Material Flow Accounts and Policy. Data for Sweden 2004

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Preface

This report has been prepared on commission from Eurostat. The European Commission through DG Environment has contributed financially to the project. Annica Carlsson, Anders Wadeskog Viveka Palm and Fredrik Kanlén, Environmental Accounts Statistics Sweden, have carried out the study and are responsible for the report.

The aim of the work on environmental accounts at Statistics Sweden is to develop a system of physical accounts that are linked to the production and consumption activities described in the national accounts. In practice this means developing a system of environmental and natural resource statistics that can be linked to the industry, product and sector categories used in the national accounts. According to the UN, a system of environmental accounts should in principle cover:

- Flows of materials through the economy, e.g. energy and chemicals, together with the emissions and waste to which these flows give rise. Within the EU, many countries have opted to use the NAMEA system[1] to describe these flows.
- Economic variables that are already included in the national accounts but are of obvious environmental interest, such as investments and expenditure in the area of environmental protection, environment-related taxes and subsidies, and environmental classification of activities and the employment associated with them.
- Natural resources. Environmental accounts should make it possible to describe stocks and changes in stocks of selected finite or renewable resources. They should deal both with questions related to the monetary valuation of this natural capital and qualitative aspects that do not have any market or other defined monetary value, e.g. the value of outdoor life and biodiversity.

Material Flow Accounts can be linked to all these areas and are integrated into the Swedish Environmental Accounts of Statistics Sweden. In addition to the results presented in this study, Statistics Sweden have, since June 2006, been commissioned by the Swedish Government to develop national material flow accounts on a regular basis.
The material flow accounts for Sweden are based on a number of data sources and all people involved in the data collection are gratefully acknowledged. Margareta Östman and Åsa Almkvist from the National Chemical Inspectorate have kindly supported with data on imports and use of chemical products that are labelled as hazardous for health and or the environment. Jan-Olov Bäcke at the Swedish Forest Agency is acknowledged for guidance on data on forestry production. Special thanks also to the colleagues at Statistics Sweden; Caisa Bergman, statistics on production of commodities and industrial services; Erik Eklund, foreign trade statistics; Anna Hjerne, statistics on waste; and Gerda Ländell, statistics on agricultural production.

Statistics Sweden, December 2006

[1] NAMEA stands for National Accounting Matrix including Environmental Accounts. In principle this is a Social Accounting Matrix (SAM) supplemented by environmental accounts data on, e.g., emissions to air and waste, linked to the Use and Supply Matrices that a SAM is constructed around..

Summary

In this report, data on the economy-wide material flow accounts (MFA) for Sweden in 2004 are presented. The study focuses on the flow of raw materials and does not include data on material flows related to semi-finished and finished products. The results have been compared with the results of two earlier studies, an earlier Swedish MFA that was carried out in the late 1990s (Statistics Sweden, 2000) and a summary report on MFA for EU15 (1970-2001) by Eurostat/IFF (2006). For international comparisons, the data on the national MFA have been used for the calculation of the indicators Domestic Material Consumption (DMC) and Domestic Material Input (DMI). In addition to these, the indicators GDP/DMC and GDP/DMI, which are sometimes used as a measure for Resource Productivity have been calculated. Two flows of materials, flows of waste and flows of chemical products have then been given extra attention in order to search for key substances. Flows of waste are of interest since waste is, to some extent, the outcome of the input of material flows into society. Key substances in the flows of chemical products represent a flow of materials/substances that may be small in magnitude but that can contaminate other material flows. Finally, the indirect flows corresponding to the domestic material input per industry have been calculated.

Data on material flows for Sweden have been collected based on former experience in the field, a guidance document from Eurostat (Eurostat, 2001) and contacts with colleagues in Denmark and Germany. A number of data sources have been used: foreign trade statistics have been used for data on imports and exports of materials; data on domestic extraction of materials are based on statistics on commodities and industrial services, statistics on fishing catches from the Swedish Board of Fisheries, data on agricultural production from agricultural statistics and statistics on biomass from forestry from the Swedish Forestry Agency. Data have been collected on a detailed (8-digit CN code) level. In order to define the relevant MFA categories, the CN codes were mapped into CPA codes as well as the NACE coding used in the most detailed supply/use tables in the National Accounts. The CPA codes were used to link the materials to the MFA categories and the NACE categories where used to define materials used to industries and final demand.

