Swedish Waste Management 2018

AVFALL SVERIGE

Contents

Preface

This year's statistics show that waste volumes are once again on the rise. This is a trend that reappears every time there is an economic boom. However, the general policy and Avfall Sverige's aim is to break the correlation between increased growth and increased waste volumes.

Avfall Sverige's statistics on household waste in Sweden for 2017 show that the volumes have increased by 2.5 percent since the preceding year. During the same period, the GNP (a measure of economic growth) increased by 2.4 percent. Population growth also contributes to increased volumes in total.

A large proportion of the waste increase consists of bulky waste for energy recovery. Residual waste, which is what we put in a regular rubbish bag, has decreased.

The waste trend for the year shows that there have been some changes in the distribution between different treatment methods. Approximately one-third of household waste is sent to material recycling, which is largely unchanged compared to previous years. But, energy recovery has increased slightly, with half of household waste sent for energy recovery.

Biological treatment – anaerobic digestion and composting – has decrease slightly, and 16 percent of household waste goes to biological treatment.

The volume of household waste sent to landfill is continuing to decline, and is currently down to 0.5 percent. An interesting comparison is that the average EU country sends about one-fourth of household waste to landfill.

Swedish Waste Management 2018 is intended for actors in the waste management industry, decision makers, authorities, educational institutions, the media and all other stakeholders. Using text, diagrams and tables we describe the management of household waste in Sweden. Statistics are taken from the Avfall Sverige web-based statistics system, Avfall Web, and from producer organisations.

Malmö, June 2018

Weine Wiqvist, Managing Director
Avfall Sverige

How Swedish waste management works

Preventing the creation of waste is the top step in the waste hierarchy. It is the priority of both Swedish and European waste legislation.

The waste hierarchy priority is:
» waste prevention
» reuse
» material recycling and biological treatment
» other recycling, e.g. energy recovery
» disposal, e.g. to landfill.

Exceptions to this hierarchy may be necessary for technical, financial or environmental reasons.

According to the definition in the Swedish Environmental Code[1], waste is any matter or object that the bearer disposes of, intends to dispose of, or is obligated to dispose of.

There are different methods for treating waste[2]:
» material recycling
» biological treatment
» energy recovery
» landfill.

Hazardous waste can be treated using one or more of these methods, depending on its properties. Waste that may contain hazardous substances should not be recycled, but rather phased out of the eco-cycle.

Recycling means that the waste will be used as replacement for another material. Preparation for reuse is also a recovery operation. According to the definition, preparation for reuse means inspecting, cleaning or repairing any item that is waste so it can be reused without further treatment.

Material recovery saves energy and natural resources, thereby reducing environmental impact. Biological treatment closes the eco-cycle and returns nutrients to the soil. With biological treatment, the waste is treated through anaerobic digestion (treatment without access to oxygen) or composting (treatment with access to oxygen, which is known as aerobic treatment). Anaerobic digestion produces digestate for fields as well as biogas, which can be used as vehicle fuel. Compost is a soil conditioner which can be used in gardens, parks and landscaping.

Energy recovery is a method ideally suited for waste which cannot be recycled in any other way. Recovering energy from waste provides both district heating and electricity.

Landfill is a treatment method for waste that cannot or should not be recycled. Landfill entails waste being stored in a manner that is safe in the long-term. Sending organic or combustible waste to landfill is prohibited.

THE RESPONSIBILITIES OF MUNICIPALITIES

Under the Swedish Environmental Code, each municipality is responsible for ensuring that household waste[3] within the municipality is transported and recycled or disposed of. The term household waste refers to waste that comes from households and equivalent waste from businesses such as restaurants, shops, offices, etc.

Every municipality is required by law to have its own waste and sanitation ordinance which consists of a waste plan and regulations for waste management[4]. Municipalities can collaborate and draw up common regional waste plans.

The municipalities are working at increasing rates to promote the prevention and reuse of waste. Preparation for reuse of household waste is also part of the municipal responsibility. The municipalities also have a duty to inform about waste management and about the content of the waste plans.

THE RESPONSIBILITY OF PRODUCERS

Sweden has producer responsibility for:
» recyclable paper
» packaging
» waste electrical and electronic equipment (WEEE)
» tyres
» cars
» batteries
» pharmaceuticals.

Producers are responsible for collecting and disposing of end-of-life products. This means that there must be suitable collection systems and treatment methods for recycling.

Producer responsibility is also intended to encourage producers to develop products that are more economic with resources, easier to recycle and do not contain substances which are harmful to the environment.

1 Swedish Environmental Code (1998:808)
2 Avfall Sverige Report 2017:23 Right item to the right treatment. Material recycling, waste incineration and the detoxification of society
3 Avfall Sverige Guide #4: The meaning of "household waste" as a term
4 Avfall Sverige Report 2017:01 Basis for the waste disposal regulations in the Municipal Waste Regulation Ordinance

In their information about waste, the municipalities are also obliged to inform about the responsibility of producers. This is done, inter alia, through the national waste portal sopor.nu, which is a collaboration between Avfall Sverige and several other actors.

THE RESPONSIBILITY OF HOUSEHOLDS

Households are responsible for separating and depositing waste at available collection points. They must also follow the municipality's rules for waste management.

THE RESPONSIBILITY OF BUSINESSES

Businesses are responsible for disposing of non-household waste and waste that is not covered by producer responsibility.

ORGANISATIONAL STRUCTURES

The municipalities must choose themselves how waste management is organised. Local government autonomy is part of the Swedish Constitution.

There are several organisational structures available:

- self-administration
- municipal enterprise, owned independently or jointly with other municipalities
- joint board
- municipal association.

The Riksdag has decided to introduce a general opportunity for contractual cooperation in the Local Government Act, increasing opportunities for municipalities to organise and cooperate with other municipalities in the manner deemed most appropriate.

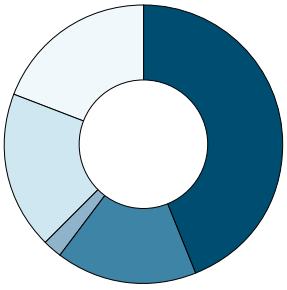
The waste sector has a long history of collaboration between municipalities. As the sector has faced greater and greater demands, the collaborations have grown in scope and have undergone development and expansion[5]. Collaboration between municipalities is a natural operational structure, providing the greatest possible environmental and social benefit, managing waste cost effectively and ensuring the requisite competencies are in place. Municipalities can also cooperate in relation to specific issues, such as joint procurement.

PRIVATE CONTRACTORS OR IN-HOUSE

In 64 percent of the country's municipalities, the collection of food and residual waste is primarily carried out by private contractors. 33 percent of municipalities carry out collection themselves, and the others use a combination of private contractors and in-house collection services. There has been a clear increase in the number of municipalities carrying out collection in-house as the proportion was 25 percent in 2014. This follows an international trend and stems from the municipalities' desire for greater flexibility and control.

Waste treatment is either undertaken by the municipalities themselves, or by an external contractor, which can be a different municipality, a different municipal enterprise or a private company. The distribution between the various structures depends on the method of waste treatment.

Breakdown of responsibilities



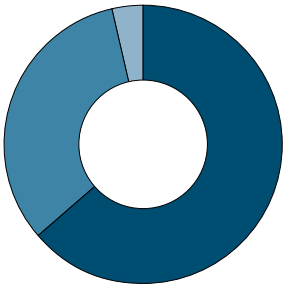
Number of municipalities

Municipal self-administration	128	44%
Municipal association	47	16%
Joint boards	7	2.4%
Municipal enterprise, wholly-owned	53	18%
Municipal enterprise, partially-owned	55	19%

There are also regional companies that do not officially take over the municipal waste responsibility, e.g. Sysav, Renova and Sörab. A total of 33 municipalities cooperate in such regional companies.

5 Avfall Sverige Report 2016:24 Municipal collaboration in the waste sector – experiences and trends

Service providers for the collection of food and residual waste



Percentage of municipalities

Solely private contractors	64%
Solely in-house	33%
Combination of in-house and contractors	3%

READ MORE:
Avfall Sverige Report 2017:25 Contractors for household waste collection 2016

Waste quantities are increasing, with bulky waste accounting for a large part of the increase.

Waste quantities 2017

In 2017, the quantity of household waste treated was 4,783,000 tonnes. This is an increase of 2.5 percent on 2016. For the population as a whole, every Swede produced 473 kg of household waste in 2017, compared to 467 kg per person in 2016.

33.8 percent, 1,617,640 tonnes, went to material recycling. This corresponds to 160 kg/person and is largely the same as in 2016.

Biological treatment decreased by 2.1 percent to 741,280 tonnes, or 73 kg/person. This means that 15.5 percent of household waste underwent biological treatment in 2017.

The amount of food waste going to co-digestion plants decreased by 1.5 percent, while food waste going to central composting plants fell by 42 percent.

Energy recovery rose by 6.1 percent to 2,400,440 tonnes, or 237 kg/person. 50.2 percent of household waste went to energy recovery in 2017.

The amount of household waste going to landfill fell by 24 percent to 23,650 tonnes compared with 2016, 2 kg/person. Landfill accounts for 0.5 percent of the total amount of the waste managed.

The household waste statistics are primarily taken from the Avfall Sverige web-based statistics system, Avfall Web, and from producer organisations. Avfall Web is a tool used by the municipalities for development, benchmarking and statistics.

Municipalities and treatment plants report information on waste management and the quantities collected and treated. This information then forms the basis of national household waste statistics.

HOUSEHOLD WASTE THROUGHOUT THE EU

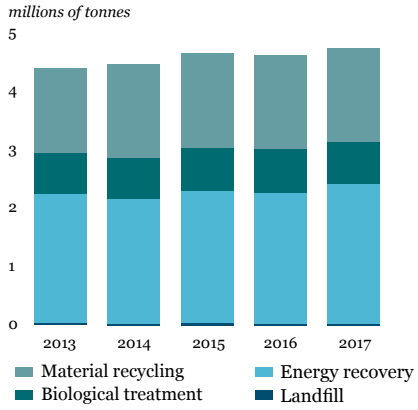
It is difficult to compare statistics within the EU because the countries apply different concepts and measurement methods. The latest statistics, which are for 2016, show that household waste quantities in the EU amounted to 480 kg per person for the population as a whole. Approximately 47 percent of the household waste was treated through material recycling, including biological treatment. In total, 30 percent went to energy recovery and 25 percent was sent to landfill within the EU[6]. Once the EU Waste Directive is implemented, better definitions will gradually lead to clearer and more accurate statistics.

WHERE ARE WE HEADING?

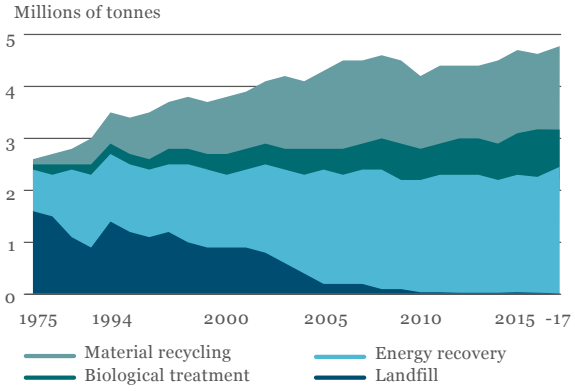
Avfall Sverige has partnered with other stakeholders in the industry to develop waste indicators as guidance for measuring and monitoring the development towards resource-efficient waste management. The indicators are also a tool for monitoring development and work with Avfall Sverige's vision of “Zero Waste”.[7]

6 All EU statistics are available at http://ec.europa.eu/eurostat
7 Avfall Sverige Report U2014:01 Waste indicators – guidance for measuring and monitoring the development towards resource-efficient waste management

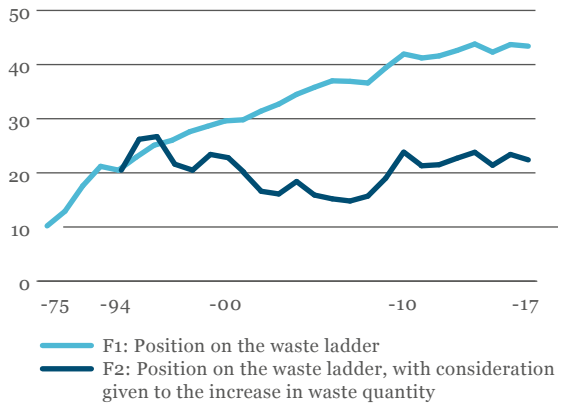
Waste trend 2013-2017



Overview 1975-2017

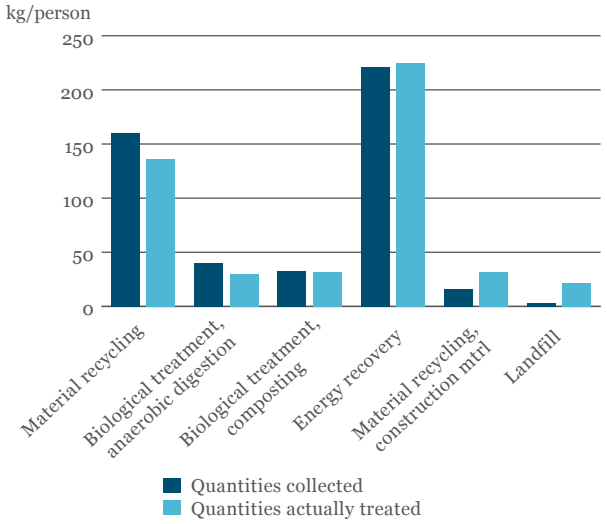


Movement indicators F1 and F2



Avfall Sverige has developed indicators for resource-efficient waste management and a tool for monitoring development and work with Avfall Sverige's "Zero Waste" vision. Movement indicator F1 shows the movement along the waste ladder. The indicator is calculated based on the actual quantity treated on each rung and not the amount collected. There has been steady movement up the ladder since the mid-1970s, but we have still not reached the halfway mark. Indicator F2 also takes into account the change in the total amount of household waste generated. All quantities over the quantities from 1994 lower the position value with the same value as prevented waste raises the position value.

