (PC).

Events

Many festivals face the same challenge: sorting plastic waste is challenging, and it often ends up in mixed waste.

Difficult plastic waste are shot glasses and bundles. There are also often several different types of plastic in the plastic collection containers, of which biodegradable plastic is problematic because it cannot be recycled with other plastic.

Problems solved by:

- Offering the visitors the possibility to sort their garbage into different fractions like cardboard, plastic, biowaste, and mixed waste
- Providing good sorting guidance
- Measuring the collected waste so that waste management could be improved in the following years
- Using smart waste management and sensors to improve emptying the containers in right time.

Oulu is the capital of Smart waste management in Finland

HAURU
Ouluainen ympäristötekijä

55% of Oulu's housing companies already use smart waste management. Thanks to data, they have optimized not just the routes but the number, type and size of waste bins.

Now it is possible to make 20% less collections and waste transport companies can serve more clients with the same resources.

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Hotels and restaurants

- Restaurants have been producing single-use plastic items, such as utensils, cups, and straws. No single use plastics are under SUP directive
- In addition to single-use plastic items, restaurants also generate plastic waste through packaging, such as takeout containers, bags, and wrapping like
- Hotels are producing plastic films (clear and colored plastic films) and plastic packaging
- Typical characteristics to tourism centers in northern parts of countries:
  - Seasonality
  - Lack of plastic waste collection service providers until 2023 in Lapland
  - Few plastic collection sites
  - Long distances to transport plastic waste
  - Plenty of vacation apartments

Plastics in the agriculture

- A wide range of plastic packaging is used in agriculture: wraps, fertilizer sacs, seeding trays, planting pots and plastic boxes that are used for crop collecting, handling and transport
- Other than plastic packaging are: plastic films used to store silage, plastic reservoirs, plastic irrigation systems, plastic tunnels and greenhouses

Agricultural plastic

- In Finland: New voluntary PRO, 4H, The Central Union of Agricultural Producers and Forest Owners (MTK)
- In Sweden: Svepretur
- In Norway: Grønt Punkt Norge