Data on flows of waste have been collected from the national reporting on waste statistics to EU. Key substances of hazardous chemicals have been identified using data from the National Chemical Inspectorate in Sweden. Data for key substances are considered per industry and, when possible, connected to their field of application.

The Swedish material flows presented in this report are distributed between the material categories biomass, minerals and fossil fuels in roughly the same proportions as in the former MFA for Sweden. The total material flow expressed as domestic extraction + imports - exports (i.e. as Domestic Material Consumption, DMC) was 148.8 million tonnes in 2004. The results show that the material flows in Sweden are totally dominated by flows of minerals, mainly construction minerals followed by iron ores. The flow of biomass in terms of wood is also large. Most of the extracted iron ores are exported. In comparison with the EU15, this generates a unique situation with Sweden as the only net exporter of materials in the EU15. Imports are dominated by petroleum with total imports of 21.3 million tonnes in 2004.

The data on waste and material flow data are not easily comparable. The discrepancy between what is waste and what is a by-product is, for instance, not self-evident. The large material flow of iron ores in Sweden is reflected in the flows of waste. Mineral extraction causes considerable amounts of waste and the mining and quarrying industry also has the most homogenous waste flow, with all waste being mineral waste. (In 2004 about 58.6 million tonnes of waste were generated by the extraction of minerals).

In this report, material flows expressed as direct material input, DMI, per industry have been calculated for the first time for Sweden. This makes it possible to connect the data to the environmental accounts data, such as emissions and economic data per industry. The indirect flows of materials show the amount of raw materials that follow products that are exported and the amount of raw materials that remain in the country, either consumed as products or as waste. If we look, for instance, at iron ores, 94% of DMI materials are exported and 6% remain in the country.

The results of the study show that, for the majority of material flows of raw materials, it is possible to compile data from existing sources in the Swedish statistical system. The use of CN codes as the basic unit of the data collection enabled both the data collection and aggregation into material flow categories.

For environmental policy purposes, time series of Swedish material flows can likely constitute a base for the strategy of ‘Non-toxic resource saving environmental life cycles’ (Swedish Government bill 2002/03:117). The knowledge gained from the MFA can also be related to existing national environmental monitoring and work with environmental quality objectives. Internationally, data on material flows can be used for measuring progress in efficiency and productivity in the overall use of natural resources.

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1. Introduction

1.1 National Material Flow Accounts

The general objective of national material flow accounts (MFA) is to quantify and balance the physical inputs and outputs of a national economy. The theoretical framework for MFA, based on the law of mass conservation, is well presented in other studies (e.g. Baccini and Brunner (1991); OECD (2006a)). The environmental importance of mass conservation, when it comes to issues such as the toxic releases of materials and resource management are illustrated with MFA studies by, for example, Bringezu et al., 1997 and Bergbäck et al., 2001.

To a large extent, national statistical offices already collect the data needed to provide national material flow accounts. Data on international trade and domestic extraction of raw materials and production are part of national statistics, especially in economic terms. Several countries in Europe have produced national Material Flow Accounts and some are also doing so on a regular basis, e.g. Germany, Denmark and Finland (c.f. Federal Statistical Office Germany, 2006, Mulalic, 2005, Mäenpää, 2005). In addition to the mentioned national MFA, time series of national material flows for the EU15 have been compiled for the years 1970-2001 by IFF-Social Ecology, Vienna/Eurostat (IFF 2006).

The need for a harmonisation of concepts and methods for MFA has been an issue for several years in the MFA task force of Eurostat. A common framework would enhance the possibilities for comparisons of MFA results between countries. A first guidance on economy-wide material flow accounts and derived indicators was provided by Eurostat in 2001(Eurostat, 2001). However, a revised version of the guide, as well as national standard tables for material flow accounts and a set of material flow indicators is planned to be issued from Eurostat.

