

Re:waste

– how Sweden is rethinking resources



Precious trash. Artist Johanna Törnqvist makes couture – and a statement – out of recycled textile and plastic that she sources from her own and her friends' and family's waste.



Photo: Fredrik Sederholm

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Photo: Kenneth Bengtsson

What a waste

Waste, rubbish, litter, refuse. There are almost as many names for waste as there are problems associated with it. And through our consumption, we all contribute to the mounting challenge as we add used products to the waste management system. Some products are designed to last only a few minutes, while others can be used for hundreds of years.

The European Union (EU) defines municipal waste as waste from households and similar waste from business activities. The world generates 0.74 kilos of waste per capita per day, more in high-income countries and less in low-income nations. An estimated two billion tonnes of municipal waste were generated globally in 2016, and according to projections from the World Bank, this number is expected to increase by 70 per cent before 2050.

Meanwhile, two-thirds of the world's population lack access to a waste management system, with their waste ending up in landfills with no environmental safety measures. Poorly managed waste is contaminating the world's oceans, increasing toxicity in the environment, clogging drains and causing flooding, transmitting diseases, increasing respiratory problems from waste burning and harming wildlife that consume waste.

Additionally, our consumption is interlinked with air and water pollution, especially greenhouse gases. Increased consumption leads to a surge in demand for new material and creates pollution in the production and user phases. Waste management itself stands for almost 10 per cent of all greenhouse gases, mainly from landfills.

Companies need to start taking on more responsibility, in terms of manufacturing processes, product design, choice of materials and their internal waste management. The linear business model needs to move towards more circularity. Governments can give incentives and pass laws for this to happen, and consumer demand bears on the effect, but in the end, it is up to the companies to do the transformation.

New innovations and solutions make it easier for us to reduce these risks. And there are lots of things we can do to stop this development – from looking at what and how we consume, to what we do with the things we can't use. Local conditions often dictate what is possible, and solutions will vary depending on factors such as socioeconomic condition and level of urbanisation.

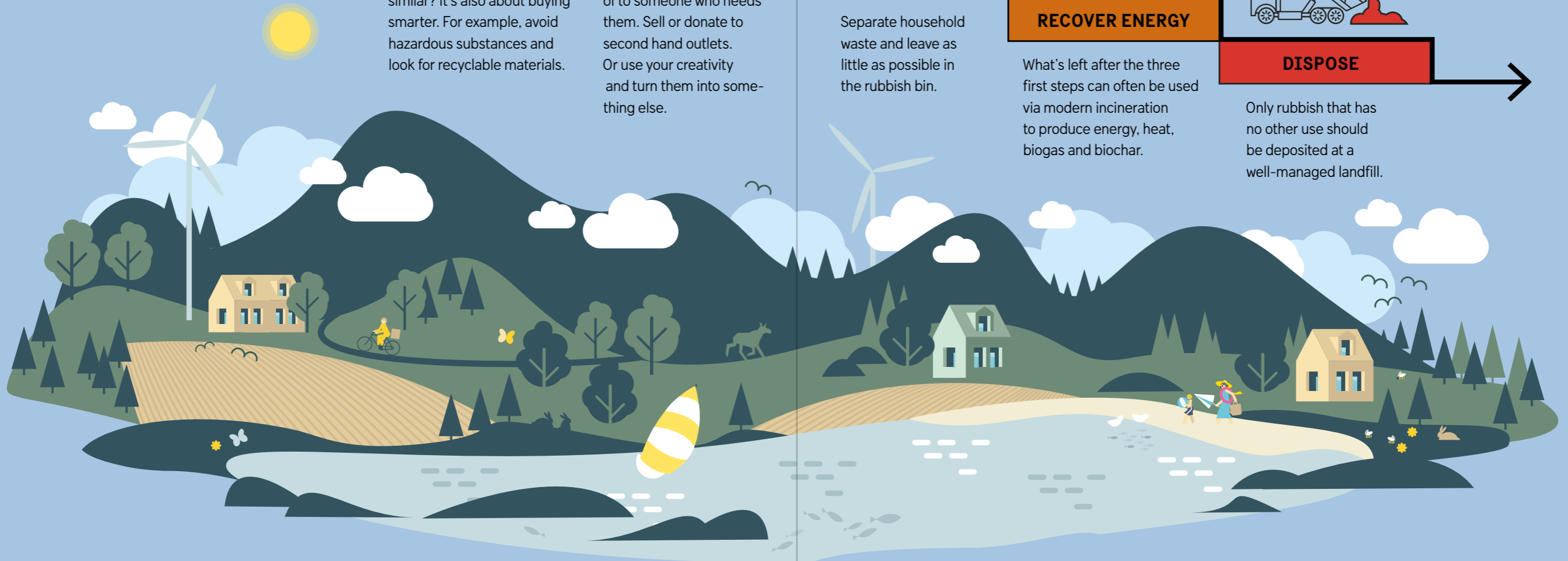
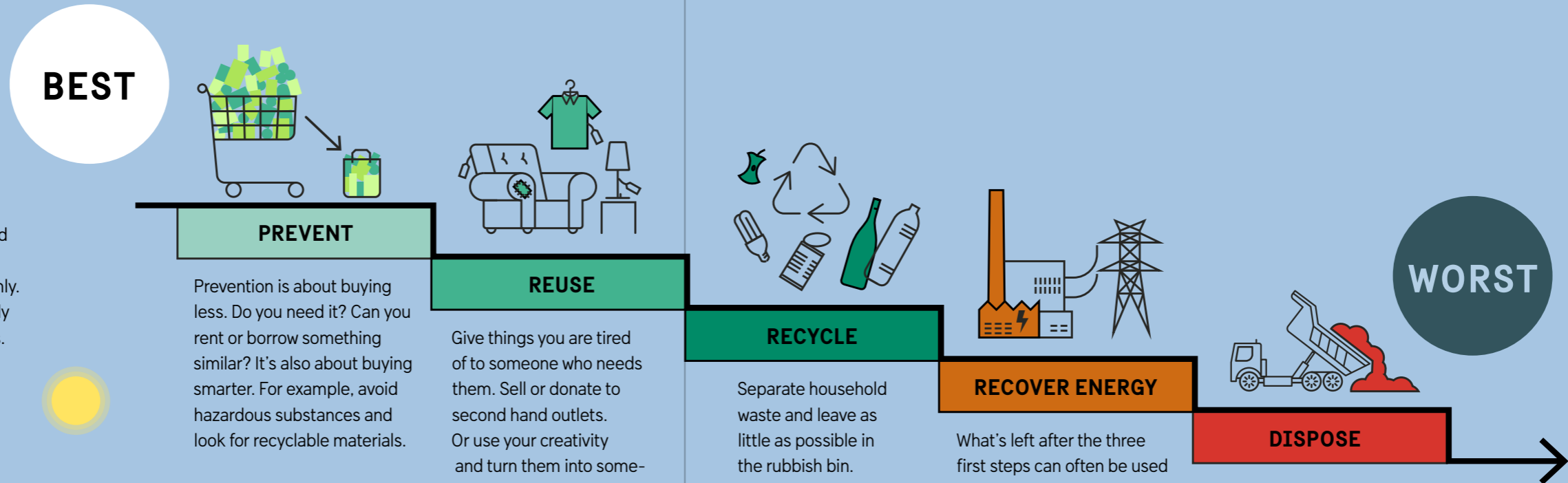
Reaching a sustainable solution to waste will require a joint effort involving politics, research, innovation and citizen dedication. Through clever design and by thinking ahead, we can maintain a sustainable consumption pattern.

