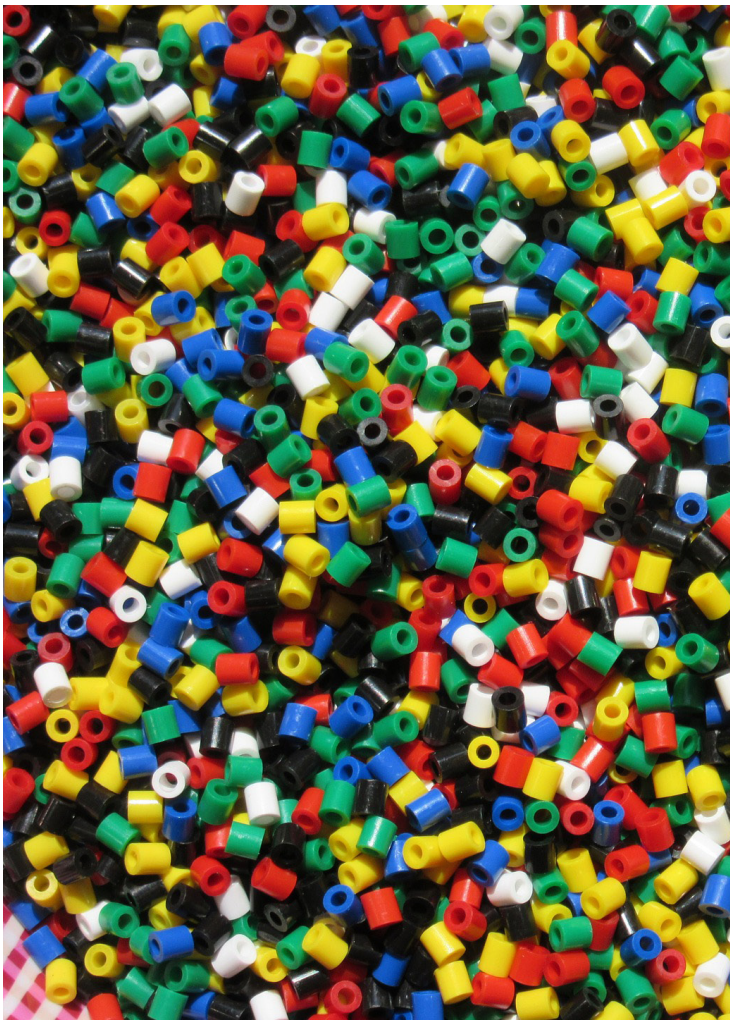
NATUR VÅRDS VERKET

SWEDISH ENVIRONMENTAL PROTECTION AGENCY

Plastic in Sweden – facts and practical advice

Data from 2020



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This is a summary of the report
Kartläggning av plastflöden i Sverige 2020 – med avseende på råvara, produkter och avfall
(Mapping Plastic Flows in Sweden) which is available here: www.naturvardsverket.se/978-91-620-7038-0
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SMED is primarily commissioned to produce and develop environmental statistics by the Swedish
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Use plastic where it provides the most benefit

Plastic is of huge importance in contemporary society. We use plastic for almost everything in our everyday lives, and consumption is expected to increase. Plastic's varying properties mean that it has many areas of use, but our high level of plastic consumption causes environmental impact in all areas of its lifecycle, from extracting raw materials to waste treatment and leakage into nature.

Waste leads to great climate impact

The central element of plastic's environmental impact is its strong dependence on fossil-based materials, as most plastic is produced from fossil oil and gas. Additionally, the extraction and production processes require large amounts of power that is often fossil in origin.

Our high level of plastic consumption also leads to large amounts of plastic waste, which is usually incinerated and the energy recovered. Greenhouse gas emissions occur when plastic waste is incinerated, with over 90 per cent of carbon emissions due to energy recovery from waste in Sweden estimated as coming from fossil-based plastic.

Plastic is high on the agenda

Utilising the advantages of plastic while minimising its disadvantages is at the top of the agenda in Sweden, the EU and globally.

In Sweden, plastic is among the prioritised flows that are highlighted in the strategy for a circular economy. The government's action plan for plastic presents how work should be carried out to achieve a sustainable use of plastic, and the EU has chosen to highlight plastic as one of the seven prioritised product value chains in its circular economy action plan.

Producers must take responsibility

In Sweden, producers have a legislated responsibility for a number of products made from plastic. This means that producers must report current volumes, as well as collecting and managing the products when they are no longer in use.