Other international organisations have also shown interest in the development of the MFA method. Material flow accounts and the measurement of resource productivity has been the topic of an OECD work programme in recent years. Within the programme a series of events have been arranged for discussing national material flow accounts and their policy relevance. A number of documents on how to measure national MFA and resource productivity, including a guidance manual for the member countries, will be published in 2007.

1.2 MFA as a tool for policy-making

In order to identify the current level use of materials, material flow data and material flow indicators are needed. Systems that make comparisons of material flows possible on different levels (e.g. regions, nations, local and industries and with economic data) are preferred since they make most use of the data and may enable the use of the data for policy purposes. For international comparisons on the use of resources, national MFA data have been used in calculating indicators such as total material requirement (TMR), direct material input (DMI) and domestic material consumption (DMC). Data

on the stock of materials accumulated in the economy can also together with relevant emissions factors, contribute to the estimation on diffuse emissions from products in use.

Materials management sometimes refers to the ambition of increased resource productivity. Comparing material use by industry with value-added per industry constitutes a base for such measures.

For policy-making and a deeper understanding of resource management of materials, it is important to consider the amount of waste together with relevant statistics on material flows. This can offer key information on how long materials are in use, the potential for recycling and, perhaps most important, may give a prediction on future waste management issues. Within the EU, the statistics on waste will be improved in the forthcoming years (c.f. Regulation (EC) No 2150/2002 of the European Parliament and of the Council of 25 November 2002 on waste statistics). The first report, covering data for 2004, was published in summer 2006, and the member states will, from now on report statistics on waste every second year.

It is also of importance to keep a record of the flows of hazardous substances. These may be smaller in terms magnitude but can play an important role for the possibilities of resource management. For instance, contamination by hazardous substances may decrease the functioning of ecosystems, contribute to health hazards as well as decrease the possibilities of recycling of specific materials.

In 2005, the European Commission proposed a Strategy on the Sustainable Use of Natural Resources used in Europe. The objective of the strategy was to reduce the environmental impacts associated with resource use and to do so in a growing economy. Focusing on the environmental impacts of resource use is said to be a decisive factor in helping the EU to achieve sustainable development (see http://ec.europa.eu/environment/natres/index.htm). In the communication, the commission outline plans to develop indicators to measure progress in efficiency and productivity in the use of natural resources by 2008.

From a Swedish perspective, the results of national MFA can be one source of information for evaluating the work on some of Sweden's Environmental Quality Objectives (cf. Swedish Government, 2006), especially for a “non-toxic environment“ and a “good built environment”. One of the three action strategies for achieving the environmental quality objectives involves ‘non-toxic resource saving environmental life cycles’(Swedish Government bill 2002/03:117).

1.3 Swedish environmental accounts and MFA

Environmental accounts describe the connection between the environment and the economy, e.g. in natural resource extraction or emissions of air pollutants in given sector of society or industry (see e.g. SEEA, 1993; UN, 2000; SEEA, 2003). It is a system that links environmental pressure to the economic actors in society, and it can also be used to link national environmental pressure to the consumption of different product groups with the help of input-output analysis, see for example Keuning et al., 1999; Hellsten et al., 1999; Statistics Sweden, 2003; and Isacsson et al., 2000).

By including statistics on traded goods and services from different countries, as well as environmental data from these countries, the total environmental pressure of national consumption on both national and international territory can be assessed. The data on the environmental side, such as emissions and energy use by industry, are still difficult to obtain, but the method can be used with national environmental data as a proxy (Carlsson et al., 2006). The Swedish environmental accounts data are available on the Internet, in a tool that allows the user to see the environmental pressure divided either by industry or by product group (www.scb.se/mi1301-en). The environmental accounts also include other data, e.g. environmental taxes, subsidies and environmental protection expenditures as well as some social data (see e.g. Palm 2001, Sjölin and Wadeskog, 2000, MIR2003:3, MIR2003:4, MIR2004:1).

