Resource efficiency and circular economy in Europe – even more from less

An overview of policies, approaches and targets of Sweden in 2018

July 2019

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Acknowledgements

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This country profile was prepared as part of the 2019 EEA review of material resource efficiency, circular economy and raw material supply policies, which aimed to collect, analyse, and disseminate information about experience with the development and implementation of these policies in EEA member and cooperating countries.

At the time of writing, a summary report is being finalised. The report reflects on trends, similarities and differences in policy responses, showcases selected policy initiatives from member countries and identifies possible considerations for the development of future policies.

These country profiles were compiled and finalised by members from the European Topic Centre on Waste and Materials in a Green Economy, namely Bart Ullstein, Bettina Bahn-Walkowiak, Jeroen Gillabel, Margareta Wahlström, Jutta-Laine Ylijoki, Dirk Nelen, Theo Geerken, Veronique Van Hoof and Evelien Dils. The responsible EEA project managers for the work were Pawel Kazmierczyk and Daniel Montalvo.

Sweden, facts and figures

Note: data in this section was sourced from Eurostat databases (April 2019), except where noted otherwise

GDP: EUR 475.2 billion (3.0 % of total EU28 in 2017)

Per capita GDP: EUR 47,200 (purchasing power standard) (157.3 % of EU28 average per capita figure in 2017)

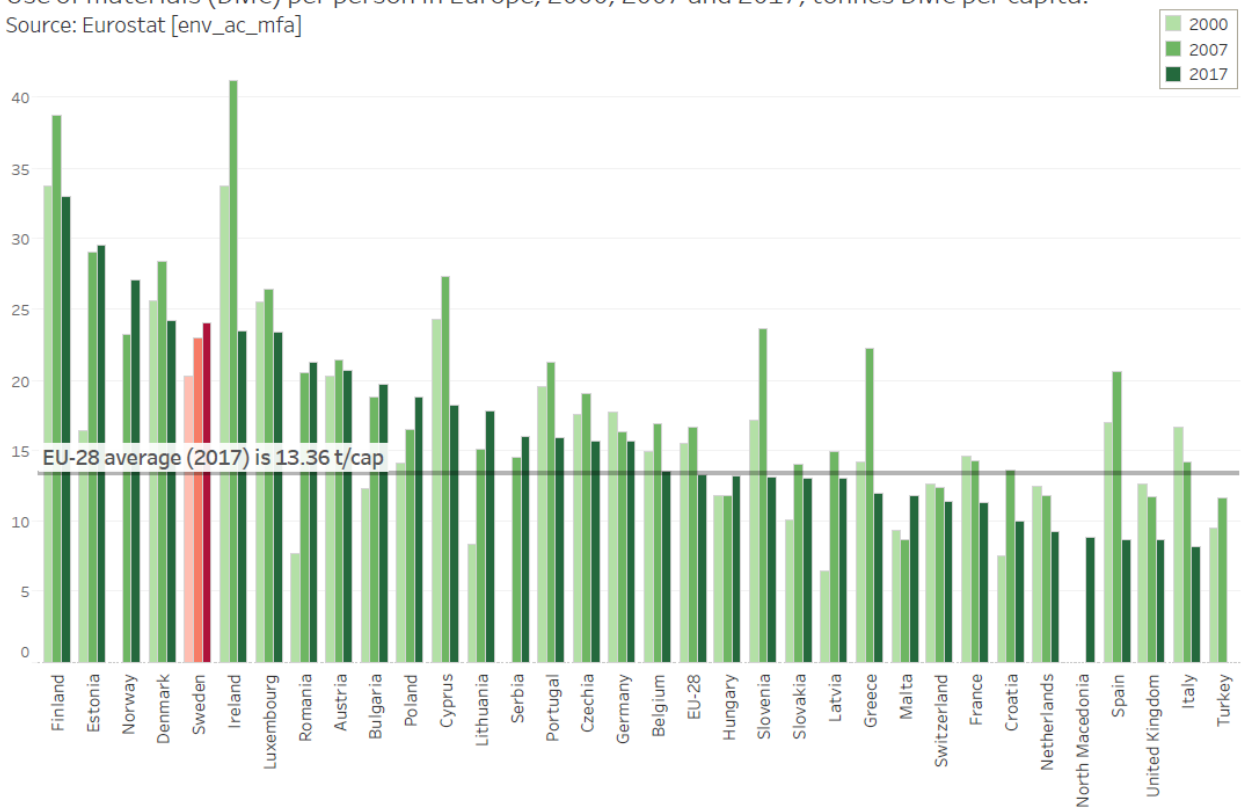
Use of materials (domestic material consumption (DMC))
241.8 million tonnes DMC (3.5 % of EU28 total in 2017)
24.0 tonnes DMC/capita (179.9 % of EU28 average per person in 2017)

Structure of the economy:
agriculture: 1.2 %
industry: 25.1 %
services: 73.7 %

Surface area: 438.6 thousand square kilometres (km^2) (9.8 % of total EU28)

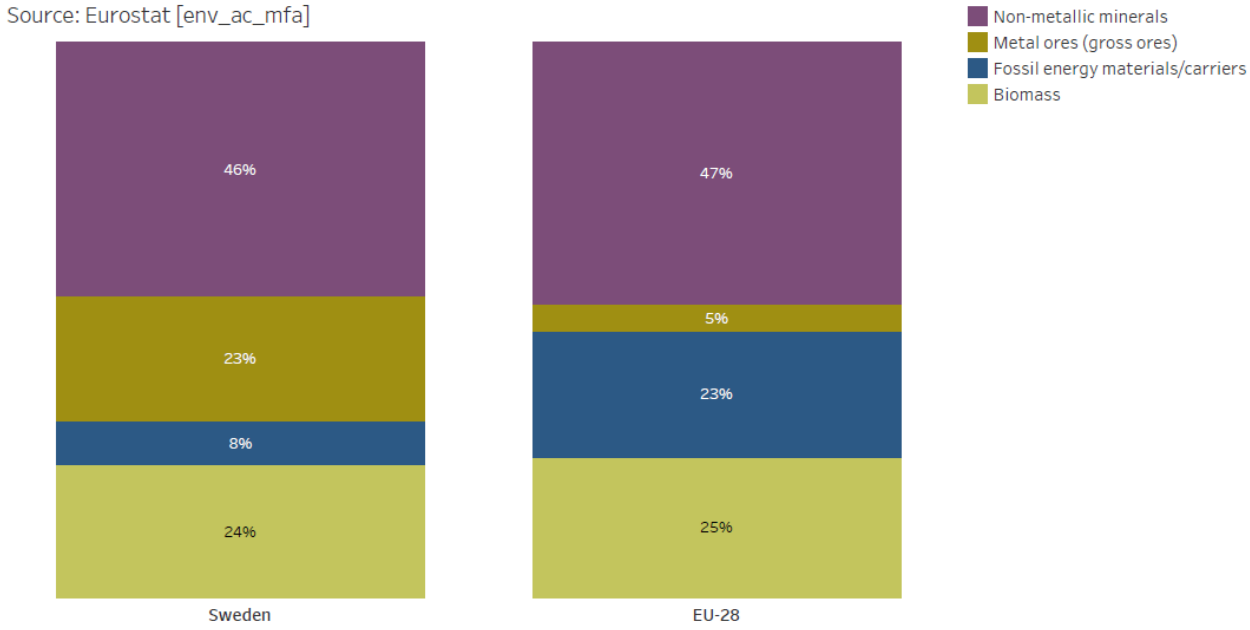
Population: 10.0 million (1.95 % of EU28 total in 2017)

Use of materials (DMC) per person in Europe, 2000, 2007 and 2017, tonnes DMC per capita.
Source: Eurostat [env_ac_mfa]



Sweden & EU-28. Domestic Material Consumption by material category, 2017.