Collected volumes vs volumes actually treated 2017 (kg/person)



The above figure shows the volumes that enter the treatment process and the volumes that are actually treated for different treatment methods. There is a clear difference between the volumes collected for each treatment method, which are often reported in the statistics, and how the waste volumes are actually treated. For material recycling and biological treatment through anaerobic digestion, the difference between volumes collected and volumes treated is made up of rejects. It is waste that is primarily sent to energy recovery. For material recycling, some waste from energy recovery is added since metals from the bottom ash are sorted out for material recycling. The waste volumes actually sent to landfill in recent years are significantly greater than the volumes collected for landfill. One reason for this is fly ash from energy recovery that is sent to landfill.

Treated volumes of household waste 2013–2017 (tonnes)

	2013	2014	2015	2016	2017
Material recycling	1,467,200	1,617,930	1,652,710	1,615,170	1,617,640
Biological treatment	711,450	713,110	728,570	757,480	741,280
Energy recovery	2,235,930	2,148,640	2,284,210	2,262,610	2,400,440
Landfill	33,300	32,900	38,300	31,000	23,650
Total volume treated	**4,447,880**	**4,512,580**	**4,703,790**	**4,666,260**	**4,783,010**

Treated volumes of household waste 2013–2017 (kg/person)

	2013	2014	2015	2016	2017
Material recycling	152	166	168	162	160
Biological treatment	74	73	74	76	73
Energy recovery	232	221	232	226	237
Landfill	3	3	4	3	2
Total volume treated	**461**	**463**	**478**	**467**	**473**

Treated volumes of household waste 2013-2017 (%)

	2013	2014	2015	2016	2017
Material recycling	33.0	35.9	35.1	34.6	33.8
Biological treatment	16.0	15.8	15.5	16.2	15.5
Energy recovery	50.3	47.6	48.6	48.5	50.2
Landfill	0.7	0.7	0.8	0.7	0.5

Collected volumes of food waste, residual waste, and bulky waste, 2013–2017 (tonnes)

	2013	2014	2015	2016	2017
Food and residual waste	2,208,000	2,221,720	2,221,280	2,240,690	2,213,540
of which food waste		318,850	336,940	358,790	373,100
Bulky waste	1,780,000	1,719,180	1,773,930	1,725,670	1,760,140

Collected volumes of food waste, residual waste, and bulky waste, 2013–2017 (kg/person)

	2013	2014	2015	2016	2017
Food and residual waste	229	228	225	224	219
of which food waste		33	34	36	37
Bulky waste	185	176	180	173	174

Source: Avfall Web
Hazardous waste is included under material recycling or energy recovery depending on the recycling method.
The term “waste in bins and bags” has been replaced with the term “food and residual waste”, which consists of both combustible household waste and source-separated food waste.

Prevention and reuse

Preventing the creation of waste is the first step in the waste hierarchy. It is the priority of both Swedish and European waste legislation. All EU member states must have national programmes to both reduce the amount of waste and reduce the amount of hazardous substances in the waste.

PREVENTING WASTE LEADS TO THE GREATEST ENVIRONMENTAL BENEFIT

In Sweden, 0.5 percent of household waste goes to landfill. This relates to waste that cannot or should not be disposed of in any other way. The rest is recycled to recover materials, energy and nutrients from the waste. Although this represents an improvement for the environment, further environmental benefits are achieved by preventing the generation of waste and increasing reuse. Preventing waste means both reducing waste volumes and reducing the amount of hazardous substances in the waste, which must occur during the production stage. The municipalities play an important role in this work, but manufacturers and producers must also give consideration to prevention when designing the products.

TOOLS FOR PREVENTION

Avfall Sverige is continuously striving to develop tools to support municipalities in their efforts to prevent waste. One such tool is a work method that involves working in a structured manner within a municipal organisation. The method has been tested and has resulted in a reduction in both waste volumes and costs. The work method is described in a handbook[8].

Another tool is the “Miljönär” label, which was developed by Avfall Sverige and is used by the municipalities to inspire sustainable consumption. The label aims to draw attention to organisations that make it possible for the public to repair, share or reuse, or to reduce waste in any other way. The website, miljönär.se, contains a map marking all of the Miljönär-labelled organisations in the country and provides tips on how to reduce waste volumes.

In 2018, Avfall Sverige will also focus on “invisible waste”, i.e. waste that occurs at the production stage and the consumer does not see. The volume of this waste is often significantly larger than the actual product when it becomes waste. For example, a mobile phone, which weighs about 200 grams, generates 86 kg of waste in the production stage. Expanding waste prevention to the production stage will lead to significant environmental benefits.

Since 2009, Avfall Sverige has been the national coordinator of the EU project "European Week for Waste Reduction", which is also supported by the Swedish Environmental Protection Agency. The project runs for one week in November, when activities aimed at reducing the amount of waste and the quantity of hazardous substances in waste are arranged all over Europe. This campaign can also be used by the municipalities in their work to reduce waste. Information on the project is available at avfallsverige.se and www.ewwr.eu.

There are several ways to work with waste prevention in a waste plan. Some municipalities choose to only have general goals, while others have measurable targets and specify concrete actions. Several examples of this have been compiled in a report[9], which can also be used in waste prevention work.

8 Avfall Sverige Report 2017:17 Handbook for preventing waste in the municipality – Methods and inspiration
9 Avfall Sverige Report 2016:19 Waste prevention work in municipal waste plans

Flea markets and second-hand sales give clothing and objects a second chance instead of being disposed of as waste.

REUSE

Reuse is defined as a measure that involves a product or component that is not waste being used again for the same purpose as it was originally intended. Preparing for reuse involves waste management that applies to inspection, cleaning or repair to enable products or components submitted as waste to be reused.

More than half of the country's recycling centres have simpler means for accepting materials for reuse, such as clothes and furniture, often in collaboration with aid organisations that sell or donate the material. There are also recycling centres with recycling parks that have expanded operations, such as repairs and sales. Several municipalities have plans to develop their recycling centre to a centre for repair, rental, borrowing, and exchanging and sharing activities[10].

To facilitate the prevention and reuse work of the municipalities, Avfall Sverige has published a guide that explains the legal requirements[11].

Materials collected for reuse 2014–2017

The diagram shows the volumes that the municipality itself, or in cooperation with reuse operators, collected at the recycling centre/recycling park, etc.
It is nowhere near providing a complete picture of the volumes handled for reuse in the community.

10 Avfall Sverige Report 2017:14 General information about and experiences from municipal reuse centres
11 Avfall Sverige Guide #9: Legal requirements for prevention and reuse

READ MORE:
Avfall Sverige Report 2016:21 WRAP's work with waste prevention
Avfall Sverige Report 2017:38 Communication support for prevention coaches
Avfall Sverige Report 2018:06 Prevention of waste in public procurement

Collection and transport

The volume of collected food and residual waste decreased by 1 percent to 2,213,540 tonnes, 219 kg/person. 373,100 tonnes of this was food waste, 37 kg/person. The volume of bulky waste increased by 2 percent to 1,760,140 tonnes, or 174 kg/person.

The volume of food waste collected increased by 4 percent to 373,100 tonnes. In 2017, 223 of the country's 290 municipalities had separate collection of source-separated food waste.

The difference in the collected and treated volumes can be explained by the fact that the waste may have been collected during one year, but then stored and treated the subsequent year.

There are a number of different systems for collecting and transporting household waste. Household food and residual waste can be collected either as a mixed fraction for energy recovery or in separate fractions – one for food waste and one for combustible waste. The waste is then usually collected in two separate bins.

Mixed combustible residual waste from single-family houses is generally collected in 190 litre bins that are emptied every fortnight. There are also a number of different bag and bin sizes emptied at different intervals. Waste from apartment blocks is usually collected on a weekly basis.

To achieve higher levels of material recycling, kerbside collection of packaging and newspapers from households is increasing.[12] Different methods are used for collection from single-family houses. One example of this the four-compartment system, where the property has two large bins with four compartments each (eight fractions in total), but there are also variants with different numbers of compartments in the bins. There is also collection of different fractions in different coloured bags, which are then sorted optically.

In apartment blocks with kerbside collection of packaging and newspapers, fractions are collected in separate bins or underground containers. Here too, you can find collection with different coloured bags for different fractions, followed by optical sorting.

An additional system, which is only used by one municipality thus far, is to place metal and glass packaging in the same bin. The waste is then machine-sorted at a plant in Germany since there is no plant of this type in Sweden at present. A few municipalities are currently conducting a trial with dual-stream collection. With this, the household has two divided bins. One bin is for food and residual waste, while the other is for plastics and “all paper” (i.e. paper packaging and recyclable paper mixed). Both systems are examples showing that kerbside collection is on the rise, and that a growing number of different solutions are being implemented.

60 PERCENT INCORRECTLY SORTED

Over 60 percent of the contents of household rubbish bags could be recycled. This can be food waste, packaging and recyclable paper. Half a percent of the contents of rubbish bags consists of hazardous waste, batteries and waste from electrical and electronic equipment (WEEE), but mostly WEEE. This is shown in a survey from Avfall Sverige[13]. The survey compiled solid waste analyses[14] conducted in 109 Swedish

Most common collection systems from single-family houses

Two separate bins
(one for food waste, one for residual waste)
49%

Only one bin
25%

Multi-compartment bins
(primarily four-compartment)
15%

Different coloured bags for optical sorting
(usually food waste+residual waste, but there is also residual waste+food waste+newspapers/packaging waste)
10%

12 Avfall Sverige Report 2017:22 Basis for decision making on introduction of new collection systems. Mapping and analysis.

municipalities from 2013 to 2016. The survey also showed that households in single-family houses produce more waste than households in apartment blocks, but it is better sorted. 61 percent of the residual waste was incorrectly sorted in single-family houses, while 66 percent was incorrectly sorted in apartment blocks.

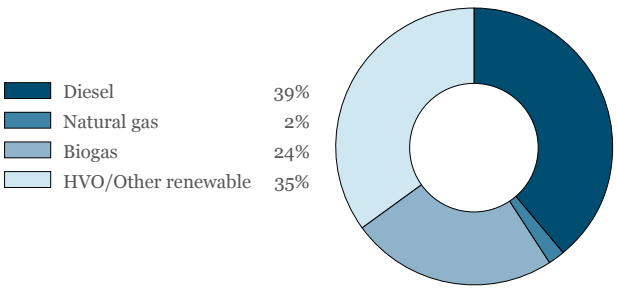
VEHICLES AND FUEL

Rear-loading vehicles are still the most predominant waste collection vehicles, but side-loading vehicles are also common. The proportion of multi-compartment vehicles is increasing as a growing number of municipalities transition to collection in multi-compartment bins.

The choice of fuel can be controlled by the requirements the municipality sets during procurement. 44 percent of the municipalities that registered a value in Avfall Web use biogas as fuel in whole or in part. On average, biogas represents 24 percent of the volumes consumed. In recent years, there has been a clear shift from fossil diesel to various forms of biodiesel, such as HVO, which is a synthetic diesel made from e.g. slaughterhouse or grain waste. HVO is a renewable fuel, but unfortunately the use of palm oil as a raw material is on the rise. The production of palm oil causes major environmental problems, so it is important to choose the right HVO.

