ENVIRONMENTAL ACCOUNTS

MIR 2015:5

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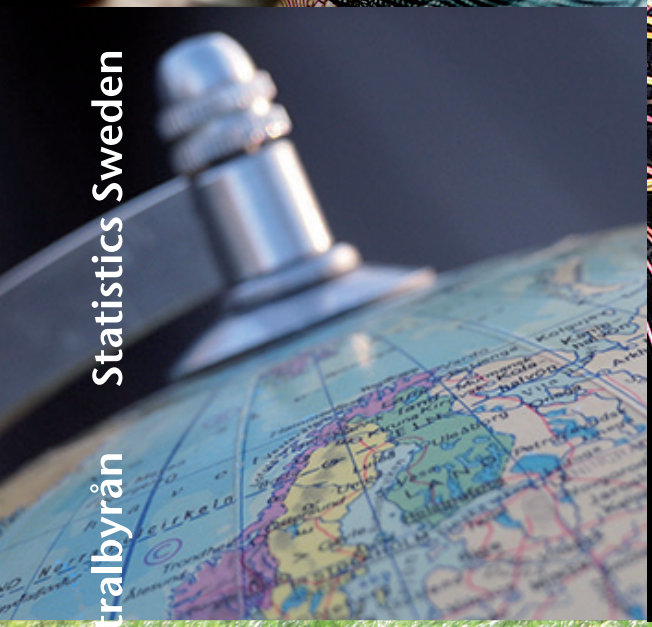

Statistics Sweden

Statistiska centralbyrån

Environmental Accounts – a jubilee

ENVIRONMENTAL ACCOUNTS 2015:5

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Foreword

The environmental accounts are a statistical system that describes the links between the environment and the economy. This is done by measuring the contribution from the environment to the economy (e.g. the use of raw material, water, energy and land) and the impact on the environment made by the economy (emissions to air and water, and waste). The environmental accounts system also highlights the environment-related transactions in the national accounts system.

In 1993, Statistics Sweden, together with the National Institute of Economic Research and the Swedish Environmental Protection Agency, was tasked by the Swedish Government to create a system for describing the links between the economy, the environment and natural resources. At Statistics Sweden, this has involved compiling statistics on the environment and natural resources that can be linked to the classifications of industries, product groups and sectors that are used in the national accounts (NA).

The environmental accounting system was first described in 1993 in the Handbook of National Accounting: Integrated Environment and Economic Accounting 1993 (SEEA 1993). A number of handbooks and manuals then followed to help Member States to introduce e.g. environmental protection expenditure, air emission accounts and material flow accounts. The UN has also provided compilers with the System of Environmental Economic Accounting Central Framework (SEEA CF 2012), an international statistical standard.

According to the UN, an environmental accounting system should cover: material flows in the economy, economic variables of environmental interest, natural resources and stocks (stores or inventories).

Gross domestic product (GDP), gross value added (GVA) and turnover are examples of economic variables that are linked to environmental issues. This report describes the driving forces of environmental problems, what impact these forces have, and responses to these environmental problems.

The report has been produced by the Environmental Accounting Group at Statistics Sweden.

Statistics Sweden, April 2015

Marie Haldorson

Kaisa Ben Daher

A word of thanks
Thanks to our respondents – private individuals, enterprises, agencies and organisations – Statistics Sweden is able to produce reliable and timely statistics that meet the demands for information from society.

Contents

Summary

Environmental accounts are a statistical system that allows the analytical connection between the environment and the economy. By re-adjusting the environmental statistics, it is possible to align them with economic statistics and thereby present the statistics jointly, even in an accounting framework.

The environmental accounts also facilitate additional international comparisons within the environmental area, especially since the UN Statistical Commission adopted the environmental accounts as a global statistical standard.

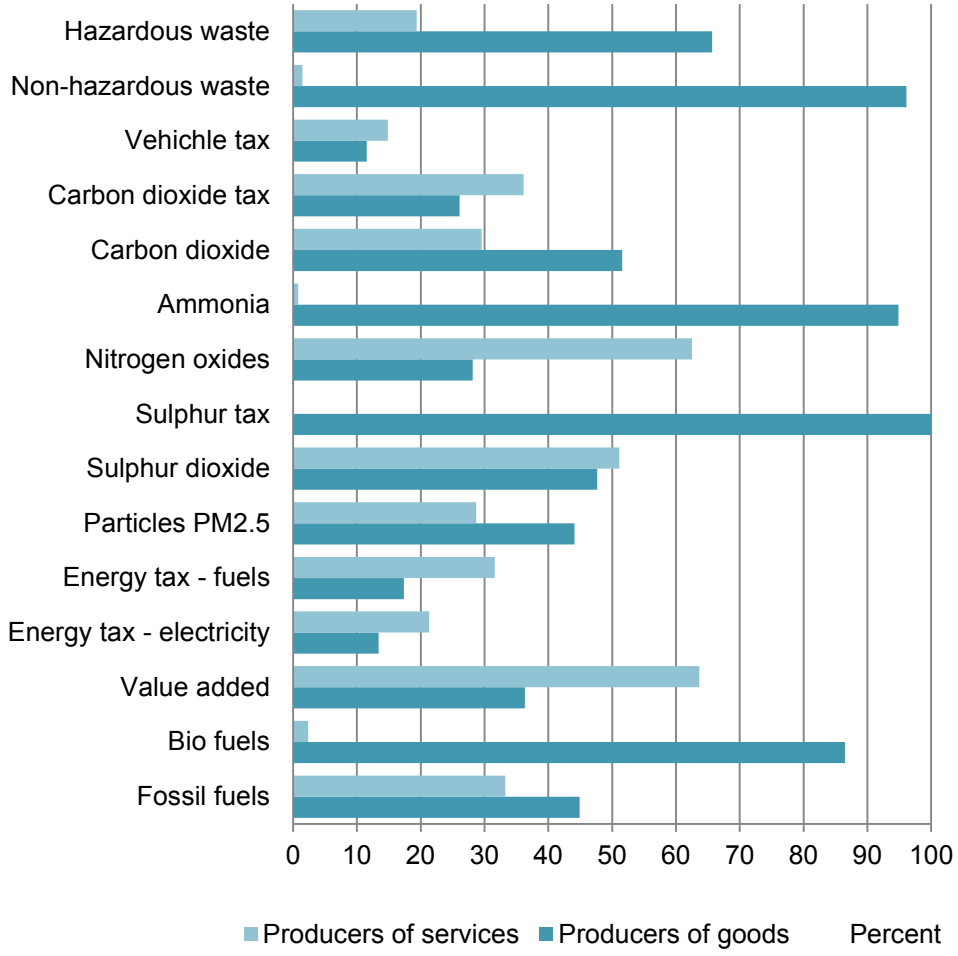
This report describes the driving forces that can create environmental pressures of different kinds. These drivers are e.g. the economy, the population, fuel use and means of transport. The pressures that these driving forces may have on the environment, e.g. emissions created, or the use of certain raw materials or the generation of waste, are discussed later in the report. There are a number of ways to prevent and minimise the environmental problems we create, and the report discusses some of them: environmental taxes, environmentally motivated subsidies, the environmental goods and services sector and the expenditures spent on reducing the impacts through environmental protection expenditure.

Towards the end of this report, the reader is pointed in the direction of previous studies and reports published in this series: *The Environmental accounts.*

Environmental economic profiles are one way to look at the contributions of different actors to environmental pressures, the economy and different ways to compensate and adjust for the pressures through e.g. taxation. We can see below that the share of gross value added (industry's contribution to GDP) of producers of goods is lower than that of producers of services. On the other hand, producers of goods have a higher share of the use of fuels, but a lesser share of energy taxes. We can also see that the producers of goods pay a lesser share of carbon dioxide taxes put on fossil fuels. We also know that the producers of goods are part of the emissions trading scheme, but no statistics are available at this point in time to include in the figure.

Producers of goods account for almost all non-hazardous waste, where the Mining and quarrying industry accounts for the largest share.

Figure S.1
Environmental economic profile, share of total economy, year 2012

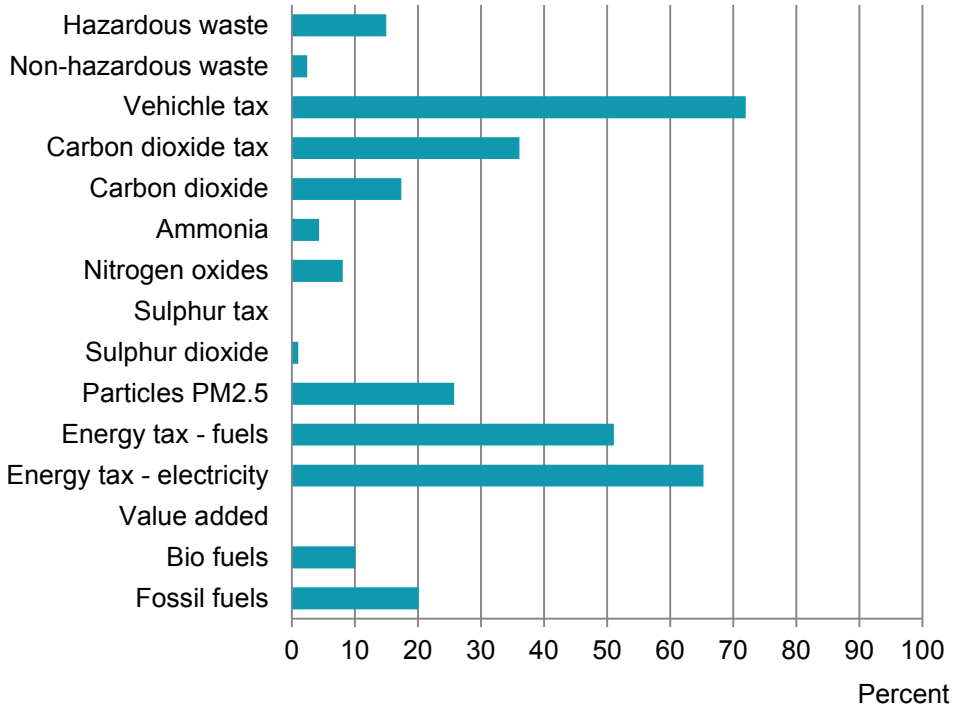


Source: Statistics Sweden

Instead, if we turn to households and non-profit institutions serving households (NPISH), we see that they account for 17 percent of carbon dioxide emissions, but 36 percent of carbon dioxide taxes. They also account for over half of energy taxes paid to the Swedish Government, while the share related to the use of fossil fuels amounts to 20 percent. Households give rise to 26 percent of emissions of $PM_{2.5}$ particles. (the smallest particles that come from the burning of wood in houses and from vehicle emissions)

Figure S.2

Environmental economic profile, households and non-profit institutions serving households (NPISH), 2012, percent



Source: Statistics Sweden

The area of environmental accounts is still expanding and developing in Sweden, within the EU, the OECD and the UN. Areas such as the statistical measurement of potentially damaging subsidies are being discussed internationally, as well as how ecosystem services and climate change impact through consumption can be measured and calculated in statistical terms.

Statistics Sweden is actively participating in this discussion and will continue to develop the environmental accounts in Sweden and internationally through participation in international projects and international development cooperation.

The work in Sweden to improve existing statistics and further develop new modules within the environmental accounts is a continuous effort. During 2015 the potential to develop statistics on emissions trading by industry will be investigated. In combination with statistics on carbon dioxide taxes and carbon dioxide emissions, the possibility will be created to provide a measurement of how much is paid for each ton of carbon dioxide emissions for each industry in the economy. Also, the statistics on environmentally motivated subsidies and transfers will be developed during the year, as an industry breakdown will be forthcoming.

Other areas of development are the perspective of climate impact of Swedish consumption, ecosystem accounts, regional environmental accounts and the further development of input-output analysis and more up-to date air emission accounts in the form of quarterly calculations of carbon dioxide emissions.

1 Introduction

1.1 Why environmental accounts?

Environmental accounts provide a statistical framework that enables us to analyse the link between the environment and the economy. This is done by reprocessing environmental statistics so that they correspond to economic statistics and can then be presented together. The environmental accounts also contribute to more international comparisons in the environmental field, especially since the UN Statistical Commission adopted the environmental accounts as a global statistical standard.

The aim of the environmental accounts is to treat the statistics on natural resource use in the same way as other resource consumption, as well as to highlight details in economic statistics that affect the environment, such as environmental taxes, environmental subsidies and environmental enterprises. They show the use of environmental economics tools and their effects and environmental impact. Another type of analysis is how household consumption affects greenhouse gas (GHG) emissions.

By using the national accounts (NA) as a basis, we can have the same definitions of economic activities, and of the scope and structure of variables for the environmental statistics and for the environmental-economic statistics. As a result, the environmental accounts are also called a *satellite account* to *the national accounts.* There are also other satellite accounts, e.g. social accounts, and tourist accounts.

The statistics published within the framework of the environmental accounts consequently follow an industry structure and provide detailed information on which industry, materials or products affect the environment and which are affected by environmental-economic instruments.

Today's environmental objectives system identifies specialist areas in which nationally important strategies for dealing with environmental issues in society are pinpointed. Annually monitored indicators on the national, regional and local level are linked to the environmental objectives. Using the environmental accounting system, it is possible to tweak the information so that an economic aspect emerges.

Development of the environmental accounts has been going on for over 20 years in Sweden and this report summarises the collective experience of Statistics Sweden in the area.

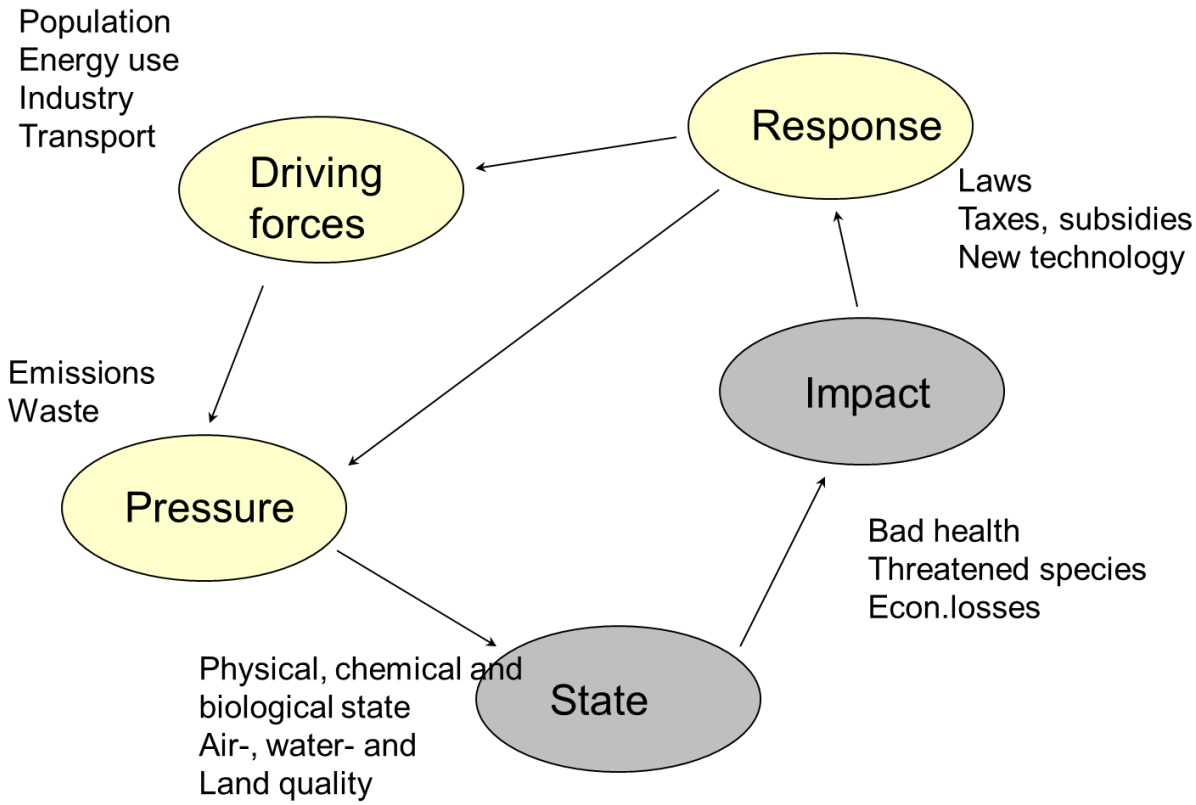
1.2 Following a context – driving forces and pressures

Going to the shop to buy food, a company supplying new goods and central government introducing new or modified instruments all affect the environment. There is negative impact, e.g. driving on fuel that increases GHG levels, and a positive impact, e.g. switching to a fuel mixture that does not affect the climate. In statistical terms, indicators are sometimes described within the framework of a model abbreviated as the DPSIR Model. According to the DPSIR Model, the indicators are divided into the following groups: driving forces, pressures, states, impacts and responses. The aim of the method is to include indicators that show how various economic activities in society affect the environment and human health and what is being done to prevent further impact.

Above all, the environmental accounts can help to develop indicators that show driving forces, pressures and responses. Impacts can be described by e.g. putting a monetary value on environmental damages. Describing states, e.g. concentrations of various substances in certain habitats, requires field measurements and research.

The Swedish Environmental Protection Agency (Swedish EPA), which is the agency responsible for the state of the environment, has, for example, made environmental monitoring data available via its website. Among other things, these data measure the state of the environment in the mountains, agricultural land, natural landscapes and air.

Figure 1.1
The DPSIR Model



1.3 The environmental accounts – a global compact

The idea of an interconnected system for the environment and the economy goes back to the mid-1900s but not until 2012 did the UN Statistical Commission adopt a statistical standard for what became known as the System of Environmental-Economic Accounting. Since the early 1990s, statistics offices around the world have been engaged in the project after the EU and the UN agreed to create satellite accounts in a more standardised form within the framework of the national accounts.

Today, environmental accounting also has its own statutory EU regulation providing for the annual reporting of different components of the accounts. The following areas have been included since 2011: air emission accounts, environmental taxes per industry, material flows per product, energy flow accounts, environmental goods and services sector and environmental protection expenditure accounts. Furthermore, the regulation is gradually being extended.

The OECD is also starting to collect data for the different components of the environmental accounts in order to follow the strategy for green growth. This data collection is supposed to provide an even more extensive and better basis for environmental-economic information for global comparisons.

Since Statistics Sweden has the opportunity to participate in bilateral cooperation projects financed by SIDA, there has been an increase in projects aimed at helping developing countries to devise environmental accounts, or parts thereof. The fact that colleagues who produce and develop environmental accounts can help colleagues in other parts of the world creates trust and contributes to effective cooperation. It also creates greater confidence in the statistics of other countries as problems are solved jointly and experiences are shared.

Between 2002 and 2014, Statistics Sweden and the Environmental Accounts Unit have participated in the development of statistics in approximately 15 countries, stretching from Bolivia in the west, Burkina Faso in the south to Armenia in the east.

1.4 Structure of the report

The report is arranged as follows:

Chapter 2 - *Driving forces* - describes the driving forces that can cause environmental problems of different kinds. These driving forces are: the economy, the population, fuel consumption and transport.

Chapter 3 - *Pressures* - describes the pressures the driving forces can exert on the environment, e.g. emissions, material use or waste generation.

Chapter 4 – *Responses* - provides examples of different ways of combating and reducing the environmental problems we cause; such as environmental taxes, environmental subsidies, enterprises whose operations promote a better environment and the environmental protection expenditure of businesses.