The Material Flow Accounts for Sweden are designed to become integrated into the Swedish Environmental Accounts, using the same industry classification (NACE). Several earlier projects have been carried out examine the data sources and test the international comparability of the methodology. In the late 1990s, the Environmental Accounts at Statistics Sweden made a first project on material flow accounts. The size of the Swedish extraction, imports and consumption of natural resources was estimated from 1987-1997 as totals but not by industry (c.f. Statistics Sweden, 2000 and Isacsson et al. 2000). The report concludes that, even though some parts of the material flows were possible to follow using existing data sources, extended development work was needed. One of the areas mentioned as interesting for further development was data on flows of chemicals. As one step to improve knowledge on the use and emission of environmental and health hazardous chemicals the Environmental Accounts are compiling data on the use of chemical products that are labelled as dangerous for the environment (c.f. Palm and Carlsson, 2003). These so-called chemical indicators are based on data from the Product Register at the National Chemical Inspectorate and data on use of fossil fuels from the Energy Statistics. Fossil fuels are of special interest since they are in terms of magnitude, the largest chemical products that are classified as hazardous to health available to consumers. Chemical indicators per industry are planned to be integrated into the material flow accounts, both as part of the total material flows and also for identification of key-substances.

Since June 2006, Statistics Sweden has been developing national material flow account on commission from the Swedish Government. The project intends to result in a database available to the users by the end of 2008. Work is underway to assess the data sources, to receive comments from users on what data are needed and to streamline the process of future up-dating of the data base. The work on how to proceed from total national material flow data to a more disaggregated presentation by industry is also part of this investigation.

2. Objectives

The overall aim of this project is to quantify the material flows for Sweden for 2004 and, based on these data:

- make a comparison with the time series on MFA for Sweden available from earlier studies,
- compare the results with available statistics on waste and available information on the amount of materials being recycled
- search for key-substances of hazardous chemicals that contaminate/may contaminate other materials,
- analyse the resource productivity by a division of material flow data into industry and the values per industry.

3. Method

In order to address the objectives of the study the work has been divided into several phases. First, the material flows for Sweden in 2004 have been recorded by extract and put together data from a number of sources. The focus of the study has been on raw materials. For comparison of the results, results from earlier MFA studies with data for Sweden have been used. To enhance comparisons with other countries, various MFA indicators have been calculated. Two special flows of materials, flows of waste and flows of chemical products have then been given attention in order to search for key-substances. Flows of waste are of interest since they are, to some extent, the outcome of the input of material flows to society. Key substances in the flows of chemical products represent a flow of materials/substances that may be small in magnitude but that can contaminate other material flows. Finally, the indirect flows corresponding to the national material flows for Sweden in 2004 and the material input per industry have been calculated. The method and result sections in this report are presented in the same order as the phases of the work.

3.1 Accounting for Swedish material flows

Data on material flows for Sweden for 2004 have been collected based on former experience in the field, a guidance document from Eurostat (Eurostat, 2001) and contacts with colleagues in Denmark and Germany. The system boundaries of the study have been followed in setting the boundaries of the Swedish economy against the rest of the word's economies and the national environment.

This pilot version of the Swedish Material Flow Accounts is focused on material flows of raw materials and does not include data on material flows related to semi-finished and finished products. These flows are, of course of great importance both for the total quantity of materials circulating in the technosphere, and for the emissions caused by products in use and the amount of materials reaching waste management.

The MFA includes data on the imports, exports and the domestic extraction of materials related to Swedish economic activities, i.e. material flows of air and water or due to erosion processes are not included. As pointed out in Mäenpää, 2005 activities of the economy may cross the national geographical borders and to some extent this is covered in the results presented by calculating the share of imports and exports of indirect DMI.

For most materials, a share of the annual inflow is accumulated in the national economy, creating a stock of materials that may generate an outflow sometimes several years later as emissions to the environment or in waste management. The accumulation of materials in stock has a major environmental impact (e.g. Berbäck et at., 2001), but has not been accounted for in this project. However, to some extent the output of materials within the economy is covered by data on material flows to waste management. This flow may both be a result of materials input the same year and the stock of materials in the technosphere. Since the material flow data in spite of the data

for waste, do not yet include semi-manufactured and finished products, the material flows and the waste flows are not fully comparable.