Hybrid electric vehicles and electric vehicles have great potential for the waste industry and are being tested here and there, albeit on a smaller scale. In addition to the environmental benefits, electric vehicles also significantly reduce noise levels during operation and emptying.

Fuel



The diagram shows the breakdown of different fuels as an average of the percentage distribution within each municipality.

Through procurement, municipalities can impose requirements on the adaptation of waste bins and vehicles for health and safety at work.

DEVELOPMENT OF THE COLLECTION SYSTEM

Waste collection previously meant heavy lifting and many work-related injuries, but today bags have been replaced by bins or other types of containers, providing a better working environment. While the working environment has improved in many respects, there are still problems that the industry is working to resolve.

In many places, manual waste handling has been replaced by new technology and automated systems such as vacuum waste collection and underground container systems. Both of these systems are on the increase, particularly in the cities and in newly built areas. One advantage is that they do not require any heavy manual handling during emptying.

Vacuum waste collection is a fully automated system which reduces the need for transports, particularly in residential areas. There are two kinds of vacuum waste collection systems, stationary and mobile. The stationary vacuum waste collection system collects waste pneumatically in an automated vacuum system. This is then transported through underground tubes from the refuse chutes to large containers located in a terminal. These containers are collected by a hookloader vehicle. The mobile vacuum waste collection system also uses air to collect waste. A storage tank is positioned under each refuse chute. The tanks are connected together to a docking point through an underground system of tubes. The vehicle connects to the docking point for collection.

Underground container systems are another fast growing collection system. Containers placed underground reduce the need for space at street level. The temperature underground is relatively low, which prevents odours. The containers are emptied using a vehicle with loader crane.

There are also underground containers that can be emptied using a front loader vehicle. Because underground containers hold larger volumes, the number of trips can be reduced.

RECYCLING CENTRES

At the manned municipal recycling centres, households can hand in bulky waste, garden waste, WEEE and hazardous waste. Bulky waste is household waste that is too heavy, too bulky or otherwise inappropriate for collection in bags or bins.

13 Avfall Sverige Report 2016:28 What do households put in their waste bins?
14 Avfall Sverige Report 2017:31 Manual for solid waste analysis of household food and residual waste

In 2017, households dropped off 1,760,140 tonnes of bulky waste, mostly at manned municipal recycling centres. This amount of bulky waste corresponds to 174 kg/person. There are 580 recycling centres throughout the country which combined receive about 29 million visits annually.

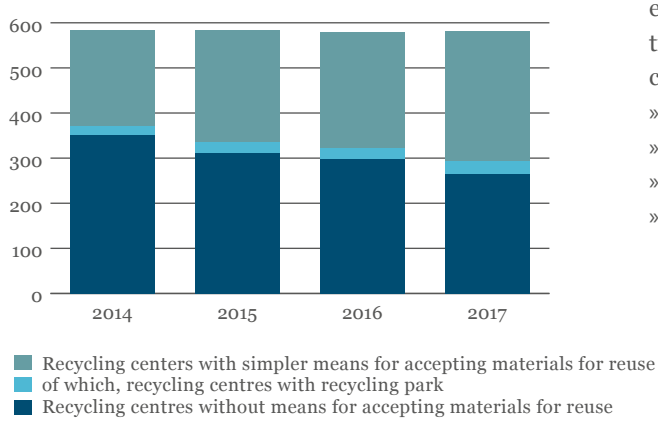
The volume of bulky waste and hazardous waste dropped off at recycling centres has increased steadily in recent years, and customer service needs have also grown. Many municipalities have therefore adapted and modernised their recycling centres. Several municipalities are choosing to collect activities in one or just a few large plants and are phasing out plants that are too old, too small, or that have logistics, working environments, and a service level that do not live up to current needs.

In several places in the country, there are unmanned recycling centres where households can leave their waste. In order to access these recycling centres, the visitor must have a driving licence and have completed a short training programme in sorting.

Mobile recycling centres are also common. These are manned mobile centres that accept hazardous waste, some bulky waste and also WEEE. These mobile centres visit a number of permanent collection points according to a schedule. A number of municipalities are also conducting trials with neighbourhood recycling centres.

The recycling centres also handle hazardous household waste with the risks that this can involve when the waste is received, sorted and transported. In order to create a safe environment for visitors and staff continuous occupational health and safety work is undertaken on risk assessment, the correct protective gear and secure premises for handling the hazardous waste.

Recycling centres



Many of the country's recycling centres have been hit hard by theft and break-ins, a fact addressed in a report by Avfall Sverige[15]. Personnel have also been threatened by visitors. Most of the larger, newly-built recycling centres have therefore installed various technical security solutions, such as electric fences or surveillance cameras. Some have employed security firms during particularly vulnerable periods.

Several municipalities have also introduced a barrier system at their recycling centres. This improves safety, provides a functional access control system and boosts visitor statistics. This is often combined with an entry pass giving households a certain number of free visits. In several municipalities, owners of small businesses may also use the services provided at the recycling centres for a fee.

RECYCLING STATIONS

The producer system, with some 5,800 unmanned recycling stations for handling packaging and newspaper, is designed to cover the entire country. Collection systems should be based on consultation between the producers and municipalities. The recycling stations have separate containers for newspaper and various packaging materials.

COLLECTING COOKING OIL

There are municipalities that collect source-separated cooking oil, mainly to reduce operating problems and blockages in drainage systems, but cooking oil can also be recycled or reused. A report from Avfall Sverige shows different methods of collecting and treating the oil[16]. One system is that households pour cooking oil into sealed containers and then hand it in at a recycling centre. An alternative is to pour the cooking oil into a container that is then collected with combustible waste and goes to energy recovery. There are various recovery and treatment options for the source-separated and collected cooking oil. It can be used:

» as a raw material for the chemical industry
» in anaerobic digestion for biogas production
» in the production of biofuel
» energy recovery.

15 Avfall Sverige Report 2017:11 Safety at recycling centres
16 Avfall Sverige Report 2015:07 Cooking oil sorting and treatment – good examples from municipalities and housing companies

READ MORE:
Avfall Sverige Report 2017:19 Kerbside collection of packaging and recyclable paper in the SAMSA area
Avfall Sverige Report 2017:20 Template for waste collection procurement
Avfall Sverige Report 2018:11 Kerbside collection in an urban environment

Sludge and latrine waste

Collecting sludge, latrine waste, grease separator sludge and cooking oil is the responsibility of the municipalities. Sludge from sludge separators and blackwater from closed tanks are often treated at municipal wastewater treatment plants together with other incoming sewage. However, Revaq-certified wastewater treatment plants[17] are finding it more and more difficult to take in sludge from sludge separators as it is often of poor quality. Other options for sludge disposal are therefore needed[18]. Certification requirements for systems to ensure the quality of fractions from small sewers, SPCR 178, have been in force since 2012. The system defines requirements for which sewer fractions may be included. For the plant to obtain certification, the sewer fractions must meet basic criteria[19]. Examples of approved fractions are urine and WC wastewater (which are usually collected in closed tanks), plus latrine waste and phosphorous filter material. Traditional sludge from sludge separators is not permitted.

The 235 municipalities that reported sludge management data to Avfall Web have just shy of 592,000 individual wastewater treatment plants. These handle about 1.6 million tonnes of sludge. 16 percent of the municipalities use sludge dewatering vehicles, 82 percent use conventional full-drainage sludge vehicles, and the rest use other techniques. 89 percent of municipalities employ private contractors for the collection of sludge; 9 percent undertake this in-house. On average, the sludge collection fee is SEK 1,068 incl. VAT for each collection.

161 municipalities have reported that they handle 64,700 latrine waste collections per year, in total 980 tonnes of latrine waste. The scope varies from one latrine waste collection per year in certain municipalities to up to 9,000 collections in municipalities with many second homes. The number of latrine waste collections has decreased by 16 percent just since 2012. Many municipalities have systematically worked to phase out latrine waste collection for reasons related to occupational health and safety.

Sludge from grease separators also constitutes household waste. 114,400 tonnes of sludge from 15,100 grease separators was reported by municipalities in Avfall Web in 2017. On average, each system is emptied three times a year. A small number of municipalities receive payment for the disposal, while others must pay a treatment fee of up to SEK 3,300 per tonne.

Solutions for reducing phosphorous in individual plants, such as phosphorous traps[20] and micro treatment plants[21], have increased in scope in recent years. This is because more stringent requirements have been imposed on the reduction of emissions that cause eutrophication. Filter material from phosphorous traps and sludge from micro treatment plants are classed as household waste, and it is municipal waste management services that are responsible for removal and treatment.

Sludge collection is often hard and physically tiring with several manual operations such as pulling hoses long distances and lifting heavy manhole covers and hard sludge cake. The Swedish Work Environment Authority is scrutinising sludge collection and in various campaigns has told employers that heavy manual handling must stop.

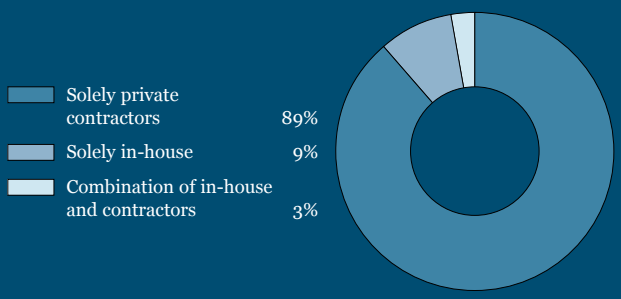
The municipalities are taking an active role in the long-term improvement of the working environment. Cooperation is required between the various actors to strategically and systematically work on occupational health and safety issues. Taking inventory of and documenting the municipality's collection points is an important component in improvement, and is crucial to a sound and transparent procurement process[22].

17 Revaq certification applies to sludge from treatment plants; see svensktvatten.se
18 Avfall Sverige Report 2016:20 Dewatering of sludge from small wastewater treatment plants – quality and disposal
19 Avfall Sverige Report 2018:02 Knowledge of and attitude towards SPCR 178 – survey results
20 Avfall Sverige Guide #19 Phosphorous filters – handling and replacement
21 Avfall Sverige Report U 2013:14 Micro treatment plants in private sewers
22 Avfall Sverige Guide #13: Sustainable occupational health and safety during sludge collection from private sewers

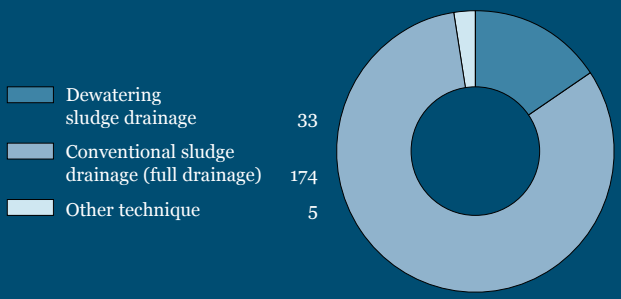
READ MORE:
Avfall Sverige Report 2016:07 Sustainable eco-cycle of small sewers
Avfall Sverige Report 2016:12 Drainage of sludge separators – comparative study of full drainage, mobile dewatering and partial drainage

Sludge collection can be heavy and physically taxing as it requires heavy lifting or the pulling of hoses.

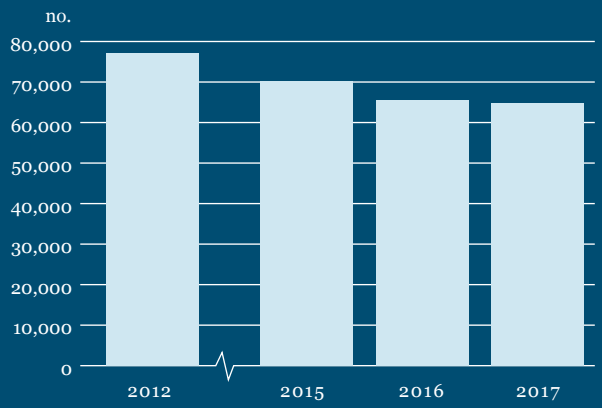
Sludge collectors 2017



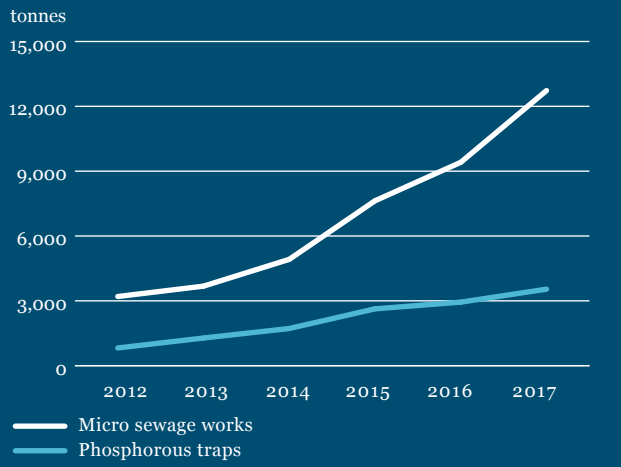
Sludge collection technique 2017



Number of latrine waste collections 2012–2017



Number of micro treatment plants and phosphorous traps 2012–2017



Hazardous waste

76,980 tonnes of hazardous waste[23] were collected from households in 2017, an increase of 7 percent compared to 2016. This corresponds to 7.6 kg per capita. This also includes 50,400 tonnes of impregnated timber and 3,160 tonnes of asbestos. Hazardous waste in the form of paint, chemicals and oil waste amounted to 23,420 tonnes. Impregnated timber is increasing, while asbestos and other hazardous waste is decreasing.