The average Swede generates 1.24 kilos of waste per day. Yet, thanks to a systematic approach that involves high political ambitions, clear responsibilities, economic incentives and citizens' involvement, less than 1 per cent of Swedish municipal waste ends up in landfills. The EU average is 24 per cent.

But waste remains a problem, and Sweden is far from sitting on a final solution. Going forward, societies worldwide need to take a holistic approach that includes all parts of society and incorporates circular thinking – to stop waste before it becomes waste.

Waste hierarchy

Waste hierarchy is a set of principles to guide waste management systems. It can be illustrated as a series of steps, where the highest step has the most effect, and the lowest is a last resort only. It can be used by individuals but should definitely be adapted also by producers and governments.



Crown Princess Victoria is royally conscious as she attends her brother's wedding. She wears an outfit made only of organic and recycled materials from H&M's Conscious collection.

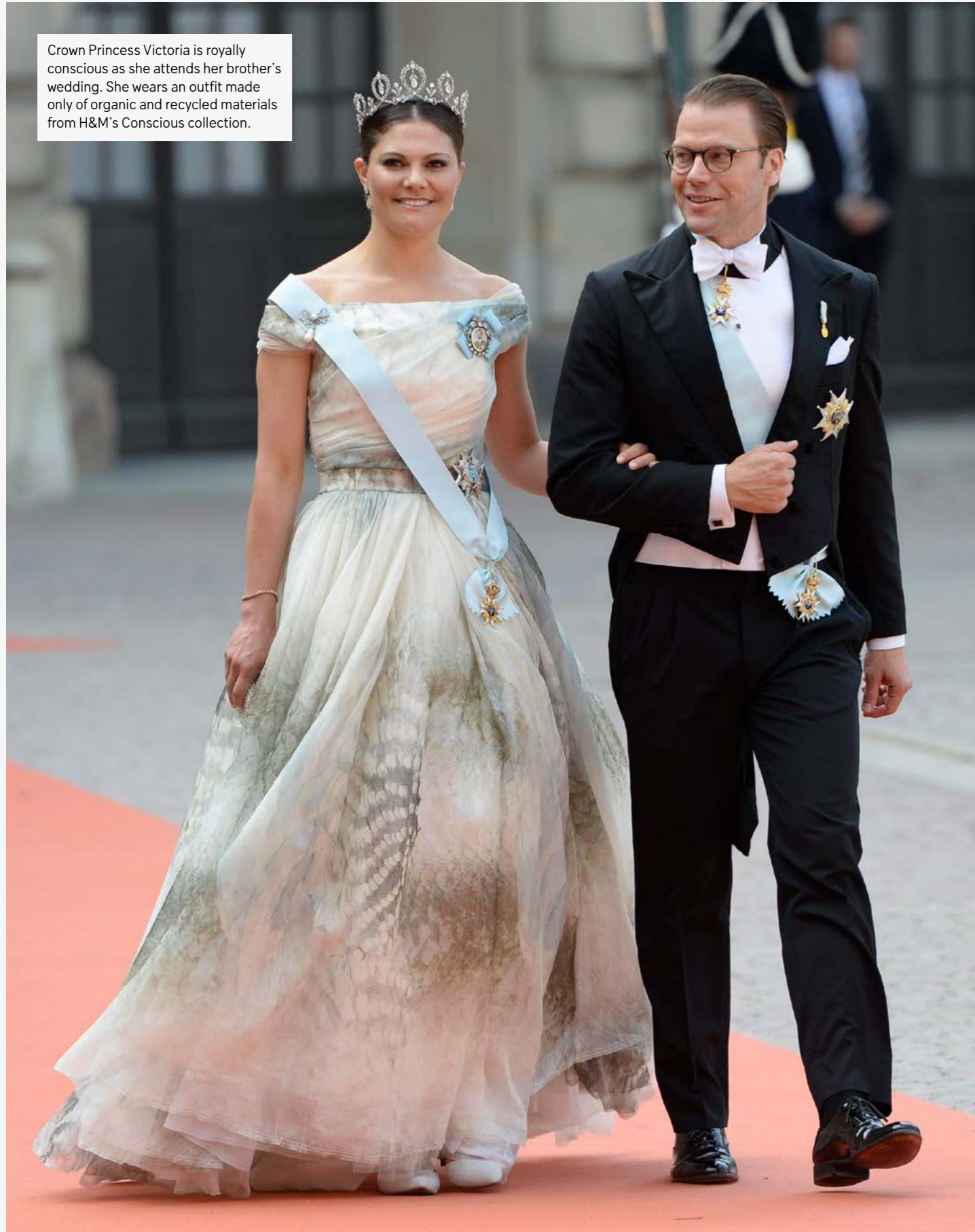


Photo: Andreas Bardell/TT

Aiming for a circular economy

The ultimate approach to waste management is to not create any in the first place. To successfully minimise waste, we would have to avoid unnecessary consumption of goods and services and reduce the inputs and hazardous substances that go into the creation of products.

Current production and consumption patterns are mostly based on the linear system, from digging up resources, processing and using them, to discarding them as waste. This is by no means sustainable, and we must switch to a circular economy. This is a process that starts at the drawing table when a product is designed, and its components and materials are defined.

Design has a key role in terms of product development, as well as in creating trends and influence behaviour. Designers work with values such as aesthetics, function and usability. But their choices also affect materials, recycling, upgrading and other technical areas. With more knowledge about resource efficiency, life cycle and materials, designers can make better choices in their work.

Source reduction efforts include reducing or eliminating the use of virgin materials, focusing on energy conservation and pollution reduction, as well as reducing the use of hazardous components. Specific initiatives include packaging reduction, energy-efficient production facilities, and the use of recycled and recyclable materials. Future business models will also have to consider how to extend the life of products, by using more durable materials, improving repair and maintenance opportunities, as well as prolonging the life of individual materials through reuse, recycling and up-cycling.

Quadruple helix efforts

In 2018 the Swedish government established an advisory body to help make circular economy a key policy. The purpose of the delegation is to strengthen Sweden's transition to a circular and bio-based economy.