Norrbotten Län 2022

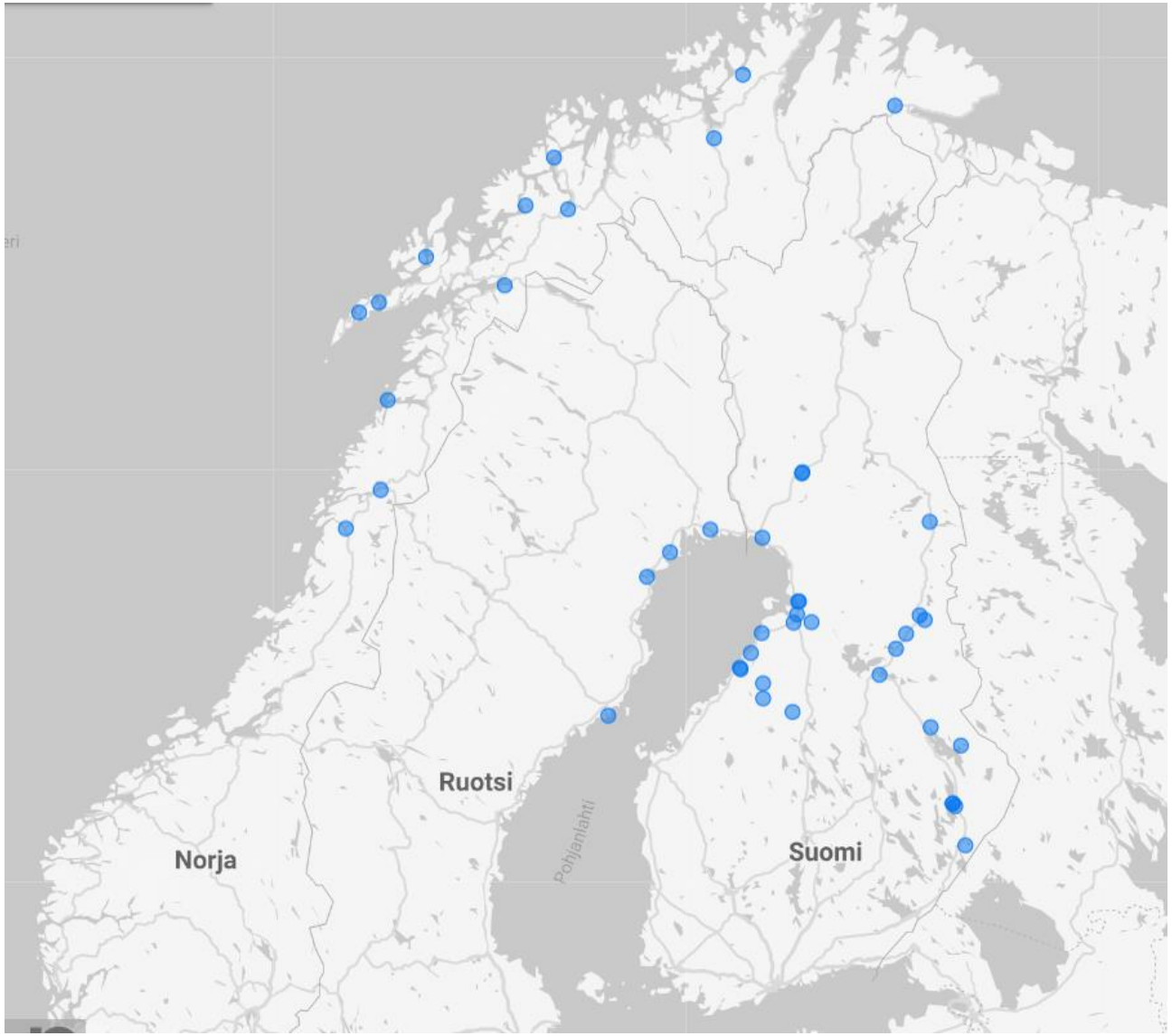
Kommun	Insamlingsplats	Datum
Boden	ÅVC i Boden	12 Sep - 14 Okt
Haparanda	Hänvisas till Kalix	
Kalix	Kalix ÅVC, plan till höger innanför grinden	5-9 September
Luleå	Tips på insamlingsställen tas tacksamt emot!	
Pajala	Tips på insamlingsställen tas tacksamt emot!	
Piteå	Hushållningssällskapet Agropark Öjebyn	12-13 September
Jokkmokk	Vuollerim, Bodenvägen 102	23-24 September
Älvsbyn	ÅVC Korsträsk	Alla vardagar
Övertorneå	Luttugården Soukolojärvi	22-23 Augusti
Överkalix	Saravalsvägen 16	29-30 Augusti

Collection and utilisation of plastic waste

- The plastic waste is typically collected separately from households and industry, trade, construction, agriculture and aquaculture.
- Producer responsibility applies to plastic packaging and producers of packages are obligated to organize the wide collection network for plastic waste packaging
- Many municipal recycling stations also accept different types of plastic waste. Return arrangements vary from municipality to municipality
- Waste companies and municipal waste organisations that offer plastic transport, collection, handling and recycling services in Barents area are many:
  - Norway: Remiks, Lofoten Avfallsselskap IKS, Reno-Vest IKS, Iris Salten IKS, Finnmark Ressursselskap AS, ØSTBØ and SHMIL
  - Sweden: Kuusakoski Ab, Stena Recycling Ab, Ragn-Sells, and Lycksele avfall & vatten AB
  - Finland: L&T, Revisol, Hettula, Ecomurske, Esa ja Pojat (Pohjanmaan hyötykäyttö), MP roskaton, Kempeleen jätekuljetus and Itä-Suomen murskauskeskus and municipal waste stations
- The collected plastic waste is incinerated or sorted and processed into recycled plastic raw materials
- The goal is that 50 % of the plastic waste generated in the EU would be recycled by 2025