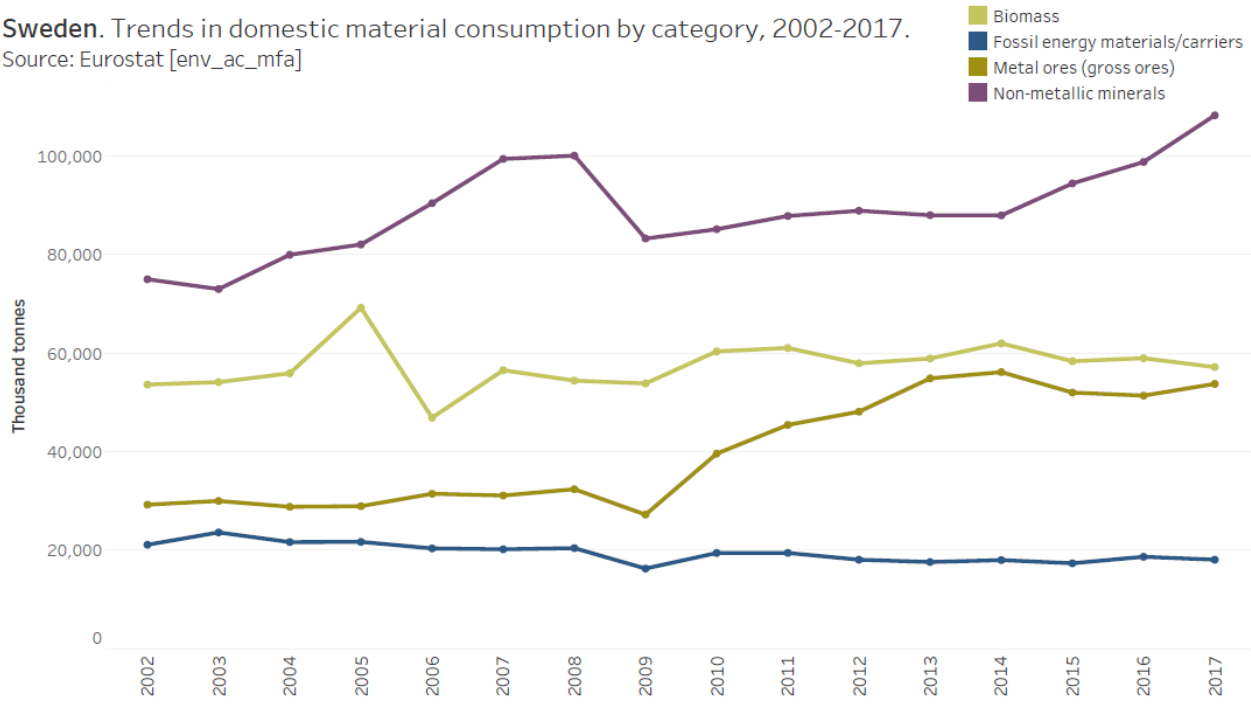
Source: Eurostat [env_ac_mfa]



Note: The domestic material consumption categories 'other products' and 'waste for final treatment and disposal' are excluded from the figure.

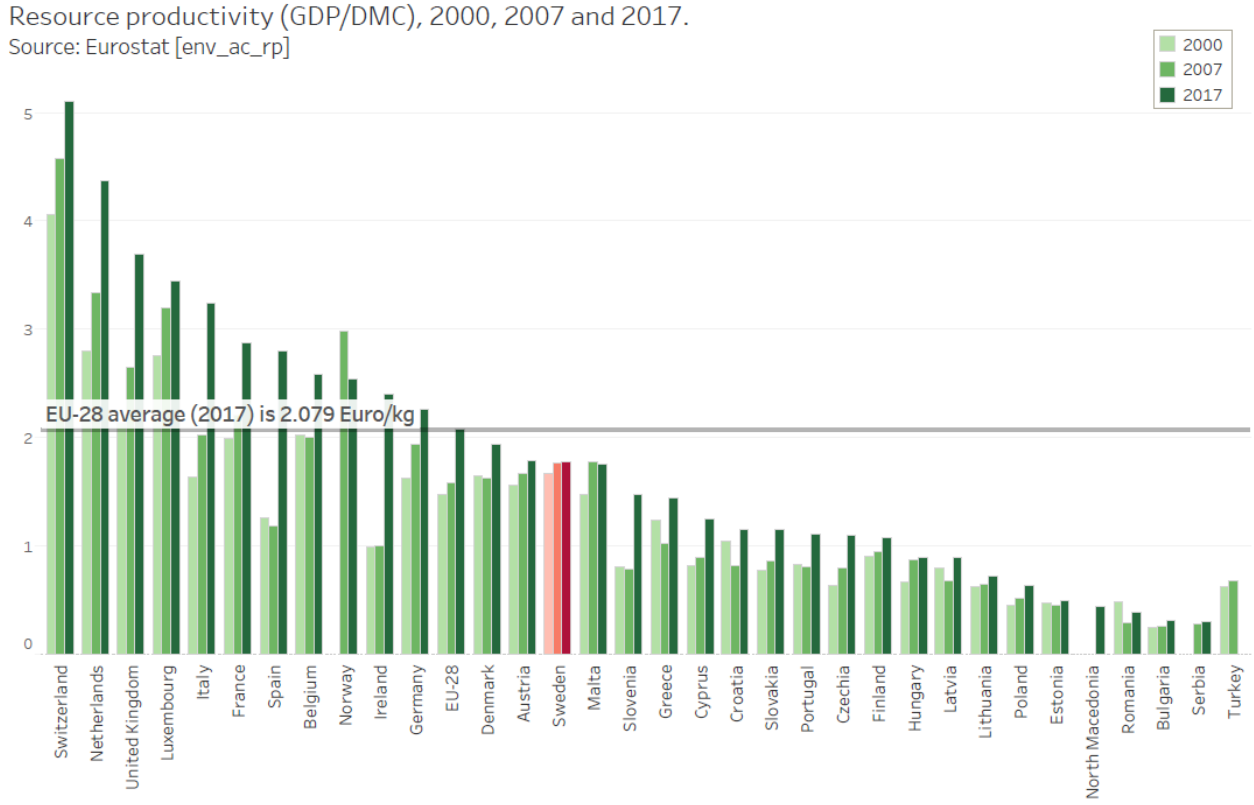
Sweden. Trends in domestic material consumption by category, 2002-2017.

Source: Eurostat [env_ac_mfa]



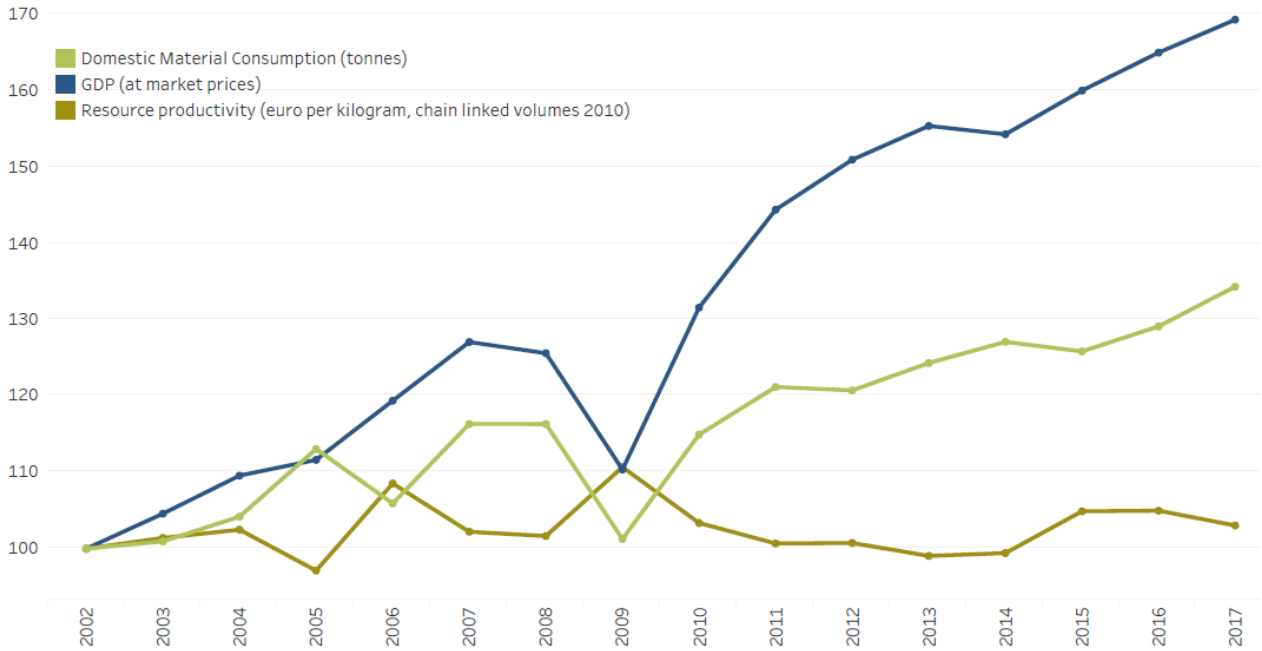
Note: The domestic material consumption categories 'other products' and 'waste for final treatment and disposal' are excluded from the figure.