Chapter 5 - *Want to know more?* - provides information to readers who would like to know more about the statistics published in the environmental accounts and previous publications.

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2 Driving forces

Driving forces tell us which activities, e.g. energy use, transport, consumption or industrial activities are behind various environmental problems. This section describes the main driving forces.

2.1 Economy and population

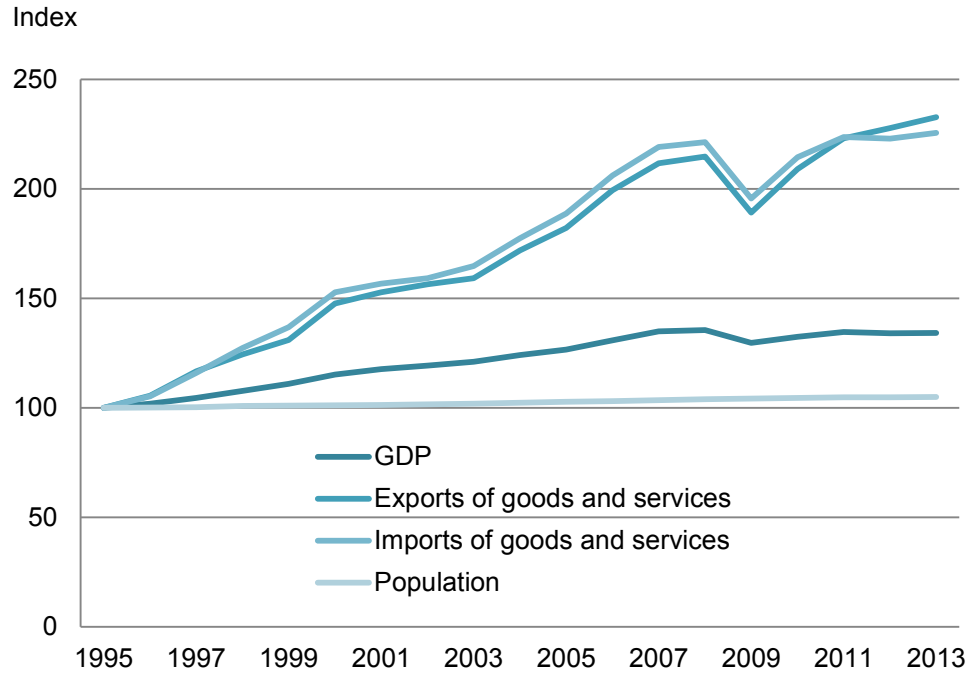
Population growth, economic development and imports and exports put great strain on our environment. A rising population not only increases the risks of greater environmental problems but also means that we are consuming more of Earth's natural resources. The economy affects the natural environment both as a result of resource extraction and due to the residual products that are generated and spread via the air, soil and water.

International comparisons

An overview of population and economic variables for Europe (EU-28) as a whole is given below. We can see that both the population and the economic indicators increase over time, even if the population increase is modest compared to economic development. Europe as a whole exports slightly more than it imports.

Figure 2.1

Economy and population in the EU (EU-28) 1995-2013, Index 1995=100

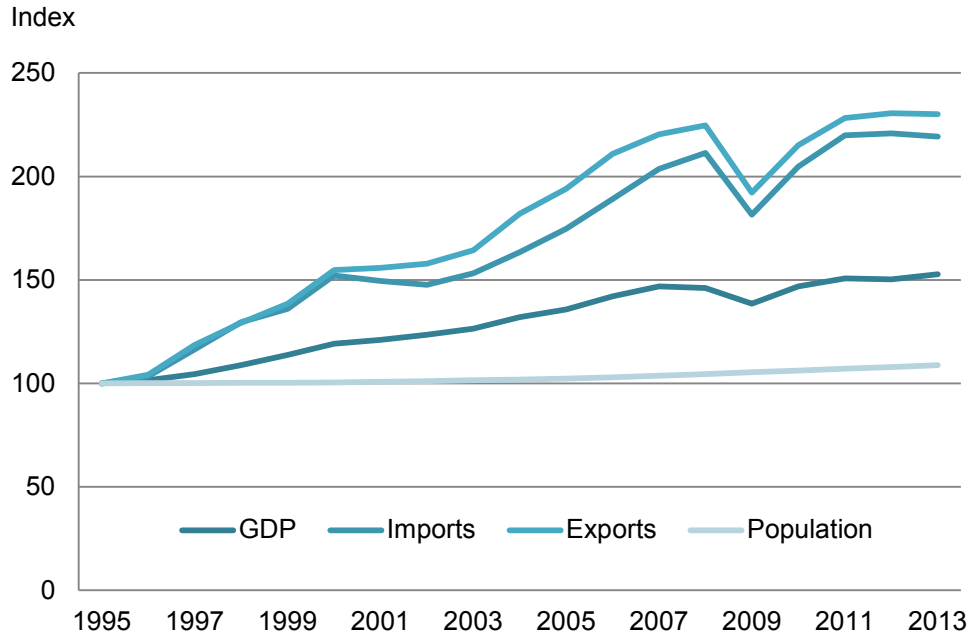


Source: Eurostat
Footnote: Constant prices

Economy and population in Sweden

Both the population and economic growth have on the whole increased in Sweden over time. The figure below shows the development since 1995. Sweden has had positive net trade, i.e. we have exported more than we have imported, during the entire period since 1995.

Figure 2.2
Economy and population in Sweden, 1995-2013, Index 1995=100



Source: Statistics Sweden
Footnote: Constant prices

2.2 Use of fuel

Our energy consumption affects the environment in different ways; it can cause emissions of GHG, acidifying substances or be health- and environmentally hazardous chemicals. This section examines our use of fossil fuels and biofuels as they give rise to different emissions to varying degrees. In Section 3 below we can see what pressures the combustion of fuels give rise to. Other forms of energy generation, such as hydropower, are not included in this section.

International comparisons

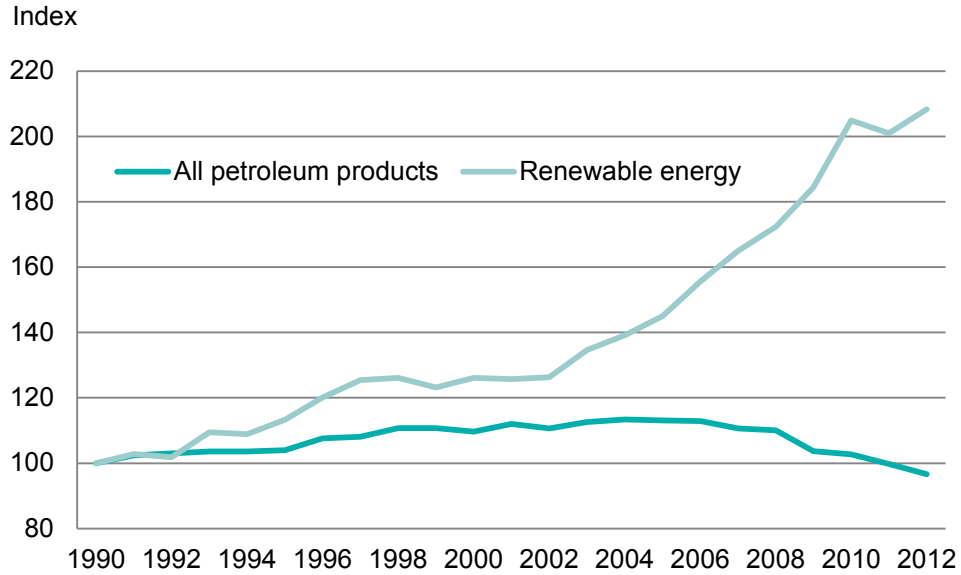
Regarding the environmental accounts, there are currently no internationally comparable statistics, e.g. energy use broken down by industry. Eurostat will, however, start publishing energy accounts as from 2017. On the international level, the International Energy Agency (IEA) and Eurostat collect energy balance statistics.

Eurostat defines final energy use as the total energy consumption of the final users, e.g. households, industry and agriculture. These figures exclude the energy used by the energy sector itself.

Here we can see that the final energy use of all oil products varies somewhat over time, although 2011 was on the same level as 1990, i.e. about 18 million terajoules. We can, however, see that renewable energy is increasingly substantially, albeit it from a low level. In 1990, renewable energy stood at 1.6 million terajoules, in 2012 final energy use was 3.3 million.

Note that Figure 2.3 is not comparable with Figure 2.4 below, which concerns fuel use in Sweden, since there are differences in methodology between energy accounts and energy balances, see the "Facts about the statistics" section for a description of these.

Figure 2.3
Final energy consumption in Europe (EU-28), TJ), 1990-2012, Index 1990=100

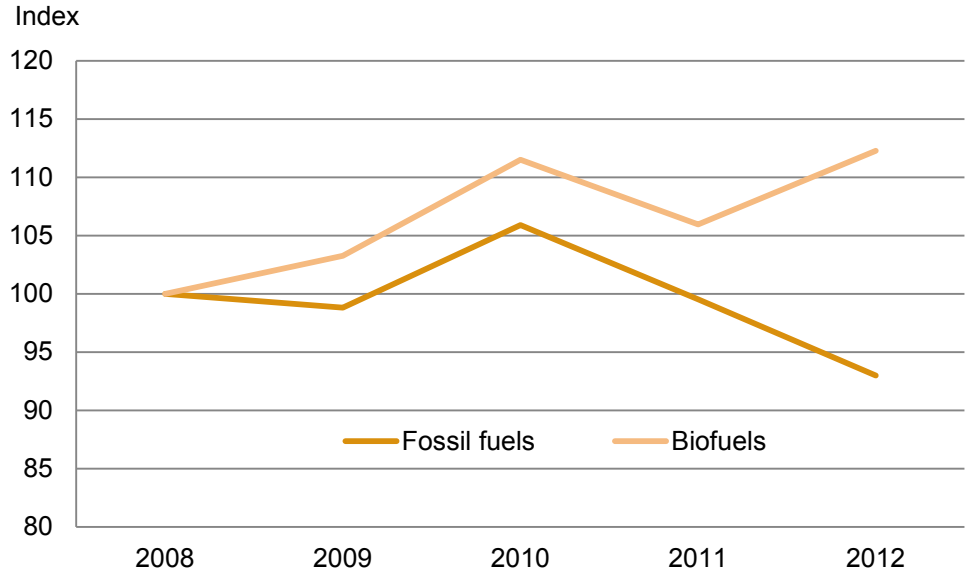


Source: Eurostat

Combustion of fuels in Sweden

Combustion of fossil fuels in Sweden has decreased slightly since 2008 on the whole, although the combustion of biofuels has increased[1]. The figures have been retrieved from the energy accounts, which also include the energy sector itself. There are different explanations for the rises and falls. Differences in climate and temperature can have an effect on fuel use, especially when it comes to electricity, gas and district heating supply. The falls in energy use can also be linked to downturns in the economy. The rise in biofuel combustion is also due to us heating our homes to a greater extent using renewable energy sources, such as district heating and geothermal heating instead of oil.

Figure 2.4
Energy use in Sweden (TJ), 2008-2012, Index 2008=100



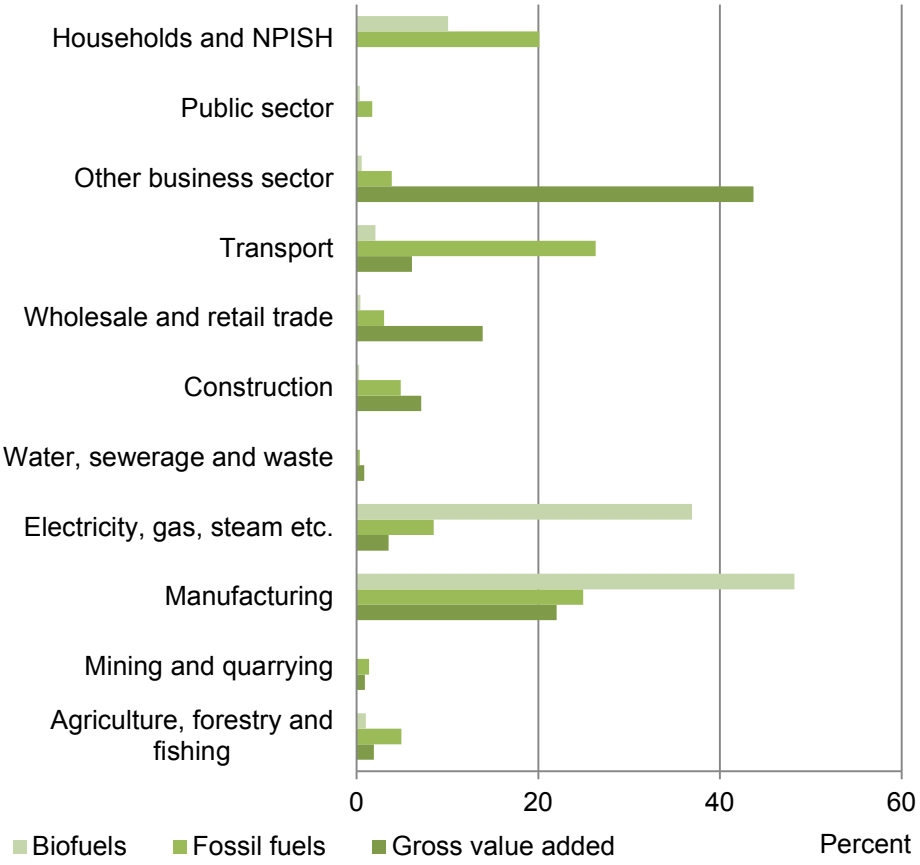
Source: Statistics Sweden

[1] The fact that the time series starts in 2008 is due to the adoption of a new classification system, Swedish Standard for Industry Classification (SNI - Swedish NACE) 2007.

Which economic actors use the most fuel? The transport sector is highest as regards fossil fuels, with 26 percent of total use, followed by the Manufacturing with 25 percent and Private consumption (households) with 20 percent.

If we instead look at gross value added in the industries[2], we receive a slightly different picture. The figure below shows how Transport uses large amounts of fossil energy in relation to its contribution to the economy. The opposite is true of e.g. Wholesale and retail trade.

Figure 2.5
Share of fuels and gross value added, 2012



Source: Statistics Sweden
Footnote: NPISH = Non-profit institutions serving households

If we put use of fuel in relation to gross value added, we can work out intensities. High intensity indicates that a great deal of fuel is required to create the contribution to the economy. Electricity, gas, steam and air conditioning supply has a high intensity not only for biofuels, but also for fossil fuels. For obvious reasons, intensity is high for Electricity, gas, steam and air conditioning supply since energy production is its core activity, in which biofuels are a main input. A similar result can be seen in Manufacturing, where substantial use of biofuels has an impact on the intensity.

[2] How much each industry contributes to the Swedish economy

So, what does the trend look like for each industry respectively? Intensity has fallen for transport if we compare 2008 with 2012. There has been a minor decrease for Electricity, gas, steam and air conditioning supply and for Agriculture, forestry and fishing. The intensity is unchanged, however, for Mining and quarrying and for Manufacturing.

2.3 Transport

Transport plays an important part in today's society, with increased globalisation, both regarding the transport of goods and regarding travel. In the environmental accounts, emissions and fuel consumption from transport are divided up among the various commercial industries. This is described below in Section 3 - Pressures. In this section, we can see what the trend in transport over time and the classification into different transport means look like.

International comparisons

Regarding the environmental accounts, there are currently no internationally comparable statistics linked to transport. Eurostat does however collect transport-related statistics every year. In this section, a globally oriented study published by the Swedish National Board of Trade in 2012 is used.

Trade and transport are inextricably linked and transport trends follow the growth in trade and GDP, which means that transport is increasing in global terms. Transport has a major impact on our climate; water transport is responsible for 90 percent of all world trade transport (in weight) and terrestrial transport for 10 percent. (Kommerskollegium, 2012)

Road transport is however responsible for about 73 percent of global transport-related carbon dioxide emissions (2008), water transport for 9 percent and air transport for 7 percent. (Kommerskollegium, 2012)

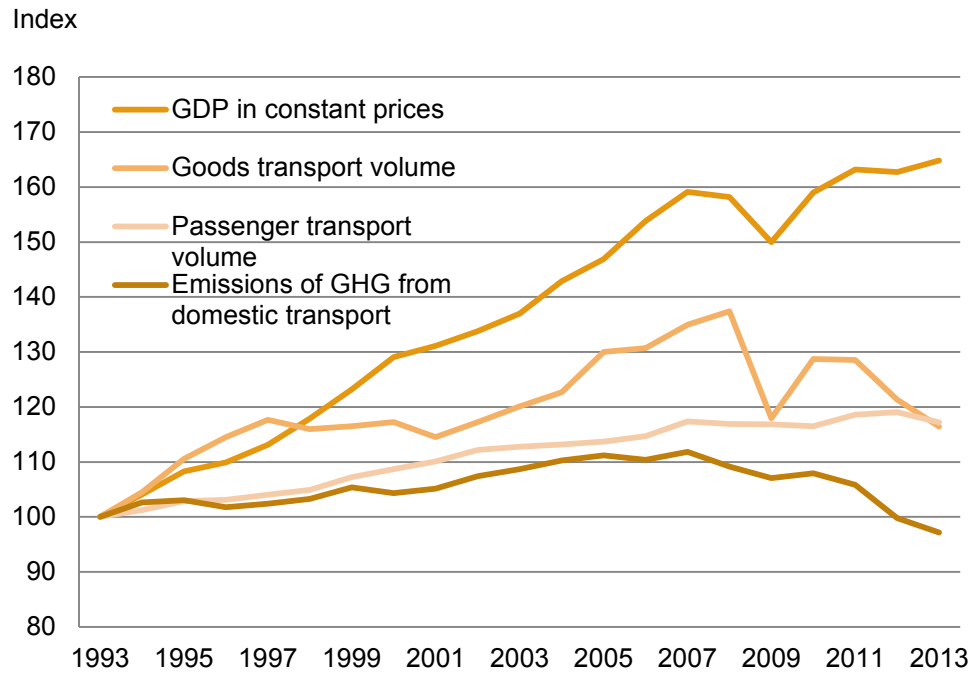
Passenger transport dominates as regards carbon dioxide emissions from air transport. And if we calculate carbon dioxide emissions per kilometre, air transport is highest by some distance and water transport is lowest. (Kommerskollegium, 2012)

Transport in Sweden

Transport is also on the increase in Sweden, in a longer-term perspective, and this is true for both goods and passenger transport.

The figure below shows the development in transport in Sweden, the trend in GDP and emissions from transport. We can see that goods transport follows GDP, which is not true for passenger transport. In the diagram, we can also see that emissions from transport have basically remained on the same level, despite transport increasing as far as number of kilometres is concerned, which suggests that transport has improved in terms of new fuels and more efficient fuel consumption.