Plastic packaging waste collection points

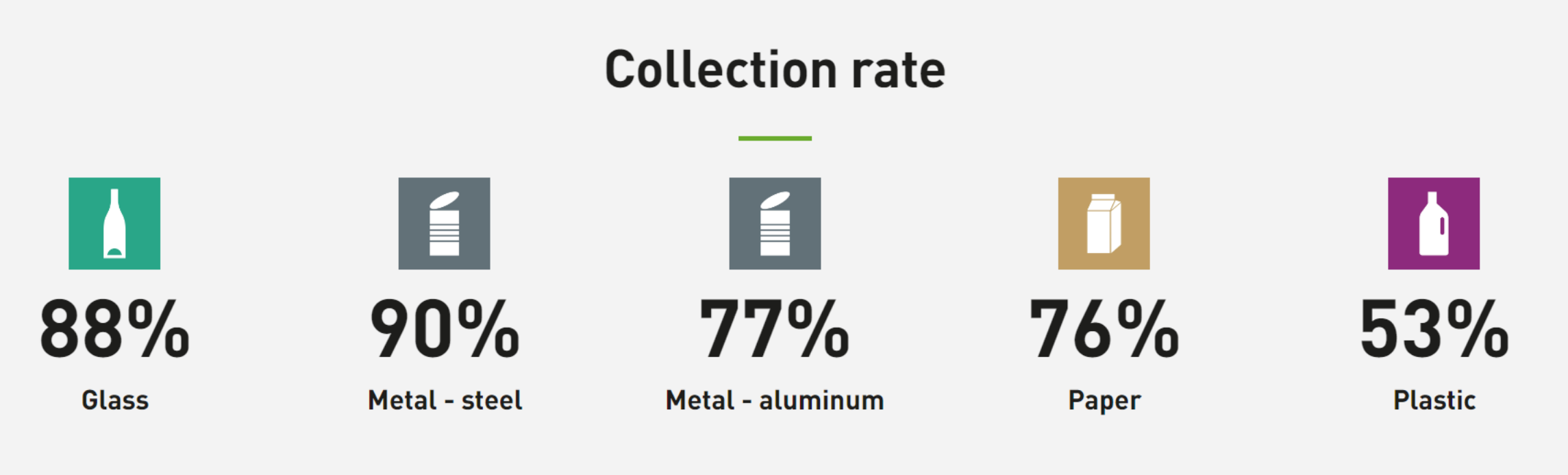
- Organizers:
  - Grønt Punkt Norge (Norway)
  - FTI and TMR (Sweden)
  - Finnish Packaging Producers Ltd SUMI (Finland)
  - + 4H collection (Finland)
- Collected packaging waste:
  - Hard plastic (HDPE, PP)
  - PP film and laminates
  - LDPE films
  - PP bags
  - PS/EPS (polystyrene)
  - Agricultural plastics



Collected plastic packaging waste

- Sweden (FTI): Recycling rate for household + commercial packaging = 32 % (2021)
  - Collectors: Stena Recycling (own recycling plant), Luleå Miljöresurs AB, BDX Företagen AB
  - All packaging that FTI collects is transported to recycling facilities that recycle as much of the collected material as possible.
  - The material that can’t be recycled is sent for energy recovery and used as a substitute for fossil raw materials in industry
- Finland (Rinki): Recycling rate for packaging waste = 25 % (2021)
  - Collectors: L&T ympäristöpalvelut (own recycling plant), Itä-Suomen murskauskeskus (material processing), TKL-Kuljetus, JPS-Kuljetus, Encore Ympäristöpalvelut/Stena Recycling
- Norway (Grønt Punkt Norge): Recycling rate for companies packaging waste = 38,7 % (2022)

Collection rate of different packages in Sweden



https://fti.se/en/about-fti/statistics

Plastic waste utilization

Incineration with energy recovery is still the most common form of treatment for plastic waste

The largest amount of plastic that is recycled originates from packaging, PET bottles, tyres, electrical equipment and agricultural plastic

Plastic recycling

Plastics recovery methods can be grouped into four categories:

- Recovery in own processes: manufacturing plastic side streams are returned back to the manufacturing process
- Mechanical recycling in closed loops: this method maintain the quality of materials but require 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.