To detoxify the eco-cycle, it is important that hazardous waste be separated and handed in properly and in the right place. Hazardous substances may be found in extremely small quantities in some products, but taken as a whole they can cause substantial harm if they end up in the wrong place.

The municipalities are responsible for the collection, transport and treatment of hazardous waste from households. This responsibility is regulated by the Swedish Environmental Code, the Swedish Waste Ordinance and the Municipal Waste Regulation Ordinance.

Households have an obligation to separate hazardous waste from other household waste. Most municipalities have regulated this obligation in the municipal refuse collection regulations.

There are no exact details on the amount of hazardous waste produced by industry, but according to the latest official waste statistics, reported to the EU by the Swedish Environmental Protection Agency, 2.4 million tonnes of hazardous waste were produced in Sweden in 2016. The waste came mainly from construction, the household sector, service providers, energy supply, metal and metal products, and the manufacture of chemicals, pharmaceuticals, and plastic products. Of this, about 328,000 tonnes were exported[24] to European treatment plants[25].

COLLECTION SYSTEMS

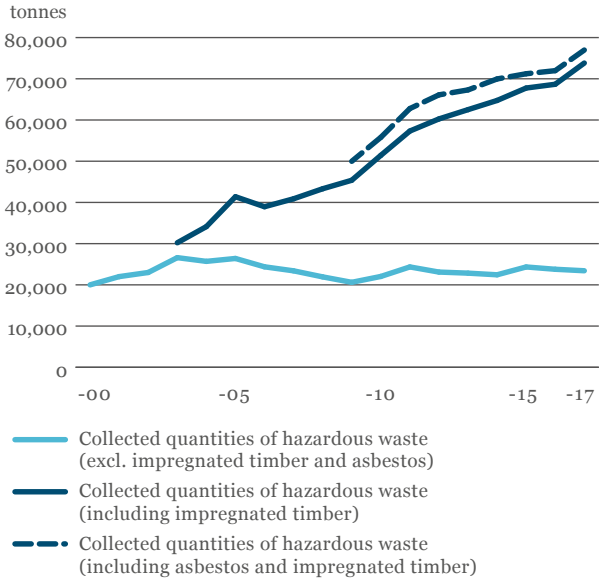
The most common collection system for hazardous household waste is dropping it off at manned municipal recycling centres. A survey conducted by Avfall Sverige shows that almost half of the country's municipalities also practice some type of kerbside collection of hazardous household waste[26].

Almost one-third of the municipalities have collection via recycling collection vehicles and/or recycling stations. Use of recycling collection vehicles is becoming more common, while the number of recycling stations has decreased.

The percentage of municipalities with mobile recycling centres has increased some. All collection systems that involve a higher level of service have increased during the past year.

Hazardous waste dropped off at collection or waste treatment plants often requires pre-treatment. As hazardous waste may contain substances which are to be phased out of the eco-cycle, treatment is often aimed at destroying these substances. Substances that cannot be rendered harmless or reused are taken to landfill. In such cases, it is important that the waste be chemically and physically stable so that hazardous substances do not leak out into the surrounding environment.

Volume of hazardous waste collected 2000–2016



23 Hazardous waste is waste that Annex 4 of the Swedish Waste Ordinance describes with a waste code marked with an asterisk (*), or which can be considered hazardous waste according to regulations issued pursuant to Section 12 of the Swedish Waste Ordinance.
24 Swedish Environmental Protection Agency's export statistics, 2016
25 Avfall Sverige Report 2017:21 Where does hazardous waste go?
26 Avfall Sverige Report 2015:23 Kerbside and consumer-oriented collection of hazardous waste from households

WEEE and batteries

127,800 tonnes of WEEE, excluding batteries, were collected in 2017, an average of 12.6 kg per person. This is a reduction compared with 2016 due to a reduction in the weight of individual products. However, when counted in quantity, more products are actually being collected. For example, 3,250 tonnes of portable and built-in batteries and 6,610 tonnes of car batteries were collected in 2017.

COLLECTION SYSTEMS

Since Sweden's introduction of producer responsibility for WEEE[27] in 2001, municipalities and producers have cooperated in the collection of WEEE. Avfall Sverige, the Swedish Association of Local Authorities and Regions, and the electrical producers' service company, El-Kretsen, are collaborating on the "El-retur" system. The municipalities undertake, in return for remuneration, to be responsible for the collection of WEEE from households, while the producers are responsible for its treatment. In turn "El-Kretsen" collaborates with Recipo, an economic association that also represents the producers.

Avfall Sverige and El-Kretsen collaborate with several municipalities on different projects to develop these collection systems.

Collection of WEEE from households is primarily carried out at the 580 manned municipal recycling centres found throughout the country. But, the majority of municipalities have several different collection systems for WEEE, both kerbside and consumer-oriented[28].

More than half of the municipalities have some form of consumer-oriented collection of hazardous waste, for example in shops or other public places.

Since 1 October 2015, shops are responsible for taking in WEEE. Large shops that sell electronics are required to collect all types of consumer electronics smaller than 25 cm, even if the consumer does not buy anything. For other shops, a one-for-one principle applies, i.e. if you buy a product you have the option of turning in one equivalent old product at that shop. The collected products are submitted free of charge to an approved recycling collection system.

The technological development of different recycling methods has facilitated collection for consumers. One example is that all small light sources can now be placed in the same container. The battery producers are responsible for the collection, treatment and recycling of all batteries, regardless of when they appeared on the market.

TREATMENT METHODS

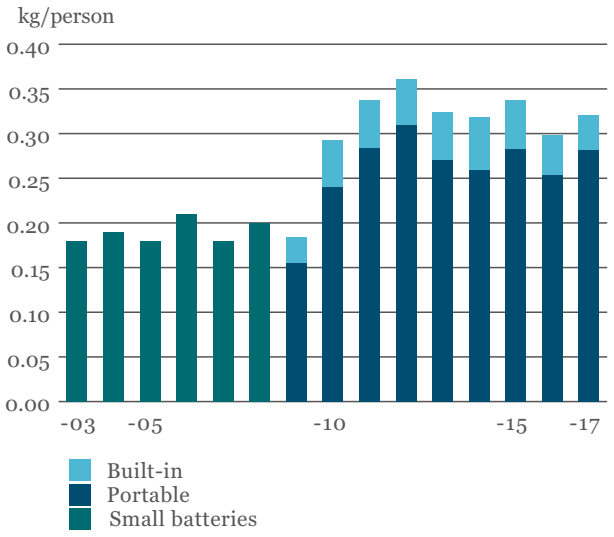
WEEE is pre-treated through separation and dismantling before being sent for further treatment. Pre-treatment is carried out at certified facilities, after which the waste is sent for final treatment or recycling. Components containing hazardous substances are treated at approved treatment plants.

Much can be recovered once the hazardous substances have been removed. Plastic cases are incinerated in energy recovery plants, and metals are sent to smelting plants for recovery. Recovered copper, aluminium and iron are used as raw materials in new products. Computers, mobile phones and other IT products contain small amounts of precious metals that are also recovered. For example, some printed circuit boards contain gold and/or silver. Fluorescent tubes and low-energy bulbs contain mercury. These products are therefore separated and treated in a closed process in which the mercury is disposed of in a safe and controlled manner while the fluorescent powder can be reused in the production of new light sources. Metal and electronic waste go to specialised recovery companies that recover metals and use plastics for energy recovery. The glass is cleaned and reused. Other types of light bulbs, such as incandescent bulbs and LED lights, are treated as part of the same process as fluorescent tubes and low-energy bulbs.

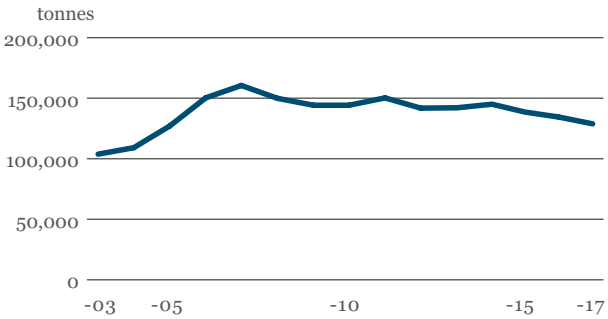
Batteries are sorted by chemical content before being sent for recovery or disposal.

27 See the definition of electrical and electronic waste (WEEE) in Ordinance (2014:1075) on Producer Responsibility for Electrical and Electronic Equipment
28 Avfall Sverige Report 2018:07 Kerbside collection of small WEEE from apartments – opportunities and risks

Collected volumes of portable and built-in batteries 2003–2017



Collected WEEE for recycling 2003–2017



Includes WEEE not coverd by producer responsibility

Material recycling

1,617,640 tonnes, 34 percent, of household waste went to material recycling in 2017. This corresponds to 160 kg per person and is largely the same as in 2016.

The total volume of waste to material recycling includes collected packaging and recyclable paper from households. These fractions amounted to 701,800 tonnes or 69.3 kg per person. The total volume also includes 312,000 tonnes of packaging from businesses, mainly equivalent packaging waste.

Material recycling plays a key role in a sustainable society. It is therefore vital that waste be viewed as a resource, and handled correctly. Material recycling means that separated materials can replace other production materials or construction materials. This not only results in a reduction in the consumption of virgin material; it also leads to energy savings.

RECYCLING TARGETS

The EU wants to guide member states towards a more circular economy and has therefore intensified recycling targets in the new waste legislation. By 2025, at least 55 percent of municipal waste in the EU shall be recycled to new material. The target increases to 60 percent by 2030 and to 65 percent by 2035. 65 percent of all packaging material should be material recycled by 2025, and 70 percent by 2030. The targets apply to material recycling, including preparation for reuse.

The Swedish Environmental Protection Agency conducts annual follow-ups of producer responsibility in Sweden, with the latest statistics relating to 2016[29]. At that time 69 percent of packages were sent to material recycling, which means that the target of 55 percent is met. Beginning 2020, the recycling target for packaging is 65 percent, which means that Sweden has more stringent requirements than the EU.

COLLECTION SYSTEMS

Household packaging and paper is mainly collected through unmanned recycling stations owned by the producers. Collection can also be available using manned municipal recycling centres.

A growing number of municipalities have introduced the kerbside collection of packaging and newspapers. This is increasing in particular for single-family houses through collection in multi-compartment systems or through the collection of coloured bags which then undergo optical sorting. 40 municipalities has multi-compartment bins, three municipalities have optical sorting, and about eight municipalities have kerbside collection with another system. Over half of the country's apartment blocks have source sorting at the property. Avfall Sverige has compared different systems for kerbside collection in an urban environment.[30] Several municipalities have decided to introduce kerbside collection, so will continue to see an increase in coming years.

Most producers of packaging and recyclable paper have organised their collection and recovery undertakings through the company Förpacknings- och tidningsinsamlingen – FTI. A small number of producers are organised through the company TMR.

Households, and sometimes also small businesses, can hand in their bulky waste, WEEE and hazardous waste at manned municipal recycling stations. The volume of waste submitted to the municipal recycling centres is steadily increasing, as are the possibilities for material recycling and treatment of a variety of materials.

RECYCLING

Packaging and recyclable paper are processed at different plants, both in Sweden and abroad, depending on the material. The recycling levels are high for paper and glass, while material recycling of plastics, for example, is lower.

In recent years, there has been an increase in the number of fractions at recycling centres as options for further recycling are evolving. Examples of new fractions that are increasing are plastics and textiles.

Most bulky waste undergoes material recycling or energy recovery; recycling of pure material is easier. Hazardous waste is destroyed to detoxify the eco-cycle.

Products for reuse are increasing, such as construction material for reuse, which is collected separately. In cooperation with other stakeholders, construction material is refined and resold.