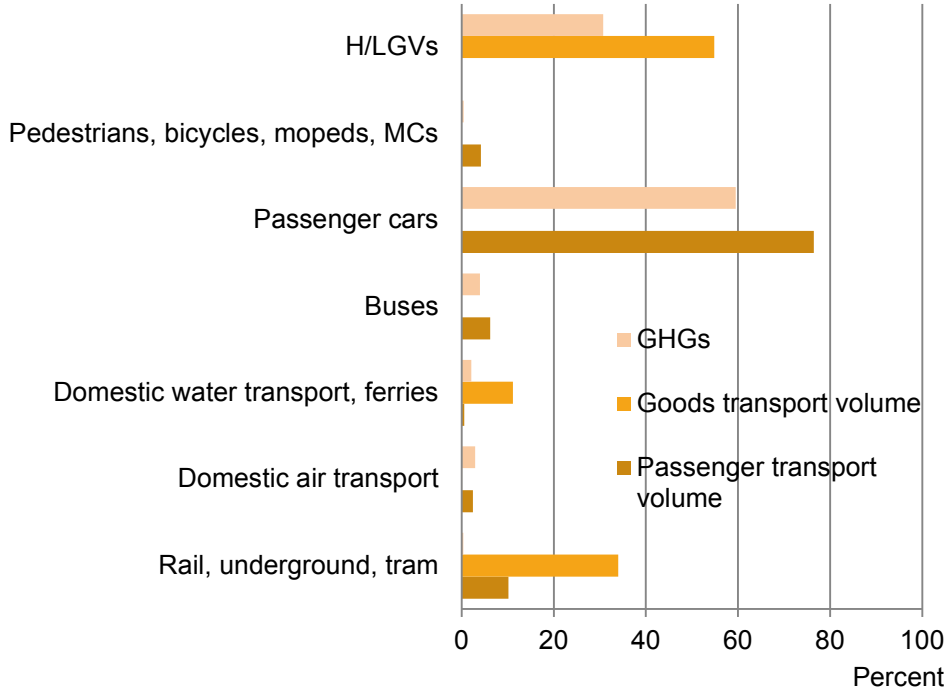
Figure 2.6
Transport volume, GDP and GHG emissions from domestic transport, Index 1993=100



Source: Statistics Sweden, Transport Analysis and the Swedish EPA
Footnote: Passenger kilometres, goods kilometres and GDP in constant prices

So, which types of transport dominate and how do they impact GHG emissions? Below we can see that passenger car transport is highest both regarding emissions and number of kilometres. Other road transport, such as heavy goods vehicles (HGV), is also high with respect to these variables. We can also note that overground rail, underground and tram transport are in third place as regards passenger kilometres, but have only negligible GHG emissions.

Figure 2.7
Domestic transport volume, share of billion ton and passenger kilometres and GHG emissions, 2013



Source: Traffic Analysis and the Swedish EPA

Greater interest is being shown in the way goods are transported in Sweden. Most of the goods imported into Sweden come by sea, 82 percent, followed by terrestrial transport with 17 percent of imported goods measured in weight. (Kommerskollegium, 2012)

Water transport also dominates when it comes to goods exported from Sweden, with 66 percent, measured in tons, while HGVs are responsible for 17 percent. The figures relate to 2010. Norway, Denmark, Finland, Germany and the Netherlands are our most important import and export countries, measured in weight. Norway is at the top, followed by Germany, regarding both imports and exports. (Trafikanalys, 2012)

3 Pressures

Pressures are the physical or chemical causes of environmental problems. They can be, e.g. emissions of GHG, acidifying substances, ecotoxic substances and particles. The materials we use and the waste we generate also contribute to the pressures on our environment. This section describes environmental pressures from an environmental accounts perspective. In other words, we link environmental pressures to economic actors.

3.1 Emissions of greenhouse gases

It is possible to reduce the effect of the climate change we are seeing today by decreasing emissions of greenhouse gases (GHG) such as carbon dioxide. This can be done in several ways, including by modifying the production system. Another way is changing how we purchase various goods and services.

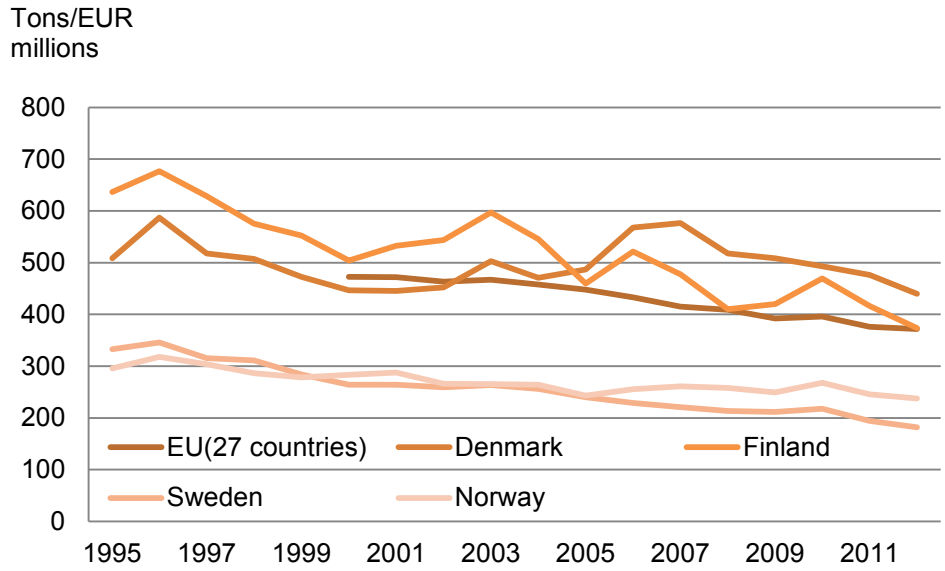
International comparisons

By combining economic trends with emissions to air, we can show how economic growth develops in comparison with the emissions. GDP, which is often used as a measure of economic growth, is increasing globally. The contribution of businesses to GDP, i.e. gross value added (GVA), is also rising. How does increased growth affect carbon dioxide emissions?

From a European perspective, carbon dioxide emissions per GVA are falling. This means that the total economy has reduced its driving force for emissions in relation to the production of goods and services. It can be the result of improved technical solutions or reduced use of fossil fuels such as oil and coal. It may also be an effect of businesses having changed their structure, i.e. they have gone from being an enterprise that manufactures goods to one that offers services, or that manufacturing enterprises have disappeared and new service companies have come into existence.

The figure below shows that Sweden and Norway are under the EU average, while Denmark and Finland are above it. The differences between the countries can have different causes. Denmark, for example, has a lot of water transport and pig farming, which cause considerable emissions. Sweden and Norway have a lot of hydropower, which helps to reduce emissions per GVA.

Figure 3.1
Carbon emissions per gross value added (GVA), 2000-2012, tons and EUR million



Source: Eurostat
Footnote: Constant prices

Emissions in Sweden

Sweden has calculated carbon dioxide emissions for many years and these have increased over time at the same rate as economic growth measured in terms of GDP. Since the beginning of the 1990s, however, carbon dioxide emissions have remained rather constant; indeed they have recently decreased slightly despite growth in the economy. Improved heating, more service production and greener fuel, such as biofuel, windpower and geothermal heating are some of the explanations for the decrease, while a continued increase in emissions from transport have produced the opposite effect far into the 2000s, even if they seem now to be decreasing slightly.

Using statistics, it is possible to explain what is happening with carbon dioxide emissions.

There are several factors and causal connections that have contributed to the link between GDP and carbon dioxide emissions having been at least partially broken.

From an economic production perspective (the environmental accounts), carbon dioxide emissions are influenced by the type of goods and services produced, e.g. real estate services and transport. The figure below shows that the manufacture of less emission-intensive products is on the increase (distribution between goods and services) and that the fuel mix has been changed (the emissions intensity). We have gone from using fossil fuels to using e.g. biofuel, windpower and geothermal energy instead.

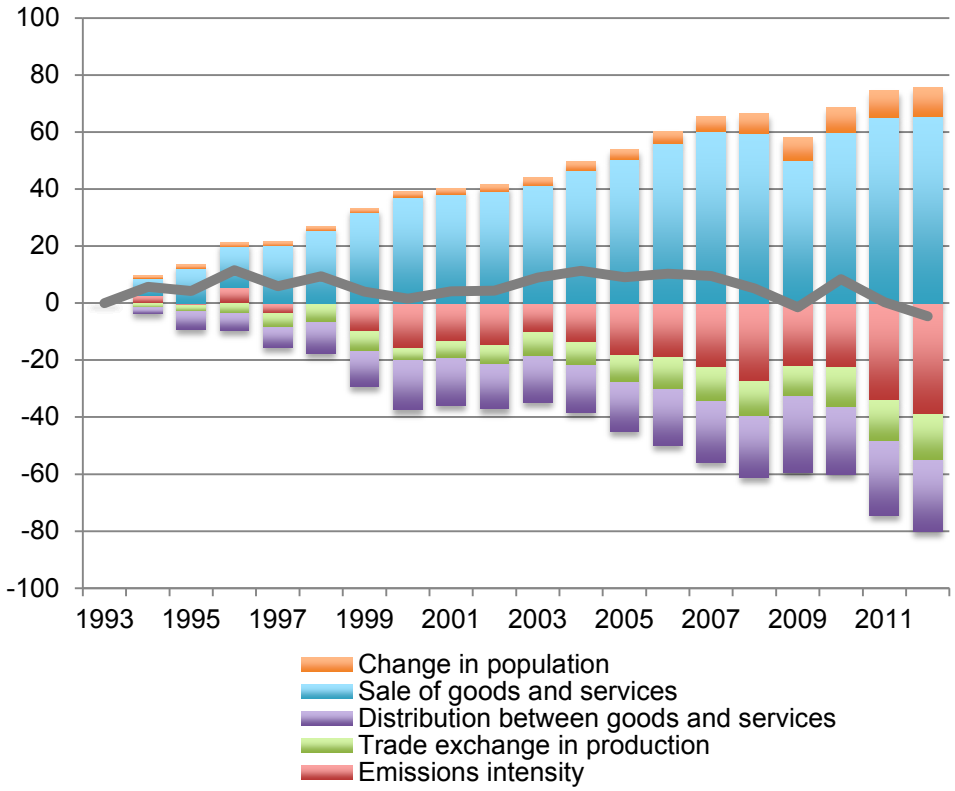
Another factor that is helping to reduce climate impact is that producers are starting to change the types of input materials they use in production (e.g. plastic, steel and wood) and where they buy them from (domestically or abroad). These factors, the purchase of input goods, are shown in the figure as trade in production. The reduction in the frequency of input goods may have something to do with the goods being imported instead of being purchased in Sweden. This is something that must be considered in the analysis separately.

Despite the fact that several of the factors such as increased service production in relation to goods production and greener fuel indicate a positive impact on carbon dioxide emissions reduction, total emissions are not changing to any great degree.

This is because the driving forces of the emissions are cancelling each other out on the national level. A growing population and greater production of goods and services, measured as GDP, are factors that have an impact in the opposite direction, towards increased emissions.

The figure below shows the change in actual carbon emissions in production 1993-2012 and how contributory factors have developed during the same period.

Figure 3.2
Factors affecting carbon dioxide emissions in Sweden - a decomposition analysis
Percent

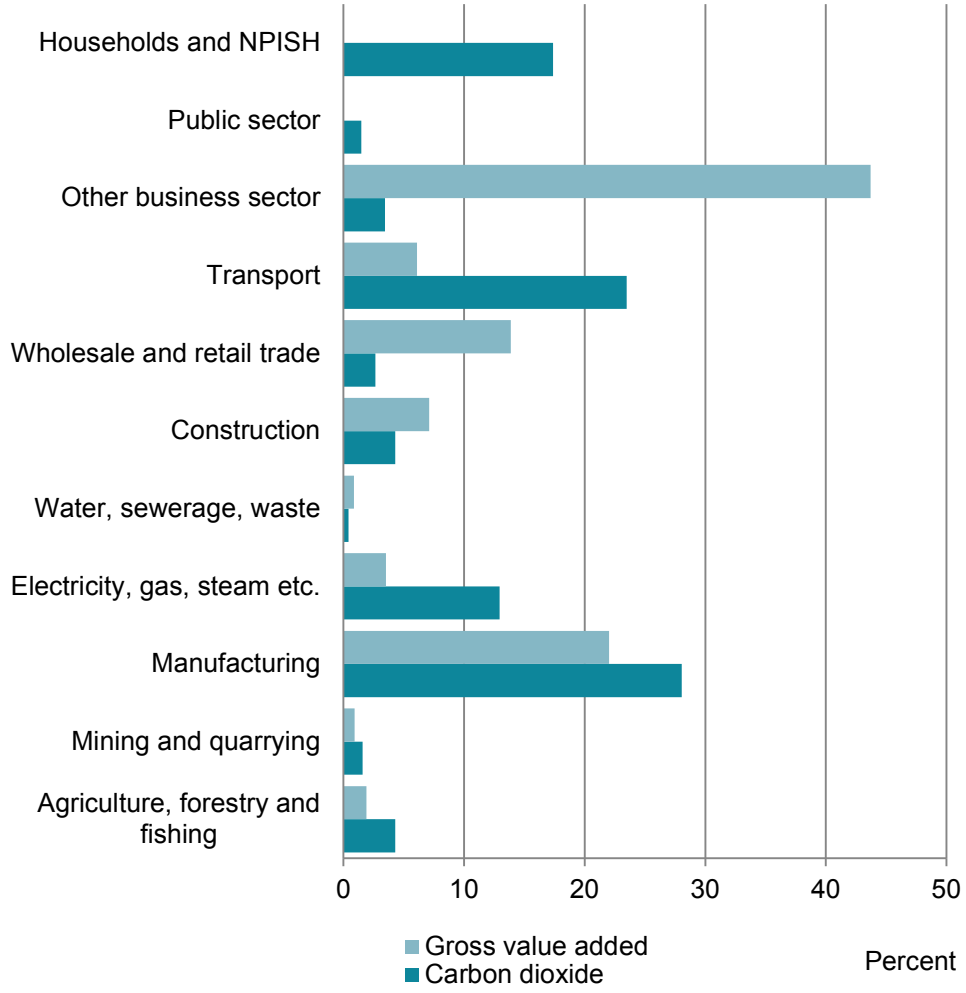


Source: Statistics Sweden

Note: The figure shows the change in actual emissions in production compared to the 1993 level and how contributory factors have developed during the same period. For example, the figure shows how the emissions intensity has decreased since 1993 and hence counteracted an increase in actual emissions. The sale of goods and services is expressed in terms of GDP growth.

If we instead look at the industries that generate carbon dioxide emissions, we see that Manufacturing generates the most, followed by Transport. Both these industries have a lower share of the business sector's gross value added. The third largest emitter is households and Non-profit institutions serving households.

Figure 3.3
Share of carbon dioxide emissions and gross value added, 2012



Source: Statistics Sweden
Footnote: NPISH = Non-profit institutions serving households

Emissions from final use

Emissions in Sweden are not the whole story. To see the total effect of Swedish final use, we have to look outside Sweden's borders as well as study what and how much we import, and what environmental impact production has in other countries.

Both businesses and consumers in Sweden are buying more imported goods, which is a key reason why emissions are not increasing within Sweden's borders; they are happening somewhere else. Environmental impact is, however, increasing, in the countries where our goods are being produced.

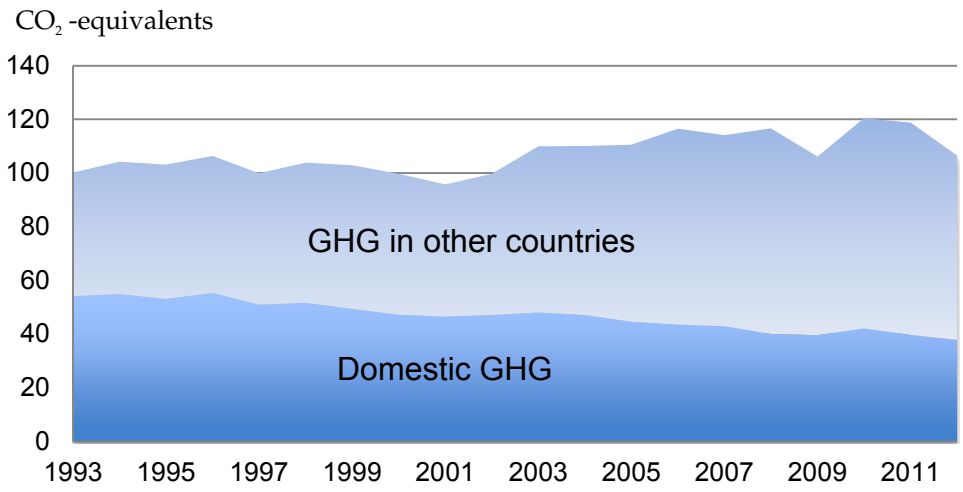
Just under 70 percent of all goods that are imported into Sweden come from another European country (country of dispatch). Germany, Norway and Denmark are among our largest trade partners, together with the United Kingdom. In Asia, our largest trade partner is China.

Computers and electronic equipment, motor vehicles and chemicals and pharmaceuticals are imported into Sweden on a large scale. They are responsible for about 25 percent of all imports, measured in SEK. Imports of agricultural products, food and textiles are together responsible for about 8 percent of all imports.

The environmental impact of GHG that can be attributed to imports of agricultural products, food and textiles into Sweden is increasing, however. For almost a decade, GHG have increased by over 50 percent for this group of products.

In the figure below, we can see the GHG emissions that are caused by our Swedish consumption, both within our country's borders and the emissions we cause in other countries. We can see that we have increased our emissions in other countries over time, and that these emissions are greater than those in Sweden.

Figure 3.4
Emissions of GHG from Swedish consumption, 1993-2012, million tons CO_2-equivalents



Source: Statistics Sweden and the Swedish EPA
*GHG emissions include carbon dioxide (CO_2), methane (CH_4), nitrous oxides (N_2O). Emissions of CH4 and N2O are normally converted into CO2-equivalents so that they can be added to the total.

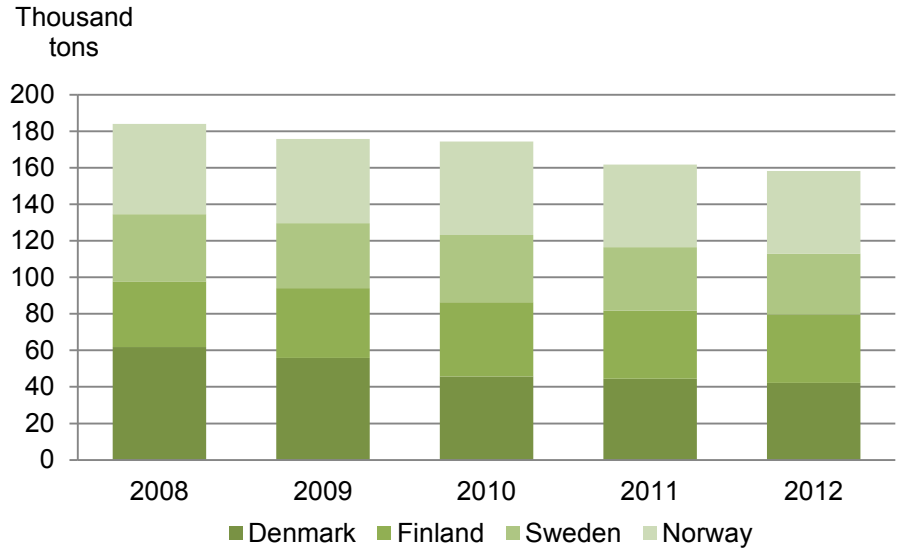
3.2 Emissions of particles

Particles in the air have a negative effect on both the climate and human health. Our combustion of fuel causes emissions of particles to the air, which has a negative impact on our air quality. Particles are normally divided up into PM_{10} that are less than 10 micrometres in size, and $PM_{2.5}$ that are less than 2.5 micrometres, i.e. the smallest particles.