Sweden is particularly fond of the 'quadruple helix' model – cooperation between government, academia, the business sector and non-profit organisations. Verapark is a science centre in southern Sweden that aims to become the leading centre for circular economics in Europe. Associated companies receive help with exposure, contacts, collaboration with business and government, and connection to the academic world.

Circular Sweden is a corporate forum that aims to create more circular material flows by driving technological development, consumer behaviour and policy forward in the four pillars of the circular economy: circular design, sustainable consumption, increased access to and use of recycled materials, and circular value chains. Circular Sweden's strength lies in its members, as it is made up of large corporations that have the ambition and power to influence major material flows.

Business benefits

Millennials and Generation Z, that is, people under the age of 40, are spearheading demand for circular products and recycled content. Under-40s are increasingly willing to accept personal responsibility in meeting environmental challenges. They are also more likely to realise that circular product and service models can create additional non-environmental benefits for them, such as financial savings.



Repairs and upcycling is one way out of our throwaway culture, and a growing business trend. ReTuna is Sweden's – and the world's – first second hand shopping centre. IKEA second hand is one of their tenants.



What consumers can do

Consume less. Try a zero-waste lifestyle: rethink, refuse, reduce, reuse, repair and recycle.

Consider borrowing, sharing, renting or choosing Product-as-a-Service alternatives.

Choose products made from renewable and recyclable materials. Buy things that will last longer and can be repaired.

Ask the brands you buy from about their efforts to achieve less waste. The final product will have generated waste even before it reaches your home.

THANKS FOR CONSUMING LESS!



As more and more people are following in the steps of younger generations, demand keeps rising along with interest from the business community. The segment turns out to be lucrative. There have been numerous studies to estimate the business opportunity presented by the circular economy. While the figures aren't in exact agreement, most projections are around several trillion euros. Business leaders are starting to recognise not only the sustainability angle, but also the commercial benefits of changing their business models.

Swedish companies in industry segments as diverse as fashion, furniture and electronics are taking substantial steps towards a circular corporate system. Products last longer and are used, repaired, reused and finally recycled to new resources. While none has achieved complete circularity, sportswear manufacturer Houdini's fall and winter collection 2019 was 68 per cent fully circular. Other larger companies that stand out include H&M, Electrolux and IKEA. IKEA and H&M have committed to design all their products with circular capabilities by 2030.

The sharing economy

Part of a circular economy is to share and rent rather than own products. The idea is that sharing will result in fewer products, because each item can be shared among many users.

Sege Park is an upcoming Malmö district with about 1,000 planned homes, but also a so-called test bed for future sustainability solutions, where the sharing economy will play a prominent role. Businesses and the city of Malmö are collaborating to create a sustainable area with a focus on sharing and cultivation.

Ahead of the construction, an exhibition called 'Shareful Sege Park' presented challenges and proposals for sustainable housing solutions, where the sharing economy has a prominent role. The initiative is a part of Sharing Cities Sweden, a national programme developing test beds for the sharing economy.

Ambitions and policy

The waste hierarchy is a set of principles for how waste policies should be arranged to fulfil the overall ambitions to create a sustainable waste management system. It illustrates how prevention needs to be the primary component, followed by reuse, before the actual waste management, which should prioritise recycling and composting over energy recovery. Finally – disposal, which should be the last resort.

The old aphorism of reusing, reducing and recycling certainly is a good start. But it won't take us all the way. Some household things, like a sheet of typing paper, is easily recycled, whereas complex fabric blends in an item of clothing presents a huge challenge. A waste hierarchy reveals that there are items that reducing, reusing and recycling won't take care of. There's need for further prevention, additional recovery methods and, yes, landfill as the final resort.



What consumers can do

Contact your elected officials and encourage them to implement and increase their waste management efforts.

Make use of all available waste management initiatives, from recycling stations to economic incentives.

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The need for a legal framework

Waste management will not develop by itself – it requires political and legal action, both nationally and internationally. The United Nations (UN) has set up a Global Partnership on Waste Management to improve international cooperation. The EU has shared waste management rules; however, member states have some flexibility when it comes to implementation, and there is no unified waste management system. It is up to governments to use all available steering instruments, including strict regulations, taxes, economic incentives and information.

In Sweden, there's practically political unity on the issue, so Swedish ambitions and targets have been able to develop regardless of changes in the political landscape. One powerful action was the 2005 ban for combustible or organic waste to be put into landfills. This meant a huge boost for recycling and energy-from-waste (incineration) operations. Another important milestone was the pronounced goal to separately collect and treat more than 50 per cent of food waste by 2028. As of 2021, separate collection of food waste will be mandatory. A new goal to halve food waste by 2025 is under way.

Recycling targets for packaging and electronic waste also urge the system in the right direction. Collection services for packaging and paper waste at households will be standardised in 2020. Following EU legislation, certain single-use plastic items will be banned in the coming years, which is a very rigid involvement in the market.

Clear responsibility

Ambitious goals and targets are necessary but will not deliver results without a clear view on who is responsible to set up collection and recycling systems. The Swedish system is based on the three-tier responsibilities: local authorities/municipalities for municipal waste, producers for certain waste categories, and the waste holder for industrial and building waste.

Managing citizens' waste is a service of general interest. Everyone needs access to and is forced to use whatever system is set up. That's why it is most natural that local authorities are responsible for arranging the management of municipal waste. Often, local authorities will cooperate and learn from each other.

According to EU rules and Swedish legislation, producers are responsible for the collection and recycling of certain used products such as packaging, electronic waste, paper, vehicles, batteries and pharmaceuticals. In these cases, local authorities are exempt from their responsibility. Under the Extended Producer Responsibility (EPR) policy approach, producers are given a significant responsibility – financial and/or physical – for the treatment or disposal of post-consumer products. EPR gives incentives to prevent waste at the source and promote sustainable product design. These duties are financed by fees placed on the products and payed for by consumers.

Economic incentives

Investment in new waste treatment infrastructure requires a lot of capital, and the Swedish government offers grants of up to 50 per cent capital support for innovative solutions. To help increase demand for sustainable options there are subsidies and tax exemptions for biogas vehicles.

The deposit refund system is another economic instrument used primarily for PET bottles and aluminium cans, but also some glass bottles. Consumers pay a deposit in the supermarket and get a refund when they return the item for recycling. Other government initiatives include reduced VAT for repair services, taxes on landfill deposits and waste to energy (incineration), as well as taxes on single-use plastics.

Attitudes and behaviour

Without public participation and acceptance of different rules and incentives, the results will falter. For this reason, Sweden has



put a lot of effort into increasing awareness, aiming for long-lasting change of citizen behaviour. Information campaigns and surveys of customers satisfaction are important government duties. It's crucial that relevant authorities communicate what waste management is, how it is done and why it is important. Such information and communication must also build on trust. If the government asks people to sort materials for recycling, the government must also fulfil its obligation to recycle the materials. Another method is nudging, using positive reinforcement and indirect suggestions as ways to influence the behaviour and decision-making of individuals.