STENA RECYCLING

MECHANICAL PLASTIC RECYCLING

At Stena's largest facility in southern Sweden - Stena Nordic Recycling Center - they have developed new techniques for recycling different plastic qualities.

In a recycling process, a technology is used that converts soft plastic (LDPE) into pellets - which can then be used to manufacture plastic bags and garbage bags.

Another process cleans and shreds plastic from electronics so it can be used in new products.

https://www.stenarecycling.com/sv/vart-erbjudande/losningar-per-materialslag/plast/

Lamor has decided to construct a chemical recycling plant of plastics together with Resiclo

Lamor has signed today an agreement with Resiclo Oy with the objective of constructing a chemical recycling plant to treat plastics in Kilpilahti area located in Porvoo, Finland.

In the first phase, the plastics chemical recycling plant in Kilpilahti is estimated to have an annual capacity of 10.000 tons. The aim of Resiclo Kilpilahti is to build an annual capacity of approximately 40.000 tons of chemical recycling of plastics in Finland by the end of 2026.

The construction work on the Kilpilahti recycling plant is expected to begin in the second half of 2022, and the commissioning of the recycling plant is scheduled to take place in 2023. The recycling plant will produce chemically recycled raw material from waste plastics, which can be used in the petrochemical industry to produce recycled plastic and it can be delivered to suitable refineries for further processing.

https://www.lamor.com/articles/lamor-has-decided-to-construct-a-chemical-recycling-plant-of-plastics-together-with-resiclo

Syklo

Old hard plastic soil pipes and other hard plastics used in earthworks gain a new life when treated by Syklo Oy. Recycling hard plastic pipes is only a taste of things to come, as Syklo plans on further boosting the recycling of plastic products.

Hard plastic construction pipes have been challenging to recycle. Recycling and reutilising hard plastics has been relatively inefficient in Finland, so a large portion of plastic pipes have either made their way to elsewhere in Europe for recycling or to a waste incineration plant to be used as an energy fraction.

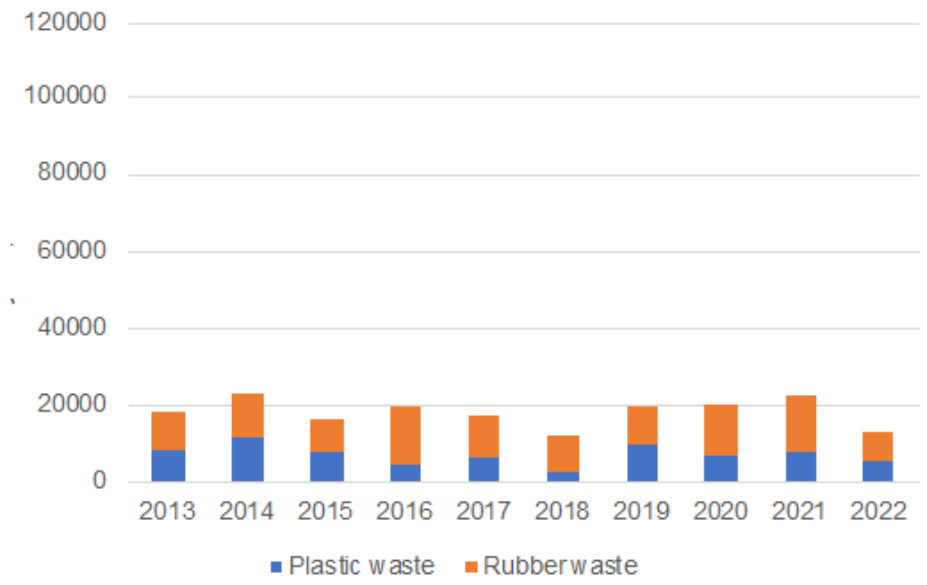
Freighting plastic pipes over long distances is not a very cost-effective recycling method. Waste incineration has not been a very good solution either, as large plastic pipes are difficult to treat

Syklo intends to further improve the recycling of plastic in the future. The next thing to be processed will be large, decommissioned recycling containers. They are of the same plastic grade as hard plastic pipes.