Resource productivity (GDP/DMC), 2000, 2007 and 2017.
Source: Eurostat [env_ac_rp]

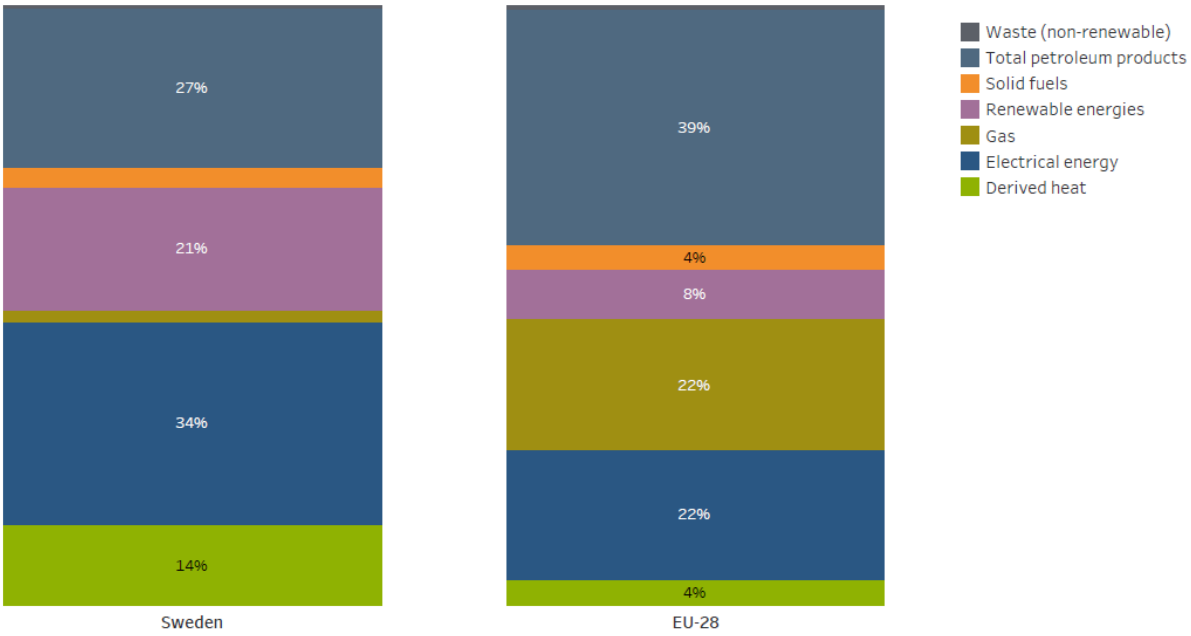


Note: GDP expressed in chain linked volumes 2010.

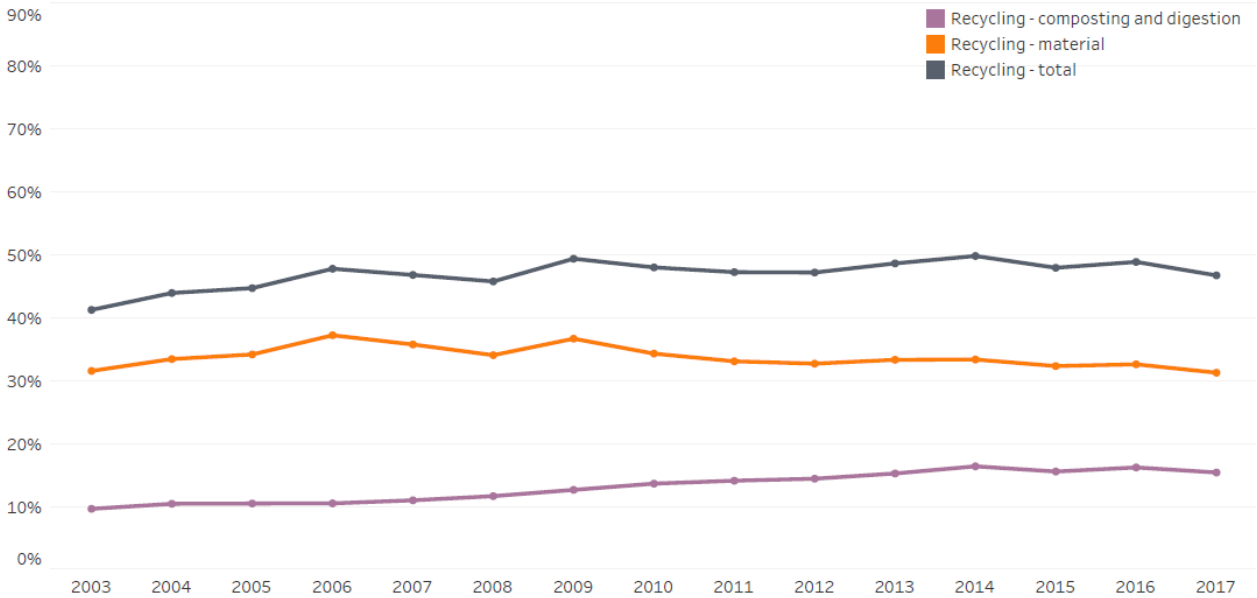
Sweden. GDP, DMC and resource productivity trends, 2002-2017, index 2002=100.
Source: Eurostat [env_ac_mfa], [env_ac_rp] & [nama_10_gdp]



Sweden & EU-28. Primary energy consumption by energy product, 2016.
Source: Eurostat [nrg_100a]



Sweden. Recycling of municipal waste, 2003-2017, as share of total waste treatment.
Source: Eurostat [env_wasmun]



Note: The amount of municipal waste treatment is reported for the treatment operations incineration (with and without energy recovery), recycling, composting and landfilling.

Policy framework

Driving forces for material resource efficiency and circular economy

The sustainable use of natural resources and the development of a fossil-free society are strong driving forces for the establishment of a circular and bio-based economy. Based on key policy documents, the major parameters for resource efficiency could be summarised as environmental concerns and competitiveness. In addition, waste management and waste prevention have to a large extent been drivers of policy. Most of the basic principles were politically formulated in the Government Bill on the Ecocycle in 1993, and since the 1990s several policy instruments have been introduced to move away from landfill and increase energy and material recovery. Waste prevention activities are also linked to policy measures on sustainable consumption and production. A priority is the strive for non-toxic and resource-efficient cycles, this is primarily about increasing recycling without causing risks to the environment and human health due to the spread and exposure to hazardous substances.

The generational goal defines the overall direction of environmental efforts, there are also 16 environmental quality objectives and a number of milestone targets. The generational goal indicates the sorts of changes in society that need to occur within one generation to bring about a clean, healthy environment. It focuses environmental efforts on recovery of ecosystems, conserving biodiversity and the natural and cultural environment, good human health, efficient material cycles free from dangerous substances, sustainable use of natural resources, efficient energy use, and patterns of consumption.

Dedicated national strategies or roadmaps for material resource efficiency and a circular economy

Many initiatives and instances of cooperation in support of resource efficiency and the circular economy are currently taking place in Sweden. A full range of organisations, from major industrial companies to not-for-profit concerns, are involved together with a number of research and innovation programmes. As described in the section on Policies which include elements of material resource efficiency, the overall generational goal stresses the need for material cycles to be resource-efficient and, as far as possible, free from hazardous substances. The section on Policies which include elements of material resource efficiency presents other policies and strategies that cover aspects of resource efficiency.

Delegation for circular economy

To strengthen the transition to a resource-efficient, circular and bio-based economy a delegation for circular economy has been established. The delegation is an advisory body to the government. The tasks of the delegation are as follows.

- Prepare a strategy for the delegation's work on a transition to a circular and bio-based economy. It should include how the transition can be stimulated at different levels in society. In its work, the delegation will, among other things, start from the outcome of inquire on circular economy (SOU 2017: 22).
- To be point of contact between relevant actors in order to facilitate work and create synergies.
- Provide a knowledge centre and respond to environmental awareness by gathering good examples and information on ongoing significant initiatives as well as facilitating an effective cooperation between these.
- Identify obstacles, contradictive incentives, need for education and advice and suggest cost-effective measures to the government

Another national programme is the **partnership programme Circular and Bio-based Economy**[1]. This was one of five strategic collaborative programmes that were introduced in 2016-2018 for creating next-generation transport, smart cities, a circular and bio-based economy, life sciences, connected industries

[1] http://www.government.se/articles/2016/07/innovation-partnership-programmes--mobilising-new-ways-to-meet-societal-challenges/ (English)

and new materials[2]. The aim of the Circular and Bio-based Economy programme was to jointly mobilise innovation initiatives to ensure that the proportion of the bio-based economy grows and promotes circular solutions. Six working groups were formed to identify and prioritise actions for a circular and bio-based economy: wooden building; circularity/resource efficiency; innovative biomaterials; biofuels; new materials; and upscale and commercialisation. In another strategic programme, Smart Cities[3], on the use of information and communication technologies, the aim is to improve the quality, performance and interactivity of municipal services, reduce costs and resource consumption and improve contact between citizens and authorities.