Products that contain plastic and which are covered by producer responsibility are packaging, PET bottles, vehicles and electrical and electronic products. There is a voluntary agreement for agricultural plastic.

Single-use plastic must be reduced

The EU has introduced a directive to reduce the consumption of single-use plastic products. These products are defined as being entirely or partially made from plastic and are not designed, constructed or introduced on the market for return to a producer to be refilled or reused for the same purpose.

Sweden introduced a tax on plastic carrier bags in May 2020, entailing a higher price for these bags and stores beginning to charge even for the thinnest bags.

In addition, a prohibition on some single-use plastic 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, straws, etc.

Facts about plastic

There are many different types of plastic.
The most common ones in Europe are polypropylene and polyethylene.

The four most common types of plastic

Type of plastic	Abbreviation	Example products
Poly-propylene	PP	Food packaging, pipes, vehicle parts, banknotes
Poly-ethylene, low density	PE or LDPE	Reusable bags, agricultural wrapping, food packaging film
Poly-ethylene, high density	PE or HDPE	Toys, shampoo bottles, pipes, household products
Polyvinyl chloride	PVC	Window frames, profiles, flooring, pipes, cable insulation, garden hoses, inflatable pools

Other types of plastic

Type of plastic	Abbreviation	Example products
Polyurethane	PUR	Insulation, mattresses
Polyethylene terephthalate	PET	Drink bottles
Polystyrene	PS	Single-use products, glasses frames
Polystyrene, expanded	EPS	Insulation, takeaway food containers

Plastic is used in many areas

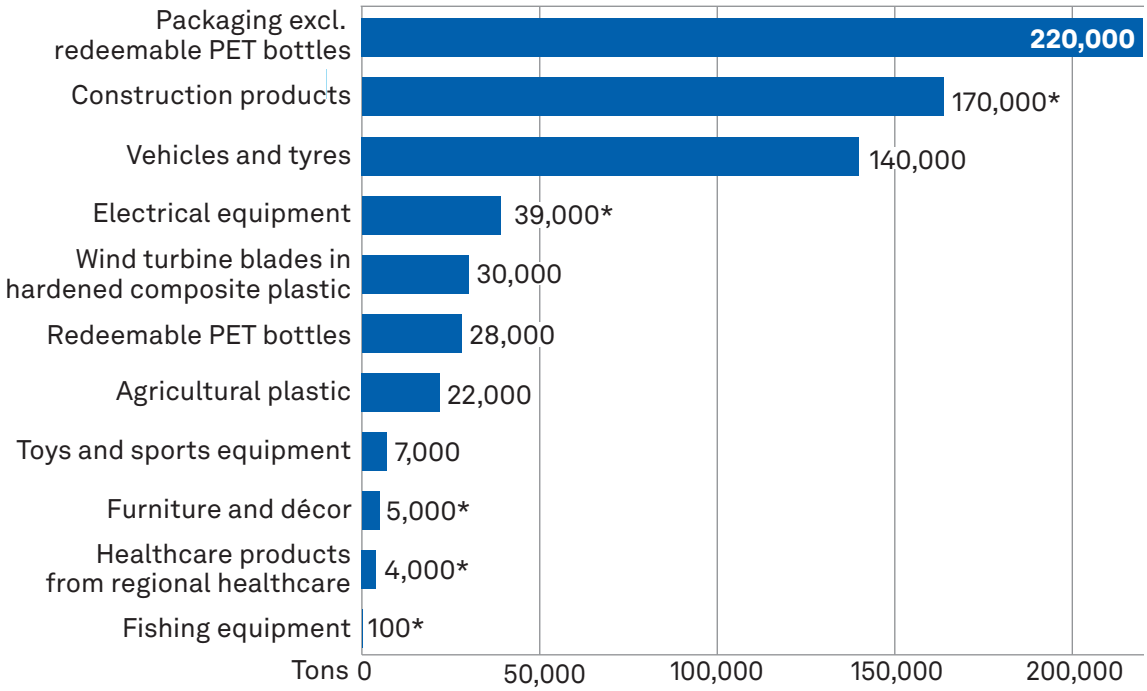
In total, almost 1.3 million tons of plastic raw materials entered the Swedish market in 2019. This is equivalent to more than 120 kg of plastic per person and year – about the weight of a four-metre-long plastic rowing boat.

Plastic's properties can be varied, so it has many areas of use. The biggest of these areas is packaging, followed by the construction sector and vehicles and tyres. Many products that contain plastic are exported, and others are imported, so the amount of plastic raw materials is not the same as the amount of plastic in the products that enter the market in Sweden.