International comparisons

As we know, emissions are spread across national borders. Emissions of particles have decreased in our neighbouring Scandinavian countries since 2008. Below we can see the $PM_{2.5}$ emissions that have decreased by 15 percent since 2008 overall in Sweden, Norway, Denmark and Finland. Denmark has reduced its $PM_{2.5}$ emissions by 33 percent since 2008, while Sweden's and Norway's emissions have fallen by 5 and 11 percent respectively. Finland's have increased by 10 percent, however.

Figure 3.5
Emissions of $PM_{2.5}$, thousand tons, 2008-2012



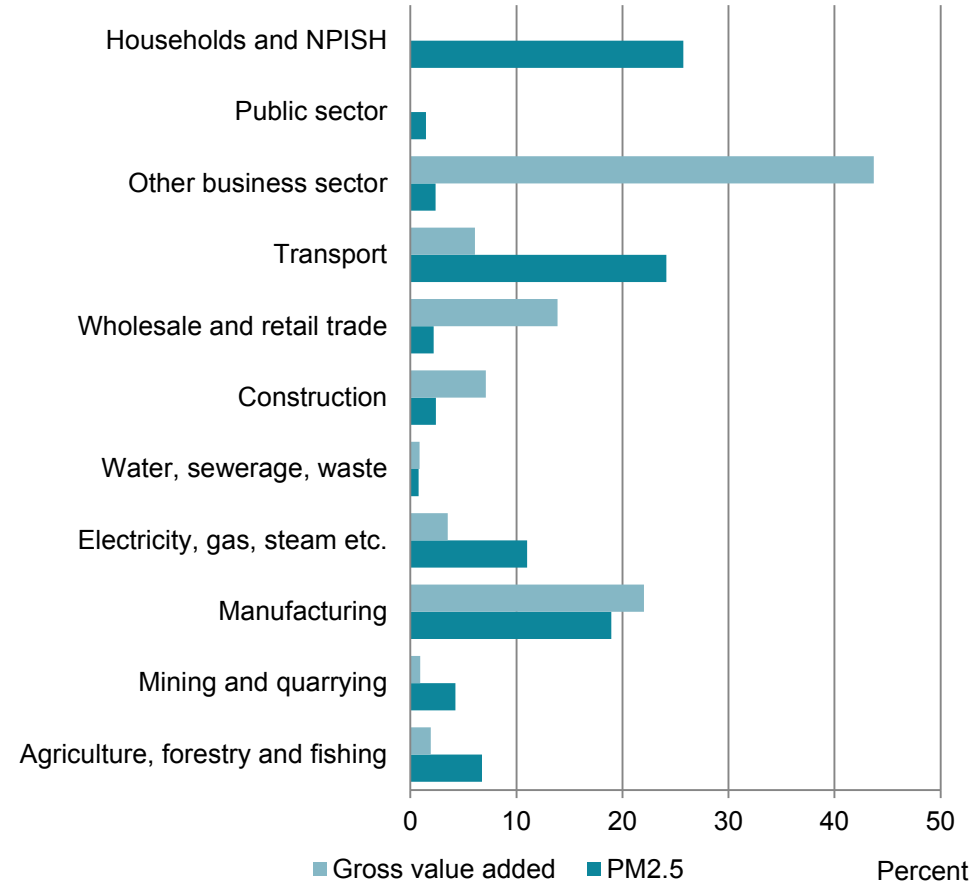
Source: Eurostat

We can however ascertain that these emissions are significantly greater in other European countries. Germany has the largest emissions of $PM_{2.5}$, 229, followed by France, 166, and Poland, 146, calculated in thousands of tons. Germany on its own emits more than twice as much as the Scandinavian countries put together.

Emissions in Sweden

Emissions of particles have decreased by 8 percent in Sweden between 2008 and 2012. Swedish $PM_{2.5}$ emissions are dominated by Private consumption, Transport and Manufacturing. Transport has a high share of the emissions, but a low share of the gross value added. The opposite is true of the Other business sector category, which together is responsible for 44 percent of the gross value added but only 2 percent of $PM_{2.5}$ emissions.

Figure 3.6
$PM_{2.5}$ emissions by industry and gross value added, share, 2012



Source: Statistics Sweden

Footnote: NPISH = Non-profit institutions serving households

3.3 Emissions of acidifying and eutrophic substances

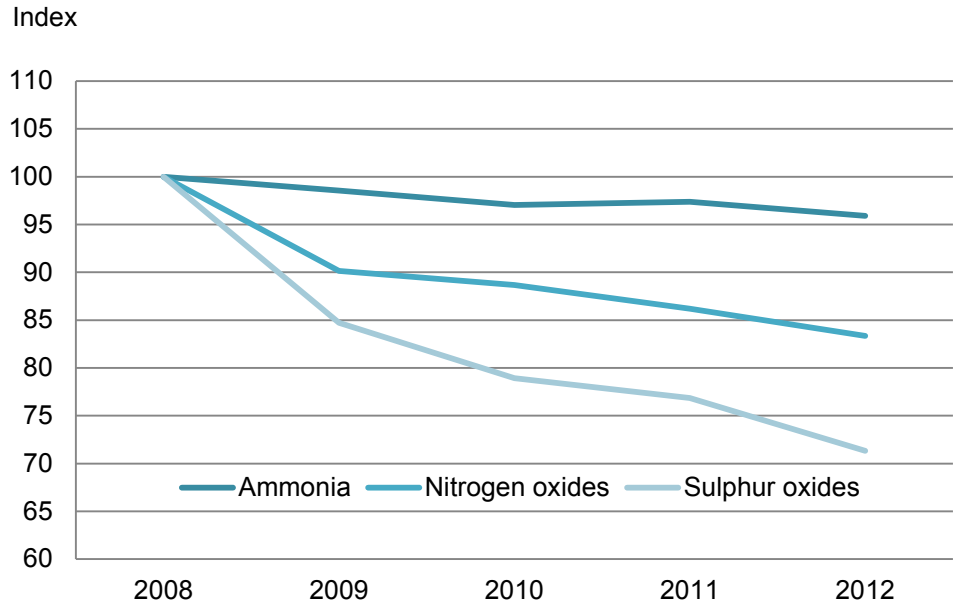
Emissions of sulphur dioxide are the most important cause of acidification. Most of the emissions come from the burning of coal and oil. Nitrogen compounds, e.g. nitrogen oxides and ammonia, are the most important cause of eutrophication but also contribute to acidification. Nitrogen oxides are formed during combustion and ammonia emissions come mostly from fertilizer use by agriculture.

Acidifying substances are released into our environment from e.g. our combustion of fuel. In this section, we present the emissions of ammonia, nitrogen oxides and sulphur dioxide.

International comparisons

Emissions of ammonia in the EU have basically remained on the same level since 2008, while nitrogen oxides and sulphur dioxides have decreased slightly. These lower levels can be attributed to the fact that the EU has reduced its animal husbandry activities, made changes to the way fertilizer is managed and decreased its use of artificial fertilizer. Furthermore, Electricity, gas, steam and air conditioning supply has reduced its emissions of acidifying substances, which has had an impact on the EU level[3].

Figure 3.7
Emissions of acidifying and eutrophic substances, EU-28, Index 2008=100



Source: Eurostat

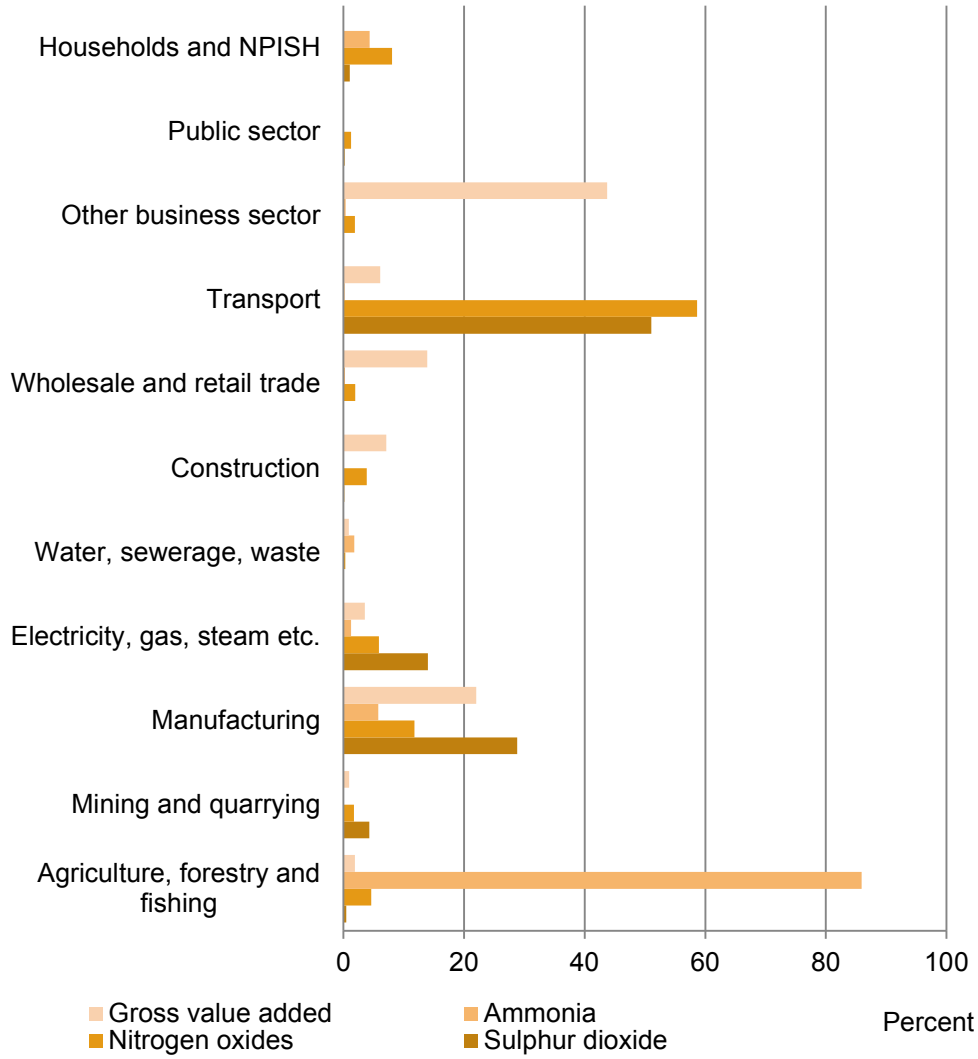
[3] Eurostat: Statistics explained – Air pollution by industries and households

Emissions in Sweden

Air emissions in Sweden of acidifying and eutrophic substances such as nitrogen oxides and sulphur dioxide have decreased slightly since 2008, while emissions of ammonia are on approximately the same level.

Most emissions of ammonia in Sweden occur in agriculture, which was responsible for 86 percent of total ammonia emissions but only 2 percent of gross value added in 2012. Transport generates most emissions of nitrogen oxides and sulphur dioxide. The transport sector's share of gross value added is 6 percent.

Figure 3.8
Share of emissions of acidifying and eutrophic substances and gross value added, 2012



Source: Statistics Sweden

Footnote: NPISH = Non-profit institutions serving households

3.4 Use of chemicals

It is often difficult to find coherent data on the use of chemicals in society on an international level. This depends to a great extent on the sheer number of chemicals in circulation, and the fact that it is therefore most common to discuss the small number of ecotoxic substances that have been well researched, due to them having caused some form of environmental disaster.

The Swedish Chemicals Agency is responsible for what is known as the Product Register in which chemical products are registered and from which time series dating back to 1992 are available. The primary purpose of the register is to track the management, import and production of chemicals. It is also used for downstream use and the labelling of chemicals for enforcement purposes, statistics and monitoring. The register contains chemical data about the products and used quantities.

The indicators used by Statistics Sweden measure the quantity of products that are classified as toxic and ecotoxic according to international criteria broken down by industry.

International comparisons

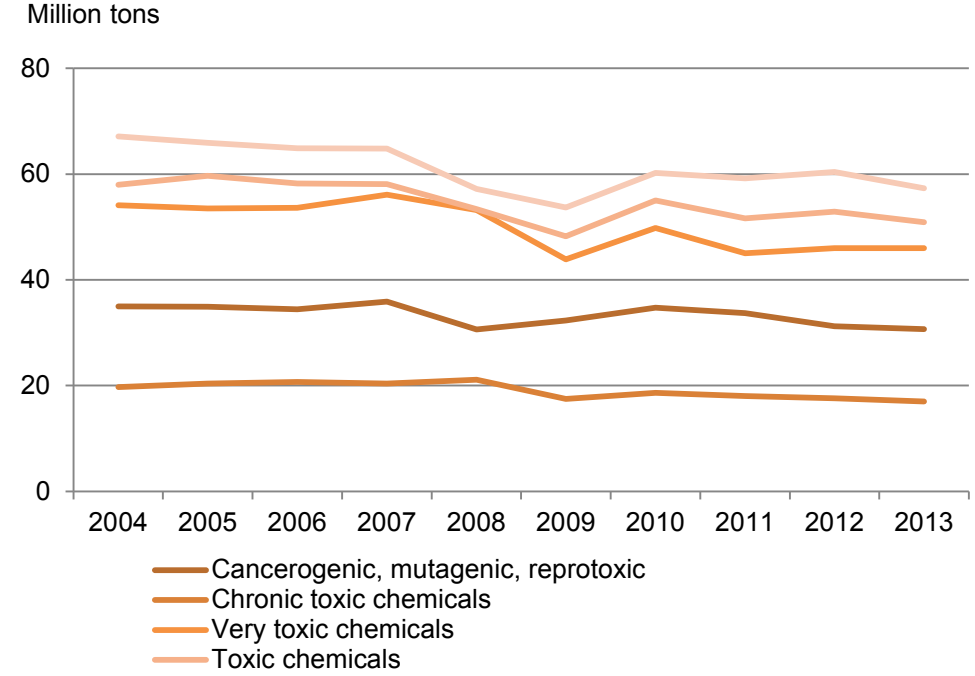
As far as the environmental accounts are concerned, there are currently no internationally comparable statistics linked to chemicals use. However, Eurostat itself calculates and publishes a chemical indicator that is similar to the Swedish compilation.

The EU has a long-term vision of a non-toxic environment and is working to combat the risks and disseminate information on e.g. chemicals in products. The REACH regulation[4] is a comprehensive piece of European legislation that regulates industrial and consumer chemicals and places a responsibility on businesses for the safe management of chemicals.

[4] Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH)

The figure below shows that in EU-28 production of toxic chemicals has fallen between 2004 and 2013. Hazardous and very toxic chemicals are produced to an ever smaller degree. Although the share of chemicals most hazardous to human health has not fallen despite the reduction in the production of toxic chemicals.

Figure 3.9
Production of toxic chemicals, EU-28, 2004-2013, million tons



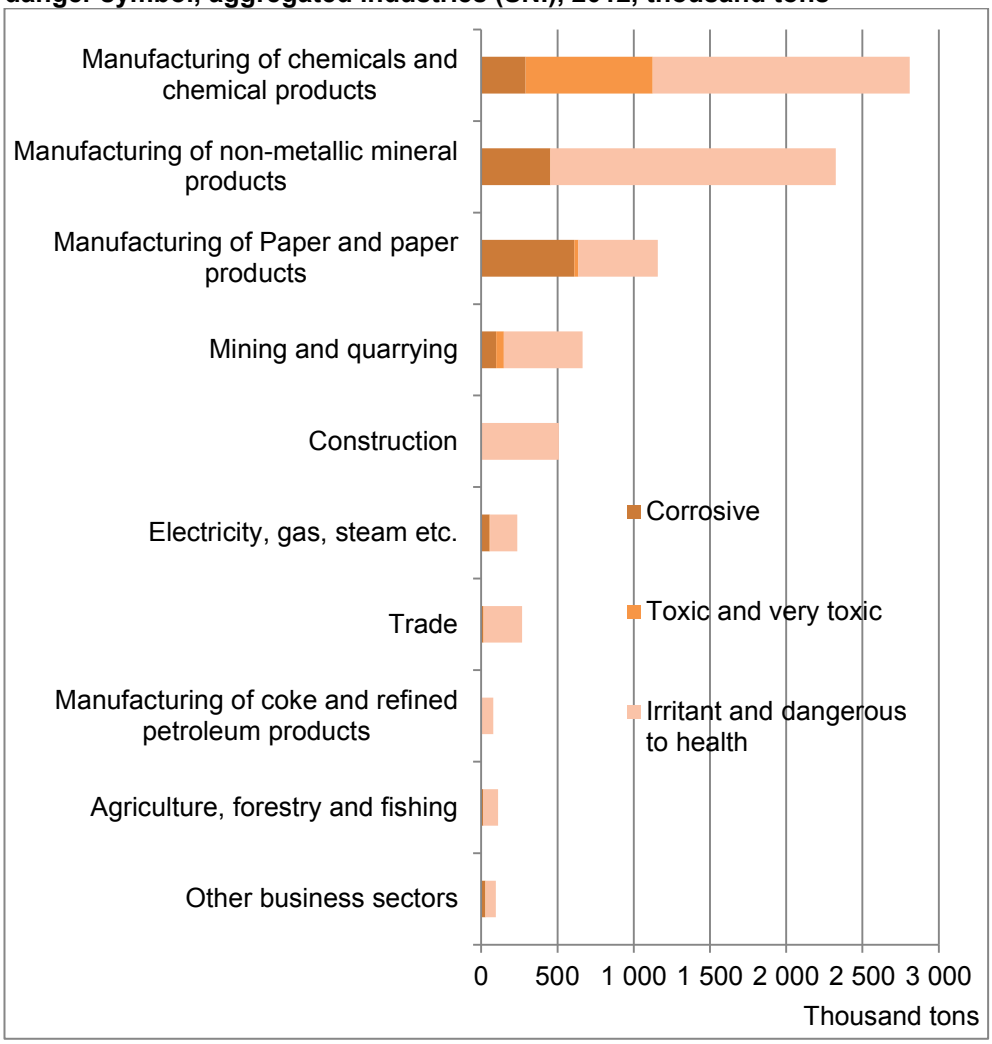
Source: Eurostat

Use of chemicals in Sweden

The manufacture of chemicals and chemical products disposed of the largest volume of hazardous chemical products in its production in 2012. The group "Irritating, hazardous to human health and toxic" constitutes the largest volume of chemicals that consists of e.g. synthetic raw materials and input goods for plastics manufacturing. The statistics presented exclude the use of crude oil and fuel.