See the section on Policies which include elements of material resource efficiency for additional information on policies and strategies that cover aspects of resource efficiency.

Overview of dedicated national or sectoral strategies for raw materials

Minerals have been mined in Sweden for more than 1,000 years. Geological information and knowledge about the country's assets are vital if mineral resources are to be used in a sustainable way. An important part of the Geological Survey of Sweden's (SGU) responsibility is to survey and document the geology of Sweden.

Sweden's Mineral Strategy[4], launched by the government in 2013, aims for the sustainable use of Sweden's mineral resources so as to create growth throughout the country. Sweden's mineral assets are to be exploited in a long-term sustainable way, with consideration shown for ecological, social and cultural dimensions, so that natural and cultural environments are preserved and developed. The Mineral Strategy deals with non-energy minerals for industrial purposes. The first objective of the Strategy concerns mining in harmony with the environment, culture and other industries; greater resource efficiency (the Mineral Strategy aims for extraction and processing of ore and minerals from Swedish bedrock to be done with increased resource efficiency, whereby the recovery rate of metallic and mineral products will increase and the amount of waste diminish); improved dialogue and synergy with other industries; and mining communities with attractive natural and cultural environments.

In 2015, mandated by the Swedish Mineral Strategy, the SGU, in consultation with the Swedish Environmental Protection Agency (EPA), carried out a survey of mining and recycling potential of the country's metal and mineral resources[5]. A general assessment of the mineral potential of Swedish bedrock (known as primary resources) and the recovery potential from mine waste (secondary resources), industrial landfills, municipal landfills and urban mining (metals within urban infrastructure) was reported.

Iron, copper, lead, zinc, gold, silver and tellurium are all currently mined in Sweden. Functional recovery, recycling in which primary metal is recovered, takes place for iron, copper, chromium, aluminium, lead, molybdenum, phosphorus, zinc, silver, gold and cobalt – the order of listed metals is based on the relative quantities recovered. The report concludes that the overall statistics of secondary resources are calculated theoretically and are therefore only indicative, making it difficult to evaluate and compare primary and secondary resources with each other. Many tests have been made for different metals in old mine waste but there is still much uncertainty as to what overall volumes are present, and if extraction could be economically viable. There is a theoretical potential for metal extraction from municipal landfills and urban

[2] The Swedish Agency for Innovation Systems were assigned by the government with assisting the work on the partnership programmes in 2016–2018.

[3] http://www.government.se/articles/2016/07/innovation-partnership-programmes--mobilising-new-ways-to-meet-societal-challenges/ (English)

[4] http://www.government.se/reports/2013/06/swedens-minerals-strategy-for-sustainable-use-of-swedens-mineral-resources-that-creates-growth-throughout-the-country/ (English)

[5] http://resource.sgu.se/produkter/regeringsrapporter/utvinnings-och-atervinningspotential-metaller-mineral-2014.pdf (Swedish)

mining, recovering of metals embedded in buildings and infrastructure; however, the state of knowledge is uncertain.

In 2017 the Swedish EPA and Geological Survey Sweden proposed a strategy for environmentally sustainable management of mining waste. This is based on several starting points; '… support for resource efficiency and the development of a circular economy by leveraging mining waste resources in a sustainable manner while taking into account that environmental life cycles should be non-toxic' is one of them[6].

For critical raw materials, there is a map of critical raw material deposits in Europe compiled by ProMine Mineral Database partners and EuroGeoSurveys Mineral Resources Expert Group. The Geological Survey of Sweden has contributed to this map.

Policies which include elements of material resource efficiency

The main areas in need of change, identified in a flagship initiative and the Roadmap to a Resource Efficient Europe, are largely environmental considerations covered by the Swedish Generational Goal and the Environmental Quality Objectives[7]. The Generational Goal, which defines the direction of environmental policy, provides guidance on the values that are to be protected and the changes in society that are needed if the desired quality of the environment is to be achieved. The Goal is intended to guide environmental action at every level in society. The bullet points that spell out its practical implications will be among the criteria used to assess whether the basic conditions for achieving each of the Environmental Quality Objectives are met.

'The overall goal of Swedish environmental policy is to hand over to the next generation a society in which the major environmental problems in Sweden have been solved, without increasing environmental and health problems outside Sweden's borders.'

The Generational Goal means that the basic conditions for solving the environmental problems we face are to be achieved within one generation, and that environmental policy should be directed towards ensuring that:

- ecosystems have recovered, or are on the way to recovery, and their long-term capacity to generate ecosystem services is assured;
- biodiversity and the natural and cultural environment are conserved, promoted and used sustainably;
- human health is subjected to minimum adverse impacts from environmental factors, while at the same time the positive impact of the environment on human health is promoted;
- material cycles are resource-efficient and as far as possible free from dangerous substances;
- natural resources are managed sustainably;
- the share of renewable energy increases and the use of energy is efficient, with minimal impact on the environment;
- patterns of consumption of goods and services cause the least possible problems for the environment and human health.

As seen above, two of the seven points listed relate to material resource efficiency: material cycles are resource-efficient and as far as possible free from dangerous substances and natural resources are managed sustainably. In addition, the final point, patterns of consumption of goods and services cause the

[6] http://www.naturvardsverket.se/Miljoarbete-i-samhallet/Miljoarbete-i- Sverige/Regeringsuppdrag/Redovisade-2017/Strategi-for-hantering-av-gruvavfall/ (Swedish, English summary available)

[7] for more information please see: http://www.sverigesmiljomal.se/environmental-objectives/ (English) and http://www.swedishepa.se/Environmental-objectives-and-cooperation/Swedens-environmental-objectives/The-environmental-objectives-system/ (Swedish and English)

least possible problems for the environment and human health, clarifies the need for the transition to sustainable consumption patterns.

The Environmental Quality Objectives are of relevance to both material resources in biomass and soil protection. The objective on sustainable forests, for example, reads: 'the value of forests and forest land for biological production must be protected, at the same time as biological diversity and cultural heritage and recreational assets are safeguarded'. There is also an obligation to reforest productive forest land in Sweden (SFS 2008:662).

In addition to the Environmental Quality Objectives there are 24 Milestone Targets. The Milestone Targets are intended to identify a desired social change and specify steps towards achieving the Generational Goal and one or more of the Environmental Quality Objectives. The Milestone Targets are divided into five areas: reduced climate impact, air pollution, hazardous substances, waste, and biodiversity. For waste, there are two Milestone Targets:

- *Better resource management in the food chain*
  Measures are to be taken so that, by 2020, resource management in the food chain is improved through separation and biological treatment of at least 50 per cent of food waste from households, catering services, shops and restaurants, with the aim of recovering plant nutrients, with at least 40 per cent treated in such a way that energy is also recovered.

- *Construction and demolition waste*
  Measures are to be taken so that, by 2020, at least 70 per cent by weight of non-hazardous construction and demolition waste is prepared for reuse, recycling and other material recovery.

Under the area of hazardous substances there is a Milestone Target:

- *Non-toxic and resource-efficient ecocycles*

The Swedish Environmental Protection Agency, in collaboration with the Swedish Board of Agriculture, and the Swedish National Food Agency, are currently working on a proposal for a national milestone target in the environmental objective system for reduced food loss/waste by 2030 based on Sustainable Development Goal (SDG) 12.3 of the UN Agenda 2030[8].

<u>The Environmental Code</u>

The Environmental Code – the country's package of environmental laws – includes general consideration of resources. It was adopted in 1998 and entered into force on 1 January 1999[9]. The purpose of the Environmental Code is to promote sustainable development which will ensure a healthy and sound environment for present and future generations. To achieve this, the Environmental Code aims to ensure that:

- human health and the environment are protected against damage and detriment, whether caused by pollutants or other impacts;
- valuable natural and cultural environments are protected and preserved;
- biodiversity is preserved;
- the use of land, water and the physical environment in general is such as to secure long-term good management in ecological, social, cultural and economic terms;
- reuse and recycling, as well as other management of materials, raw materials and energy, are encouraged so that natural cycles are established and maintained.