Data have in most cases, been collected both as quantities (tonnes) and in monetary terms (SEK). A number of data sources have been used foreign trade statistics have been used for data on imports an exports of materials, domestic extraction of materials is based on statistics on commodities and industrial services, statistics on fishing catches from the Swedish Board of Fisheries, data on agricultural production from agricultural statistics and statistics on biomass from forestry from the Swedish Forestry Agency. Data on flows of waste have been collected from the national reporting on waste statistics to the EU. Key substances of hazardous chemicals have been identified by using data from the National Chemical Inspectorate in Sweden. Data are considered per industry and, when possible, connected to their field of application. All data sources are further presented below. Data have been collected on a detailed level (8-digits CN codes) and later aggregated into the relevant MFA categories (cf. Appendix A).

Material Flows Indicators of Total Import, Total Export, Domestic Material Consumption (DMC), DMC/capita, Domestic Material Input (DMI) and DMI/Capita and Resource Productivity (GDP (in constant prices)/DMI) have been calculated.

There has been an ongoing discussion in the Eurostat Task Force for Material Flow Accounts during 2006 on the outline of the Eurostat Standard Tables for MFA. As a final version of the tables had not been remitted to the member states when this study was started, we have chosen to present the MFA data for Sweden for 2004 close to the format of those MFA tables that were discussed in the task force in January 2006 together with experience from the work with the Danish MFA (for future communication of MFA results to Eurostat, an adaptation to the standard tables on MFA will be made as far as possible).

The results of this study have been compared with results of two earlier studies, an earlier Swedish MFA that was carried out in the late 1990s (c.f. Statistics Sweden, 2000 and Isacsson et al. 2000) and a summary report on MFA for EU15 (1970-2001) by Eurostat/IFF (2006).

3.2 Data sources

The material flow accounts for Sweden presented in this study are based on a number of data sources that are briefly presented below.

3.2.1 Foreign trade statistics

Before Sweden’s entry into EU, the flows of goods to the EU were analysed via customs. Since Sweden’s entry into the EU in 1995, foreign trade statistics for imports have included goods that i) arrive in Sweden via trade with other EC countries (single market), or ii) are imported from countries outside the EC and released for free circulation within the single market or released for free consumption on the Swedish domestic market. Exports include goods that: i) are dispatched from Sweden via trade with other EC countries or ii) are exported or re-exported, after import, to countries outside the EC.

The Combined Nomenclature coding system (CN) is used for the collection of foreign trade data at the product level, i.e. goods. The statistics are collected on a detailed level (8-digits CN, CN8), every month. Collection of EC trade (Intrastat) is regulated by EU legislation and involves the monthly collection of detailed information on trade from member states. Since the introduction of Intrastat in 1995, many users of foreign trade statistics have questioned the quality of the detailed foreign trade statistics, and it is apparent that it is difficult to report information at the CN8 level. In order to improve the quality of the published official foreign trade statistics, Statistics Sweden has decided to reduce the level of detail for goods into CN6. However, according to EU regulations, information will still be collected and delivered to Eurostat at CN8 level. For the calculation of Swedish MFA in this study the most detailed level (CN8) has been used with a reservation that quality may be lacking. Data have been collected both in SEK and in weight for 2004 divided between imports/exports EC and non-EC countries.

3.2.2 Production of commodities and industrial services

Statistics on the production of Swedish industry, (i.e. 10-37 NACE Rev 1) are compiled every year. Both the production of goods and industrial services (e.g. repairs and maintenance) are included in the statistics. The statistics are arranged according to CN and available in current prices. For most products, the produced volumes are collected in weight (kilograms) to retain comparability with, the imports and exports data. There are, however, a number of products where a different unit of volume is considered more appropriate, e.g. m^3, m^2, number of units etc.. Furthermore, volume data are not collected for a small number of products where it has proven difficult to obtain meaningful data.

In this study we have included data on products that have been produced and put on the market in 2004 for CN8. For some products, no quantitative data were available, i.e. the volumes are in other units. In those cases we have transformed data into weights using densities, for example.