Figure 3.10

Use of chemical products classified as hazardous to health broken down per danger symbol, aggregated industries (SNI), 2012, thousand tons

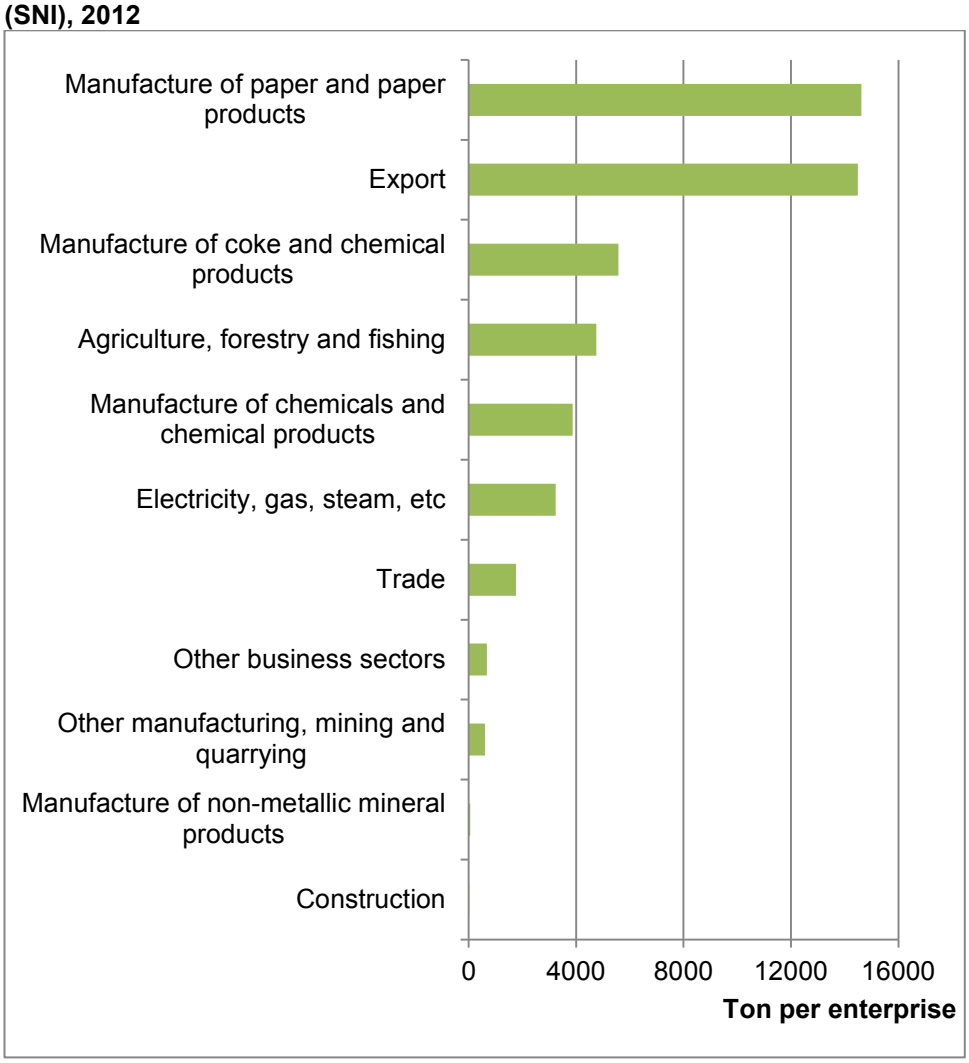


Source: Statistics Sweden, based on data from the Swedish Chemicals Agency

The fact that the manufacturing industry uses the largest volumes of toxic chemicals in its production can clearly be seen in the figure above. In 2012, about 61 percent of all enterprises that handled toxic chemicals were manufacturing enterprises. The total number of enterprises reporting chemicals handling was just over 4 000 in 2012.

If we change perspective and instead look at the volumes of hazardous chemicals per enterprise that handles toxic or ecotoxic chemicals, another picture emerges. Paper and paper products manufacturers use an average of 14 600 tons of chemicals hazardous to health per enterprise. Approximately the same amount is exported. Construction uses the least amount of toxic chemicals, about 25 tons per enterprise.

Figure 3.11
Tons of chemicals hazardous to health per enterprise, aggregated industries (SNI), 2012



Source: Statistics Sweden, based on data from the Swedish Chemicals Agency

3.5 Use of materials

The material flow accounts show how the natural environment and a country's economy are linked together, as well as trade with other countries.

Domestic extraction and imports make up the incoming flow. The volume of materials used in the Swedish economy is referred to as Domestic Material Consumption - DMC and comprises domestic extraction and imports. Exports of the products manufactured, the waste and emissions generated make up the outflow (Eurostat, 2013).

Being able to measure whether our use of materials is becoming more efficient is an important part of the EU's strategy for sustainable development. DMC follows up the thematic strategy for sustainable use of natural resources (Eurostat, 2013)

International comparisons

In 2012, Sweden's total material consumption per person was 22 tons, which is higher than the EU average of 13 tons per person. Does this mean we are "worst in class"? Not necessarily. A comparison between the EU average, Finland, Denmark and Sweden is shown below to highlight differences and similarities between the materials consumption of different countries.

The figure below shows domestic material consumption per material category (tons per capita). The composition of these categories is affected by the type of material resources that are extracted in each country respectively.

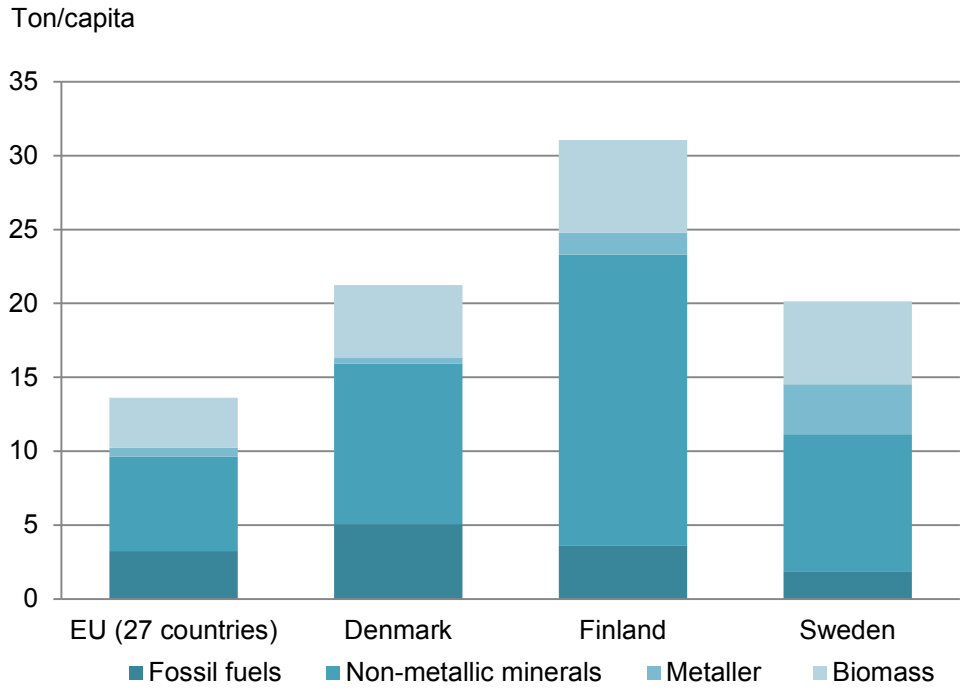
Both Sweden and Finland have higher domestic material consumption of biomass than the EU average, which is due to forestry being an important industry in both countries. As regards fossil fuels, Sweden is under the EU average, while Denmark is above it. Sweden has to a considerable extent gone over to fossil-free fuels for heating.

Concerning metal ores (gross ores), Sweden and Finland are high consumers, due to the fact that both countries have a large mining industry, which generates large volumes of materials.

Non-metallic minerals (including sand and gravel) constitute significant parts in all three countries. This can suggest a high share of construction activities per capita. Large volumes of sand and gravel are extracted in Sweden; the majority of which goes to domestic consumption.

As well as domestic extraction, imports are also included in domestic material consumption. Countries that have limited material resources themselves import more, which has an effect on them and on the EU overall for this indicator. Material consumption will be lower than for countries with a high level of domestic material extraction, since the imported goods have already been worked up and weigh less than the original material they are made out of.

Figure 3.12
Material consumption per country and material category, 2012 (tons per capita)



Source: Eurostat
Footnote: In addition to these material categories there are also Other products and Waste, These categories consist of small amounts. (Denmark 0.1 0.3 Finland , Sweden 0.4 and the EU 0003) .

Material use in Sweden

Total material consumption in Sweden has increased by about 20 percent since 2000. On average, every Swedish person now uses about 22 tons of materials per year, which corresponds to approximately 60 kg a day.

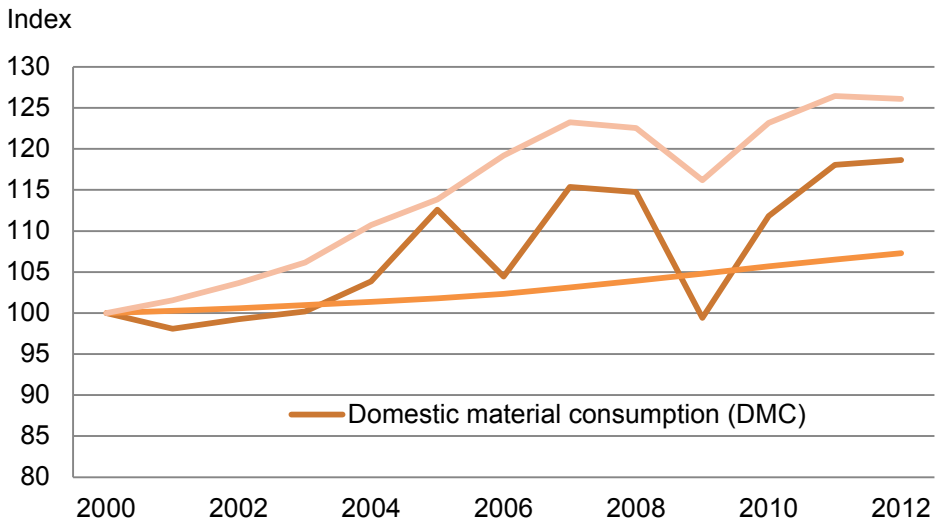
It is primarily the rise in the extraction of metal ores and non-metallic minerals (e.g. sand and gravel) inside Sweden that has contributed to the increase.

Total materials use has, as we have seen, risen in Sweden. Have we not then improved and become more efficient at managing our resources?

There are several explanations why consumption has not decreased. Increased population and greater economic growth are contributing to the increase in total consumption. In 2012 both GDP and material consumption decreased.

The growth in material consumption is also affected by natural events and the state of the world economy. For instance, the Gudrun storm led to major changes in the supply of biomass during 2005 and 2006. In 2009, the temporary dip in the DMC curve was the result of the global financial crisis.

Figure 3.13
Trends in material consumption in Sweden, population and GDP, 2000-2012, Index 2000=100



Source: Statistics Sweden
Footnote: GDP in fixed prices

Extraction, consumption and trade with other countries

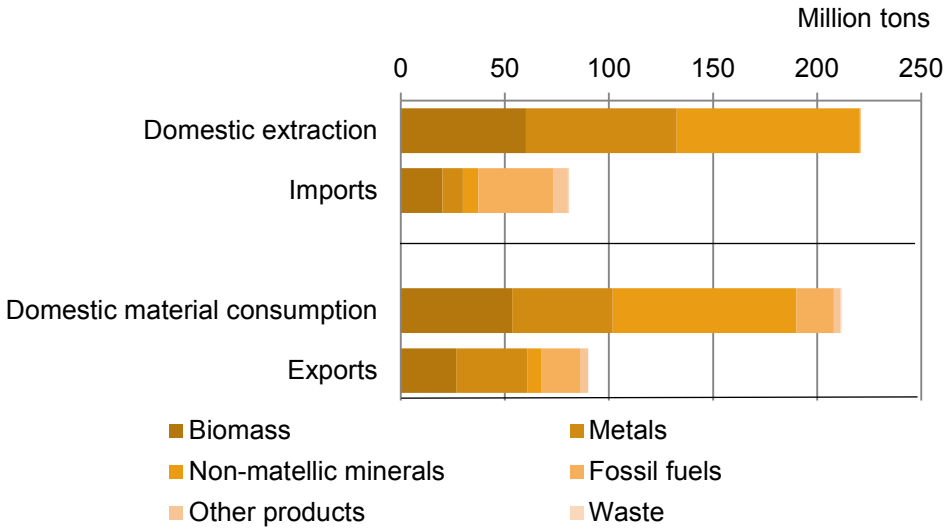
In Sweden we export more material than we import, see the figure below. In 2012, the surplus was 9 million tons. It is primarily the export of biomass and metals that has increased; metal exports having increased by 41 percent between 2000 and 2012.

As regards imports, it is fossil fuels, such as oil, that dominate, even though the volumes are decreasing slightly as we use more alternative fuels. It is interesting to note that in Sweden we use half of the fossil fuels and export the rest in processed form.

As regards non-metallic minerals such as sand and gravel, we mostly extract them ourselves and most of them are also used in Sweden.

The figure below provides an overview of the material flow in Sweden. The top two bars show what comes into the flow, in terms of domestic mining and quarrying and imports. The bottom two bars show the output, i.e. use inside Sweden (domestic material consumption) and exports.

Figure 3.14
The physical flow of materials in the Swedish economy (million tons), 2012



Source: Statistics Sweden
Footnote: Waste according to EW_MFA categories.

3.6 Waste

Our production and consumption of goods and natural resources also generate large volumes of waste. The way we manage our natural resources is also reflected in Sweden's waste statistics. This section only deals with generated waste, however. More information of Swedish waste statistics can be obtained from the Swedish EPA

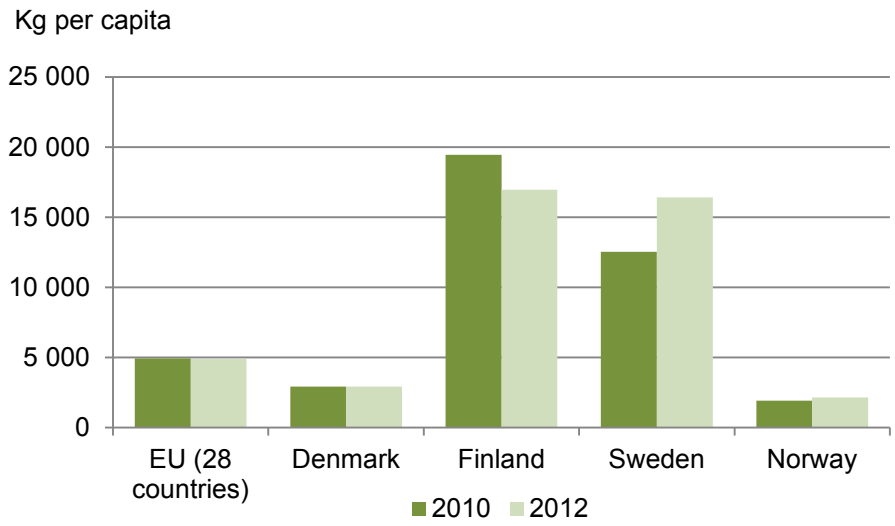
International comparisons

Regarding the environmental accounts, there are currently no internationally comparable statistics linked to waste. However, Eurostat itself calculates and publishes a chemical indicator that is similar to the Swedish compilation.

The EU generates approximately 4.9 tons of waste per capita. The two most recent surveys, in 2010 and 2012, indicate a stable development. There are major differences between the Nordic countries as regards how much waste is generated. Finland and Sweden are on approximately the same level, just over 16 tons per capita. Denmark and Norway are also on the same level as each other, under the EU average with about 2 tons per capita.

By far the largest waste category is mineral waste from mining.

Figure 3.15
Total waste generated, kg per capita, 2010 and 2012



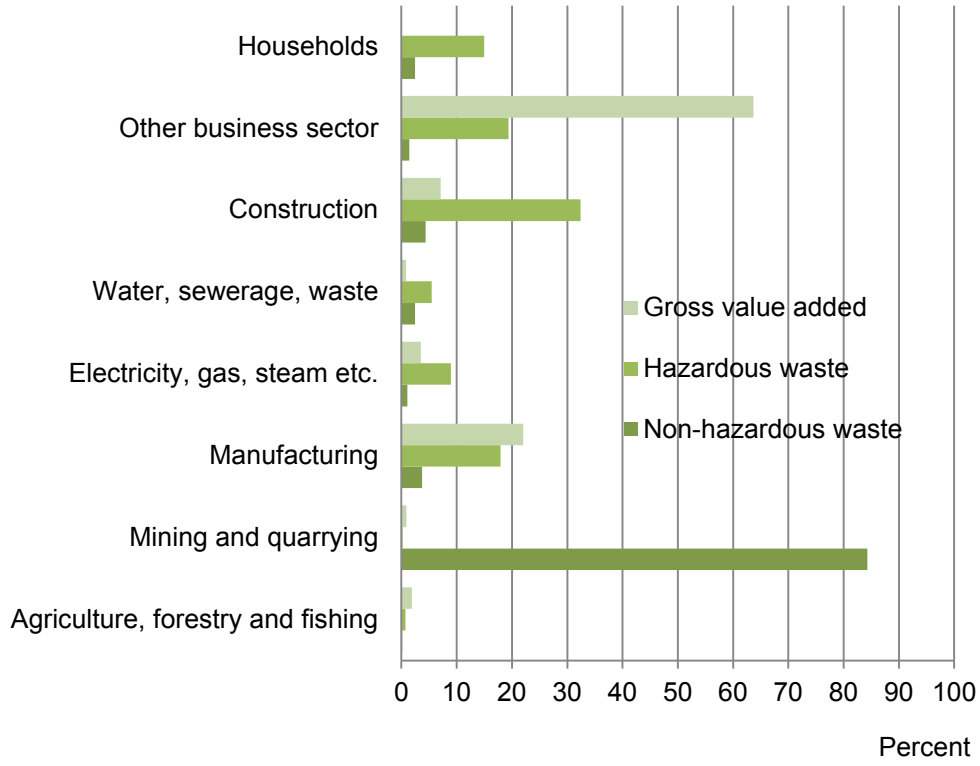
Source: Eurostat

Waste generated in Sweden

In 2012, households and businesses in Sweden produced about 156 million tons of waste in total. The largest share of this (129 million tons) comes from the mining industry. The share produced by households is just under 4 million tons, or 439 kilograms per person.

So, where in the economy is the waste generated, and how does the generated waste relate to the value that is created? The figure below shows that Mining and quarrying is responsible for 84 percent of non-hazardous waste, but only 1 percent of gross value added for industry. Construction produces the most hazardous waste, but is responsible for 7 percent of the gross value added. Other business sector, on the other hand, is responsible for 66 percent of gross value added, but only 1 percent of non-hazardous waste and 23 percent of hazardous waste.

Figure 3.16
Share of generated waste in Sweden and gross value added, 2012



Source: SMED/Swedish Environmental Protection Agency and Statistics Sweden

4 Responses

Responses are specific measures that are implemented to alleviate or solve environmental problems, e.g. laws, taxes, emission rights and new technology. Other responses are licensing, various limit values, liming and eco-labelling.

In this section, we mainly describe environmental policy responses - aka economic-environmental instruments. The aim of these is to guide us in a better direction and they are seen as an important component on the road to a sustainable society. They include environmental taxes, emission rights and green subsidies. In addition, we describe the environmental sector (i.e. enterprises that in some way work to combat environmental destruction) and the costs of enterprises for protecting the environment (environmental protection expenditure).

4.1 Environmental taxes

Environmental taxes aim to influence our use of goods and services that are taxed in a way that is positive for the environment. To some extent, environmental taxes make the costs of environmental impact visible and work as a driving force to factor in environmental aspects in our actions. In practice, however, trade-offs are made against other areas of interest such as competitiveness, regional policy and employment.

Environmental taxes have two effects; firstly they influence our use of products whose price has been increased by the tax, and secondly the increased price results in higher revenues for the state.

Statistics on environmental taxes are published every year in Sweden as part of the environmental accounts. Statistics are also compiled internationally by Eurostat and the OECD.