[8] https://www.livsmedelsverket.se/globalassets/publikationsdatabas/rapporter/2018/2018-more-to-do-more-action-plan-for-food-loss-and-food-waste-reduction-by-2030 (English)

[9] For more information on the Environmental Code please refer to http://www.swedishepa.se/Guidance/Laws-and-regulations/The-Swedish-Environmental-Code/ (English)

Waste Plan and Waste Prevention Programme

The national Waste Plan and the Waste Prevention Program provide an overview of the targets, instruments and measures introduced in Sweden to prevent waste and to achieve a more resource-efficient and non-toxic waste management in accordance with the waste hierarchy. The National Waste Plan and Waste Prevention Program 2018–2023[10] that were published in the end of 2018 replaces both the National Waste Plan *From Waste management to resource -Efficiency* (2012), and the National Waste Prevention Programme *Together we will gain from a non-toxic and resource-efficient society* (2014). To provide a better overview, the National Waste Plan and Waste Prevention Programme are now in the same document. The plan focuses on describing the direction that is politically determined through objectives, instruments and actions as well as on-going work and analysis of the current situation. During the work with the plan, representatives from authorities, industry organizations and operators were invited to dialogue.

Guidance on waste prevention[11]

The Swedish EPA guides and works together with various actors to prevent waste. New regulations and guidance on municipal waste plans for the prevention and management of waste were introduced in 2017. Through the new regulations and guidance, the Swedish EPA wants municipalities to focus more on waste prevention measures.

Guidance on material recovery

A circular economy implies that a larger proportion of waste is recycled. The Swedish EPA and the Swedish Chemicals Agency have published guidance on how material recovery safely can be increased[12]. The target group for the guidance includes Swedish companies and organisations that work for increased material recovery as well as authorities with responsibilities for the supervision of recycling activities.

Regulation and guidance on plastic bags

The purpose of the Regulation is to reduce the consumption of plastic bags to reduce littering and develop a more efficient use of resources. To reduce the consumption of plastic bags, consumer behaviour needs to change. There is guidance on reporting requirements and information obligations related to the regulation on plastic bags on the Swedish EPA's website.

Landfill tax

A tax on waste going to landfill entered into force in January 2000. The tax has dramatically reduced disposal in landfill and helped in the implementation of landfill bans. It has been illegal to dispose of sorted burnable waste in landfill since 2002 and for organic waste since 2005 (SFS 2001:512). The aim of these bans is to improve resource conservation and reduce environmental impacts. To make recycling easier, a requirement for sorting burnable waste at source was also introduced in 2002.

Producer responsibilities[13]

There are legislated producer responsibilities for batteries, cars, tyres, electrical and electronic equipment, packaging, newspapers, medicines and radioactive products. In addition, there are voluntary commitments for office paper and agricultural plastic film.

[10] https://www.naturvardsverket.se/Documents/publikationer6400/978-91-620-6857-8.pdf?pid=23951 (Swedish)

[11] https://www.naturvardsverket.se/Stod-i-miljoarbetet/Vagledningar/Avfall/Kommunal-avfallsplanering/ (Swedish) and http://www.naturvardsverket.se/Stod-i-miljoarbetet/Rattsinformation/Foreskrifter-allmanna-rad/NFS/2017/NFS-20172-Kommunala-avfallsplaner-om-forebyggande-och-hantering-av-avfall/ (Swedish)

[12] https://www.naturvardsverket.se/Stod-i-miljoarbetet/Vagledningar/Avfall/Materialatervinning/ (Swedish)

[13] http://www.naturvardsverket.se/Amnen/Producentansvar/ (Swedish)

Deposit refund system

A deposit refund system for cans has been running in Sweden for more than 30 years, it was introduced in 1984 and 10 years later, in 1994, a deposit refund system for plastic bottles was added. Today, plastic bottles and metal cans containing beer, wine, water, soda and similar beverages are required to be included in an approved recycling system before being marketed in Sweden. The recycling system has to be specified on the label, in addition to the amount paid for returning the container. The system has to be approved by the Swedish Board of Agriculture.

Institutional setup and stakeholder engagement

Delegation for circular economy

To strengthen the transition to a resource-efficient, circular and bio-based economy a delegation for circular economy has been established. The delegation is an advisory body to the government and its secretariat organised within the Agency for Growth. However, the delegation is responsible for its own decisions and with an annual reporting assignment in March each year, 2019-2021.

Innovation partnership programme – Circular and Bio-based Economy[14]

The Swedish government in 2016 launched five innovation partnership programmes[1] The Swedish Agency for Innovation Systems was specially tasked with assisting the work on the partnership programmes in 2016–2018. One of these was the Circular and Bio-based Economy aimed to jointly mobilise innovation initiatives to ensure that the proportion of the bio-based economy grows and promote circular solutions. Representatives from businesses, public actors, universities and research institutes were linked to the programme.

In 2016-2019 Vinnova [15], Sweden's Innovation Agency, will implement efforts to strengthen the prerequisites for a circular economy and industrial symbiosis. The aim is to support their development by reducing obstacles and develop opportunities at national or regional levels, for example by financing preliminary studies for new or developed solutions. Other examples are support for intermediaries to develop three programmes that focus on the Strategic Innovation Programme for Bio-innovation, the Strategic Innovation Programme RE: Source and Challenge-Driven Innovation.

The institutional set-up for the work on environmental objectives is as follows.

- Sweden's parliament (the Riksdag), the supreme political decision-making body in the country, has adopted Environmental Quality Objectives and interim targets for sustainable development.
- The Swedish government bears overall responsibility for the Environmental Quality Objectives.
- The Committee on Environmental Objectives (Miljömålsberedningen) has been set up to secure broad political consensus on environmental issues.
- The Environmental Objectives Council is a platform for the heads of government agencies that are strategically important in achieving environmental objectives. Each year a list of measures is presented.
- The Swedish EPA coordinates follow-up, provision of information and the use of economic impact assessments within the environmental objectives system. The progress of the work with the environmental objectives is continuously evaluated, both annually and in in-depth evaluations approximately every fourth year.
- In total 25 national authorities and the county administrative boards have clearly identified responsibility for contributing to achieving the environmental objectives.
- Swedish municipalities play an essential role in the work of achieving environmental objectives. By translating national and regional objectives into local aims and action, they can make the objectives effective tools in local politics.

[14] http://www.government.se/articles/2016/07/innovation-partnership-programmes--mobilising-new-ways-to-meet-societal-challenges/ (English)

[15] https://www.vinnova.se/en/ (English)

- The business sector, in cooperation with other stakeholders, has a substantial role in achieving the environmental quality objectives as many companies are engaged in structured work that has a major bearing on the environment.

The SaMMa network[16] (Samverkansgruppen för minskat matavfall) was formed in 2010 as a network of authorities, researchers, associations and industry within different parts of the food chain. The network's purpose is to provide a contact area for cooperation and exchange of information that promotes a reduction of food waste throughout the food supply chain. The network holds regular meetings. The EPA, the Swedish Food Administration and the Swedish Board of Agriculture are coordinating the network, and the Ministries of Enterprise and Innovation and the Environment and Energy support the work initiated.

Dialogue on textiles[17]
Through dialogue and co-creation, the EPA and the Swedish Chemicals Agency will involve relevant actors in the textile value chain. The dialogue takes place in cooperation with authorities, researchers, the textile industry and voluntary organisations as well as other textile actors. The initiative originates from the government Assignment on Textile Management 2016. The dialogue will run for three years and at each dialogue meeting a special theme will be highlighted. The purpose of the dialogue is to contribute to reducing environmental and health impacts throughout the textile value chain to create resource-efficient and non-toxic cycles.

Waste Council[18]
The Waste Council is the EPA's expert council for waste issues and consists of around 15 members from various areas of society. The Council is an advisory body only and not a decision-making one. On average, three meetings are held each year.

Approaches to resource efficiency and circular economy policy evaluation

Socio-economic evaluations form an important part of the basis for the in-depth evaluation of environmental objectives.

The EPA is responsible for coordinating, developing, monitoring and annually evaluate the use of socio-economic impact assessments within environmental issues. The primary objective of these socio-economic impacts assessments is to evaluate impacts and effectiveness of policies. A platform for networking with other authorities has been established to develop cooperation with researchers and other actors.