29 Swedish Environmental Protection Agency report Sweden's recycling of packaging and newspapers – Follow-up of producer responsibility for packaging and newspapers 2016
30 Avfall Sverige Report 2018:11 Kerbside collection in an urban environment

Materials that are generally difficult to recycle or that are made up of different materials go to energy recovery and are converted to electricity and heat. Examples of such materials are certain types of construction waste, sports equipment, some furniture and toys, and foam rubber, carpets, tarpaulins and cushions.

Material recycling of bulky waste is carried out, for example, for scrap metal that is sent directly to processing plants that the municipalities have contracts with. There, it is inspected, sorted based on type of metal, fragmented, and ultimately used to produce new products at steel and metal works.

Wood is usually sorted based on how it was treated, e.g. pure wood, painted, or pressure impregnated. Untreated wood is chipped and used as a biofuel, or is used in the manufacturing of chipboard. The wood is processed separately if it contains chemicals. For example, certain types of painted wood and pressure impregnated wood are processed in special incineration plants for hazardous waste, where they are destroyed and produce energy.

Garden waste, such as branches and fruit that has fallen off the tree, are refined through biological treatment. It can either be composted to create nutrient-rich soil, or be sent for anaerobic digestion to create digestate and biogas. Some garden waste is sent for energy recovery.

Stone, soil, brick and ceramics are turned into fill material that can be used in various forms of construction work.

Corrugated board is a large fraction and is sent for recycling into new corrugated board. One paper fibre can be recycled 7-8 times.

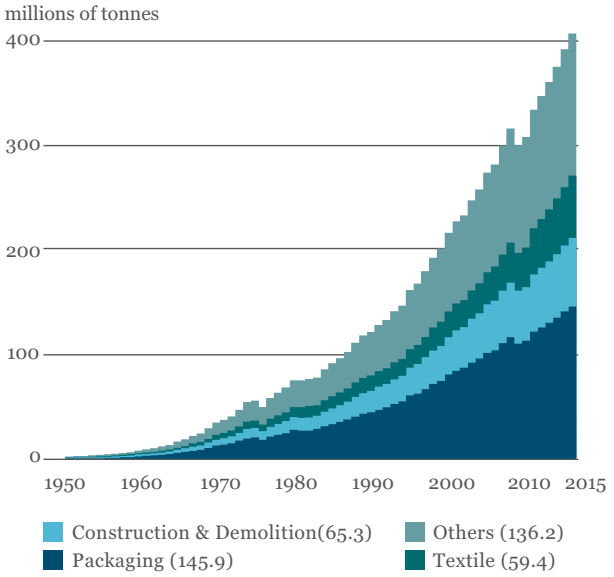
There are now also recycling methods for materials that were previously difficult to recycle, such as plaster and flat glass. Plasterboard is ground down into plaster powder, which is used to make new plasterboard. Flat glass is primarily recycled into insulation, but is also used to make new glass.

PLASTICS PROBLEMATIC WHEN IT COMES TO RECYCLING

Glass and metal are two materials that could theoretically be recycled an infinite number of times as long as they are not contaminated. Material recycling of plastics, on the other hand, is complicated since plastic waste is a mixture of a number of different types of plastics and the products often consist of several composite materials[31].

Studies show that 49 million tonnes of plastic were used in the EU in 2015. Almost half of the plastic is used for packaging. The rest is used for everything else, like in the construction industry and for cars, furniture, toys, etc. The material recycling levels for plastic are generally low within the EU. Certain types of plastic, like PE, HDPE and PET, are easier to recycle and have higher material recycling levels. Other types of plastic have low sorting and material recycling levels.

Global plastic production 1950–2015



31 Report No. C245 IVL "Material recycling of plastic waste from recycling centres"

Plastic is a very useful material that combines many good properties. But, plastic can also create problems, both in manufacturing and use. Various environmental and health effects are examples of such problems, along with littering. Plastic that cannot be reused or recycled because it contains hazardous substances or it is improperly designed is a major problem, particular in the waste stage. But, responsibility for addressing the problem begins right from the design and production stage. Avfall Sverige has defined a number of positions[32] in relation to plastic for better management of the material, but also finds that the responsibility for achieving these targets lies primarily with the producers. The Government has also called attention to the various problems that plastic can cause, and launched an investigation to review possibilities for reducing the negative environmental effects of plastic. The investigation shall propose measures for increased material recycling of plastic and investigate the need for alternative methods/techniques for reuse and material recycling.

The Swedish Environmental Protection Agency has decided to contribute to SIS, Swedish Standards Institute, to establish an ISO secretariat for the development of plastic recycling standards and strive for international development towards the increased material recycling of plastic. Many manufacturers are hesitant about using recycled plastic because they are uncertain about its availability and quality. An international standard can contribute to increased recycling.

It is important to increase the recycling of plastic, not least because it is mostly fossil. Many municipalities now provide for the collection of plastic that is not packaging, referred to as municipal plastic waste. According to Avfall Web, 11,740 tonnes of municipal plastic was collected for recycling in 2017, an increase of 6 percent compared to the previous year.

Technological development for automated sorting and material recycling is increasing steadily, as is the quality of the secondary raw material. In parallel, it is important to increase the demand for recycled material, particularly among producers, manufacturers and designers of new products.

TEXTILE COLLECTION

Textile is another fraction that has received increased environmental focus and is increasingly collected separately, usually in partnership with non-profit organisations. At present, textiles are mainly collected for reuse and further processing for reuse via sorting facilities in Europe.

The focus and demand for textile recycling is large globally, but only a limited proportion of textiles are capable of material recycling at present. However, many new initiatives for material recycling of textile are under way in Sweden. Several stakeholders, researchers, research institutes, colleges, industrial networks, municipalities and recyclers are collaborating in various initiatives and methods with promising results.

The municipalities collected 2,240 tonnes of textile waste intended for material recycling from households in 2017, an increase of 22 percent compared to 2016. A further 9,300 tonnes of textiles for reuse were collected by the municipalities, usually in partnership with second-hand organisations.

READ MORE:
Avfall Sverige Report 2013:15 Textile waste a future resource – pilot project in Stockholm
Avfall Sverige Report 2017:12 Pre-project prior to system study of mechanical sorting and source sorting
Avfall Sverige Report 2017:13 Sorting experiments with Swedish residual waste in ROAF's sorting plant

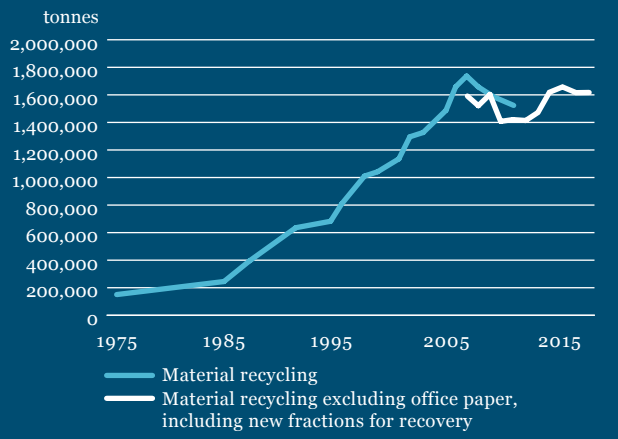
32 https://www.avfallsverige.se/om-oss/vad-vi-tycker/

Collected volumes of packaging and recyclable paper from households that has been dropped off for material recycling 2017

	tonnes	kg/person
Recyclable paper	249,900	24.7
Paper packaging	146,400	14.5
Metal packaging	18,440	1.8
Plastic packaging	70,430	7.0
Glass packaging	216,630	21.4
Total	**701,800**	**69.3**

Source: Avfall Web and Förpacknings- and tidningsinsamlingen (FTI)
The information relates only to waste collected from households through recycling stations and by kerbside collection.

Material recycling households 1975–2017



Collected household waste for material recycling 2013-2017 (tonnes)

	2013	2014	2015	2016	2017
Recyclable paper	332,780	313,640	293,310	269,520	249,900
Packaging made of corrugated board, metal, plastic and glass	648,650	673,310	712,020	751,410	763,690
Electrical waste including cooling units	146,270	148,780	126,540	122,310	117,750
Portable batteries	3,120	3,100	3,040	2,980	3,250
Car batteries	6,850	6,590	6,720	7,060	6,610
Oil waste	1,740	1,840	1,830	1,740	1,790
Water-based paint	4,210	4,140	4,220	4,040	4,210
Other hazardous waste for material recycling	-	-	8,580	8,550	8,560
Scrap metal	153,030	156,060	160,850	165,400	161,900
Plaster waste	22,410	23,040	23,490	23,830	26,620
Flat glass	1,400	1,590	1,640	1,890	1,580
Plastic, not packaging	4,170	3,350	7,150	11,040	11,740
Corrugated board from recycling centres	43,420	44,060	52,610	54,970	54,110
Textile waste	-	2,320	1,760	1,830	2,240
Construction material	-	175,150	210,730	156,830	165,200
Other material submitted for recycling, incl. tyres	99,150	60,960	37,810	31,320	38,060
Deep fat fryer and food grease	-	-	410	450	430
Total	**1,467,200**	**1,617,930**	**1,652,710**	**1,615,170**	**1,617,640**

Source: Avfall Web, El-Kretsen, Elektronikåtervinningsföreningen and Förpacknings- och tidningsinsamlingen (FTI)
The volumes of packaging also include packaging collected from businesses. A lot of this material is "equivalent household waste".
*Electrical waste and batteries only include that collected from households. According to information from El-Kretsen, 8 percent of the amount is presumed to come from businesses.
Deep fat fryer and food grease are the amounts the municipalities have data on. The assumption is that 15% of the collected deep fat fryer and food grease goes to material recycling. The rest undergoes anaerobic digestion.

Biological treatment

In 2017, 741,280 tonnes of household waste went to biological treatment – anaerobic digestion or composting. This is a decrease of 2 percent compared to 2016. 73 kg household waste per person underwent biological treatment in 2017. Biological treatment now makes up 15.5 percent of the total amount of treated household waste.

The biological treatment of food waste, excluding home compost, amounted to 427,720 tonnes* in 2017. The amount of food waste treated in co-digestion plants decreased by 1.5 percent, while food waste treated in central composting plants fell by 42 percent.

According to the Swedish Environmental Protection Agency's calculations[33], approximately 78 kg of food waste is produced per person annually in Swedish households. In addition 14 kg/person is produced from restaurants and catering and 3 kg/person from retail. In total 949,000 tonnes of waste are produced in the above categories.

In 2016, 40 percent of food waste was recycled through biological treatment to recover plant nutrients[34]. With 32 percent of the waste, both plant nutrients and energy were recovered. By 2018, the goal is for at least 50 percent of food waste to be treated biologically to recover plant nutrients and at least 40 percent of the waste treated to recover both nutrients and energy.

INCREASED COLLECTION OF SOURCE-SEPARATED FOOD WASTE

The collection of source-separated food waste increased by 4 percent in 2017 compared to 2016. 77 percent of the municipalities, i.e. 223, collect source-separated food waste to varying degrees.

The majority of the municipalities provide collection from households, catering kitchens and restaurants, while 6 municipalities only provide collection from catering kitchens and restaurants.

Avfall Sverige compiled a report to help municipalities and enterprises get started with the collection of source-separated food waste[35]. Among other things, this report shows that it takes many years to introduce a collection system for source-separated food waste, from initial planning to the introduction of the system. It also shows that factors such as planning, adequate human resources, information, monitoring and control are key factors to success. The report outlines the systems available in the market, and describes the experience of those municipalities that have already introduced source-separated food waste collection.

Avfall Sverige has also created an overview of various collection systems for source-separated household food waste[36]. The report describes what happens throughout the chain and uses this to assess how it affects quality.

Another report from Avfall Sverige shows that active quality assurance in the collection phase is required to achieve good quality[37]. The quality of the end product is dependent on how well the food waste is separated at the source. An important tool for good quality is varying types of communication initiatives[38, 39].

COLLECTION SYSTEMS

The most common collection system for source-separated food waste from single-family houses is a separate bin. 65 percent of the municipalities use this system. There are also multi-compartment systems in which different fractions are sorted into separate inserts in two large bins, and collection systems using the optical sorting of different coloured bags that are put into the same bin. Of the municipalities that collect food waste, 17 percent use multi-compartment bins and 14 percent use optical sorting. Some municipalities also have a two-compartment bin for food and residual waste.

TREATMENT METHODS

The main purpose of biological treatment is the circulation of nutrients in society as a means of closing the eco-cycle.