The total amount of plastic in the product groups mapped in 2020 exceeded 660,000 tons. The diagram on the next page illustrates the amounts of plastic that entered the market in 2020, after which there is a brief description of usage for the areas that were mapped.

However, there are difficulties in estimating the amounts of products that enter the Swedish market, as there are private imports that are often not registered with Swedish Customs, as well as large amounts of plastic in complex goods with varying proportions of plastic. The amount of plastic in products that enter the market is thus often underestimated.

Plastic that entered the market in 2019 (tons)



**Minimum amounts that entered the market, see text for each product category for more information.*

Packaging (excluding redeemable PET bottles): 220,000 tons

Packaging is the largest area of use for plastic. In 2020, 220,000 tons of plastic packaging (excluding redeemable PET bottles) entered the Swedish market, where the majority (almost 60 per cent) was consumer packaging, which primarily ends up in households.

However, the amount of plastic packaging on the market is underestimated, partly because not all companies take their responsibility as producers. Another uncertainty is that packaging waste from private imports, among other things, is rarely reported. The exact amount is therefore unknown, so the official statistics are not entirely correct.

Sweden's goal is that in 2025 at least 50 per cent of all plastic packaging, including redeemable PET bottles, will go to material recycling. There is an equivalent goal within the EU. In 2020, however, only 34 per cent of the plastic packaging that entered the Swedish market was recycled for material. Instead of being sorted and recycled for material, large amounts of plastic packaging from households and businesses end up as mixed waste that is incinerated and the energy recovered.

Construction products: Over 165,000 tons

Construction products are the second-largest area of plastic use. It is estimated that more than 165,000 tons of plastic was used in construction products in 2020, based on the quantification of plastic in pipes, insulation, materials for floors and walls, electrical installations, plastic constructions, components and fitting, as well as doors and windows.

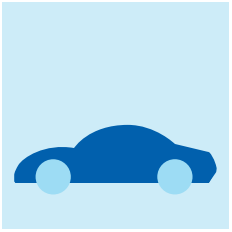
This is an underestimation, as there is actually plastic in more construction products than this.

Many types of plastic have properties that make them suitable for use in construction as they are compact, light and relatively cheap, have high moisture resistance and good insulation properties. Construction products in plastic generally require little maintenance and also have a long life, between 30 and 50 years.

The construction industry also uses large amounts of plastic packaging (such as shrink wrap and stretch wrap, bubble wrap, plastic ties and timber wrap) for packaging construction products.

Only about 2.5 per cent of the plastic waste generated by the construction industry goes to material recycling, a total of less than 3,000 tons per year. The plastic that goes to material recycling is from pipes, insulation and leftovers from flooring and pipes.

Vehicles and tyres: 140,000 tons



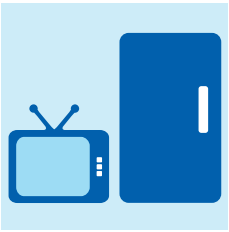
An ordinary family car contains around 300 kg of plastic, but the amount varies with the manufacturer and model. The total amount of plastic in the cars, trucks, buses, mopeds, motorcycles and ATVs that were added to Sweden's traffic in 2020 is estimated at 109,000 tons.

Tyres are about 43 per cent rubber.[1] The amount of rubber in tyres that entered the market in 2020 (including tyres on new vehicles) is estimated to be about 31,000 tons.

Plastic in vehicles is of a high quality, but there are few incentives for reusing it or recycling it for material. Only a small amount from scrapped vehicles currently goes to material recycling, primarily bumpers and larger plastic fittings that are easily removed, while the rest is incinerated for energy recovery and a small amount goes to landfill.

In 2020, almost 91,000 tons of car tyres were collected. The majority (65 per cent) was incinerated for energy recovery, 24 per cent went to various types of material recycling, 9 per cent was used as blasting mats and 2 per cent was exported. The recycled tyre material is used in pavements and cycle paths, as levelling material for artificial grass pitches, in noise barriers or as outdoor tiling and activity areas.

Electrical equipment: 39,000 tons



Based on how much electrical equipment entered the market in 2020, the amount of plastic in electronics is estimated to be 39,000 tons. However, there are uncertainties because different electronics products have different plastic contents. For example, fridges and freezers are around 20 per cent plastic, while washing machines and tumble driers only contain about 3 per cent.