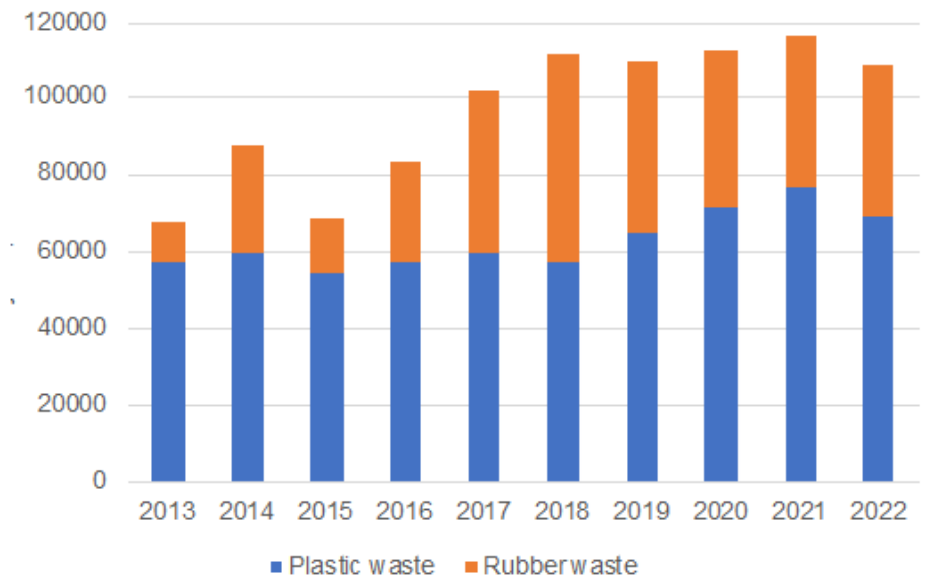
https://syklo.fi/en/recycling-hard-plastic-doubles-the-life-cycle-of-plastic-tubes/