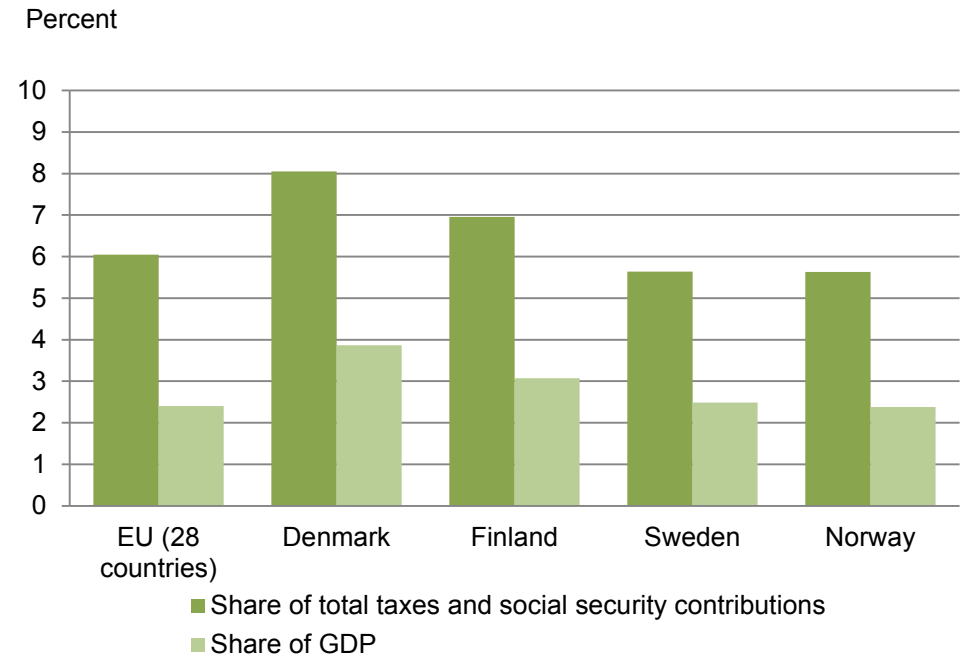
International comparisons

A comparison between our neighbouring countries and the EU in total is shown below. We can see that both the level and the share of environmental taxes are different between the EU aggregate and the separate Member States. Comparisons should be drawn with a certain amount of caution since it is not possible to determine whether the purpose of an environmental tax is actually to protect the environment or to finance other state activities.

Denmark has the highest share of environmental taxes both in relation to the total taxes and social insurance contributions and to GDP. Sweden and Norway are on approximately the same level while Finland is above. Compared to the EU average, Sweden is slightly under as regards the share of total taxes and contributions. Sweden has a high total tax level, which can affect what the share of the total tax take looks like.

Regarding the EU aggregate, about 75 percent of all environmental taxes are related to energy. And they are mainly taxes on fuels. The remaining types of environmental taxes are transport-, resource- and pollution-related.

Figure 4.1
Environmental taxes share of total taxes and social insurance contributions and GDP, 2012



Source: Eurostat

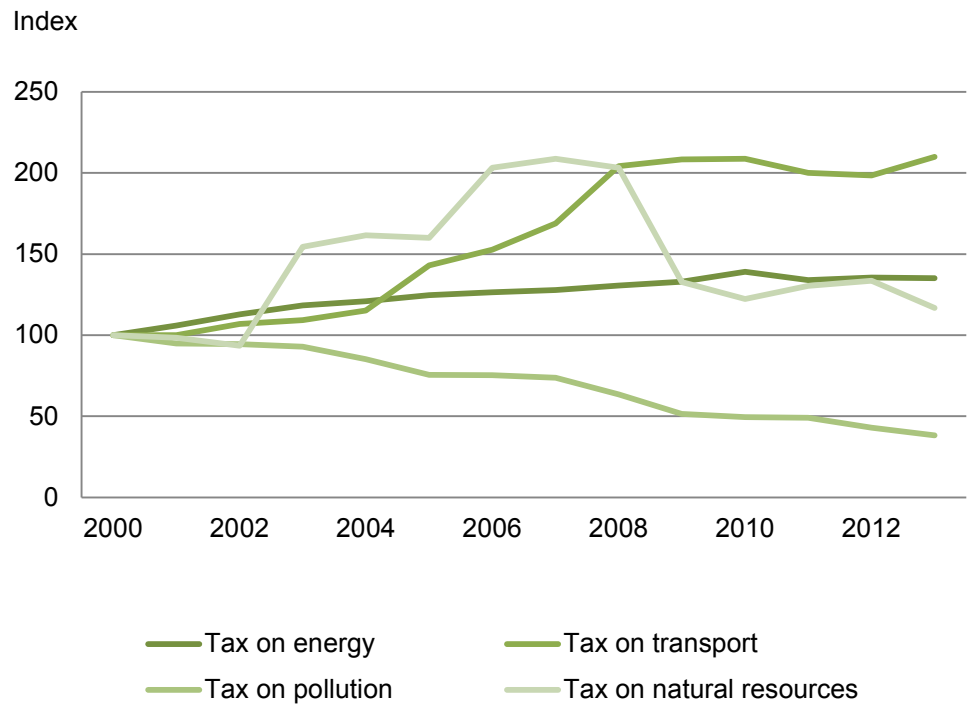
Environmental taxes in Sweden

Sweden's environmental taxes have increased over time. In 1993, revenue was just over SEK 49 billion compared to SEK 89 billion in 2013.

Environmental taxes can be divided into four areas: energy, pollution, natural resources and transport. Energy taxes dominate and are slightly above 80 percent of all environmental taxes, about SEK 72 billion. Energy taxes include taxes on fuel, nuclear power and electricity, as well as carbon dioxide and sulphur. After energy taxes, transport taxes are the next largest category, where the vehicle tax is largest at SEK 11.5 billion. Taxes on natural resources and pollution together make up just over SEK 1 billion. These include taxes on natural gravel, waste and nitrogen oxide.

The figure below shows how environmental taxes have changed over time. Taxes on pollution are falling, from a low level, while taxes on transport have increased. The trend for energy taxes points slowly upwards.

Figure 4.2
Environmental taxes by environmental area, 2000-2013, Index 2000=100



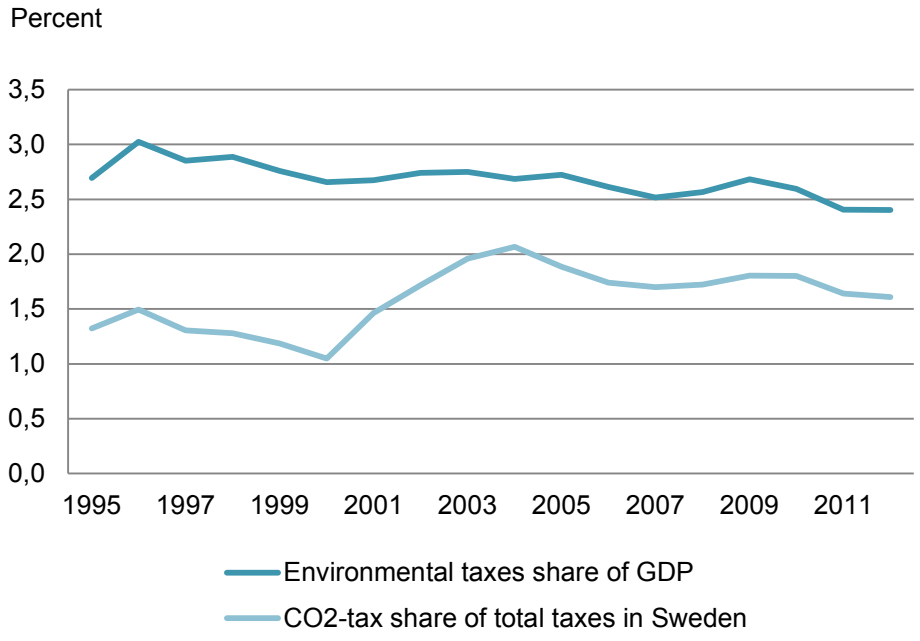
Source: Statistics Sweden

Many other economic measures are also increasing, e.g. GDP. If we put environmental tax revenue in relation to GDP, there is a decreasing trend, from 3 percent in 1996 to 2.4 percent in 2012, which can be seen in the figure below. This means that GDP is increasing as a faster rate than revenue from environmental taxes.

If we put carbon dioxide tax revenue in relation to other state tax revenue, the share of carbon dioxide tax clearly increased between 2000 and 2004 but before and after that there is mainly a declining or stable trend. This means that carbon dioxide tax revenue in Sweden is not increasing at the same rate as total tax revenue.

Between 1993 and 1995, major changes were made to the tax system to bring it into line with the EU, in particular in the areas of transport and energy taxation. Between 2001 and 2006, a green tax shift occurred when environmental taxes were both introduced and increased. The purpose has been to achieve environmental gains and a greater environmental influence in the tax system. The carbon dioxide tax and energy tax were raised, which was compensated for by an increase in the basic tax allowance and reduced income taxes and payroll taxes. Since 2004, the conditions have changed as a result of, among other things, emission rights trading.

Figure 4.3
Environmental taxes share of GDP and the carbon dioxide tax share of total taxes, 1995-2012

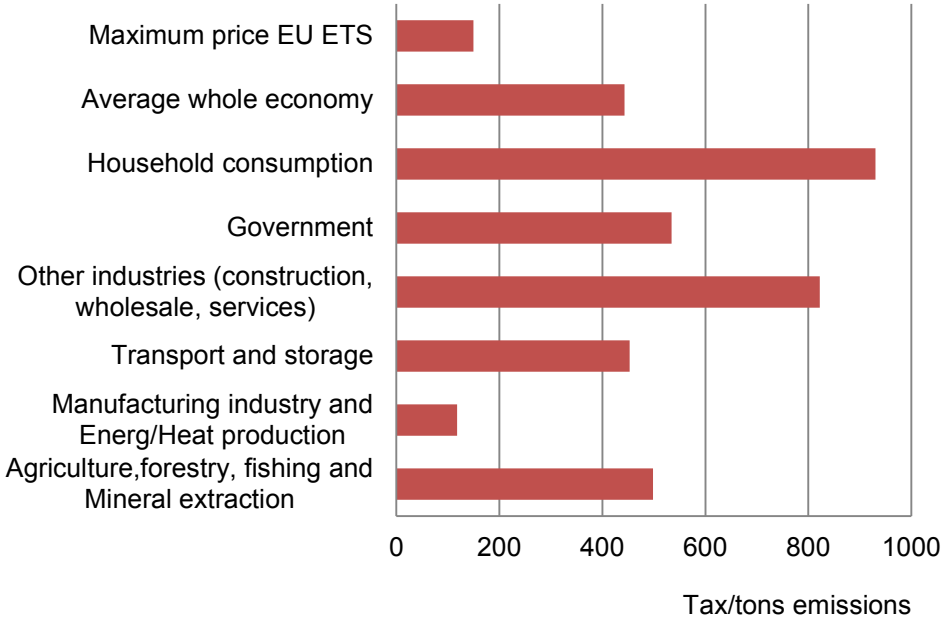


Source: Statistics Sweden
Footnote: As taxes are usually presented in current prices, this is also done for GDP in this figure.

If these tax revenues are combined with statistics on carbon emissions, an average is created which shows how much tax is paid per ton of carbon emissions, creating a kind of "price" for carbon emissions. In 2011, this price was about SEK 440 per ton of emissions in current prices, compared to SEK 175 in 1993. The greatest increase occurred between 2000 and 2004, when the tax revenue per ton doubled.

The statistics can be broken down by industry and it is then possible to identify differences between various groups of actors in the economy. Carbon dioxide tax per ton of emissions is lowest in the manufacturing industry and the energy and heat production industry, where approximately SEK 120 was paid for a ton of carbon dioxide emissions. These industries are also included in the emission trading scheme and in 2011 the maximum price for an emission permit was about SEK 150. Other actors pay more, the highest being households, who pay just over SEK 930 for a ton of carbon dioxide emissions. The service industry, trade and the construction industry also pay more for a ton of emissions than other parts of the business sector.

Figure 4.4
Carbon dioxide tax per ton of emissions broken down by industry/sector, 2011, SEK

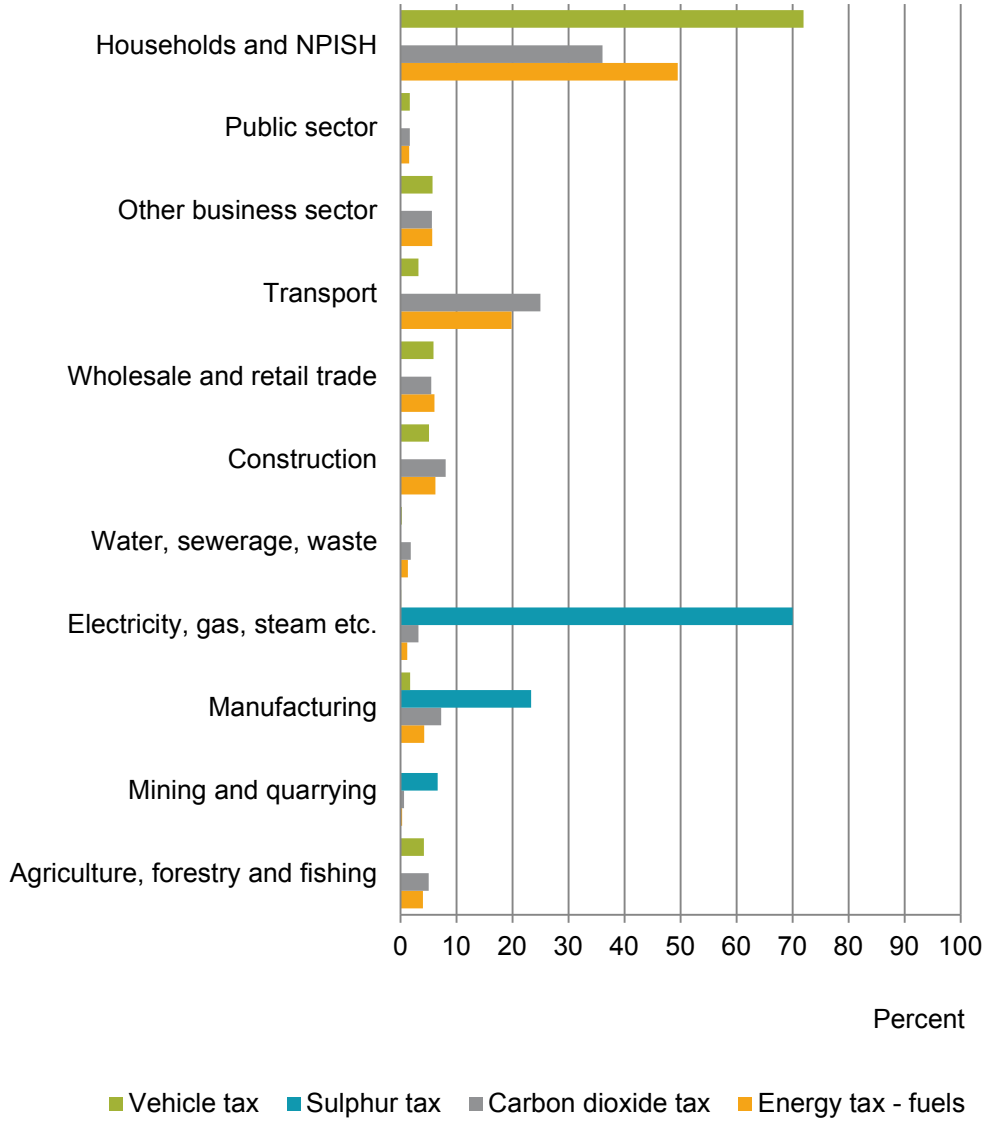


Source: Statistics Sweden
In 2011, the price of emission rights fluctuated considerably, between a maximum of EUR 16.83 on 31 May and EUR 6.39 on 14 December. The maximum price has been converted to SEK at an exchange rate of SEK 8.8857 per EUR. (EEX, European Energy Exchange)

The cause of the differences is mainly exemptions and tax deductions for e.g. manufacturing, energy/heat production, mining and water transport. The mix of fuel types used to cover the energy need also looks different among different enterprises and private citizens. The fact that the carbon dioxide tax has different tax rates per fuel type can affect how much carbon dioxide tax is paid per ton of emissions.

The vehicle tax, sulphur tax, carbon dioxide tax and energy tax on fuel are shown below broken down by industry, public sector and households/NPISH (Non-profit institutions serving households). Households are responsible for a high share of all these taxes, apart from the sulphur tax. As regards energy tax, transport is second highest after households, and Electricity, gas, steam and air conditioning supply is highest regarding sulphur tax.

Figure 4.5
Environmental taxes share by industry, 2012



Source: Statistics Sweden
Footnote: NPISH = Non-profit institutions serving households

Statistics Sweden does not currently produce any regular statistics on emission rights trading. During 2015, work on the Statistics Sweden environmental accounts will continue to focus on analysis of environmental issues and their connection to economic actors. Special EU funding will be used for a project focusing on economic instruments in particular, including the link between carbon dioxide tax and emission rights trading.

4.2 Subsidies to promote a better environment

Every year the state provides grants and subsidies to producers, private citizens, organisations, non-profit associations, municipalities and county councils as well as to the EU and international operations, the aim of which is environmentally motivated. As regards the definition of environmentally motivated subsidies, it is the subsidy's underlying motive that governs whether it is environmentally motivated. This definition is broader than the one used by the National Accounts for subsidies.

International comparisons

No international organisation collects comparable annual statistics on subsidies to promote a better environment.

Preparations are ongoing within Eurostat to collect statistics for this area. Among other things, a manual will shortly be published as a guide to compiling the statistics. This is a long-term project, however, and it will be some time before these statistics are available.

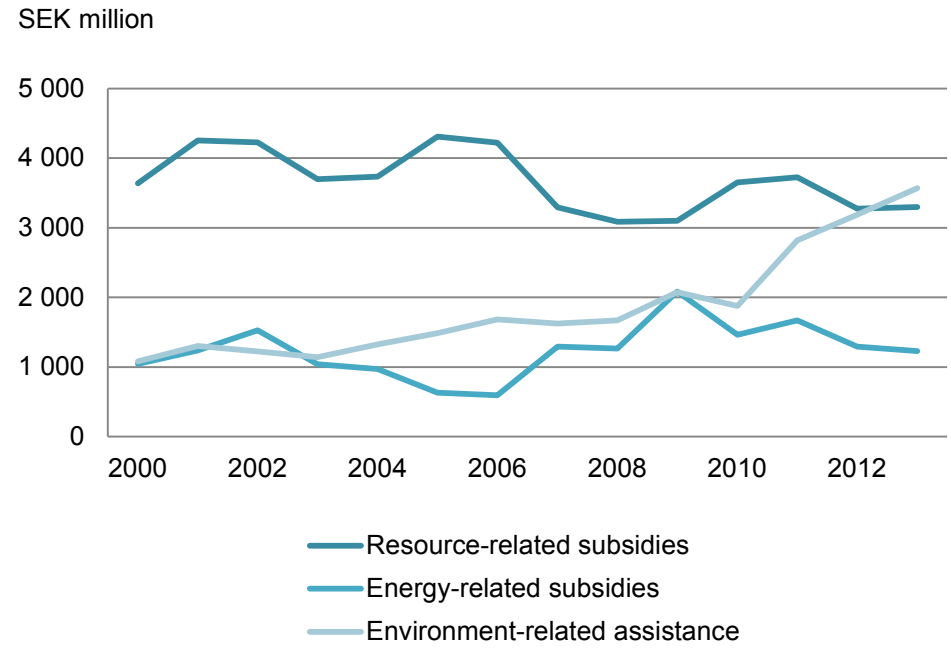
Environmentally motivated subsidies in Sweden

On the whole, environmentally motivated subsidies have increased slightly since the beginning of the 2000s. The share of environmentally motivated subsidies compared to GDP has remained relatively constant over the years and in 2013 was 0.23 percent. In the figure below, we can see that environment-related international development assistance, which includes the work done by Sida (Swedish International Development Cooperation Agency), has increased since 2010.