The electrical waste collected in 2020 contained about 23,000 tons of plastic. More than half of the plastic collected went to material recycling and almost 40 per cent to incineration with energy recovery. The remainder went to landfill.[2]

1. Rubber is included in this overview because it is a polymer.
2. Although there is a prohibition in Sweden on placing burnable and organic waste in landfills, exemptions may be permitted for specific waste.

Vind turbine blades: 30,000 tons

In 2020, 357 wind turbines were built in Sweden. Their blades contained more than 20,700 tons of hardened composite plastic. It is estimated that the wind turbines also consisted of more than 9,600 tons of other plastics. There is a lack of information about how the plastic is processed when the blades are replaced or scrapped, but the material is currently difficult to recycle.

Redeemable PET bottles: 28,000 tons

In 2020, 25,000 tons of redeemable PET bottles entered the Swedish market. In total, 86 per cent of the PET bottles that entered the market had their material recycled to new bottles, plastic trays, wrapping, etc. This is equivalent to 24,000 tons of plastic.

Agricultural plastic: 22,000 tons

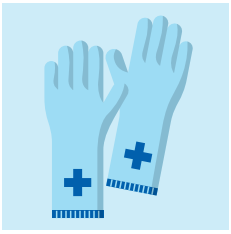
Around 22,000 tons of agricultural plastic entered the Swedish market in 2020. Plastic has many functions in the agricultural sector because it is relatively cheap, elastic, waterproof and durable.

Under the sector's voluntary agreement on plastic, almost 14,000 tons was collected in 2020. Agricultural plastic is often very dirty after use, due to soil, stones and gravel. In total, about 75 per cent of the collected agricultural plastic went to material recycling and the rest went to incineration with energy recovery.

Toys and sports equipment: 7,000 tons

It is estimated that around 4,200 tons of plastic in toys and 3000 tons of plastic in sports equipment entered the Swedish market in 2019. These products are generally disposed of in municipal unsorted waste; they are incinerated and the energy recovered.

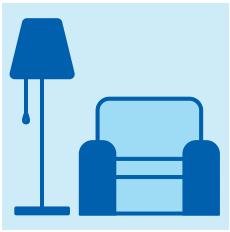
Medical plastic (within healthcare regions): Over 4,000 tons



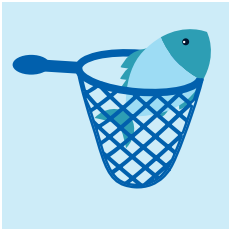
Healthcare uses large amounts of single-use plastic, from cups to surgical equipment, blood bags, cleaning products, aprons, gloves, etc. Because these are primarily single-use products, the amount of plastic waste is assumed to be of about the same volume as the plastic that enters the market in healthcare, which is also indicated by the waste analyses that have been carried out, called pick analyses.

However, the volume of products and waste is probably an underestimate, as only a few pick analyses have been conducted and mapping only includes product and waste flows from regional healthcare, so they do not include private or municipal healthcare.

Furniture and décor: Over 5,000 tons



In 2019, at least 5,000 tons of plastic in furniture and décor entered the market in Sweden. This is an underestimate, as it only includes furniture entirely made from plastic. The amount of plastic in furniture that is only partially plastic is thus unknown. Uncertainty about waste management for furniture and décor mean that quantification of the amount of plastic waste and type of waste treatment has not been possible.



Fishing equipment: Over 100 tons

In Sweden, at least 100 tons of plastic entered the market as fishing equipment in 2020. The total amount of fishing equipment that was disposed of in 2020 could not be assessed. However, around 40 tons of plastic material recycling was collected at Sweden's only marine recycling centre.

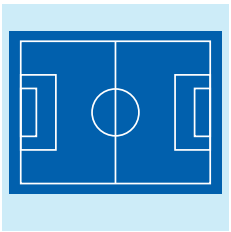
About 80–85 per cent of the waste that ends up in the seas around the EU is plastic, which is calculated based on the rubbish that washes up on beaches in the union. Around 27 per cent of this plastic is fishing equipment. Marine waste is the origin of microplastic and has a huge impact on marine ecosystems, biodiversity, tourism and human health, among other things.

Single-use products: No information

The directive on single-use plastics states that cups and food containers as two products for which consumption must considerably reduce over the next few years. Sweden's goal is to reduce consumption by 50 per cent between 2022 and 2026.