Norway: Plastic and rubber import and export

Import, tons



Export, tons

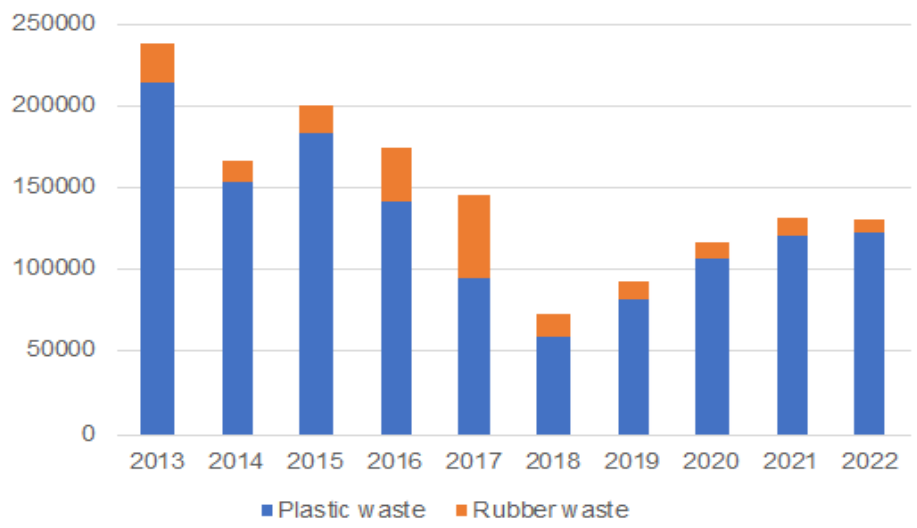


Source: SSB

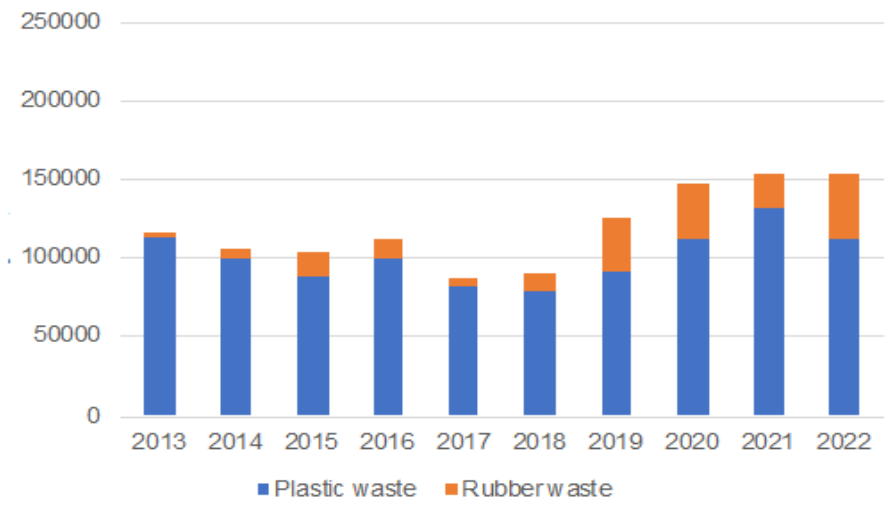
In Norway, most of the international trade in plastic waste is ethylene polymers, i.e. polyethylene (PE). There are also many unspecified qualities. Significantly more plastic waste is exported than imported. Rubber waste is imported slightly more than plastic waste. In exports, the quantities of rubber 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