* Treated volumes include dilution water, which is one of the reasons that the figure is higher than the volume of food waste collected.
33 SMED Report 2017:11 Follow-up of milestone for increased resource conservation in the food chain – data for 2016. This figure excludes liquid food waste poured down the drain, but includes biological waste (like flowers) that is not actually food waste.
34 Swedish Environmental Protection Agency report 6707 Annual follow-up of Sweden's environmental quality objectives and milestones 2016
35 Avfall Sverige Report U 2011:19 Tools for introduction of systems for the collection of source-separated food waste and Guide #2 Introduction of system for collecting source-separated food waste
36 Avfall Sverige Report 2015:15 Food waste's journey from table to earth
37 Avfall Sverige Report 2015:17 Quality assurance of source-separated food waste
38 Avfall Sverige Report 2016:03 Collection of food waste in apartment blocks Good examples from municipalities and public housing companies
39 Avfall Sverige has compiled good examples of communication regarding the collection of food waste in a database found at infobasen.avfallsverige.se

Anaerobic digestion is the most common method of treating food waste. Anaerobic digestion produces biogas, which consists mainly of methane and carbon dioxide. Biogas is a renewable source of energy. Following refinement, it can be used as a vehicle fuel. It can also be used for heating or electricity generation.

Anaerobic digestion also produces digestate, a fertiliser with a high nutrient content. 1.7 million tonnes of digestate were produced in 2017. 95 percent of this organic fertiliser was used in agricultural land. Using digestate instead of mineral fertiliser recycles plant nutrients back into the eco-cycle.

Digestate is an important fertiliser for increasing organic farming in Sweden, which is a goal of the National Food Strategy for Sweden.

Avfall Sverige operates the website biogodsel.se. The website contains information on what digestate is, how it is used, what effect it has, and what regulations govern its use.

BIOGÖDSEL

CERTIFIED RECOVERY

Plants that produce compost or digestate from clean source-separated waste from the foodstuff and/or feedstuff chains can quality label their products through our certified recovery system. This is a certification system developed by Avfall Sverige in consultation with the agricultural and food industries, compost and digestate producers, soil producers, public authorities and researchers. LRF (Federation of Swedish Farmers), Svenska Kvarnföreningen (Swedish Flour Milling Industry Organisation), Lantmännen, Svenska Foder and KRAV are some of the organisations that approve digestates based on source-separated food waste the meets the certification requirements of SPCR 120[40].

Certification places demands on the entire production chain, from incoming raw material to the end product. There are also requirements related to the implementation of the process.

CERTIFIERAD ÅTERVINNING

40 Avfall Sverige Report Annual report 2017 – Certified recycling, SPCR 120
41 Avfall Sverige Report 2016:17 Methane measurement handbook Revision 2016
42 Avfall Sverige Report 2016:18 Reporting of data from methane measurements using self-inspection of methane emissions – voluntary undertaking 2007-2015

1.3 million tonnes of certified digestate was produced in 2017 for use as agricultural fertiliser. In total, approx. 4,500 tonnes of directly available nitrogen, approx. 730 tonnes of phosphorus, and approx. 2,500 tonnes of potassium were supplied to agriculture. Digestate has low levels of metal. The mean level of cadmium was 0.3 mg/kg TS, well below KRAV's limit of 0.7 mg/kg TS.

Today, 78 percent of all digestate produced in co-digestion plants is certified.

The website biogodsel.se contains contact details for biogas plants that produce certified digestate, what amounts of certified digestate are produced, and what it contains.

MINIMIZING METHANE EMISSIONS

Avfall Sverige is engaged in an initiative for self-inspection to minimise methane emissions from biogas and refining plants. Since 2018, Avfall Sverige and the Swedish Water & Wastewater Association have been collaborating on a system get even more water and sanitation plants on board. Methane emissions should be minimised for environmental, economic, safety and other reasons. Some 40 plants have joined the system. The systematically measure emissions, and follow-up of the measurement results show that emissions are steadily decreasing[41, 42].

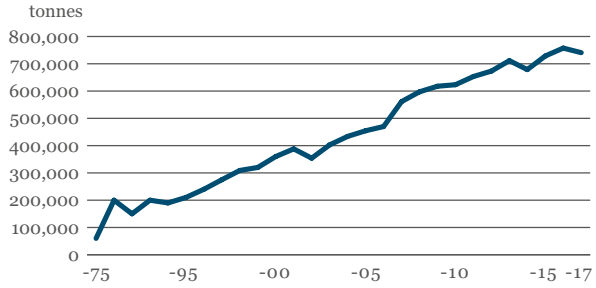
READ MORE:
Avfall Sverige Report 2016:14 Aeration of digestate to reduce methane emissions
Avfall Sverige Report 2016:16 Biogas upgrading – Technical review
Avfall Sverige Report 2016:26 Process-internal methane enrichment in co-digestion plants – simultaneous
reduction of carbon dioxide, hydrogen sulphide, and ammonium in the anaerobic digestion of food waste
Avfall Sverige Report 2016:31 Mapping of endotoxin in the working environment for composting and biogas plants
Avfall Sverige Report 2017:05 Benchmarking for more efficient biogas production
Avfall Sverige Report 2017:15 Sustainability criteria for biogas An overview of data and methods
Avfall Sverige Guide #15: Food waste collection – what applies under animal by-products legislation?
Avfall Sverige Report 2017:33 Suitable instruments of control for Swedish-produced biogas after 2020
Avfall Sverige Report 2017:32 Instruments of control for biogas
Avfall Sverige Report 2017:35 Important properties of food waste collection bags
Avfall Sverige Report 2018:01 Aeration of digestate to reduce greenhouse gas emissions – stage 2
Avfall Sverige Report 2018:05 Evaporation of digestate

Biological treatment of household waste 2013–2017 (tonnes)

	2013	2014	2015	2016	2017
Food waste to co-digestion plants	227,720	275,370	316,850	358,680	353,190
Food waste to central composting plants	63,030	52,880	44,700	35,100	20,410
Food waste undergoing anaerobic digestion at treatment plants	79,320	61,500	66,080	48,060	54,120
Food waste that is home composted	48,700	48,300	44,500	42,900	37,100
Garden waste to central composting plants	292,680	275,060	256,440	272,740	276,460
Total	**711,450**	**713,110**	**728,570**	**757,480**	**741,280**

Food waste is household waste and thus equivalent whether it comes from households, restaurants, food shops, schools and similar businesses. Waste from the food industry, slaughterhouses, etc. is not included.
Food waste undergoing anaerobic digestion at treatment plants includes food waste that travels to the sewer system via a food waste disposer (3,440 tonnes).

Biological treatment of household waste 1975–2017



Biological treatment in total including household waste 2013–2017 (tonnes)[1]

	2013	2014	2015	2016	2017
Anaerobic digestion	945,550	1,227,990	1,616,080	1,614,920	1,562,210
Composting	528,640	502,500	418,340	476,090	450,360
Total	**1,474,190**	**1,730,490**	**2,034,420**	**2,091,010**	**2,012,570**

Resource management 2013–2017 (tonnes)

	2013	2014	2015	2016	2017
Digestate	939,800	1,236,560	1,712,050	1,708,320	1,678,260

Energy production 2013–2017 (MWH)

	2013	2014	2015	2016	2017
Vehicle gas	511,470	591,960	747,680	829,280	856,170
Electricity	0	2,100	18,070	17,140	5,660
Heating	24,400	30,070	38,480	42,820	36,850
Flaring	31,760	38,260	34,100	35,480	60,230
Other	3,180	18,480	16,610	16,770	
Total (MWh)	**567,630**	**665,570**	**856,810**	**941,330**	**975,680**

Source: Avfall Web, Avfall Sverige.
1) These quantities relate to the plants that have reported figures to Avfall Web. This summary does not provide a complete picture of biological treatment in Sweden.

Plants that compost food waste 2017

Municipality	Food waste (tonnes)
Eslöv	1,640
Hässleholm	3,560
Karlshamn	5,020
Luleå	6,300
Uppsala	1,360
Östersund	2,530
Total	**20,410**

Source: Avfall Web, Avfall Sverige.

Wastewater treatment plants that carry out anaerobic digestion of food waste 2017

Municipality	Food waste (tonnes)
Alingsås	9,450
Boden	3,000
Borlänge	100
Botkyrka	14,800
Eskilstuna	720
Göteborg	8,400
Kalmar	5,760
Norrköping	380
Umeå	450
Växjö	7,570
Älmhult	50
Other, food waste disposer to sewer system	3,440
Total	**54,120**

Source: Swedish Water & Wastewater Association

Digestion plants 2017

Municipality	Total (tonnes)	of which food waste
Alvesta	49,830	1,210
Bjuv*	39,170	7,120
Borås*	48,510	15,920
Falkenberg*	79,510	20,320
Falköping	6,980	4,700
Gotland	48,860	6,610
Gävle	7,890	5,440
Helsingborg*	118,210	19,210
Huddinge	49,980	36,370
Härnösand	2,080	2,080
Höör	26,450	5,250
Jönköping*	15,480	12,960
Kalmar*	28,040	2,950
Kalmar*	84,760	29,330
Karlshamn	7,540	7,540
Karlskoga	45,930	20,060
Katrineholm*	50,460	0
Kristianstad*	97,290	34,730
Laholm*	46,600	15,640
Lidköping*	102,440	0
Linköping*	89,300	43,700
Luleå	5,470	0
Mariestad	71,000	0
Skellefteå	5,800	4,850
Skövde*	46,480	6,950
Sävsjö*	53,240	470
Trelleborg*	65,720	0
Uppsala*	34,510	28,610
Uppsala	20,650	0
Vårgårda*	72,170	2,090
Vänersborg*	180	180
Västervik	7,950	2,300
Västerås*	20,680	16,520
Västerås	68,100	80
Örebro*	44,950	0
Total	**1,562,210**	**353,190**

Source: Avfall Web, Avfall Sverige.
Avfall Sverige's statistics include digestion plants classified as co-digestion plants, i.e. plants that treat several types of waste. Most co-digestion plants receive household waste.
More information about the plants is available on Avfall Sverige's website.
*) SPCR 120-certified plant

Energy recovery

In 2017, 2,400,440 tonnes of household waste went to energy recovery. This is an increase of 6 percent from 2016. This means that every inhabitant of Sweden sent 237 kg of household waste to energy recovery in 2017. Energy recovery makes up half of the total amount of treated household waste. The increase in household waste from 2016 to 2017 is partly attributable to bulky waste from recycling centres.

Waste is a fuel used in Swedish district heating systems. Converting waste to energy meets the heating needs of 1,250,000 apartments and the electricity needs of 680,000 apartments. In 2017, more than 18.3 TWh of energy was produced, of which 16.1 TWh was used for heating and 2.2 TWh for electricity. In addition, three plants reported that they delivered 74,610 MWh of district cooling. Sweden recovers more energy from waste than any other country in Europe, approximately 3 MWh per tonne[43].

In addition to household waste, 3.7 million tonnes of other waste, primarily industrial waste, was also treated by Swedish plants.

In 2017, Swedish energy recovery plants also treated 1,480,800 tonnes of waste from other European countries, 535,000 tonnes of which was household waste. This waste contributes to the fuel supply in Sweden and solves some waste management problems in exporting countries.

Avfall Sverige's statistical information refers to plants treating household waste, with the exception of Kils Energi. Energy recovery also occurs in plants that do not treat household waste. However, we do not have access to statistics on this. There are no comprehensive statistics on the total energy recovery from waste in Sweden.

There is residue from combustion. Slag from the furnace makes up about 16 percent by weight of the amount of input waste, and flue gas treatment residues make up 4 percent by weight. Slag consists of materials that are not combustible or do not evaporate during combustion. Examples of such materials are glass, porcelain, iron scrap, gravel, and more.

Once larger objects and metal residues have been sorted out for material recycling and the remaining material has been sifted and stabilised, what remains is granulated slag. This is mainly used as a construction material in landfill sites, but it would be beneficial to be able to use it instead of sand and gravel from natural deposits in road construction for example[44]. Sand and gravel from natural deposits are a finite resource that should be reserved for particularly pressing areas of application. Avfall Sverige actively works with its members to ensure that granulated slag used outside of the plants does not jeopardise people or the environment in any way.

Flue gas treatment residues is the collective term for a fine-grain fraction that is created during treatment of flue gas. The fraction consists of fly ash, filter cake from hose filters, and sludge from wet flue gas treatment. After they are stabilised, flue gas treatment residues are either transported to landfill or used as a neutralization agent when refilling mines and pits.

There are 34 incineration plants for household waste in Sweden. According to a study by Avfall Sverige, the capacity for energy recovery in Sweden is greater than the domestic availability of combustible waste[45].

RECOVERY METHODS

According to the EU Framework Directive on Waste and the Swedish Waste Ordinance, waste incineration with efficient energy recovery is regarded as recycling[46]. Swedish plants fulfil the energy efficiency criterion (R1 formula) by good margin. Energy recovery is a hygienic and environmentally sound treatment method for waste that cannot or should not be treated in any other manner.