This investigation has mapped the amount of plastic that entered the Swedish market in the form of cups and lids. In 2020, there were at least 7.2 million plastic cups, 22 million paper cups and 8.9 million plastic lids. This is equivalent to 60 to 160 tons of plastic, but the figures are uncertain as the total amount of cups and lids has been difficult to determine.

Artificial grass and activity areas: No information



Sweden has about 1,300 outdoor football pitches in artificial grass. Playgrounds and sports facilities that use moulded rubber are also common. The total area of artificial grass pitches and activity areas is estimated to be approximately 1.2 million square metres. This varies between municipalities and appears to be increasing, which entails larger amounts of waste that need managing.

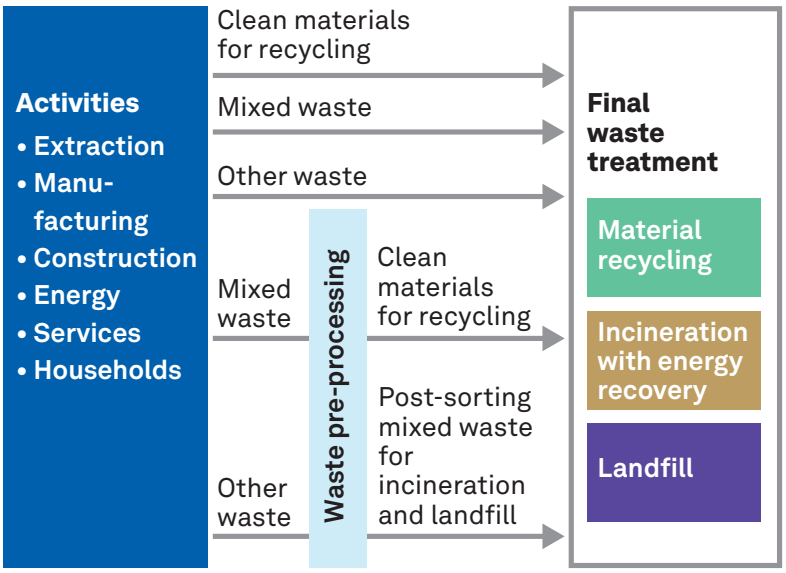
It has been impossible to quantify the plastic flow from artificial grass and activity areas because of significant uncertainty about the amount of waste that is generated.

Plastic consumption generates huge amounts of waste

Plastic consumption leads to huge amounts of waste. This can either be sorted and separated for material recycling, or end up as mixed fractions which, after varying degrees of pre-processing, go to material recycling, incineration with energy recovery, or landfill.

However, not all material from the sorted plastic waste is recycled to make new products. If it does not fulfil requirements for cleanliness, for example, it is removed during pre-processing and goes to another type of waste treatment, usually incineration with energy recovery. Some plastic waste is exported for post-processing and recycling.

Waste flow schematic



Facts about plastic waste

• In 2020, most plastic waste arose in the product groups of plastic packaging, including redeemable PET bottles (339,000 tons), construction products (more than 120,000 tons), and vehicles and tyres (94,000 tons).

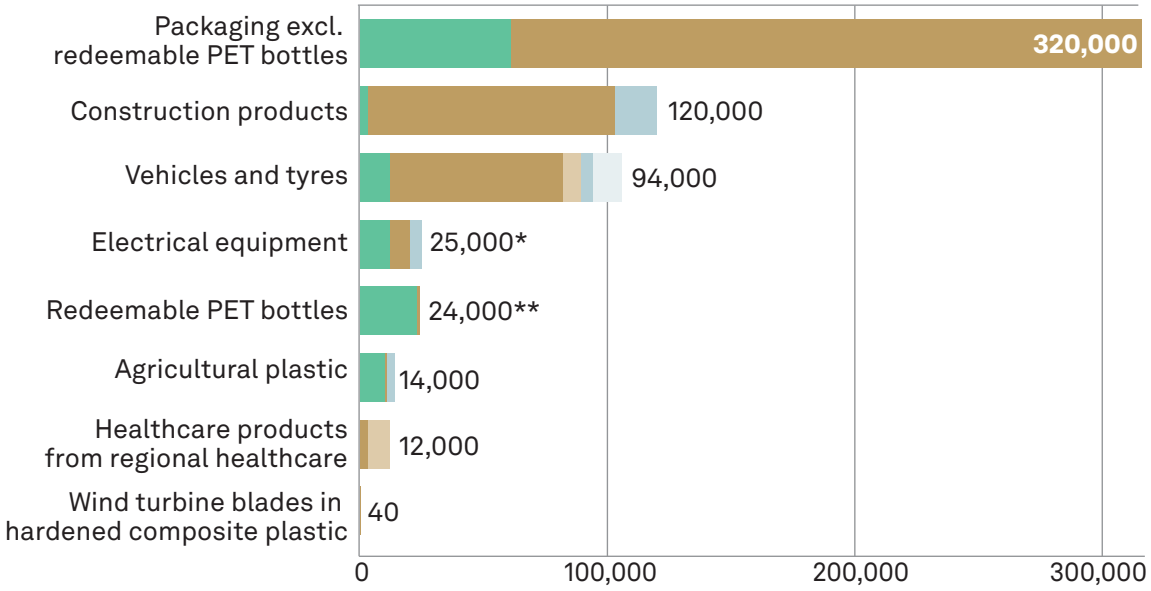
• The estimation of plastic in waste flows that cannot be traced back to specific product groups shows that the largest amount came from mixed commercial and post-sorting waste (270,000–600,000 tons), followed by sorted plastic waste from the manufacturing industry (240,000 tons) and plastic in non-recyclable waste (excl. packaging, 83,000 tons). In total, municipal mixed waste contained over 280,000 tons of plastic.