In Sweden, there are also preschools and extracurricular activities dedicated to environmental awareness. Although not mandated on the national curriculum, there are university courses and other adult education that specifically target waste management.

Waste management: Reuse and recycle

One key aspect of the circular economy is that focus shifts to the products, to minimise the amount of waste being generated. Source reduction is central to a circular economy. It can be achieved through long-term sustainable design, continuous maintenance, repair, reuse, renovation, re-manufacturing and recycling. It's the opposite of a linear economy of 'take, use and waste'. Reusing products means we don't take new resources from the planet, but rather adopt repairs, second-hand trade, donations, loans and rentals. Repairs can be done at home, but more and more people use the services of businesses. Shops are offering repair services for everything from electronics to clothes. Upcycling has become popular enough to warrant its own shopping centre. ReTuna in central Sweden is the world's first second-hand shopping centre. Every shop sells used things that have been repaired or upcycled.

However, almost all products will at some point be worn out and become waste, even if they are used and reused many more times than before. And at that stage, recycling and composting – besides being more environmentally friendly – also cost substantially less than landfill or incineration infrastructure.

Collection is the start for reuse and recycling

The sorting and collection of waste is the beginning of a long chain of processes. Proper service is crucial to maintaining a functioning collection system. The longer citizens have to transport their sorted waste, the less willing they will be to do it.

In Sweden, wastepaper and packaging waste such as glass, metal and plastics are mainly collected through unmanned

kerbside recycling stations and to a lesser extent at manned recycling centres. To make more people recycle, this system will gradually shift to a doorstep collection at a service level similar to that for food waste and non-recyclable rubbish.

As recycling and separation increases, there's a need for specialised trucks with more compartments and other sorting solutions. Swedish company Envac uses an underground vacuum-based collection system that can be integrated with its system for collection of separated waste fractions. This system eliminates the need for collection trucks.

Another way to reduce traffic is to multiuse already existing transportation for goods. Swedish food delivery company Mathem offers its customers return transport of waste packaging when they make deliveries.

Artificial Intelligence (AI) and modern technology can help advance separation, collection and customer satisfaction. Volvo Trucks is cooperating with waste company Renova to deliver a fully electric waste collection vehicle. An autonomous truck is in the pipeline.

Smart about recycling

Thanks to a widespread level of environmental awareness, continuous information campaigns, a deposit system for beverage bottles and cans, and ease of access to recycling stations, Swedes bring most of their household packaging to recycling stations. In 2018 just over 70 per cent of all packaging that came out on the Swedish market was recycled. Glass had a 93 per cent collection rate, metal 84 per cent, wood 51 per cent and



A new technique for kerbside recycling. The different coloured bags allow for optical readers to sort and separate six types of material.

plastic 46 per cent. These numbers represent collection. The actual recycling rate is lower. For plastic, only about 35 per cent of what is collected is recycled. The rest is incinerated for energy production.

At the other end of the recycling loop, Swedes also buy products made from recycled materials. A recent survey ordered by the Swedish Recycling Industries' Association showed that 86 per cent of Swedes prefer to buy products made from recycled materials. Recycled materials have a lower climate footprint than virgin raw materials and reduce emissions to air and water.

The deposit refund system

Sweden has a recycling deposit system for almost all ready-to-drink bottles and cans. The deposit is refunded once the bottles and cans are returned to the supermarket's collection machine. Sweden prohibits the sale of drinks in plastic bottles or aluminium cans that are not part of an approved recycling system. About 85 per cent of containers in the deposit system are recycled.

The deposit refund system is becoming more popular among decision-makers in Sweden and other countries due to its high recycling rates and clean material flow for recycling. There are plans to enlarge the system to also include other sorts of packaging.

The future of recycling

But not everything is as easily recycled as newspapers or soft drink cans. Cartons with curdled milk, complex electronics, furniture made from various materials – recycling can be challenging and expensive. But waste management is getting smarter by the minute.

In Ängelholm, Sweden, waste management company NSR is developing an AI operation to make their automation system even more efficient. The operation uses near-infrared beams to identify different types of plastics along a conveyor belt. Air jets remove the selected items, leaving only non-recyclables to continue to an incinerator that produces power. The plastics, meanwhile, go back into the manufacture of new products.

In 2019, Stena Recycling, ABB, Combitech and Electrolux jointly presented a pilot plant for robotics-assisted recycling of electric products. The robots scan the waste to identify product and material type. Using manufacturer data, the robot decides which components can be recovered and then dismantles the product. The method results in lower losses and better quality of what is recycled. That contributes to more sustainable production and consumption.

Creative ways to avoid waste are out there. This twist-on spout of recycled plastic turns a PET bottle into a watering can or carafe.



What consumers can do

Make recycling convenient for yourself. Place sorting bins for different materials under your kitchen sink.

Be aware when you go shopping. Limit the number of objects needing to be thrown away. Buy things that are recyclable. Avoid mixed materials.

Talk to your local authority for information about where you can drop off different materials.

Arrange a swap meet where people can trade things they no longer need.

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Photo: Malin Kihlström/Scandinav Bildbyrå

Waste management: Biogas and energy

After prevention, reusing things and recycling the base materials, a residual waste remains. Examples are wood mouldings, used hygiene products and plastics that can't be recycled several times. This is where recovery comes into the picture.

Biological waste – such as food waste that has not been composted to make soil – can be used to produce biogas, which serves as fuel and for heating or electricity generation. Sweden is a frontrunner when it comes to the transformation of separately collected food waste to energy. Over 80 per cent of local authorities collect source-separated food waste, and biological recycling represents about 15 per cent of the total amount of municipal waste. Food waste is mainly collected in paper bags. Some retailers offer customers paper bags for fruits and vegetables – the bags can then be reused for food waste in the home.

In Sweden a part of food waste is treated by means of an anaerobic digestion process. Upon digestion, biogas is produced. What is left of the material after digestion can be used as a bio-fertiliser. By using bio-fertilisers instead of mineral fertilisers, plant nutrients are returned to the cycle. This applies, among other things, to phosphorus, which is a finite resource.

Biogas is a renewable energy source. After purification, it is mainly used as vehicle fuel, largely in public transport to replace fossil fuels such as diesel and natural gas. In 2018, Swedish waste delivered enough fuel for 516 biogas vehicles to drive 15,000 kilometres per year. The city of Linköping is one of over 40 Swedish cities and regions where most public transport buses run on biogas.

Biochar

Biowaste has other uses, such as producing biochar. Biochar works as a soil improver that also lowers carbon dioxide levels in the atmosphere by locking carbon into the earth for a long time. It has the potential to contribute greatly to global farming.