In Sweden, *ex-ante* policy evaluations are carried out whenever new policies are introduced or changes made to existing ones concerning resource efficiency and the circular economy. *Ex-post* policy evaluations of resource efficiency and the circular economy are rare. When *ex-post* evaluations are done, they focus on economic and environmental impacts.

[16] http://www.naturvardsverket.se/upload/miljoarbete-i-samhallet/miljoarbete-i-sverige/avfall/matsvinn/programforklaring.pdf (Swedish)
[17] http://www.naturvardsverket.se/Kalendarium/Dokumentation-fran-seminarier/Dokumentation-fran-Dialog-for-en-hallbar-textil-vardekedja-med-fokus-pa-miljo-och-kemikalier-/ (Swedish)
[18] In 2017 the following organisations were represented in the Waste Council: *the Swedish Waste Management Association; The city of Borås, National Board of Housing, Building and Planning, Chalmers Industriteknik; FTI; Swedish Agency for Marine and Water Management; The Keep Sweden Tidy Foundation; IKEM - Innovation and Chemical Industries in Sweden; Swedish Chemicals Agency; The County Administrative Board of Blekinge; The Confederation of Swedish Enterprise; The Swedish Construction Federation; The Swedish Recycling Industries' Association; The Swedish Geotechnical Institute (SGI); Swedish Association of Local Authorities and Region Västerbotten.*

The *ex-ante* policy evaluations are, however, methodologically inconsistent and could be improved. *Ex-ante* policy evaluations in the form of cost-benefit analyses were done when Sweden introduced policies on food waste, sustainable use of textiles and electronic waste. *Ex-ante* evaluations are less common when more general measures such as sustainable consumption or waste prevention programmes and policies are implemented.

Most evaluations are published as reports from the EPA or other government agencies. Most of these reports also include an English summary.

The environmental taxes on natural gravel are annually accounted for together with other environmental taxes by the Swedish Environmental Accounts[19]. The tax aims to improve savings in natural gravel and to accelerate the development of alternative materials.

Monitoring and targets

Targets for resource efficiency and circular economy

Please see the section on Policies which include elements of material resource efficiency for background on the Environmental Quality Objectives and the Milestone Targets. For waste, there are two Milestone Targets.

- *Better resource management in the food chain*
  Measures are to be taken so that, by 2020, resource management in the food chain is improved through the separation and biological treatment of at least 50 per cent of food waste from households, catering services, shops and restaurants, with the aim of recovering plant nutrients, with at least 40 per cent treated in such a way that energy is also recovered.

- *Construction and demolition waste*
  Measures are to be taken so that, by 2020, at least 70 per cent by weight of non-hazardous construction and demolition waste is prepared for reuse, recycling and other material recovery.

In the area of hazardous substances there is a Milestone Target for:

- *Non-toxic and resource-efficient ecocycles*
  The safe use of recycled material from a health and environmental perspective through, as far as possible, avoiding the recirculation of hazardous substances while resource-efficient ecocycles are sought. This is to be achieved through an overall action strategy within the EU, which, by 2018 at the latest, is to result in a number of measures, including:
    - the finalisation and coordination of EU regulations on waste, chemicals and goods so that they steer towards non-toxic and resource-efficient ecocycles;
    - the establishment of the principle of high and uniform requirements on the content of hazardous substances in newly produced and recycled materials, through a decision where appropriate.

The national recycling targets for packaging and newsprint vary depending on the type of packaging. There is also a target for the total amount of packaging waste that is to be recycled (Table 1). From January 2020, the recycling targets will be increased by up to 20 per cent depending on the type of packaging.

[19] https://www.scb.se/en/finding-statistics/statistics-by-subject-area/environment/environmental-accounts-and-sustainable-development/system-of-environmental-and-economic-accounts/pong/tables-and-graphs/environmental-taxes/total-environmental-taxes-in-sweden/ (English)

Table 1 Recycling targets before and after 2020

	Before 1 January 2020 (%)	After 1 January 2020 (%)
Metal packaging (excluding metal packaging of beverages)	70	85
Paper packaging	65	85
Plastic packaging (excluding polyethylene terephthalate (PET) bottles)	30	50
Glass packaging	70	90
Metal packaging of beverages	90	90
PET bottles	90	90
Wood packaging	15	15
Packaging of other materials	15	15
Total packaging waste	55	65

Source: SFS 2014:1073

At the end of 2016, a regulation (2016: 1041) on plastic carrier bags was decided on the basis of EU Packaging Directive 94/62/EC. The purpose of the legislation is to reduce the consumption of plastic carrier bags and thereby reduce the littering caused by these and to promote more efficient resource utilisation. The goals are to reduce the consumption of plastic carrier bags in general and that thin plastic carrier bags do not exceed 90 bags per person and year by December 31, 2019 and 40 bags per person per year by 31 December 2025.

Producer responsibility, end-of-life vehicles (ELVs)[20]: at least 95 percent of the car's weight should be reused or recycled from 2015 onwards; the reuse and recycling should be at least 85 per cent of the car's weight reused or recycled from 2015.

Indicators to monitor progress towards a resource-efficient circular economy

According to the EU regulations on environmental accounts, Sweden compiles data on economy-wide material flow accounts (EW-MFA). The following derived indicators of EW-MFA are available on the website of Statistics Sweden[21]:

- domestic extraction per category of material, Sweden 1998–2017;
- domestic material consumption per person per category of material, Sweden1998–2017;
- trends for raw, semi-manufactured and finished products for imports and exports in Sweden 1998–2017;
- physical trade balance per category of material, Sweden 1998, 2003, 2008, 2013 and 2017;
- domestic material consumption per category of material, Sweden 1998–2017;
- growth of gross domestic product (GDP), material consumption and resource productivity in Sweden, 1998–2016;
- driving factors for material consumption in Sweden according to the population, affluence, and technology (IPAT) equation, 1998–2016.

The idea of the Environmental Quality Objectives is that they should be followed up on a regular basis with annual reports to the government and in-depth evaluations every few years. A number of government agencies are responsible for following up and evaluating specific Environmental Quality Objectives. The Swedish Environmental Protection Agency, working with all the agencies with responsibilities within the

[20] Förordning (2007:185) om producentansvar för bilar 2007:185 https://eur-lex.europa.eu/legal-content/SV/TXT/?uri=CELEX:32000L0053&qid=1539592524132 (English)

[21] https://www.scb.se/hitta-statistik/statistik-efter-amne/miljo/miljoekonomi-och-hallbar-utveckling/miljorakenskaper/ (Swedish)

environmental objectives system, prepares an overall report to the government. The results are presented on the Environmental Objectives Portal[22].
Since 2018 there is also a specific set of indicators for the generational goal, and in the context of resource efficiency and circular economy the two indicators for Treated waste and resource productivity can be mentioned.

Indicators for Agenda 2030
A set of globally proposed indicators as well as nationally developed indicators that are linked to various interim goals in the Agenda will be used for monitoring the work of Agenda 2030. Statistics Sweden has provided a first dataset as the basis for an analysis of how Sweden currently lives up to the goals and targets in Agenda 2030, based on available data and results. The globally proposed indicators on resource efficiency and the related footprint was used in the report related to SDG8: Decent work and economic growth and SDG12: Responsible consumption and production[23]. The report covers an analysis on how the Swedish environmental quality objectives and the generational goal relate to the Agenda 2030.

Statistics on producer responsibilities are monitored and presented regularly on the Swedish EPA[24] website. The Swedish EPA also reports to EU to be used in follow up the common goals that follow from the EU directives.

Example of a survey: the EPA has carried out a questionnaire-based survey[1] *Waste prevention in criteria in public procurement, Tools for achieving the national environmental quality objectives*[25], with the aim of investigating how government agencies, municipal authorities, county councils, county council-owned companies and municipal companies are working on requirements concerning waste prevention measures on the procurement of goods, services and construction contracts. Among other things, the survey shows that many of the organisations that responded to the questionnaire have governing documents such as procurement policies, which impose requirements to ensure that procurement is environmentally compatible. Nevertheless, the survey shows that no significant requirements on waste prevention measures are imposed in procurement and that there is a lack of knowledge of how these requirements should be imposed. One conclusion is that management at various levels within organisations needs to become better at monitoring and requiring the imposition of waste prevention measures connected to procurement and the way in which they should be handled during the agreement period.

Resource efficiency, circular economy and the 2030 Sustainable Development Goals

The delegation for the 2030 Agenda is appointed by the government with the aim of promoting, facilitating and stimulating the implementation of the 2030 Agenda for Sustainable Development[26].