• Incineration with energy recovery is the most common form of treatment for plastic waster in Sweden. In 2020, more than 1.1 million tons of plastic was sent for energy recovery at Sweden's incineration plants, and around 76,000 tons of plastic and rubber waste was used as fuel in the cement industry. This is equivalent to about 87 per cent of the plastic that entered the market.

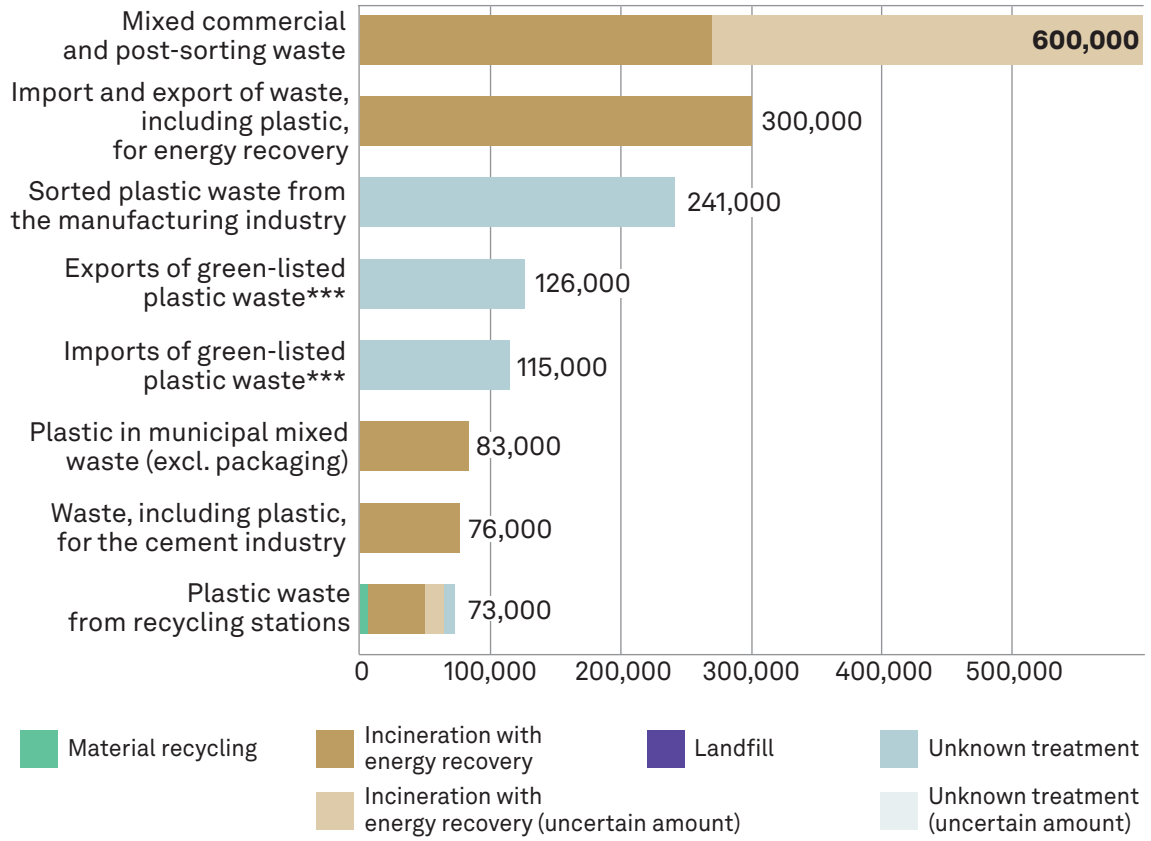
• In total, about 122,000 tons of plastic waste went to material recycling in 2020, equivalent to about 10 per cent of the plastic that entered the market. The largest amount of plastic was material recycled from packaging, PET bottles, tyres, electrical equipment and agricultural plastic.