A new innovative pilot plant for producing biochar has been built in Stockholm. The biochar at the Stockholm plant is produced from local garden waste, and the plant has motivated several other recycling operators to follow suit. Biochar production also results in a gas that becomes heat to the city's district heating network.

Energy from waste (incineration)

Recovery can also be used for things other than biowaste. Energy recovery is about generating electricity and district heating by turning waste into fuel in a cogeneration plant (producing electricity, heating and cooling through incineration).

Simply put, incinerating the waste generates heat, which is used to turn water into steam, which in turn drives a turbine to produce electricity. When the steam has passed the turbine, the remaining heat is sent out in the district heating network. Energy recovery is an important explanation for Sweden's low landfill deposit rate and relatively low demand for heating using fossil fuels. The high temperatures involved also means that many hazardous components are destroyed.



This plant outside Gothenburg took district heating two steps further: it's 100% fossil free and is teamed up with a district cooling plant.



What consumers can do

Don't throw biological waste in the rubbish bin. Separate it and see if your city will collect it. If you have access to a garden, you can build or buy a compost for your own use. Make sure all plastic and hazardous substances are removed.

Talk to your politicians and decision-makers about district heating.

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A good short-term solution

At present, about 49 per cent of Sweden's municipal waste ends up in incineration plants. Sweden recovers and uses more energy, 3 MWh, from each tonne of waste, than any other country. Sweden's energy recovery from waste corresponds to heating for 1,250,000 flats and electricity production for 680,000 flats.

Modern plants have advanced purification systems to keep emissions down, well within the strict framework. These include, for example, temperature control, reduction of nitrogen oxides, efficient filters, water purification and strict control programmes.

Of course, energy from waste is not a long-term solution for supplying Swedish homes with electricity and keeping them warm during winter. Rather, it's a relatively short-term solution, considering that solar, water and wind energy are more environmentally friendly than incineration of any kind. But energy recovery of waste will remain a necessary step to treat waste that can't or shouldn't be recycled – it is the 'kidney of waste management'.

The energy-from-waste process opens for even further recovery. Ashes and slag materials are left as residues and can be used for road building purposes. Traces of metals extracted from the ashes and slag increase the recycling rate even further.



Photo: Jeppe Gustafsson/TT

Waste management: Landfill and litter

Whatever isn't put into any of the above waste management systems of recycling and recovery will end up in landfills or, even worse, in nature. In the long-term, landfills risk leaking and polluting ground water (leachate) and other neighbouring environmental habitats, making waste management very difficult. They also give off potentially unsafe gases.

Landfills are the final resort and are likely to remain as such for all foreseeable future. To control leachate and gas emissions, high environmental precaution has to be implemented. Closed landfills can provide an environmental burden for decades if not closely confined. This is also necessary if we are to use the top surface of closed landfills for recreational purposes. In a sense, even landfill areas can be reused.

Landfills produce a global warming gas mainly consisting of methane, which is many times more aggressive than carbon dioxide. Swedish company Biogas System is a global specialist in the collection and control of landfill gas. After purification, the gas can be used for heat or electricity production, but most importantly, its harm to the environment is reduced to a minimum.

Waste management company NSR, environmental consultants and Linköping University are collaborating on research into effective use of landfill mining and reclamation – a process whereby solid wastes are excavated and processed from landfills. This reduces the amount of landfill mass and makes it possible to also remove hazardous material. In the process,

mining recovers valuable recyclable materials. Also, the soil is aerated while the combustible fraction is used to generate electrical power.

Preventing litter

Litter is misplaced waste, outside of the waste management system. Litter can damage the environment: locally, as the environment is made ugly, unnatural substances are being spread and animals are injured; and globally, as litter finds its way into water streams and eventually into our oceans.

There's also a negative financial side to litter, involving clean-up costs, reduced property values and lost income from tourism. Some lose respect for a place that is littered and continue to add their own debris.

Waste and litter are products of our consumer society and misconduct. Litter is really a resource that is wasted, because it doesn't end up in the recycling loop. Some research indicates that if we take responsibility for our local environment and understand our own role, we are more likely to develop a more sustainable lifestyle.

There are several ways to reduce litter. One is to place fines on people dropping the litter on the ground. Another is to reduce or eliminate single-use packaging. And then there's the fundamental method to raise awareness among citizens through information campaigns.



Plogging

Plogging (combines Swedish words for picking litter and jogging) is a health kick for nature and practitioners.

The Keep Sweden Tidy campaign has been running for more than half a century. Besides providing information and facts about litter, this non-profit organisation also arranges litter picking events – and litter diving events – influences lawmakers and measures the amount of waste on land and at sea. It also strives to include leakage of litter in all processes and discussions on waste management, to include measurable goals in all municipal waste plans, and make it mandatory for all local authorities to measure their litter.



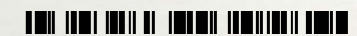
What consumers can do

Don't litter. Instead, pick up litter that others have thrown.

Avoid single-use packaging.

Get involved in local litter picking days or start your own 'plogging' circle.

THANKS FOR WASTING LESS!



A closer look at... Plastics

Certain products deserve a closer look into their specific challenges and possible solutions. Plastic is probably one of the most talked about waste products out there. Mainly because plastic is not a homogeneous material and the possibility of reusing and recycling it is often limited.

Much of the plastic that is collected is prevented from being recycled due to either contamination or its mixed composition. Therefore, a lot of plastic ends up in some sort of energy recovery process or a landfill. Eco-design criteria and higher recycling targets are needed to reduce plastic waste and to increase both the quantity and quality of recycled plastic. Even during its lifecycle, plastic sheds microplastics – extremely small plastic particles that are not biodegradable.

Each year, at least eight million tonnes of plastics leak into the oceans, creating a major challenge. If nothing changes, there will be more plastics than fish in the oceans by 2050. Larger plastic litter such as fishing nets and plastic bags can cause fish, marine mammals and sea birds to get entangled and injured.

It is estimated that 15–30 per cent of the plastic pollutants in the oceans consist of microplastics, and that 35 per cent of these come from the laundering of synthetic textiles. Microplastics have been discovered in 114 aquatic species, many of which are food to mammals, including people. Many chemicals are also spread via plastics.

But the problem is not only environmental, it is also economic. Today, 95 per cent of a plastic packaging's material value is lost

after its first use. Cleaning the beaches is a major and recurring expense for local authorities along the coast. Litter in the sea also causes damage to fishing gear and vessels.

Alternatives and recycling

The hunt for alternatives to plastic, which has outpaced the production of almost every other material since the 1950s, is under way. Paper straws are making a comeback after widespread social media campaigns. Food boxes and disposable cutlery are being made from grains or sugarcane waste. As more countries ban or place high taxes on plastic bags, supermarkets are looking for other ways to bring groceries to consumer's homes.

To develop large-scale recycling, we need to find solutions to problems associated with the different types of plastic compositions. With the right methods, some types of plastic can be recycled up to seven times.