The management of changes to our environment and climate are important for sustainable development and the sustainable use of natural resources and environmental consideration are also important for effective poverty reduction. In 2012, ecologically sustainable development made up 12 percent of Sida's total portfolio. (SIDA, 2013)

Natural resource-related subsidies are just over SEK 1 billion lower than their highest level from 2005 of SEK 4.3 billion. Environmental compensation in agriculture makes up the dominating share of these and has remained constant at around SEK 2.5 billion in recent years. This includes initiatives to reduce nutrient leakage, reduce and ensure safe use of pesticides and promote organic production as well as climate and energy initiatives in agriculture and forestry.

Figure 4.6
Environmentally motivated subsidies, the three largest environmental areas, million SEK, 2000-2013



Source: Statistics Sweden

4.3 The environmental sector

Statistics Sweden has published statistics on the environmental sector since 2003. From the beginning, the statistics were created to examine which workplaces were associated with environmental legislation, e.g. waste management and sewage treatment.

The statistics were then developed alongside with the formulation of new definitions covering areas that are spread through many parts of the business sector. Businesses that make up the environmental sector are normally referred to as environmental enterprises.

The environmental sector includes enterprises that produce goods and services that measure, prevent, limit, minimise or remediate environmental damage to water, air and soil as well as problems related to waste, noise and ecosystems. This also includes cleaner technologies and goods and services that reduce environmental risks or minimise emissions and resource consumption.

International comparisons

In 2014, there are only a few countries that produce statistics on the environmental sector, including Sweden, the Netherlands, Germany and Austria. The EU has recently adopted legislation that will lead to the Member States producing regular statistics on the environmental sector in each country respectively. In international circles, the environmental sector is referred to as the Environmental Goods and Services Sector, (EGSS).

Since the beginning of the 2000s, the sector has shown an increasing trend of its gross added value share of GDP, i.e. what the environmental sector contributes to the economy. In 2000, its share was 1.6 percent and in 2011 it had risen to over 2 percent for Europe as a whole (28 countries).

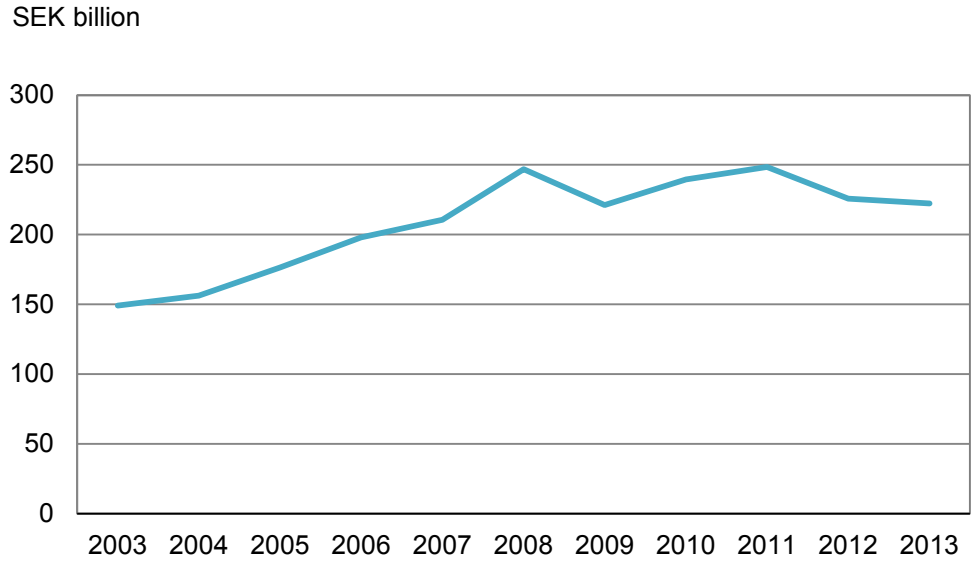
It must be said, however, that this is a cautious estimate as it does not include all resource management, in particular the management of forest resources, the management of wild flora and fauna and research and development for resource management. (Eurostat, 2014)

The environmental sector in Sweden

Since 2003, the turnover of the environmental sector has increased by SEK 70 billion. In 2013, turnover was SEK 220 billion, SEK 37 billion of which was from exports. It has not been an even trend since 2003, however. In some years such as 2009, turnover fell as a result of the financial crisis only to recover in 2011.

Turnover in the sector has again waned in 2012 and 2013, by about SEK 26 billion since 2011 in current prices. This decrease is due to lower turnover from the production of renewable energy and the service industries in the environmental sector.

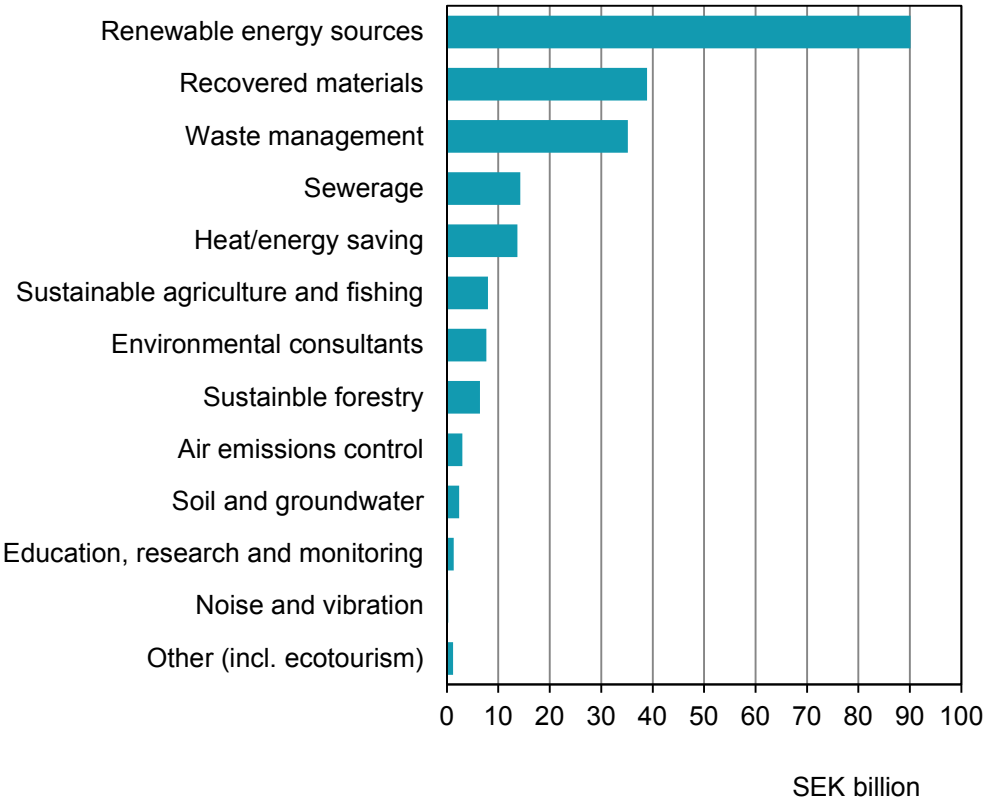
Figure 4.7
Turnover in the environmental sector, SEK billion, current prices, 2003-2013



Source: Statistics Sweden

The most common business activities in Sweden's environmental sector are sustainable agriculture, renewable energy, waste management and recovery as well as a large number of environmental consultancies. Turnover in the sector comes mainly from renewable energy, waste management and recovery as shown in the figure below. Sustainable agriculture does not therefore constitute one of the most important parts of the environmental sector's total turnover.

Figure 4.8
Turnover in the environmental sector, broken down by environmental area, SEK billion, 2013



Source: Statistics Sweden

Recovered materials are an important area for exports from the environmental sector. In 2013, about a third of the environmental sector's exports were recovered materials, worth just over SEK 12 billion. SEK 9 billion came from exports of renewable energy and about SEK 6 billion were from exports of heat- and energy-saving services and products.

4.4 Environmental protection expenditure in industry

Environmental protection refers to activities that prevent, reduce or eliminate pollution or other negative environmental impact. Industry's expenditure for this is divided up into investments and running costs.

Investments can include investments in the treatment of emissions, such as filters or treatment plants, but also emission prevention investments, e.g. new or modified ways of producing goods. Current environmental protection expenditures consist of costs for personnel, energy, input goods, e.g. for running and oversight of treatment plants, for environmental paper work, environmental management and certification, and waste management. Payments to others who carry out these measures are also included.

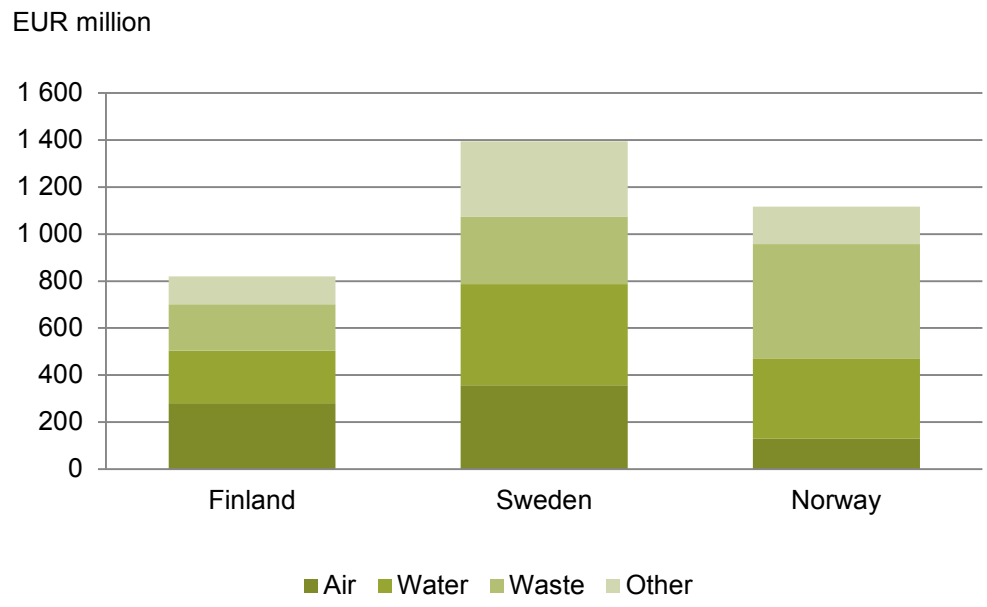
The environmental protection expenditure of industry includes enterprises in mining and quarrying, manufacturing, electricity, gas, steam and air conditioning supply, and water supply.

Both investments and current expenditures can be divided up into environmental areas, which are air, water, waste and others. The last category includes e.g. biodiversity preservation and noise abatement.

International comparisons

In a comparison with our neighbouring countries, we can see that Sweden has a high level of environmental protection costs in industry, in the areas of air, water and others, while Norway has higher costs for waste.

Figure 4.9
Environmental protection expenditure by environmental area, EUR billion, 2012

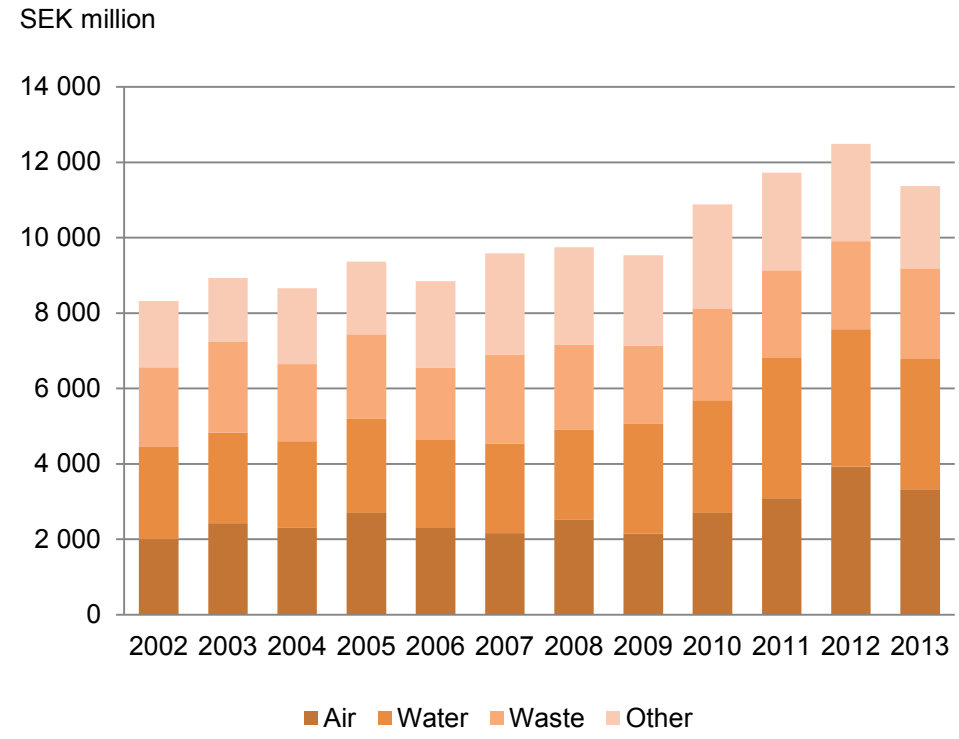


Source: Eurostat
Footnote: Finland's figures are from 2011.

Environmental protection expenditure in Sweden

Total environmental protection expenditure in Swedish industry amounted to just under SEK 11.4 billion in 2013. Costs for environmental protection fell by SEK 1.1 billion in 2013 compared to 2012, which is a decrease of about 9 percent. This is following an upward trend in previous years.

Diagram 4.10
Total environmental protection expenditure for Swedish industry by environmental area, SEK billion, 2002-2013



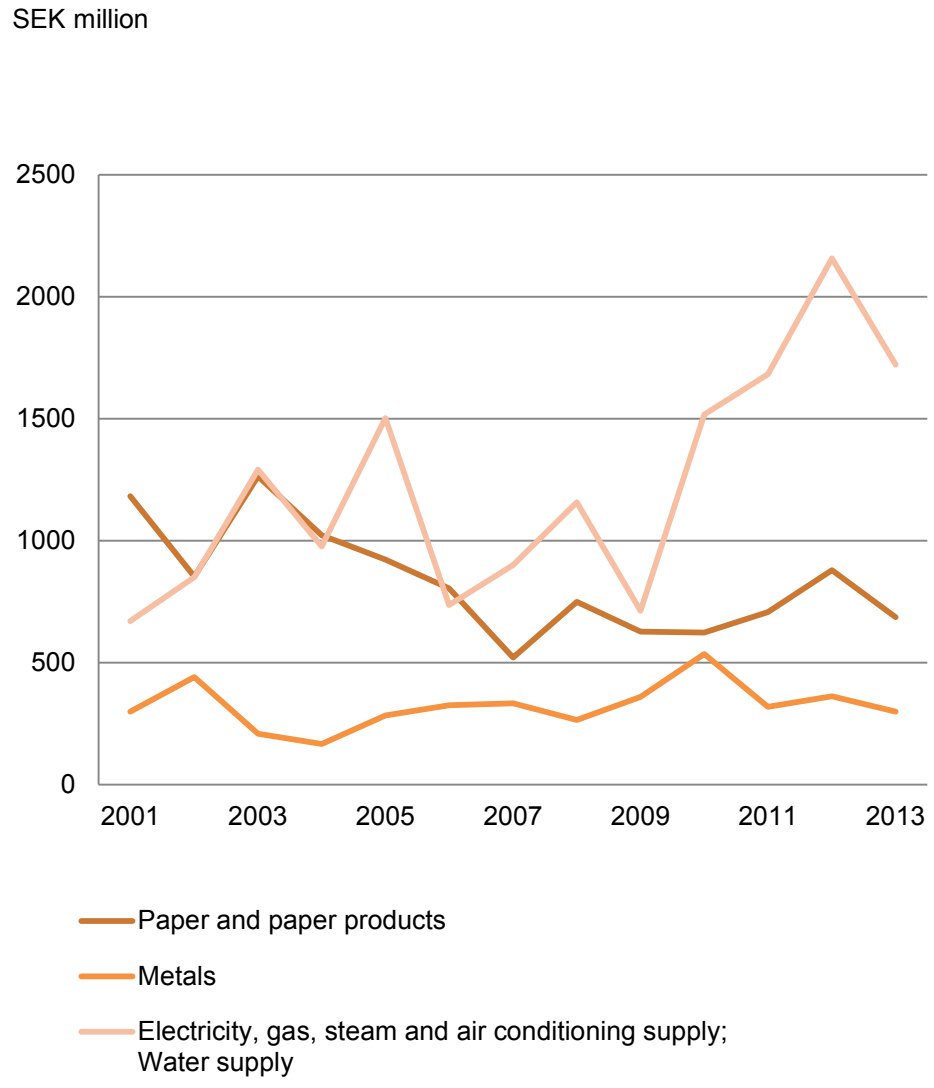
Source: Statistics Sweden

Total environmental protection expenditure consists of two items: investments and running costs. Both investments and current expenditures decreased between 2012 and 2013. Environmental protection expenditure fell by almost 11 percent compared to the year before. Current expenditures decreased by 7.5 percent.

In 2013, investments amounted to SEK 4.8 billion and running costs were SEK 6.5 billion. As regards environmental protection investments by industry, air is the dominant area, followed by investments in water. Regarding current expenditures, it is waste, water and others that dominate, with about 30 percent each.

The reduction in environmental protection investments can be seen in several sectors. The largest reduction in actual terms is in Electricity, gas, steam and air conditioning supply industry and Water supply (SNI 35-36) which taken together have decreased by SEK 436 million compared to the previous year. Before that, however, there had been an upward trend for Electricity, gas, steam and air conditioning supply since 2009.

Figure 4.11
Environmental protection investments, 2001-2013, for the industries: Paper and paper products, Manufacture of basic metals, Electricity, gas, steam and air conditioning supply and Water supply. (SNI 17, 24-25 and 35-36), SEK million



Source: Statistics Sweden

As regards current expenditures, Food, beverages and tobacco products (SNI 10-12) show the largest decrease in actual terms by SEK 247 million compared to 2012. Manufacture of basic metals and fabricated metal products (SNI 24-25) are on about the same cost level as last year.

5 Want to know more?

The published data from the environmental accounts are available on the Statistics Sweden website, where our previous publications are also available; the address is http://www.scb.se/en_/.

Links to our published statistics

The statistics are published once a year at Statistics Sweden in the statistical database and as tables on the product side.

Statistical database:

http://www.statistikdatabasen.scb.se/pxweb/en/

Environmental accounts product page:

http://www.scb.se/en_/Finding-statistics/Statistics-by-subject-area/Environment/Environmental-accounts-and-sustainable-development/System-of-Environmental-and-Economic-Accounts/

Links to publications

The environmental accounts publications are presented below. You can find them on the Statistics Sweden website, http://www.scb.se/en_/ Some reports are linked to Eurostat.

What are the environmental accounts?