3.2.3 Statistics on biomass

For the account of material flows of biomass we have used data on agricultural production, fishery and forestry. Statistics on agricultural production are mainly taken from the annual summaries of agricultural statistics (Swedish Board of Agriculture, 2006). Not all crops included in the list of MFA categories (c.f. CPA-codes in Appendix A) are produced in Sweden, e.g. rice or grapes (at least not in any considerable quantity) and have been indicated in the table with zeros. For some crops, such as maize (corn), there is domestic production but relevant statistic sources are lacking. This is indicated in the results with “no data”. Furthermore, flowers are not shown in the statistics in weight but reported as the number of produced flowers. These figures have not been possible to recalculate into quantities in terms of tonnes. It should be noted is that collection of data on agricultural production to some extent has changed during the last decade. Something that can be of importance in future Swedish MFA if accounting for historical MFA. Since 1998, statistics on crop yields for cereals, peas and oilseed crops have been based entirely on an interview study. The sample of the 2004 survey consisted of about 4350 farmers. Information was requested on the total farm production in tonnes of the crops and their average moisture content. Since 1960 Statistics Sweden has produced statistics for potatoes using a method based on

probability sampling and physical measurements with samples taken from the field. The method was changed in 1999 to postal enquiries to a sample of farmers. Due to the changes, all comparisons with years before 1999 should be made with great caution.

Harvesting of fodder for livestock is estimated from data on the share of arable land that is used for fodder production. For future MFA the methods for calculations of fodder for livestock will be further investigated.

Data on the quantities of biomass from the sea, in terms of non-cultivated fish and other fishing-products, have been taken from the annual statistics presented by the Swedish Board of Fisheries (Fiskeriverket, 2005).

The amount of biomass from forestry in tonnes has been calculated based on data from the Swedish Forest Agency. The data only includes the total net felling of coniferous saw logs, broad-leaved saw logs, coniferous and broad-leaved pulpwood, fuel wood of steam wood and other rounds wood in 2004. Other trees included in the MFA categories shown in Appendix A are not normally grown in Sweden. Data on net felling, are reported in m^3 under bark but have been transformed into tonnes based on densities given in literature (Nylinder, 1979). The calculations can be followed in Appendix B.

In the former manual from Eurostat, a standardised water content of 15% of total product weight is recommended for all biomass (Eurostat, 2001). For the calculations of biomass in this report we have chosen to count the materials at their fresh moisture level, i.e. the fresh moisture level at which they enter the economy or are exchanged in the economy, with the exception of wood.

The amount of water in wood and other forest products is, to a large extent, dependent on the ability of the tree species to hold water and the dryness of the wood. The quantities of timber are reported in volumes (m3) in the production statistics and the data have therefore been converted to tonnes using data on the density of wood (c.f. above) and a water content of 15% (as indicated in Eurostat, 2001). For future calculations on material flows of biomass from forestry, a water content of 14% will be used as indicated in the upcoming standard tables on MFA from Eurostat.

3.2.4 Energy statistics

Statistics Sweden produces energy statistics on assignment from the Swedish Energy Agency. The statistics cover data on fossil fuels, bio fuels, as well as electricity use and district heat use. Energy statistics are already a data source of great importance for the Environmental Accounts for calculations on the distribution of the use and emissions of fuels per industry.

Energy statistics are based on several surveys covering different economic sectors and different types of fuels. The manufacturing enterprises (NACE 10-40) are the most well-covered, while the agriculture, forestry and fishing industries do not have yearly surveys but are calculated from less frequent sampling. The service sectors are covered by surveys to the large housing companies and by surveys on economic statistics rather than by quantities of fuel use. Energy products are not included in the data to avoid double counting. This implies that the domestic production of coke produced by hard coal has not been accounted.

Trade in energy products has been covered with two surveys. The first source is the foreign trade statistics, which builds on customs statistics on traded goods. The foreign trade statistics are used as the source for the other traded goods and covers all energy products. The second survey has concentrated on petroleum products, asking petroleum dealers and other importers of petroleum products about their foreign trade. The differences between the two investigations were found to be small. There is therefore no reason incentive to change data source for petroleum products. The conclusion is that the foreign trade statistics are of good quality.