The purpose of using environmental criteria in public procurement is to help achieve the Environmental Quality Objectives and support Sweden's work to meet the UN SDGs and the 2030 Agenda.

The National Agency for Public Procurement[27] was established in 2015 and has overall responsibility for developing and supporting the procurement carried out by the contracting authorities and entities. Among other things addressed are promoting environmental considerations and developing and managing criteria

[22] http://www.sverigesmiljomal.se/fakta-och-statistik/ (Swedish)
[23] https://www.scb.se/contentassets/cc84f7debf404250a146e1204ea589b0/mi1303_2017a01_br_x41br1701eng.pdf (English)
[24] http://www.naturvardsverket.se/Sa-mar-miljon/Mark/Avfall/Resultat-producentansvaret/ (Swedish, English summary available)
[25] http://www.naturvardsverket.se/Om-Naturvardsverket/Publikationer/ISBN/6700/978-91-620-6730-4/ (English)
[26] https://agenda2030delegationen.se/ (Swedish)
[27] http://www.upphandlingsmyndigheten.se/en (English)

for environmental considerations in public procurement to the benefit of society and participants in the markets.

Example 12.1: for the past three years, the Swedish EPA, together with the cities of Gothenburg (2016) and Umeå (2017), have arranged national meeting places/labs on the topic of sustainable lifestyles open to actors from all society. In 2018 the event was co-arranged with the Swedish Consumer Agency and the city of Karlstad. The intention is to inspire action by sharing experience and create new networks and cooperation for resource sustainability and ecologically sustainable lifestyles for everyone. The purpose is to achieve the SDGs by taking action on both a national and international level. Together with the Nordic Council of Ministers, about 60 examples of best practice in consumer information for sustainable consumption and production, sustainable public procurement, sustainable lifestyles and education, sustainable food systems, sustainable tourism and sustainable buildings and construction, offer solutions that can be up-scaled and shared internationally. In Sweden, there is a growing interest in models and platforms for sharing goods and services as a way to decrease resource use and stimulate innovation.

Together with the Swedish Board of Agriculture, the Swedish EPA and the National Food Agency, Sweden was given a three-year assignment to find ways in which to reduce food waste. The assignment incorporated the following five key areas: analysing opportunities and possible obstacles; information campaigns targeted at consumers; increased collaboration between different stakeholders; dissemination of information about good practice; and promoting the increased use of unavoidable food waste for the production of biogas and the utilisation of digestate.

Examples of innovative approaches and good practice

Examples of good practice and innovative approaches

With the aim of stimulating the circular economy, the report of a special inquiry with a primary focus on products for consumers was presented in March 2017. It included additional suggestions of instruments to increase the second-hand market and repair of various products[28]. The main task of the inquiry was to analyse and propose policy instruments to promote increased utilisation and reuse of products to prevent waste. The government's overarching aim in appointing the inquiry was to achieve a more resource-efficient and circular economy. The inquiry has therefore chosen to describe what a circular economy involves and how Sweden can more forcefully steer in that direction.

RE:Source – a Swedish national strategic innovation programme

RE:Source[29] is a Swedish national strategic innovation programme within the resource and waste area, and supports the development of innovation that can contribute to the more efficient use of resources in both society and business. RE:Source is one of 17 Strategic Innovation Programmes.

RE:Source will run for three years from 2016, but could be extended for a total of 12 years. It addresses three challenges:
Resource-efficient society – in which waste is reduced by reusing or recycling products and a circular flow of goods and materials is secured for the long-term;
Sustainable materials supply – focusing on sustainable and competitive materials supply, reducing industry's demand for primary raw materials and enabling the circular use of materials; and
Sustainable energy system – with reduced dependency on fossil fuels by recovering energy from waste.

[28] SOU 2017:22 Från värdekedja till värdecykel – så får Sverige en mer cirkulär ekonomi. http://www.regeringen.se/49550d/contentassets/e9365a9801944aa2adce6ed3a85f0f38/fran-vardekejda-till-vardecykel-2017_22.pdf (Swedish, English summary also available)
[29] http://resource-sip.se/om-resource/resource-in-english/ (English)

RE:Source is a meeting place for these issues, at which Swedish industry actors, waste management and research can seek funding for their innovation projects. There has also been a specific call for circular economy projects. A list of current projects is available at the programme's website. The Swedish Energy Agency is the main responsible agency, while Sweden's innovation agency, Vinnova, and the Swedish Research Council, Formas, partly provide financing. The programme is led by the Research Institutes of Sweden (RISE) in collaboration with Chalmers Industriteknik, IVL, the Swedish Environmental Research Institute, and Swerea, a Swedish research group for industrial renewal and sustainable development.

Sweden's innovation agency, Vinnova have also specific calls within the team of enhancing innovation within Circular and biobased economy[30].

Mistra research programmes

The work for improved resource efficiency is underpinned by a number of research programmes funded by Mistra, the Swedish Foundation for Strategic Environmental Research, in the areas of sustainable consumption, sustainable business and circular economy. Mistra REES – *Resource-Efficient and Effective Solutions*[31] – aims to advance Swedish manufacturing industry's transition towards a circular economy. Mistra REES is focusing on material resource efficiency. New methods to reuse, repair, remanufacture and recycle products and their components need to be found. Mistra REES is aiming to develop principles, methods and guidelines that make resource efficient products, services and business models possible, and also to propose policy instruments and packages that favour the transition to a more circular economy. Another example is Mistra Future Fashion[32], a research programme on the circular economy with the aim of systemic change in the fashion industry towards closed loops and changed mindsets. The programme started in 2011 and was extended with a second phase for 2015–2019, with currently more than 40 partners involved, from researchers and authorities to brands.

Reduced value added tax (VAT) on minor repairs and tax reduction for repairs and maintenance

From January 2017, VAT on minor repairs was reduced from 25 per cent to 12 per cent. This applies to repairs of bicycles, shoes, leather goods, clothing and household textiles. There is also a tax reduction for repairs and maintenance of home appliances, such as white goods.

Hello Consumer![33] is a Swedish national information service with the overall objective of providing consumers with web-based information and support (phone, mail, chat, social media) on consumer issues, such as consumer rights or complaints. One of the areas in which consumers are offered information and support is environmentally sustainable consumption. The service is provided by the Swedish Consumer Agency in collaboration with 12 government agencies and it also combines services provided by municipalities under one umbrella in an easily accessible manner. Recently, a new mobile labelling guide that presents information about different labelling schemes and what they communicate was launched. The intention is to assist the private consumer in in their purchasing choices.

Innovation competition for zero emissions infrastructure[34]

By 2045, Sweden aims to have net zero greenhouse gas emissions. Sweden has also declared its ambition to be a pioneer in building sustainable societies. In one year, the Swedish EPA has organised a two-team competition with the challenge to build with zero emissions of greenhouse gasses in 2045. Two teams across the supply chain within the infrastructure industry sector participated, with actors cooperating that usually don't interact. Competitive companies have cooperated across traditional corporate boundaries, and inspiration from other industry sectors and sciences has promoted innovative thinking. The Öresund

[30] https://www.vinnova.se/e/cirkular-och-biobaserad-ekonomi-ny-utlysning/ (Swedish)
[31] https://www.mistrarees.se/en (English)
[32] http://mistrafuturefashion.com/ (English)
[33] http://www.hallakonsument.se/other-languages/english-engelska1/about-halla-konsument/ (Swedish)
[34] http://www.swedishepa.se/innovationcompetition (English)

bridge was used as a reference object. The winning concepts were inspired by nature. One of which taking the form of a snake and the other taking inspiration from the sea – hence the names – Serpent Bridge and the Bridge grown from the Sea. New circular business models were also included in the zero emissions future.

Innovations for sustainable cities: grants for leading-edge technologies and new system solutions. The initiative was implemented as part of the Swedish government's investments in climate action and run by the Swedish EPA in co-operation with the National Board of Housing, Building and Planning and with the Swedish Energy Agency. The grants aim was to increase the demand in and use of leading-edge technologies and advanced system solutions in urban environments. Five calls have been made and several of the projects that were supported had focus on solutions for enhancing circular economy and resource efficiency.

Seeking synergies with other policy areas

A National Food Strategy[35]
In 2017 a National Food Strategy was introduced. Reduction of waste throughout the food supply chain from producer to consumer is one of the Strategy's topics.