MIR2002:3 Content, use and users (In Swedish)

Uses of Environmental Accounts in Sweden (In English)

Air and energy accounts

Carbon dioxide emissions from Swedish final consumption 1995-2009 (In English)

Methodology on emissions to air within environmental accounts in Sweden (In Swedish with parts in English)

Energy use and CO2-emissions for consumed products ande services. IPP-indicators for private and public consumption based on environmental accounts (In English)

Documentation of fuel calculations of Environmental Accounts (In Swedish)

Regional areas of mobile emissions in the mileage database (In Swedish)

MIR2004:2 Valuing morbidity effects of air pollution in Sweden (In Swedish)

Breakdown of emissions from mobile sources by industry (In Swedish)

Structural decomposition of environmental accounts data - the Swedish case (In English)

Households in the environmental accounts (In English)

Economy, energy, environment - methods to analyse the connection (In Swedish)

MIR2002:2 Environmental Impact of Swedish Trade (In Swedish with parts in English)

MIR2002:1 Economic effekts of restrictions on carbon dioxide emissions (In Swedish)

The environmental impact of different commodity groups (In Swedish)

MIR2000:5 The Environmental impact of swedish trade -results from a pilot studie (In Swedish)

MIR1999:1 Reduced emissions of carbondioxide through changed use of materials - a pilot study (In Swedish)

The Environmental impact of Swedish Trade (In English)

Increasing the timeliness of environmental accounts carbon dioxide emissions data (In English)

Energy accounting and the NAMEA (In English)

Environmental accounts Households (In English)

Disaggregation and improvement of the Swedish NAMEA (In English)

Water accounts

The economic structures and environmental pressure in the Swedish river basin districts 1995-2011 (In Swedish with parts in English)

MIR2007:1 The economic structures and environmental pressures in the Swedish river basins 1995-2005 (In Swedish with parts in English)

Supplementary statistics for reporting according to the frame directive for water (In Swedish)

Costs and income for production and distribution of water and treatment of sewage for municipalities and municipal companies - by water district (In Swedish)

Environmental and economic profiles and forecasts for water districts - economic analyses according to the frame directive for water (In Swedish)

Forecast of water extraction and water use 2015 - presented by water district (In Swedish)

MIR2003:2 Water accounts 2000 - with disaggregation to Sea basins (In English)

Material flows

The Commodity Guide and its use in the work towards Non-toxic and Resource-saving cyclical systems (In Swedish with parts in English)

Accounting for Flows of Fruit and Vegetables in the Food chain - method development based on MFA (In Swedish with parts in English)

Material Flow Accounts - Statistics and Development (In Swedish with parts in English)

Pharmaceuticals, cosmetic and hygienic products in Sweden (In Swedish)

Combination of codes in the Combined Nomenclature for Swedish Material Flow Accounts - Method Development (In English)

Consumer goods and goods especially intended for children (In Swedish with parts in English)

Material Flows in Sweden 1998-2005 (In English)

Material Flow Accounts and Policy. Data for Sweden 2004 (In English)

MIR2000:4 Towards a national material flow statistics (In Swedish)

Direct Material Inputs (DMI) and Domestic Material Consumption (DMC) for Sweden 1987 - 1997 (In English)

Material flow study of sand and gravel in Sweden (In English)

Chemicals

MIR2010:1 Domestic Inflow of Hazardous Substances (In English)

Chemicals in Statistics - Method Development (In English)

Chemical product indicators by industry - fossil fuels, cement and other chemical products classified as hazardous to health or environment, 1996-2001 (In English)

Chemical product and substance indicators in the SMEA - health and environment (In English)

The magnitude of chemical products use in different industries (In English)

Waste

Summary of hazardous and non-hazardous wastes in environmental accounts, by industry (In Swedish with parts in English)

The recycling industry in Sweden 1995 (In English)

Environment-related economic instruments

MIR2010:2 Environmentally related taxes, subsidies and emission permits (In Swedish)

MIR2008:1 Environmental economic indicators in the Swedish state budget 1995-2006 (In English)

MIR2000:3 Environmental taxes and environmentally damaging subsidies (In English)

MIR2007:2 Environmental economic indicators in the Swedish state budget 1995-2006 (In Swedish with parts in English)

MIR2005:21 Administrative policy tools - way to implement them in the environmental accounts (In Swedish with parts in English)

Analysis of the Introduction of Emission Allowance Trading Schemes in Sweden (In English)

MIR2003:4 Environmental subsidies - a review of subsidies in Sweden between 1993 and 2000 (In English)

MIR2003:1 Economic effects for Sweden of Limited Carbon Dioxide Emission Trade within EU (In Swedish)

Energy taxes in the Nordic countries (In English)

Environmental taxes and environmentally damaging subsidies (In Swedsih)

Public environmental protection expenditures and subsidies in Sweden (In English)

Swedish Environmental Accounts Integration (In English)

Climate adaptation expenditure

Climate change adaption expenditure - A proposal for a methodology to compile, define and classify national and EU economic information as statistics (In Swedish with parts in English)

Environmental protection expenditure

Environmental Protection Expenditure – new data collection and additional information (In English)

Environmental Protection Expenditure Accounts in Sweden – a pilot application and analysis (In English)

Public environmental protection expenditures and subsidies in Sweden (In English)

Refined Environmental protection expenditures in Sweden (In English)

MIR2000:2 Environmental protection expenditure in industry 1997 - results from a swedish pilot study (In English)

Environmental protection expenditure in industry - What, why and how? (In Swedish)

Adaption of Swedish data on Environmental protection in the public sector to the SERIEE-system (In English)

Testing SERIEE´s Environmental protection expenditure account in Sweden (In English)

The environmental sector

Environmental Goods and Services sector in Sweden - Suppliers (In English)

The size of environmental sector - methodology and sources (In Swedish with parts in English)

Environmental goods and services sector in Sweden 2002-2005 (In English)

MIR2005:2 The environment industry in Sweden 2003 (In Swedish)

The Environment industry in Sweden 1999 (In English)

MIR2000:8 The environment industry in Sweden 2000 (In English)

MIR2000:1 The environment industry in Sweden 1999 (In English)

MIR 1999:2 The Environment industry and employment in Sweden (In Swedish)

Producers of Environmental services (In English)

Ecosystem accounts and biodiversity

Land accounts for biodiversity - a methodological study (In Swedish with parts in English)

Inventory of data source for quantification of ecosystem services (In English)

Inventory of data sources for quantification of ecosystem services (In Swedish with parts in English)

MIR2009:1 Biodiversity - Maps and statistics (In Swedish with parts in English)

Nordic Natural Resource and Environmental Accounting (In English)

Land accounts

Land use by industry 2000 (In English)

Land accounting for Sweden (In English)

Forest accounts

Environmental accounts for forest (In English)

MIR1999:3 Forest accounts - physical data (In Swedish)

Forest economic Environmental accounting: a pilot study of a first implementation (In English)

Sustainable development

Environmental indicators for changeover and resourcefulness of the environmental objectives (In Swedish with parts in English)

Sustainable development indicators based on environmental accounts (In English)

Social namea with a coupling to Sustainable Development Indicators - including environmental industry (In English)

MIR2004:1 Social statistics by industry (In English)

MIR2003:3 Sustainable Development Indicators based on environmental economic and social statistics (In Swedish with parts in English)

Sustainable development indicators for Sweden (In English)

MIR2000:7 Method for Socio-economic analyses of environmental measures (In Swedish)

Regional environmental accounts

Regional environmental accounts 1993-1997 (In Swedish)

Regional Environmental accounts for the greater Stockholm region-a first step (In English)

Other publications

Web-tool part 2 (In English)

SEEA on Wikipedia (In English)

A European web tool for environmental accounts data – a pilot application (In English)

Environmental and economic key figures for industries within the manufacturing industry (In Swedish)

Environmental accounting 1993-1998 (In Swedish with parts in English)

6 Facts about the statistics

The environmental accounts have been constructed based on the national accounts and present national environmental statistics and economic statistics in a joint system. Environmental data have been systematised using the same industrial classification and the same final use areas as the economic data. Systematising the statistics in this way makes it possible for us to analyse the relationship between the economy and the environment for both production and consumption.

Environmental accounting is descried in a UN manual: System of Environmental-Economic Accounts Central Framework (SEEA CF) which acts as a guide to those responsible for compiling the statistics in this area. In Europe, EU Member States and EFTA members follow EU Regulation no. 691/2011 on European environmental-economic accounts (consolidated version).

Scope of the statistics

The environmental accounts are other statistics from inside and outside Statistics Sweden that have been further processed. Emissions to air, energy consumption, electricity and district heating use, environmental taxes, environmentally motivated subsidies, environmental protection expenditure, the environmental good and services sector, and use of chemical products labelled as hazardous to human health.

Definitions and explanations

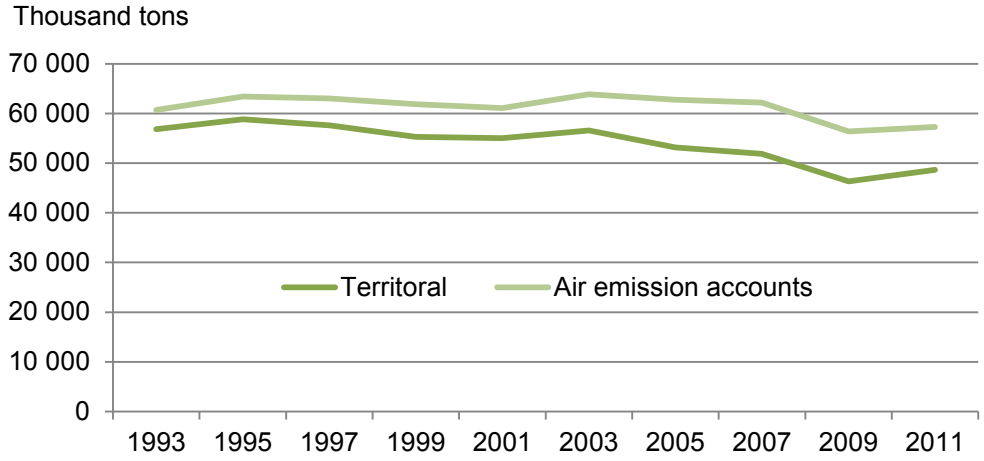
The main framework for the definition of and starting-point for the environmental accounts is the national accounts. This means that the residence principle applies (the economic activity that performs the work is assigned the respective environmental impact (regardless of where in the world the activity takes place).

Air emission accounts

The air emission accounts are built on the principle that the economic activity governs how energy use and emissions to air generated in a given year are calculated. This is irrespective of whether the activity is performed within Sweden's borders or not.

There are two different methods for producing and publishing air emission statistics; emissions based on territorial divisions and those based on the national accounts, i.e. the air emission accounts.

Figure 6.1
Carbon dioxide emissions - comparison between territorial statistics and the air emission accounts, 1993-2011. Thousand tons



The two sources, emissions based on territorial divisions and the air emission accounts, are both interlinked and independent to some extent.

- The territorially based statistics on air emissions are not broken down by industry but more roughly by sector. An example is that transport is counted as one group in the territorial statistics while in the air emission accounts, each transport undertaking is attributed to the economic activity (enterprises and authorities) and households.
- According to the territorial statistics, international air transport and water transport are not included in any final total but are instead presented separately in what is known as a "memo item"[5]. In the economy-based statistics, however, this information is included as part of the final totals. The reason is because economic actors as a whole contribute to the gross domestic product (GDP) and their emissions should also therefore be attributed to them.
- Both statistical products are based on the energy statistics regarding emissions from combustion. The territorial statistics are however based on quarterly statistics while the economy-based statistics are based on annual energy statistics.
- For parts of the statistics, such as emissions from agriculture and waste treatment facilities, the economy-based statistics use the results from the territorially based calculations.

Energy flow accounts

There are two different statistical approaches when considering energy; the first follows the principle of energy balances. An energy balance provides a general description of the entire energy flow, from supply and conversion to final use.

The energy flow accounts are also a type of energy balance, but with the national accounts as the basis for classifying energy goods. As with the air emission accounts, the energy flow accounts follow the residence principle, i.e. the use of

[5] A memo item is reported to the UN in a separate cell and is not included in any total.

energy products is attributed to the economic actor regardless of where he or she is active.

You can read more about physical energy flow accounts in the Eurostat energy accounts manual (Physical Energy Flow Accounts).

Material flows

The overarching aim of the material flow accounts (EW-MFA) is to describe the exchange of materials between the environment and the economy, expressed in units of mass per time unit.

Two types of material flows are included in EW-MFA:

- Flows of materials between the natural environment and a country's economy. This refers to e.g. the extraction of raw materials as metals and forest.

- Flows between one country's economy and the economies of other countries. This includes imports and exports of materials. Material flows inside a country's economy are not included in EW-MFA.

Indicators such as domestic material consumption (DMC) and resource productivity, which are based on EW-MFA, provide information on the volumes of different resources, expressed in tons expended in a country.

Environmental taxes

In cooperation with OECD and IEA (International Energy Association), Eurostat has developed methods and definitions with regard to how internationally comparable statistics on environmental taxes can be produced and that are described in SEEA CF. According to this definition, it is the tax base (i.e. what is being taxed) that determines whether the tax is to be considered an environmental tax or not. This implies that the reason for the tax is secondary in this context. Furthermore, there are many effective environmental taxes that are not defined as taxes.

Environmentally motivated subsidies

Environmentally motivated subsidies consist of what in the National Accounts are classified as subsidies as well as other current transfers and capital transfers (aka "investment subsidies"). Some social benefits are also included in the National Accounts' definition of a subsidy.

One must determine the intention for the subsidy in order to produce a well-reasoned subsidy. Environmental accounts have primarily used different years' Budget Bills as a source for the motive/reason, because the data come from the National Financial Management Authority's calculations of the central government budget's results where transactions are traced to the government appropriations that they come from.

Environmental protection expenditure

Environmental protection is defined as measures and expenditure that either entirely or partly are focused on reducing the impact on the natural environment from the enterprise's production (= business activity). Furthermore, peripheral costs, such as investigations, monitoring, training and administration.

The survey requests information on environmental protection expenditure using questions about environmental investments in emission treatment and prevention and about running costs for environmental protection, including costs for own personnel.

The environmental sector

The aim of the statistics is to estimate the environmental sector in Sweden, i.e. the workplaces whose activities consist of measuring, preventing, minimising or restoring environmental damage. The statistics are based on data in a database of environmental workplaces.

The statistics aim to measure the environmental sector in Sweden, based on turnover, exports number of employees/workers at the relevant workplaces. The aim is for the statistics to capture environmental enterprises within the environmental sector based on established criteria for them.

Use of chemical products

The statistics aim to present the total use of ecotoxic and toxic chemical products by different industries.

The statistics are based on data from the Swedish Product Register hosted by the Swedish Chemicals Agency on the use of ecotoxic and toxic products. This is based on data from enterprises and is used by e.g. the Swedish Chemicals Agency as a basis for inspections and risk assessment.

Other statistics in the report:

The report uses economic and transport-related statistics as well as statistics from international organisations.

The economic statistics have been retrieved from the Statistics Sweden national accounts which follow the European Framework for the National Accounts.

The transport statistics have been retrieved from:

Transport Analysis: http://www.trafa.se/en/Statistics/

The waste statistics have been retrieved from:

Swedish Environmental Protection Agency: http://www.naturvardsverket.se/Samar-miljon/Mark/Avfall/

The international statistics have been retrieved from:

Eurostat: http://ec.europa.eu/eurostat/web/main/home

International Energy Agency: http://www.iea.org/

How the statistics are produced

The underlying statistics for the environmental accounts are made up of data sources that already exist.

The statistics used come mostly from the national accounts and trade statistics from Statistics Sweden, the energy statistics come from the Swedish Energy Agency, the central government budget results from the Swedish National Financial Management Authority (ESV) and the data connected to air emissions are from the Swedish EPA (via the Swedish Methodology for Environmental Data (SMED)).

Descriptions of the statistics can be found at each agency respectively.

Air emission accounts/Energy flow accounts

The latest version can be downloaded under Quality of the statistics:

http://www.scb.se/Statistik/MI/MI1301/_dokument/MI1301_BS_2008-2012_utsl%c3%a4pp%20luft_141118.pdf

Environmental taxes

The latest version can be downloaded under Quality of the statistics:

http://www.scb.se/Statistik/MI/MI1301/_dokument/MI1301_BS_1993_2013_skatt.pdf

Environmentally motivated subsidies

The latest version can be downloaded under Quality of the statistics:

http://www.scb.se/Statistik/MI/MI1301/_dokument/MI1301_BS_2000_2013_subventioner.pdf

Environmental sector

The latest version can be downloaded under Quality of the statistics:

http://www.scb.se/Statistik/MI/MI1301/_dokument/MI1301_BS_2003-2013_Miljosektorn_150119.pdf

Material flow statistics

The latest version can be downloaded under Quality of the statistics:

http://www.scb.se/Statistik/MI/MI1301/2013A01X/MI1301_BS_2000-2013_150303.pdf

Chemicals indicators

The latest version can be downloaded under Quality of the statistics:

http://www.scb.se/sv_/Hitta-statistik/Statistik-efter-amne/Miljo/Miljoekonomi-och-hallbar-utveckling/Miljorakenskaper-/38162/Beskrivning-av-statistiken/

Transport statistics

Transport volumes, 1950-2013: These statistics are mainly made up of data retrieved from other statistical reports and are regularly updated with new information. Transport Analysis reviews the methods for calculating volumes of passenger and goods transport, which will provide better data as well as lead to certain changes in the time series.

Reliability of the statistics

Within the framework of the environmental accounts, already existing statistics are matched. Official statistics are mainly used. The quality of the data depends to a large extent on the quality of the primary statistics. Primary statistics, distribution keys and model assumptions are needed in order to classify the target characteristics into industries, public authorities and households.

The quality of the input primary statistics can be determined using concepts such as under- and overcoverage, response rate, etc. Other conditions apply when it comes the quality assurance of an accounting system. In such cases, the balance between supply and use is important. The Statistics Sweden environmental accounts are mainly used to see the use of resources and the supply of responses. Statistical quality is therefore mainly reviewed by comparing the results of the primary statistics.

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List of terms

CO_2	Carbon dioxide
EGSS	Environmental Goods and Services Sector
EPEA	Environmental Protection Expenditure Accounts
ESA	European System of National and Regional Accounts
EU	European Union
GDP	Gross Domestic Product
GHG	Greenhouse gases
IEA	International Energy Agency
NACE	Statistical classification of economic activities in the European Community
OECD	Organization for Economic Cooperation and Development
PEFA	Physical Energy Flow Accounts
PM_{10}	Particulate matter < 10 micrometres
$PM_{2.5}$	Particulate matter < 2.5 micrometres
PSUT	Physical Supply and Use Tables
SEEA-CF	System of Environmental Economic Accounting – Central Framework
SNA	System of National Accounts
Tkm	Ton kilometres
UN	United Nations

The Environmental Accounts is an information system developed to systematically describe the connections between environment and economy. Statistics on environment and economy provide a foundation for calculations on costs of environmental measures and damages, analysis of environmental and economic policy as well as indicators on environmental status and sustainable development.

Repport 2015:5 Environmental Accounts – a jubilee

This report shows the combined experience of more than twenty years of development of the Swedish environmental accounts at Statistics Sweden. The report provides a picture of the driving forces that can cause environmental problems of various kinds. These are economics, population, fuel use and transport. It also describes the impact of these driving forces may have on the environment, i.e., emissions, the use of materials or waste production. Finally, a picture is given of the means to prevent and reduce the environmental problems we cause, such as environmental economic instruments as environmental taxes and environmentally motivated subsidies, companies with activities that promote a better environment and companies' environmental protection expenditures.

Since 1998, the Environmental accounts report series has been published at Statistics Sweden. They are available on: www.scb.se/MI1301

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