43 2,961 MWh/tonne as the weighted average of the number of tonnes of waste
44 Avfall Sverige Report 2015:02 Evaluation of environmental impact of using granulated slag based on completed projects
45 Avfall Sverige Report 2017:16 Capacity investigation 2017 – Waste incineration and waste quantities through 2022
46 EU Framework Directive on Waste (2008/98/EC) and the Swedish Waste Ordinance (2011:927)

Converting waste to energy meets the heating needs of 1,250,000 apartments and the electricity needs of 680,000 apartments.

READ MORE:

Avfall Sverige Report 2015:24 Quality assurance upon import of waste fuel
Avfall Sverige Report 2015:27 Handling of fly ash from waste incineration Current handling and future choices
Avfall Sverige Report 2016:04 Critical evaluation of methods for hazard classification of the ecotoxic properties of waste (HP14)
Avfall Sverige Report 2016:05 Method comparison of dioxin sampling SRM-AMESA
Avfall Sverige Report 2016:22 ARCFUME for metallurgical treatment of fly ash from waste incineration
Avfall Sverige Report 2016:25 Corrosion in the storage of slag from waste incineration – the impact of storage on environmental properties and the ability to recover metals
Avfall Sverige Report 2017:02 What is a polluter? Allocation of emissions from energy recovery
Avfall Sverige Report 2017:03 Stabilisation of lead in fly ash from waste incineration through ageing and carbonation in contact with moisture and air
Avfall Sverige Report 2017:06 Industry-wide agreement for quality assurance of waste fuel
Avfall Sverige Report 2017:23 Right item to the right treatment Material recycling, waste incineration and the detoxification of society
Avfall Sverige Report 2017:24 Dioxin and waste incineration
Avfall Sverige Report 2018:03 Classification of incineration residues as hazardous or non-hazardous waste
Avfall Sverige Report 2018:09 Fire safety during storage of waste fuel

Energy recovery plants 2017

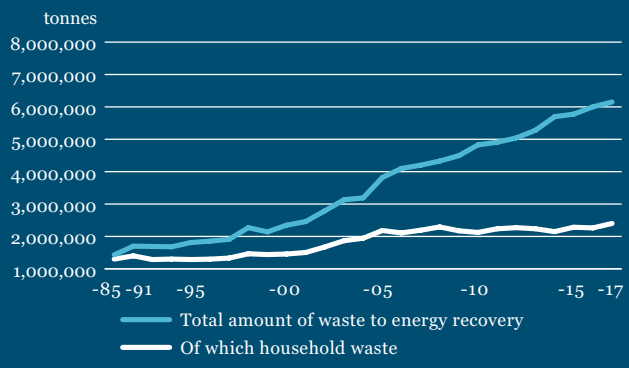
		Processed waste (tonnes)		Energy production (MWh)	
			of which		
Municipality	**Plant**	**Total**	**household waste**	**Heating**	**Electricity**
Avesta	Källhagsverket	58,100	23,840	172,000	0
Boden	Bodens Värmeverk	100,850	32,320	349,090	23,820
Bollnäs	Säverstaverket	66,880	38,060	145,020	26,900
Borlänge	Fjärrvärmeverket, Bäckelund	92,960	25,840	240,540	42,150
Borås	Ryaverket	112,260	24,780	281,900	44,240
Eda	Åmotsfors Energi	71,070	19,030	183,540	20,770
Eksjö	Eksjö Energi AB	53,660	28,150	147,450	14,570
Finspång	FTV Värmeverket	28,120	6,210	67,850	0
Göteborg	Sävenäs avfallskraftvärmeverk	549,200	197,440	1,454,150	195,410
Halmstad	Kristineheds avfallsvärmeverk	189,190	70,030	506,220	53,510
Helsingborg	Filbornaverket	199,260	48,850	449,090	116,690
Hässleholm	Beleverket i Hässleholm	50,000	34,380	121,740	10,960
Jönköping	Kraftvärmeverket Torsvik	159,290	50,050	428,570	100,790
Karlskoga	Karlskoga Kraftvärmeverk	89,930	35,260	296,210	24,100
Karlstad	Avfallsvärmeverket på Heden	50,690	43,490	165,510	0
Kil	Kils Avfallsförbränningsanläggning	11,850	0	44,830	0
Kiruna	Kiruna Värmeverk	57,220	13,500	152,710	19,370
Kumla	Ekokem Förbränning	149,990	5,540	262,840	57,160
Köping	Norsa avfallsförbränningsanläggning	21,980	17,660	62,280	0
Lidköping	PC Filen	126,590	24,290	377,640	24,020
Linköping	Gärstadverket	598,720	99,240	1,529,700	234,000
Ljungby	Ljungby Energi AB	57,520	54,530	135,290	15,130
Malmö	Sysav förbränningsanläggning	576,520	210,610	1,501,150	168,250
Mora	Avfallsförbränningen Mora	20,270	12,430	64,080	0
Norrköping	E.ON Händelöverket	396,000	140,000	824,000	134,000
Nybro	Kraftvärmeverket Transtorp	55,470	55,470	105,750	16,290
Sigtuna	Brista kraftvärmeverk	200,900	55,600	529,320	113,320
Skövde	Värmekällan	59,880	38,340	170,600	4,540
Stockholm	Högdalenverket	688,330	421,660	1,944,000	296,280
Sundsvall	Korsta kraftvärmeverk	174,070	71,200	443,490	42,970
Uddevalla	Lillesjö Avfallskraftvärmeverk	112,860	51,190	268,440	67,670
Umeå	Dåva kraftvärmeverk	149,630	59,220	354,270	84,820
Uppsala	Vattenfall AB Värme Uppsala	364,750	215,930	1,144,710	24,330
Västervik	Stegeholmsverket	67,120	12,850	190,090	20,860
Västerås	Västerås Kraftvärmeverk	389,020	148,200	999,830	245,450
	Other incineration of household waste in industrial plant		15 250	-	-
Total		**6,150,150**	**2,400,440**	**16,113,900**	**2,242,370**

* Quantities and energy refer to the average for 2014–2016
Avfall Sverige's statistics include waste incineration plants that accept household waste. Most also accept other waste.
The plant in Kil is included despite this definition.
The amount of household waste only includes Swedish household waste.
The total amount of waste also includes imported waste.
Energy recovery relates to total waste, not just household waste. Energy recovery relates to total waste, not just household waste.

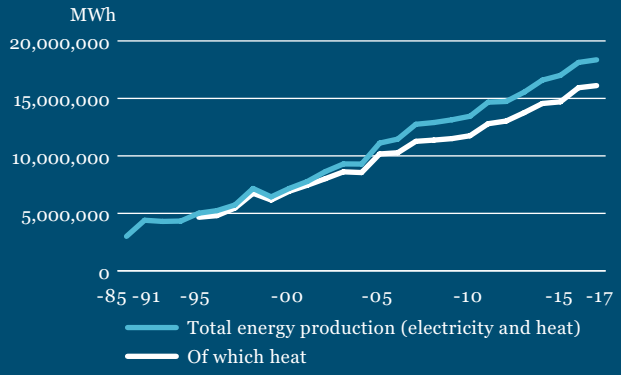
Energy recovery 2013–2017

	2013	2014	2015	2016	2017
Incineration (tonnes)					
Household	2,235,930	2,148,640	2,284,210	2,262,610	2,400,440
Other waste	3,043,160	3,549,040	3,491,190	3,740,200	3,749,710
Total	**5,279,090**	**5,697,680**	**5,775,400**	**6,002,810**	**6,150,150**
Production (MWh)					
Heating	13,762,940	14,558,030	14,702,670	15,929,210	16,113,890
Electricity	1,786,910	2,032,040	2,304,610	2,199,830	2,242,370
Total	**15,549,850**	**16,590,070**	**17,007,280**	**18,129,040**	**18,356,260**
Slag, bottom ash (tonnes)	902,760	953,770	967,700	976,070	992,330
RGR, fly ash (tonnes)	241,600	250,580	265,080	275,940	270,320

Waste to energy recovery 1985–2017



Energy production from waste 1985–2017



Source: Avfall Web

Landfill

In 2017, 23,650 tonnes of Swedish household waste went to landfill. This is a reduction of 24 percent compared to 2016. Per capita this is 2 kg. Only 0.5 percent of household waste was sent to landfill in 2017.

In 2017, waste treatment plants that submit data to Avfall Web sent a total of 2,117,300 tonnes to landfill, an increase of 134,000 tonnes compared to the previous year. However, at individual plants the total amounts of waste going to landfill can vary significantly from year to year, depending on a varying need to send ash and contaminated excavated material to landfill. In 2017, 36 plants sent household waste to landfill; another 30 some plants send only business waste to landfill.

Landfill is the treatment method used for waste that cannot be treated in any other way, e.g. contaminated materials. At a modern waste treatment plant, material separation – for processing, for reuse and material recycling, and for energy recovery – is a major part of operations. The plants sometimes also serve as temporary storage for waste fuel and waste that falls under producer responsibility, such as paper and glass. Plants often also treat biodegradable waste and contaminated excavated material.

When a landfill is full, it is capped with material (often in multiple layers) to, inter alia, prevent rainfall from penetrating the landfill site and becoming contaminated through contact with the waste. Today, materials such as slag, sludge, ash and contaminated soil are used in the various capping layers. Most of the landfill sites closed due to stricter regulations, introduced in 2008, will be capped by 2030.

LANDFILL GAS AND LEACHATE

Landfill gas is the term used for the gas produced at a landfill where organic waste was deposited in the past[47]. The gas is approximately 50 percent methane. The rest is carbon dioxide, nitrogen, and small amounts of other gases. Since it contains methane, it must be collected to reduce its environmental impact.

Since the ban on organic waste going to landfill was introduced, the formation of gas at landfill sites has progressively decreased.

In 2017, approximately 142 GWh of landfill gas was collected in total at 40 waste treatment plants, of which 102 GWh was used for energy.

Energy recovery consisted of 18.4 GWh in the form of electricity and the rest in the form of heating. In all, 40 GWh of landfill gas was flared. Flaring does not produce energy but reduces methane emissions. Waste is still sent to landfill at 28 plants with gas recovery.

Landfills are built with a bottom barrier layer to make it possible to collect and purify leachate. Leachate is defined as the liquid – usually rainwater – which has been in contact with the landfill material and flows out of or is retained in a landfill. In 2017, approximately 7.3 million cubic metres of leachate was handled at 97 waste treatment plants.
This also includes contaminated surface water from operational areas. All of the water is handled in the same treatment process.

Waste is still sent to landfill at 66 plants with leachate treatment. Less than half of the plants report that leachate is diverted to municipal wastewater treatment plants after various degrees of local treatment. Other plants report that leachate is treated locally before being released to recipients[48]. Gas and leachate is also collected from closed landfill sites.

47 Avfall Sverige Report D2013:02 Landfill gas handbook
48 Avfall Sverige Report 2015:01 List of Swedish leachate plants and the state of leachate management knowledge in Sweden 2011

READ MORE:

Avfall Sverige Report D2012:02 Avfall Sverige's landfill handbook
Avfall Sverige Report 2015:09 Landfill waste – mapping and possible disposal
Avfall Sverige Report 2015:12 Drones at the dump – more efficient management of operations at waste treatment plants
Avfall Sverige Report 2015:13 Decision-making support for handling landfill emissions during capping
Avfall Sverige Report 2015:28 Methods for remedying/stabilising old landfills
Avfall Sverige Report 2016:01 Trends for waste treatment plants with landfill – statistics 2008–2014
Avfall Sverige Report 2016:11 Aired ponds
Avfall Sverige Report 2016:25 Corrosion in the storage of slag from waste incineration – the impact of storage on environmental properties and the ability to recover metals
Avfall Sverige Report 2016:32 When is active management of landfill gas no longer necessary?
Avfall Sverige Report 2017:03 Stabilisation of lead in fly ash from waste incineration through ageing and carbonation in contact with moisture and air
Avfall Sverige Report 2017:04 Decision-making support for recycling granulated slag in specific asphalt-covered construction structures
Avfall Sverige Report 2017:07 Particles in leachate from landfills and contaminated water from landfill sites – significance and separation
Avfall Sverige Report 2017:10 Use and modification of metal-separated granulated slag – potential and matching, AMOD
Avfall Sverige Report 2017:28 Characterisation of surface water from different types of activities and waste
Avfall Sverige Report 2017:34 Application of the law on tax on waste
Avfall Sverige Report 2017:36 Handbook for assessing leachate and contaminated surface water at waste treatment plants
Avfall Sverige Report 2018:04 Handling the waste stage of plastic composites with carbon nanotubes
Avfall Sverige Report 2018:03 Classification of incineration residues as hazardous or non-hazardous waste
Avfall Sverige Report 2018:09 Fire safety during storage of waste fuel

Landfilled quantities 2013-2017 (tonnes)

	2013	2014	2015	2016	2017
Quantity sent to landfill	1,391,900	1,432,200	1,662,200	1,983,400	2,117,300
of which household waste	33,300	32,900	38,300	31,000	23,600

Avfall Sverige's landfill statistics do not provide a complete picture of landfill in Sweden. Initially, the idea was to keep statistics on plants that accepted household waste. Today, many of these plants no longer accept household waste.
There is some uncertainty about the figures for household waste as it is not always possible to distinguish flows of household waste from other waste.