The government then commissioned for the years 2017-2019 for the Swedish National Food Agency together with the Swedish Board of Agriculture and the Swedish EPA to work on reducing Sweden's food loss and food waste. The first stage of the assignment was to develop an action plan, in close collaboration with relevant players, for how Sweden can work with long-term measures to reduce food loss and food waste. The measures are to contribute to fulfilment of global sustainability goal 12.3 concerning food loss and food waste in the UN Agenda 2030. The action plan was presented to the Swedish government in June 2018[36].

Action plan for a toxic-free everyday environment 2015–2020[37]
The government assigned the Swedish Chemicals Agency to continue work on the action plan to achieve a non-toxic everyday environment. Reducing chemical risks in everyday life is one of the steps on the road to reaching the Swedish Parliament's environmental quality objective of a non-toxic environment.

In 2016 the Swedish EPA together with the Swedish Chemicals Agency conducted a study[38] to further elaborate the potential conflict between increased recycling and specific critical substances such as those designated by REACH as substances of very high concern. The following waste streams were singled out as a result: polyvinyl chloride (PVC), plastics from ELVs and WEEE, and recycled granulated tyres for use in football pitches.

Strategy for Sustainable Consumption[39]
In 2016 a national Strategy for Sustainable Consumption was introduced. It focuses on what the state, together with municipalities, the business sector and civil society, can do to make it easier for consumers to act sustainably.

[35] http://www.government.se/498282/contentassets/16ef73aaa6f74faab86ade5ef239b659/livsmedelsstrategin_kortversion_eng.pdf (English)
[36] https://www.livsmedelsverket.se/en/food-habits-health-and-environment/food-and-environment/take-care-of-the-food--minimize-food-waste/food-waste-reports (English)
[37] https://www.kemi.se/en/about-us/our-task/government-assignments/action-plan-for-a-toxic-free-everyday-environment (English)
[38] http://www.naturvardsverket.se/Miljoarbete-i-samhallet/Miljoarbete-i-Sverige/Regeringsuppdrag/Redovisade-2016/giftfria-och-resurseffektiva-kretslopp/ (Swedish)
[39] http://www.government.se/4a9932/globalassets/government/dokument/finansdepartementet/pdf/publikationer-infomtrl-rapporter/en-strategy-for-sustainable-consumption--tillganglighetsanpassadx.pdf (English)

The aim of the Strategy is to contribute to environmentally, socially and economically sustainable consumption, with a special focus on making it easier for the consumer/citizen to make smart choices. One part of the Strategy is the establishment of a Forum on eco-smart consumption. The Swedish Consumer Agency is responsible for the Forum, which was set up in 2017. Other government agencies and a network will be linked to the Forum to promote active cooperation with researchers, the business sector, county administrative boards, municipalities and county councils, and civil society. The Consumer Agency has also been assigned to identify and spread good examples of how environmentally controlled action can be stimulated, for example through nudging.

Forum on eco-smart consumption[40]
The Consumer Agency has been commissioned by the government to develop a forum for environmentally friendly consumption and to promote environmentally friendly consumption patterns through behavioural change. The Forum will work with all societal actors to compile and disseminate information, as well as stimulate innovation and better conditions for environmentally sustainable consumption. The Forum is both a digital and real-life meeting place.

A National Public Procurement Strategy was introduced in 2016[41]. Part of the strategy focuses on green public procurement (GPP). Use of GPP should therefore increase, especially in product categories with a major impact on the environment. Environmental concerns and a life-cycle perspective should be taken into account in the different phases of the public procurement process.

Smart industry – a strategy for new industrialisation for Sweden was introduced in 2016[42] and two action plans related to the strategy have followed[43,44]. The strategy aims for strengthen companies' capacity for change and competitiveness, and one out of four focus areas in the strategy is sustainable production. Implementation encouraging; developing new or improving existing technologies, goods and services with consideration given to sharp reductions in emissions, the phasing out of particularly harmful substances, higher energy and resource efficiency, greater reusability and recyclability and higher environmental performance; exploiting the potential of new digital and other technologies for the transition to a fossil-free and circular economy; encouraging circular economy business models; and ensuring that regulations and other governance mechanisms incentivise and facilitate resource-efficient and environmentally friendly production and a sustainable supply of raw materials.

The Generational Goal: *the overall goal of Swedish environmental policy is to hand over to the next generation a society in which the major environmental problems in Sweden have been solved, without increasing environmental and health problems beyond Sweden's borders*. This defines the direction of environmental policy and provides guidance on the values that are to be protected and the changes that are needed in society if the desired environmental quality is to be achieved. The Goal is intended to guide environmental action at every level in society (see the section on Policies which include elements of material resource efficiency).

[40] https://www.forummiljosmart.se/ (Swedish)
[41] http://www.government.se/4aba88/contentassets/9ec42c71c00442a39d67169d3c25faed/national-public-procurement-strategy.pdf (English)
[42] https://www.regeringen.se/49a937/globalassets/regeringen/dokument/naringsdepartementet/pdf-i-genvagsblock/smart-industry.pdf (English)
[43] https://www.regeringen.se/49dad1/contentassets/85b4aaebe8004e1b9e72b63b8215b399/20160617_handlingsplan-smart-industri.pdf (Swedish)
[44] https://www.regeringen.se/4ad776/contentassets/c95f0d78085c4e84b7829bc53164b3dd/20171201_handlingsplan2_smart.pdf (Swedish)

Resource efficiency and circular economy policy initiatives from subnational to local level

The text below summarises one example related to sustainable consumption. It should, however, be stressed that although there are likely to be a number of activities, it has not been possible to carry out comprehensive screening.

In a study by the Consumer Agency, municipal work on sustainable consumption was inventoried[45]. The Consumer Agency identified in advance a number of focus areas relevant to the study: mobility/travel, food, housing, goods and energy. The study is based on two types of interview: with a number of organisations/networks that work in a variety of ways with sustainable consumption within these focus areas, and with municipal/local government officials who actively worked on action/projects that specifically promote more environmentally sustainable consumption among citizens. The results show that there are a number of networks and organisations that already work in different ways to support local authorities in working on environmentally sustainable consumption. In many cases, it is national authorities that have created networks with a focus on a specific issue involving municipalities, but also transnational networks focusing on sustainable consumption. The areas for which there seem to be the most examples of action and activities directly aimed at citizens' consumption are local travel, waste prevention (through recycling), energy efficiency/own generation of renewable electricity, and urban cultivation. At the same time, it is difficult to find examples of municipalities that are explicitly working to reduce residents' consumption.

Examples of on-going research and development projects in the field of circular economy are available on the websites of RE:Source and Vinnova[46].

Other resources

Examples of policies which go beyond "material resources"

Grants for leading-edge technologies and advanced system solutions for innovations in urban environments[47]

In order to increase the demand for and dissemination and development of environmental technologies and innovations that contribute to green growth and the circular economy, Swedish county councils, municipalities, publicly traded companies, general partnerships, limited partnerships, organisations, associations and foundations, as well as universities and other institutes of higher education (although not for pure research) may apply for grants within the area of advanced system solutions for innovation in urban environments. The total funding available for the programme is SEK 68 million (EUR 6.8 million) for 2016–2019. Advanced systems solutions may, for example, include solutions within the biogas chain and water and sewage systems that not only purify wastewater, but also recycle its nutrients, energy and water. The EPA is announcing this grants call in cooperation with the National Board of Housing, Building and Planning and the Swedish Energy Agency. The initiative is being implemented as part of the government's investment in climate action.

Platform for Sustainable Urban Development

This is a joint commission that the government has assigned to the National Board of Housing, Building and Planning, the Swedish Energy Agency, the EPA, the Agency for Economic and Regional Growth and the Transport Administration. The aim of the platform is to increase cooperation, coordination, the development and dissemination of knowledge and the sharing of experience linked to sustainable development.

[45] http://publikationer.konsumentverket.se/var-verksamhet/rapport-2017-8-inventering-av-kommuners-arbete-for-hallbar-konsu (Swedish)

[46] https://www.vinnova.se/e/cirkular-ekonomi/cirkular-ekonomi-utredningar-och-enklare-tester-/ (Swedish)

[47] http://www.swedishepa.se/Guidance/Grants/Innovations-for-sustainable-cities1/ (English)

Post-treatment efforts provide more clean land[48]

Efforts to decontaminate large areas are a significant issue involving many stakeholders. The EPA is the coordinating governmental authority assigned to assess, prioritise and monitor all such efforts on a national level.

[48] http://www.swedishepa.se/Environmental-objectives-and-cooperation/Swedish-environmental-work/Work-areas/Post-treatment-efforts-provide-more-clean-land/ (English)

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