Sweden: Plastic and rubber import and export

Import, tons



Export, tons

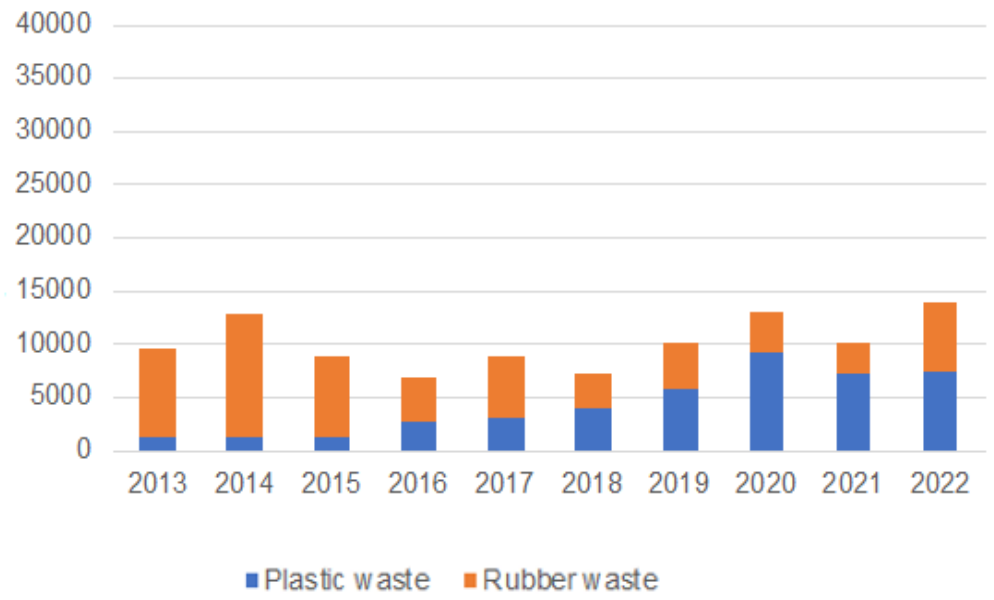


Source: SCB

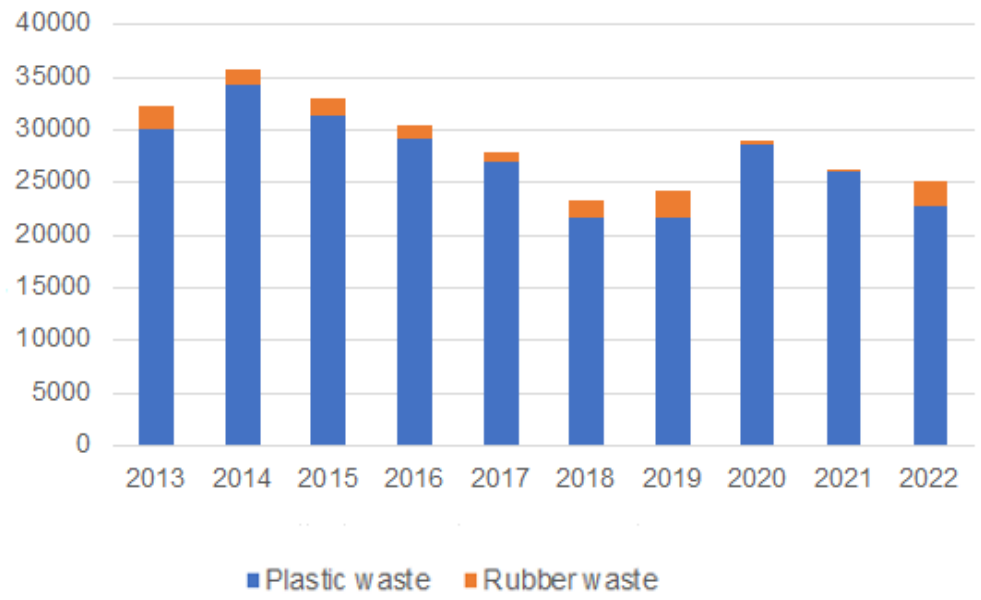
In Sweden, almost the same amount of plastic waste is imported as exported. Almost all imported plastic waste comes from Norway and the largest exporting countries are Germany, Lithuania, and Poland. Rubber waste is imported and exported significantly less than plastic waste.

Finland: Plastic and rubber import and export

Import, tons



Export, tons



Source: Tulli, Uljas-tietokanta, CN-haku

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. 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.

Conclusions

- Waste legislation is promoting the separate collection of plastic waste
- SUP directive is minimizing the use of single use plastics
- Agricultural plastic collection is developing
- Ocean littering is seen as a challenge and companies make efforts to clean the oceans
- Chemical recycling is coming and new plants are under construction

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Reports and strategies related to plastic

- Norwegian plastic strategy https://www.regjeringen.no/en/dokumenter/norwegian-plastics-strategy/id2867004/
- Achieving Circularity https://www.systemiq.earth/wp-content/uploads/2021/06/AchievingCircularity-MainReport-June2021.pdf
- Plastic in Sweden https://naturvardsverket.diva-portal.org/smash/get/diva2:1665130/FULLTEXT01.pdf

Reports and strategies related to plastic

- Muovien haitalliset ympäristö- ja terveysvaikutukset https://www.julkari.fi/bitstream/handle/10024/144561/SYKEra_17-2022_Muovien-haitalliset-vaikutukset.pdf
- Muovijätteestä tuotteeksi https://helda.helsinki.fi/bitstream/handle/10138/339305/SYKEra_2_2022_Muovijatteesta-tuotteeksi.pdf?sequence=1&isAllowed=y
- How is Europe responding to the plastic challenge? – An overview of strategies in selected countries https://helda.helsinki.fi/handle/10138/345370