In this study we have used the foreign trade statistics and data on the production of commodities and industrial services for quantifying the material flows of fossil flues. However comparisons with energy statistics have been made and the results of the both studies seemed to be coherent. Energy statistics constitute an important point of reference for the material flow accounts and will continue to do so, given their crucial role for environmental impact and economic importance.

3.3 Aggregation of data into tables for MFA

The basic unit for collected data on trade and production in Sweden are CN-codes. In order to arrive at relevant MFA categories, the CN codes were mapped into CPA codes as well as the NACE coding used in the most detailed supply/use tables in the National Accounts. The CPA codes where used to link the materials to the MFA categories, and the NACE categories where used to identify materials used to industries and final demand.

Of the original, at the most, 16000 CN codes in trade and domestic extraction/production, a subset of roughly 500 CN codes were mapped on the MFA CPA codes. A detailed presentation on the categories included in Domestic Extraction, Imports and Exports as well as the CN numbers that have been included, is found in Appendix A.

3.4 Statistics on waste

In the summer of 2006, data for waste generation and waste treatment in Sweden for the 2004, were reported to EU according to the Waste Statistics Regulation[2]. Although the agriculture, forestry and hunting, and fishing industries and parts of the service sector were excluded in this first report, it was still the first time such major survey has been carried out for Sweden. Statistics on the amounts of waste generated and waste treatment will in the future be reported to the EU every second year. For detailed information on waste statistics, we refer to the national report on the generation and management of waste (Naturvårdsverket, 2006).

In this study, data from the survey on waste statistics have been divided per industry at the most detailed level. The detail can vary between different industries and, for some industries, there are no data available (see above). Data have been collected for total amounts of waste generated for 2004 (and not divided per hazardous and/or non

[2] The Regulation of the European Parliament and the Council No 2150/2002 of 25 November 2002 on waste statistics.

hazardous waste). The three most common waste categories per industry according to the EWC-stat coded has been noted. The major treatment methods per industry (e.g. recycling, incineration, landfill and emissions) have also been noted.

Different methods were used for quantifying the waste flows:

- for recycling and waste management (NACE 37 and 90) surveys that investigate all companies were used,
- for electricity, gas and heat generating companies (NACE 40) all companies who use waste as fuel were investigated
- for manufacturing industries (NACE 10-36) and wholesale of waste and scrap (51.57) sample surveys were used.
- for the building industry (NACE 45) an expert judgement was been made.

All surveys on the waste statistics are voluntary and, for the industry survey (NACE 10-36) and NACE 51.57, the answering rate was between 60-65%. In the other surveys, the non-response was less significant.

3.5 Use of chemical products

One of the interesting policy areas connected to material flows is that of hazardous substances. The so-called substance flow analysis (SFA) is a research area in itself and has a more policy-based focus than the overall material flow analyses. The main policy focus is that on toxic materials and how they affect humans or the environment. In order to make proper use of the data on overall material use, it is important to assess which parts of the large materials are connected to the most problematic substances.

The Swedish Environmental Accounts have, for some years, presented chemical indicators on the use of chemical products labelled as hazardous for health and/or the environment (e.g. Palm and Carlsson, 2003). The data behind these indicators are collected from the so-called Product Register at the National Chemical Inspectorate in Sweden[3]. The register is to some extent unique in Europe since it is updated annually and all Swedish companies that import, repack or manufacture more than 100kg of chemical products are obliged to report to the register (there are registers in Norway, Denmark and Finland as well, but with different scope and system boundaries).

The introduction of REACH[4] will establish a new overall Chemicals Agency in EU. Over time, REACH will generate databases including data on imports, manufacturing and use of single substances (but not preparations). However, since the level of detail in the Product Register is higher it is thus doubtful that the REACH register can be used for the same purposes. The database of REACH will not be updated annually, nor will it contain data that make it possible to calculate the total volume of chemicals in a nation. Thus, it will not be possible to develop national chemical indicators or use data for national SFA and MFA studies from the database of REACH.