RISE Research Institute of Sweden operates a test bed for plastic recycling. In collaboration with the recycling industry, the packaging industry and supermarket chain ICA, RISE recently launched a soap bottle produced from 100 per cent recycled consumer plastic.

In 2019 the producer organisation Plastkretsen opened an ultra-modern plastic packaging sorting facility in the Swedish town of Motala. It will greatly facilitate sorting and upgrading of all collected plastic packaging waste. It is likely to be followed by a cleaning and extruding unit, eventually leading to the production of a recycled material fit for the market.



What consumers can do

Use a washing bag that traps microplastics when doing laundry, such as Guppyfriend. Air your clothes instead of washing them whenever possible.

Use reusable bags for shopping. Buy in bulk to reduce the amount of individual packaging.

Pack your meals in reusable (ideally non-plastic) containers instead of buying food in takeout containers or packing meals in plastic bags.

Look into your hygiene products. Toothpaste, skin care and makeup sometimes contain tiny plastic pieces. Buy ecolabel products and read through the ingredient lists.

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In 2020 Coca-Cola Sweden shifted its entire PET packaging portfolio to 100% recycled plastics.

A closer look at... Food waste

Food is included here for very different reasons than plastics. But reducing food waste is also a crucial environmental, moral and economic responsibility. Producing food requires huge amounts of resources and is responsible for environmental disasters such as over-fertilisation. And while one-third of all the food that the world produces is lost or wasted, over 800 million people go hungry. A 25 per cent reduction in food waste would be equivalent to the amount of food needed to feed 870 million people annually.

Food waste arises in several different stages in the food chain: at producers, wholesalers and suppliers, as well as in super-markets, restaurants and households. The largest share comes from private homes. Food waste includes things that are not edible for humans, such as bones and pits, but also foodstuffs such as dented fruits and perfectly good dairy products with an expired best before date.

A collective effort

We can all contribute to the reduction of food waste. Politicians can use targets, taxes and incitements to encourage businesses and individuals to move in the right direction. Businesses can self-regulate and reduce their share. And households can change their wasteful behaviours from purchase to compost.

Sweden's national environmental targets from 2018 mean that at least 50 per cent of the food waste is to be separated from households, large kitchens, shops and restaurants, and then treated biologically so that plant nutrition is utilised. And at least 40 per cent of the food waste is to be treated so that energy is also extracted.

There are several examples of creative business initiatives that help reduce waste, from no-waste restaurants and restaurants who cook food that is left over from other restaurants, to grocers who sell 'ugly' fruits and vegetables. Other restaurants have started selling servings of yesterday's leftovers at a reduced price.

Innovation, education and technology

Karma is a Swedish startup company that connects surplus food from retailers to consumers at a lower price. Consumers get food for less and businesses receive an additional revenue stream — all while reducing food waste. Karma has so far expanded into the UK and France.

In 2019 nearly 20 restaurants in the south of Sweden joined the initiative 'Kitchens saving grub' (Kök Som Räddar Käk), a venture to assist restaurateurs with education, networks and equipment to reduce food waste. The participating restaurants quickly reduced their food waste by over 25 per cent by making certain changes. They investigated where, when and how the waste occurs. They started focusing on planning, purchasing and adapting recipes to better use the raw materials — and using more of each raw material. Also, they started customising portions and refills to reduce waste on the customers' plates and in the buffet.

Whywaste is a Swedish tech company that provides supermarkets with expiration date management through intelligent technology. The waste in supermarkets often occurs due to the best before date. Whywaste wants to solve this through an app that helps supermarkets identify goods that are likely to pass their best before date. The food can then be sold at a lower price, cooked or donated for charitable purposes instead of ending up in the rubbish bin.



What consumers can do

If you serve a buffet-style meal, use smaller plates to discourage people from overloading their plates.

Love your leftovers. Many leftovers can be used in cooking. Invite friends for a leftover *fika* (Swedish traditional coffee with treats) and leftover dinners.


If you're worried about the food going bad, don't just follow the expiration date — look, smell and taste instead.

Set the temperature in your refrigerator to about 5 degrees Celsius.

THANKS FOR WASTING LESS!



Photo: Tina Stafrén/imagebank.sweden.se



Swedish design brand Nudie Jeans sells previously owned denim online and in their repair shops.

A closer look at... **Textiles**

Fashion and textiles are some of the most polluting industries in the world. Problems include huge demands for natural resources, intensive use of water, chemicals and energy during farming and manufacture, microplastics being released when washing, short lifespans and difficulties in recycling.

Both consumers and people in the industry are becoming aware that we must stop producing and consuming clothing without consideration for its adverse environmental and social footprints. The industry has initiated its change process. And governments are contributing. As of 2025, EU member states will be obliged to collect textiles separately and ensure that waste collected separately is not incinerated or dumped in landfills.

What's needed is a new approach that considers all phases of the production and user chain – from material extraction and raw material management, design, manufacture, business models and financing, through the user phase to recyclers and back to new producers. This will require collaboration between all stakeholders as well as government regulations to create the right incentives and market conditions.

A garment's lifespan is of crucial concern. An average Swede buys 50 new garments per year, and almost one-third of that is never used. But it's not just about making consumers wear clothes for a long time; a garment's lifespan is decided already in the design phase.

Many fashion companies have taken positive initiatives in recent years, including increased use of recycled materials, use of organic cotton, garment repair and remakes, garment rentals,

longer-lived fashion, and second-hand sales. The second-hand clothing market has long been established, and it has a tremendous effect: by buying second hand, you cut 80 per cent of the climate impact. The recycling of textiles to produce new clothes, on the other hand, has so far been unusual.

Recycling of fibre to fibre still presents a challenge and recycled content in fashion is low. Recycling textiles for new textiles is also energy- and resource-intensive. The challenge is great, and the reward is uncertain going forward.

From clothes to pulp

Swedish company Re:newcell, has since 2017 been operating the world's first scalable plant for chemical recycling of cellulose-based textiles (primarily cotton). Unlike mechanical recycling, chemical recycling of textiles can result in clothes of the same quality as clothes from virgin raw materials – in some respects better.

The company's technology dissolves used cotton and other natural fibres into a new, biodegradable raw material, Circulose pulp, which can be turned into textile fibre, be fed into the textile production cycle and meet industry specifications. The plant currently has the capacity to produce 7,000 tonnes of textile pulp. H&M recently became the first retailer with a collection of Circulose clothing. It's the first time chemically recycled fibres are being used in garments sold at scale.

Recycling fibre blends

One of the major obstacles to textile recycling is that the fabrics are often made from blended materials, such as cotton and polyester. When different blends are used in textiles, recycling

becomes more difficult. Long-standing Swedish research into the problem – involving RISE, Chalmers University of Technology, Mistra Future Fashion and forest company Södra – has resulted in a successful solution.