• If waste that contains plastic is to be used as land-fill in Sweden, it must be exempted from the landfill prohibition. The total amount of plastic waste that went to landfill in 2020 could not be quantified, but exemptions were granted for small amounts that included remnants from scrapping facilities, hazardous substances such as PVC, and cabling and blast mats.

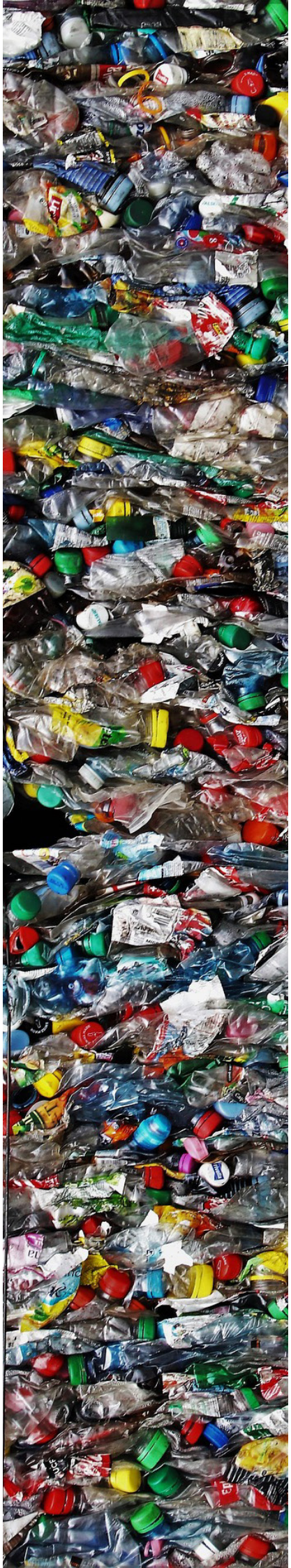
Plastic waste per product category, divided by waste treatment (tons)



Plastic waste in other waste flows, divided by waste treatment (tons)



** A limited amount of electrical equipment goes to landfill, but this is too small to be visible in the diagram.*
*** The energy recovery consists of rejects from Veolia Svenska PET's processes.*
**** Non-hazardous waste for recycling. Information must be submitted for cross-border transports.*



Future products must be circular and resource-smart

To achieve a sustainable use of plastic, future solutions must be designed so that

- the right plastic is used in the right place.
- unnecessary plastic is avoided and the plastic that is used is utilised efficiently, in terms of resources and climate impact, in non-toxic circular flows.
- leakage to the environment is minimised.

To achieve this, actors must work together to find joint solutions, for example in areas like:

- **Designing products and packaging** that enables a longer life by allowing the product to be repaired or reused.
- **Increased sorting and separation of plastic,** such as by stating demands in procurements.
- **Transitioning to materials with less environmental impact** by switching to recycled or biobased plastic, or replacing plastic with another material with less environmental impact from a lifecycle perspective.
- **More resource-efficient use** by reducing unnecessary waste, only using plastic packaging where necessary, and minimising the amount of material.
- **Increasing the quality of recycled plastic,** such as by choosing plastic without hazardous additives and enabling information about the product's content to reach the actor that will recycle the product.

Material recycling can significantly increase

Despite the recent increase in demand for recycled material, more actors need to recalibrate to create an entirely circular system. Large, stable and clean plastic flows combined with better logistics solutions for sorting and collection are necessary to fulfil the huge potential for increased material recycling.

Most recycled plastic is currently exported, but new facilities for sorting, upcycling and mechanical/chemical recycling are planned for construction in Sweden. A couple of examples are Svensk Plaståtervinning's new sorting and upcycling plant for plastic packaging waste in Motala, called Site Zero, and Borealis' planned facility for chemical recycling in Stenungsund.

Uncertainty about content is a problem

Only a small proportion of plastic now goes to material recycling. Instead, the majority goes to energy recovery through incineration.