Energy recovery at landfill sites 2013-2017 (mWh)

Energy recovery at landfill sites (MWh)	2013	2014	2015	2016	2017
Useful energy	193,800	175,300	137,100	140,220	102,480
of which electrical energy*	12,600	17,600	17,800	9,300	18,440
Flaring	50,800	46,600	53,300	36,700	40,170

* Other energy is used for heating
Source: Avfall Web

Plants that send household waste to landfill 2017

Municipality	Plant	Total	of which household waste	Useful energy, MWh
Alingsås	Bälinge	44,240	170	1,370
Arvika	Mosseberg	3,010	280	700
Borlänge	Fågelmyra	11,700	2,780	520
Borås	Sobacken	107,240	110	420
Eslöv	Rönneholm	1,540	840	0
Gotland	Slite	2,550	1,200	0
Grums	Karlberg	270	270	0
Hagfors	Holkesmossen	450	450	0
Helsingborg	Filborna	1,440	330	8,190
Huddinge	Sofielund	40,450	230	2,780
Hässleholm	Vankiva	56,790	10	0
Kalmar	Moskogen	114,850	1,770	30
Karlskrona	Mältan	6,430	1,380	0
Karlstad	Djupdalen	22,960	2,570	0
Katrineholm	Vika	1,910	40	0
Kiruna	Kiruna deponi	720	360	0
Klippan	Hyllstofta	510	100	1,580
Kramfors	Högberget	18,790	270	0
Laholm	Ahla deponi	750	310	0
Lidköping	Kartåsen	23,150	140	0
Linköping	Gärstad	12,990	1,450	0
Ludvika	Björnshyttan	680	500	120
Motala	Tuddarp	1,970	140	0
Orust	Månsemyr	140	120	0
Piteå	Bredviksberget	8,470	390	0
Skellefteå	Degermyran	14,490	540	0
Sunne	Holmby	960	410	0
Uppsala	Hovgården	9,330	60	0
Vetlanda	Flishult	39,100	1,440	0
Vänersborg	Heljestorp	137,950	260	5,700
Västervik	Målserum	1,510	180	0
Växjö	Häringetorp	3,620	790	500
Älmhult	Äskya	N/A	230	550
Örebro	Atleverket	46,180	90	5,480
Östersund	Gräfsåsen	5,520	1,230	0
Östhammar	Väddika	4,310	2,210	0
Other plants in Avfall Web		1,370,290		74,540
Total		**2,117,260**	**23,650**	**102,480**

The table only reports the plants that send household waste to landfill (and that entered a value in Avfall Web).
Avfall Sverige's statistics covers a total of 122 plants.

Operation of recycling centres is included in the municipality's basic costs for waste management.

Customers, charges and costs

Municipalities and producers handle the management of household waste. The cost to municipalities is recouped through a waste collection charge, set by the municipal council. Producers' costs are recouped through a charge on the product. The producers determine what this charge should be themselves.

As a rule, the municipality's waste collection charge covers the total cost of municipal waste management, but any deficits that occur may be funded through taxation. Administration, such as waste planning, customer service, invoicing and information are included in the costs. In addition, the charge must cover the cost of service at recycling centres, such as receiving bulky waste and hazardous household waste.

The charge is often divided into a fixed and a variable fee, for example one fee for waste collection and one for waste treatment. According to the prime cost principle in the Local Government Act, the municipalities' revenue from the waste collection charges may not exceed their costs for waste management.

AVERAGE CHARGE

The average annual waste collection charge for a Swedish household in a single-family house is SEK 2,128 (or SEK 5.80 per day) according to data from Avfall Sverige's statistics system Avfall Web. Households in apartment blocks pay an average of SEK 1,316, and the average fee for second homes is SEK 1,233 annually.

Many municipalities that introduced the voluntary collection of food waste use the charge as an incentive[49]. Then, for example, households that separate food waste pay a lower charge than those that choose to leave mixed waste for collection.

To achieve a higher recycling rate for waste, several municipalities have introduced a weight-based charge, where households pay an additional rate per kilo of waste collected on top of the basic charge[50]. In this case, collection vehicles are equipped with a scale and equipment to identify each individual bin. The total annual cost for weight-based charges varies depending on the quantity of waste left for collection. The charge varies between SEK 0.90 and SEK 3.90 per kg for residual waste and SEK 0 to SEK 3.80 for a food waste bin, combined with various types of bin charges and the fixed basic charge. 30 of the country's municipalities had a weight-based charge in 2017. Some municipalities with food waste collection have lower weight charges for food waste; in some municipalities it is free.

The total cost for waste management to municipalities is on average SEK 825 per person each year, excluding VAT. The municipal cost for collecting food and residual waste is on average SEK 287 per person. Treatment of the waste is not included in this cost. The basic cost averages SEK 370 per person. The annual basic cost covers factors such as the cost of recycling centres, the treatment of hazardous household waste, planning, information and administration. The cost is generally higher in households of municipalities with small populations versus those with large ones[51].

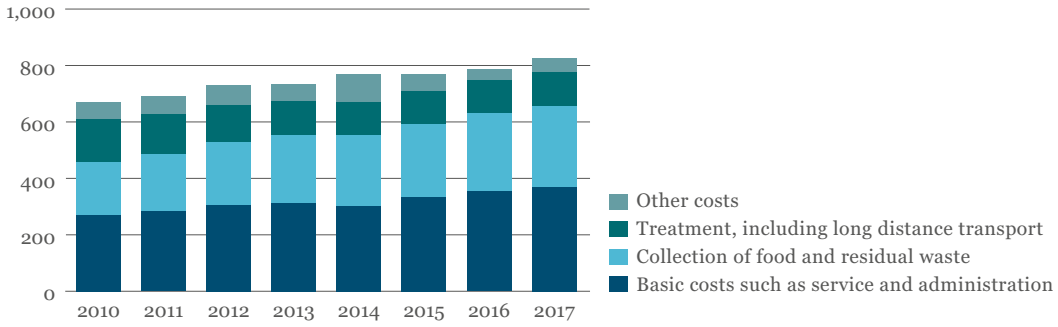
There are several national and local mechanisms in place to reduce the environmental impact of waste management, improve resource efficiency and increase recovery. These can be information or administrative and financial instruments. Examples of administrative instruments include regulations and prohibitions, such as limits to emissions and prohibiting sending organic waste to landfill. Financial instruments can either be an incentive, for example tax relief and subsidies, or a penalty, for example taxes and charges. One basic principle is that the polluter should pay.

Tax on waste sent to landfill was introduced in 2000 as a way to reduce landfill. The tax was initially SEK 250 per tonne, but has since been raised several times. Since 01 January 2015, the landfill tax has been set at SEK 500 per tonne of waste. The landfill site operator is liable for the tax.

Municipalities often pay a charge to get their waste treated. Treatment charges can vary greatly. The charge for energy recovery from residual waste has increased somewhat compared to 2016. The charge for anaerobic digestion is unchanged, while the charge for composting has decreased. The charge for landfill is also unchanged.

49 Avfall Sverige Report 2014:09 Guidance for structuring waste charges
50 Avfall Sverige Report U 2014:05 Eco-based charge? A guide to weight-based waste charge prior to decision, for implementation and operation
51 Avfall Sverige Report 2016:29 Calculation of waste management costs in Sweden municipalities

Waste management cost per person, in SEK and excl. VAT 2010–2017



The statistics come from Avfall Web and are based on data from about two-thirds of Sweden's municipalities.

Treatment charges for household waste, in SEK and excl. VAT 2017

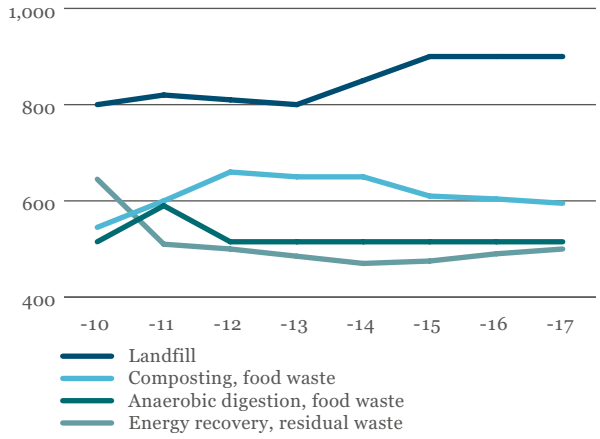
SEK/tonne	Anaerobic digestion, food waste	Composting, food waste	Energy recovery	Landfill
Average	515	605	490	900
Interval	360-680	500-820	380-670	670-1,250

Source: Avfall Web
The treatment charge refers to the median in Avfall Web. The interval shows the normal distribution of waste treatment charges.

Average waste charges per household incl. VAT 2010–2017

The diagram shows the average of municipal waste collection charges.

Treatment charges per tonne, in SEK and excl. VAT 2010-2017



Source: Avfall Web

READ MORE:
Avfall Sverige Report 2017:26 Household waste in figures

Total quantity of waste generated in Sweden

According to the EU's Waste Statistics Directive, each member state must report its country's statistics once every two years. Data on all waste in Sweden can be found in the official statistics, which are reported to the EU via the Swedish Environmental Protection Agency.

The latest statistics relate to waste quantities for 2016[52]. At that time, 142 million tonnes of waste were generated in Sweden, of which 2.4 million tonnes were hazardous waste. The majority of the generated waste, 77 percent or 110 million tonnes, consisted of mining waste from the mining industry.

The entire EU generates approximately 2.5 billion tonnes of waste each year.

Businesses are responsible for managing their own non-household waste. Some businesses have their own landfill sites at their disposal or can recover energy from waste in their own incineration plants.

Construction and demolition waste is waste from construction, renovation, rebuilding or demolition of buildings, or from more extensive construction work in gardens. The municipality is not responsible for collecting or handling such waste. However, waste from minor maintenance work and house repairs counts as household waste. Some construction and demolition waste is classified as hazardous waste, for example asbestos and impregnated timber, and must be handled accordingly. According to the Swedish Environmental Protection Agency's calculations, about one-third of all waste produced in Sweden is generated by the construction sector (mining waste excluded). Construction and demolition waste is therefore prioritised in the national waste plan and in the waste prevention programme.

The waste hierarchy serves as guidance for how waste is treated, and has been integrated in the Environmental Code (SFS 2016:782) since 2016. The national waste statistics also include final treatment of waste at the three levels material recycling, other recycling (e.g. energy recovery), and disposal. Sweden's statistics for 2016 are as follows: 6.7 million tonnes of waste (of which 226,000 tonnes were hazardous waste) underwent material recycling, 14.7 million tonnes of waste (of which 269,000 tonnes were hazardous waste) were recycled in some other way, and 5.6 million tonnes of waste (of which 841,000 tonnes were hazardous waste) were disposed of. Mining waste is excluded from these statistics.

Total waste generated in Sweden, excluding mining waste 2016

Total quantity of waste generated in Sweden in 2016, excluding mining waste, reported for different industries and broken down into non-hazardous waste and hazardous waste. Quantities are given in tonnes (rounded values). The industries that generated the most waste are reported individuals. The remaining industries are reported together under Other industries.
Source: Swedish Environmental Protection Agency

52 Swedish Environmental Protection Agency Report 6839 "Waste in Sweden 2016"

About Avfall Sverige

Avfall Sverige is the municipalities' trade association. Avfall Sverige's members ensure that waste is collected and recycled in all Swedish municipalities.
We perform our work on behalf of society: in an environmentally sound, sustainable and long-term manner. Our vision is "Zero Waste".
We are taking action to prevent waste, promote reuse and ensure that the waste produced is recycled, recovered and managed in the optimal manner.

Municipalities and their enterprises are the ambassadors, catalysts and guarantors of this change.

Avfall Sverige represents its members – municipalities, local government associations, municipal enterprises and municipally-owned regional enterprises in waste and recycling. Our members represent the entire population of Sweden. The association also includes about a hundred associate members: manufacturers, consultants and contractors active in waste management.

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