In 2017, viscose filaments were for the first time successfully obtained from cotton separated from worn-out polycotton sheets. The filaments have the same quality as filaments made from commercial dissolving pulp used in existing viscose production. The separated polyester residue, polyester monomers, can be turned into high-quality polyester.

In late 2019, Södra used the technique on a larger scale. After separating the cotton and polyester in polycotton blends, they added the resulting pure cotton fibres to wood-derived textile pulp, which could then be used to make new textiles. Production capacity will be increased in coming years.

Automated textile sorting

The public waste management company Sysav is investing in the world's first industrial-scale automated mixed textile sorting plant, continuing the pilot project initiated by Sweden's innovation agency Vinnova. The plant will be built in Malmö with operation starting in summer 2020.

The plant uses near-infrared and visual spectroscopy to sort mixed textile waste according to market needs for fibre composition and colour. The products can then move on to fibre-to-fibre recycling. The project involves large Swedish textile, fashion and furniture companies, local authorities, charities, research institutes and authorities.



What consumers can do

Make your clothes and textiles last longer. Choose materials and designs that will last and think about what would really work in your wardrobe over time. Mend your clothes or use garment repair services to make your clothes last longer.

Buy second-hand, rent or borrow clothes.

Choose garments made from renewable, biobased, recycled and recyclable materials. Avoid mixed textiles.

Instead of throwing unwanted garments and textiles into the rubbish, swap, sell or donate items you no longer want.

THANKS FOR WASTING LESS!



Shopping second hand drastically reduces your eco footprint: 80% of the climate impact comes from production.



Photo: Simon Paulin/imagebank.sweden.se



Photo: Magnus Andersson/TT

A closer look at... **Electronics**

Mobile phones arrive in new models several times per year. For many, a new model will replace a perfectly good, recent model. Kitchens are remodelled not when the appliances are worn out, but when the latest trends change. Our digital devices are thrown away while still functioning, and this behaviour is putting a huge strain on the environment.

Consider the enormous 'hidden' waste certain products represent during manufacturing. A 150-gramme phone generates 85 kilos of waste even before it hits the shelves. A 2-kilo laptop represents over 2 tonnes of waste.

And with the growing trend to have our entire home connected, the internet of things – including everything from lightbulbs, to washing machines, to cameras – keeps growing. New gadgets are made redundant at a staggering rate. Old models are thrown aside.

Harmful components

The increased consumption of electronics has two major adverse effects on the environment. First, it increases mining for the metals needed. Second, discarded devices result in large quantities of electronic waste.

This creates especially serious problems in poor countries, because rich countries often send their electronic waste there – illegally. Up to 90 per cent of electronic waste is shipped or dumped illegally, according to a UN report from 2015. While certain metals such as copper provide a side income to some, primitive recycling techniques such as burning the encasing cables expose workers to hazardous substances.

There are many health risks connected to electronic waste: direct contact with harmful materials such as lead and cadmium, inhalation of toxic fumes, as well as accumulation of chemicals in soil and water.

Electronic recycling

Global E-waste Monitor's report from 2017 found that only 20 per cent of electronic waste was recycled through the appropriate channels. In Sweden electronic waste collection corresponds to 14.5 kilos per person and year. The EU collection target is 4 kilos of electronic waste per inhabitant per year.

One reason for Sweden's high rate of electronic waste collection is its extended producer responsibility regulation, which means everyone who manufactures or imports electric equipment or batteries on the Swedish market is also responsible for making sure that the product is recycled in an environmentally sustainable way once it becomes waste.

When the extended producer responsibility was introduced in 2001, the electronics producers' trade organisations created a joint service to facilitate the recycling process: El-Kretsen. Its task is to aid producers by offering a nation-wide collection system that works in close collaboration with local authorities in the day-to-day collection services.

But another problem is that even when recycled, an average of 30 per cent of electronic material can't be recovered. It's up to manufacturers to make electronic products last longer and be less trend-sensitive. Meanwhile, there are companies working on solutions to recycle a larger portion of electronic waste.



Getting to the good stuff

Mining company Boliden’s copper smelter plant Rönnskär in northern Sweden receives deliveries of copper and lead concentrates from mines. But they have also discovered that copper (as well as silver and gold) can be found in used electronic devices. Today the smelter is a world leader in electronics recycling. Boliden has another plant where 20 per cent of the total pure zinc output stems from end-of-life electronics.

Rather than melting down raw materials, Godsintlösen (GIAB, Swedish for ‘Goods redemption’) has found another use of old gadgets. Originally, their business model was aimed at the insurance industry, and in 2018 GIAB repaired more than 60,000 broken mobile phones for the Swedish insurance system in a service called the Mobile Circle. The Mobile Circle means that policyholders will get a repaired or re-manufactured phone back, rather than money to go and buy a brand new one.

This new management entails environmental benefits, financial savings and increased customer satisfaction. GIAB has become experts in repairing, reconditioning and selling electronics and now also takes care of end-of-life IT products that they wipe the memory of and sell.

Rönnskär is a copper smelter that is also operating as a plant for recycling of copper, gold and silver from electronics.



What consumers can do

Make your electronics last longer. Do you really need a new phone every other year? A new kitchen? The latest gadget? Consider buying up-cycled electronics instead.

Make sure to deposit your electronics and batteries at the proper recycling station.

Instead of throwing unwanted electronics into the rubbish, swap, sell or donate items you no longer want.

THANKS FOR WASTING LESS!



Degradation rates

The following are approximate degradation times for various products and materials:



Newspaper:
6 weeks



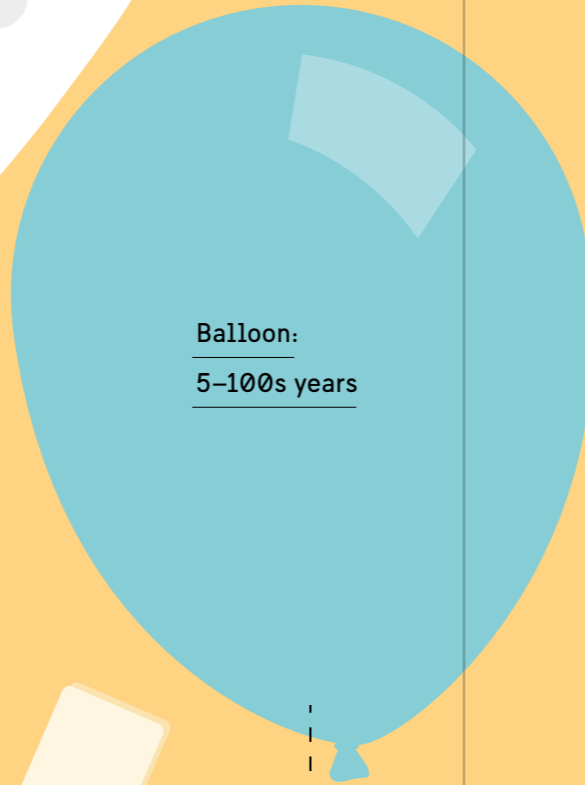
Cigarette butt:
1-5 years



Apple:
1 month



Plastic bag:
10-20 years



Balloon:
5-100s years



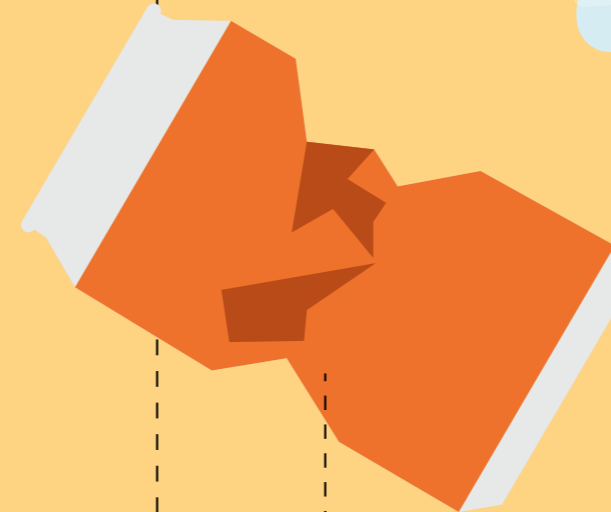
Chewing gum:
20-25 years



Disposable diaper:
450 years



Plastic bottle:
450-1,000 years



Aluminium can:
200-500 years



Glass bottle:
1 million years

In conclusion

All forms of consumption generate waste. To solve this mounting problem, we need to be creative, innovative and collaborative. As a country, Sweden has come a long way but also continues to look for inspiration from other countries. By sharing experiences and knowledge, the world can become better at managing its waste.

From advanced recycling solutions involving artificial intelligence, digitisation, automation and robotics, to strictly creative fixes such as making art out of waste, it's essential to remain open to new ideas.

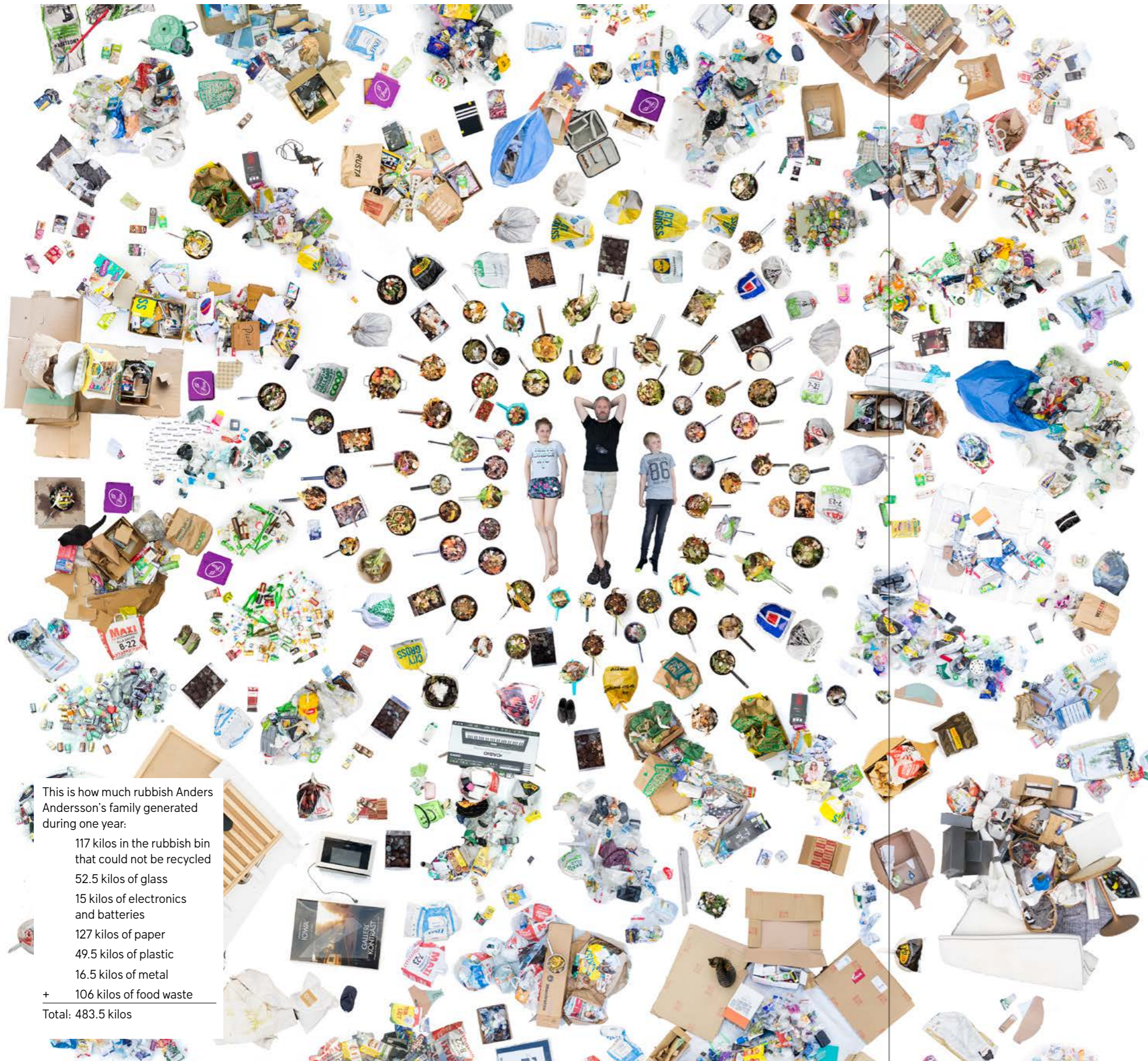
The only way forward is for governments, companies and individuals to start taking their responsibility.

The idea of recycling waste into art is expressed at museums, galleries, craft exhibits and at preschools and schools. Artist Johanna Törnqvist uses recycled materials to make jewelry and garments (see inside cover). Photographer Anders Andersson wanted to show what rubbish really looks like on a personal level when he created his photo collage (see right side) of one year's worth of rubbish generated by him and his two children.

This is how much rubbish Anders Andersson's family generated during one year:

117 kilos in the rubbish bin that could not be recycled
52.5 kilos of glass
15 kilos of electronics and batteries
127 kilos of paper
49.5 kilos of plastic
16.5 kilos of metal

+ 106 kilos of food waste
Total: 483.5 kilos



Summertime is second hand time.
That's when people gather at flea
markets, or *Loppis* in Swedish.





The Swedish Institute (SI) is a public agency that promotes interest and confidence in Sweden around the world. SI seeks to establish co-operation and lasting relations with other countries through strategic communication and exchange in the fields of culture, education, science and business.

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