Some of the barriers to increased material recycling of plastic are:

- **Poor sorting**
  Lack of space hinders the sorting of plastic. Poorly sorted plastic leads to plastic waste ending up in mixed waste and going to incineration with energy recovery instead of material recycling.
- **Badly designed products**
  Plastic is often found in complex products. It may also be attached to other materials and contain additives that hinder material recycling..
- **Poor match between supply and demand**
  Currently, large volumes of plastic are sold on global commodity exchanges, while individual companies have specific requirements for the plastic included in their products. The result is that it is difficult to find the correct quality for the various uses.
- **Uncertainty about content**
  A lack of knowledge about plastic waste's origin and content, such as potentially hazardous substances, means that it is sent to incineration with energy recovery instead of material recycling.

Facts about recycling

• MATERIAL RECYCLING

Material recycling means that waste is processed so 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 (e.g. collection, pre-sorting, shredding, automatic sorting, washing, milling and granulating). The steps that are required differ depending on the type of plastic waste to be recycled and which sorting technology is used.

Material is lost in most stages of the process, so how much of the material ends up in new products varies.

• MECHANICAL RECYCLING

Mechanical recycling is the most common technology for material recycling of plastic. It means that the plastic is melted and reshaped into a new product.

The quality of plastic may decline when it is melted, which may entail it being used in applications with lower demands. Mechanical recycling requires less energy than chemical recycling.

• CHEMICAL RECYCLING

Chemical recycling means that the plastic is broken down into smaller molecules, which can then be used to make new products. There are several techniques for chemical recycling, such as pyrolysis, solvolysis and gasification.

What can you do?

Five pointers for businesses and organisations:

1. **Reduce unnecessary plastic use in all areas.**
   Conduct an inventory of where you use a lot of plastic and consider whether you can phase anything out or reduce the amount of plastic being used. Investigate recyclable alternatives.
2. **Use plastic made from raw materials with a minimal environmental impact.**
   In purchasing or production, investigate opportunities for using or purchasing plastic with a lower carbon footprint from a lifecycle perspective, such as recycled, renewable or biobased plastic. Choose plastic that is free of hazardous substances. Place demands on your suppliers during procurements.
3. **Enable material recycling for plastic.**
   Establish collection targets and hire a waste contractor who can tell you what happens to the plastic material. Avoid laminates and mixed materials that make material recycling difficult. Avoid decomposable plastic as it is not compatible with current recycling systems. Choose plastic that is in demand on the recycling market, such as polypropene or polyethylene.
4. **Reduce plastic leakage to nature.**
   Avoid products that risk ending up in nature or causing microplastics during use or waste management. Plastic bags, plastic cutlery and other single-use products are common examples of waste in Swedish waters.
5. **Collaborate more.**
   There needs to be better dialogue between the collectors, processors and purchasers of recycled plastic to guarantee the qualities that are in demand reaching the market. Clear specifications and quality standards must be developed in a partnership between the various actors in the value chain.

Five pointers for individuals:

1. **Avoid single-use plastics.**
   Reduce your consumption of single-use plastic products such as fast-food containers, bags and cups. Bring your own container for take-away food!
2. **Continue to sort and recycle.**
   Make going to the bin room or recycling point a habit. Recycle all your PET bottles (juice and other drinks are also sold in redeemable bottles).
3. **Dispose of items at the recycling centre.**
   Dispose of garden furniture, crates, buckets and so on (everything that is not packaging) at a recycling centre that has a separate collection point for plastic.
4. **Choose recycled products.**
   Buy products made from recycled plastic and ask for them when you shop.
5. **Never dispose of plastic in the environment.**
   Plastic takes a long time to decompose. Regardless of how long it takes, it can harm people and the environment. Plastic has no place in nature.

Guidance and support

For more suggestions and good examples, read the guidance and support on the Swedish Environmental Protection Agency's website:

Naturvardsverket.se > Topics > Plastic

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Plastic in Sweden – facts and practical advice

A short version of the report *Kartläggning av plastflöden i Sverige* (Mapping Plastic Flows in Sweden)

Well-founded decisions must be made if we are to use plastic where it has the most benefit. This requires knowledge of the current situation: how plastic is used, the amount of plastic waste that is generated, how waste is processed and information about the most significant sources and routes for the spread of plastic in the environment.

The mapping of plastic flows in Sweden aims to provide this knowledge for 2020. In some cases, where there is a lack of data for 2020, information from 2019 or 2018 has been used instead.

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