[3] www.kemi.se

[4] REACH – Registration, Evaluation, Authorisation of Chemicals. 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), establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC

For this study data have been colleted from the Product Register for 2004, for all chemical products labelled as dangerous for health and/or the environment. In this case this refers to chemical products labelled as very toxic (T+), toxic (T), corrosive (C), harmful (Xn), irritant (Xi) or dangerous for the environment (N). To some extent the function of the chemical product (e.g. if the chemical products are being used for raw material/synthesis) has been considered in the compilation of data. This is to provide additional information to the data set on the amount of chemical products that have the potential to cause emissions during use.

In the search for key substances in the material flow, the method used in Palm and Carlsson, 2003 has been used. The amount of chemical products per industry has been compared to the overall material flows in the same industry. Fossil fuels are excluded in this data set from the Products Register. However, earlier studies on chemical indicators have shown that fossil fuels are the largest chemical product group that is labelled as dangerous to health (Palm and Carlsson, 2003). Something that can be of relevance if calculating chemical flows in countries that do not have register such as the Swedish Product Register. Data on the use of fossil fuels would in that case mostly be extracted from energy statistics, something that is more common.

3.6 Methods for calculation of resource productivity and indirect Domestic Material Input (DMI)

In order to make an estimate of resource productivity by industry, the supply of materials in DMI needs to be allocated according to use by industries and final demand. There are different ways of producing physical input-output tables, depending on the level of ambition and availability of detailed data. We have chosen a simplified approach in this project.

The Swedish national accounts use around 400 products in the product balances that go into the use table. We have used the mapping of the MFA into the NACE categories of the national accounts to produce a conversion/aggregation table, which allocated the 100 MFA categories into 38 National Accounts products, Table 1.

Table 1. Selection of product groups in the National Account for allocation of MFA categories. The Swedish name and classification code is kept intact for reference purposes.

Product group	Swedish name	Classification code
Rye	Råg	01111B
Baley	Korn	01111C
Oats	Havre	01111D
Other cereals	Ö spannmål	01111F
Potato	Potatis	0111300
Sugarbeet	Sockerbetor	0111401
Leguminous plants	Baljväxter	01119A
Oil plants	Oljeväxter	01119B
Tobacco	Råtobak	01119C
Seeds for cultivation	Fröutsäde	01119D
Other agricultural plants	Ö Jordbrukväxter	01119E
Fodder plants	Foderväxter	0111A
Vegetables	Grönsaker	0112A
Flowers	Blommor	0112B
Fruit	Frukt	0113A
Coffee, tea	Kaffe, te	0113B
Cocoa beans	Kakoobönor	0113C
Honey etc	Honung, mm	012D
Firewood	Brännved	0201105
Other wood	Ann Virke	0201106
Pulp wood	Massaved	02011A
Sawing wood	Sågtimmer	02011B
Other forestry	Skogsodling	0201B
Fish crayfish	Fisk, kräfta	050A
Stone coal	Stenkol	10100
Brown coal	Brunkol	1020000
Peat	Torv	1030
Raw oil	Råolja	1110001
Natural gas	Naturgas	11100A
Uranium, thorium ore	Uran-Thori	1200000
Iron ore	Järnmalm	1310000
Non-iron ore	Icke-järn	13200
Stone	Sten	141
Sandgravel	Sandgrus	142
Chemical minerals	Kemi mineral	14300
Salt	Salt	1440000
Diverse minerals	Div Mineralprodukter	14500

The monetary allocation of these 38 products was then used to allocate the MFA products over all industries and final demand, thus making it possible to estimate the resource productivity for all industries. The results only display an aggregated version that is also adapted to the level of detail in the data on waste generation and use of chemicals.

Once the mapping of MFA to NACE and the use table in the national accounts is done, it is also possible to use input-output analysis to calculate the indirect use of materials in the different components of final demand. Here we used the same procedure as in most of the input-output analysis of energy or emissions in the Environmental Accounts, using material coefficients by industry or product, i.e. material use by component of final demand was calculated as:

$MFA\_FD = MFA\_C * (I-A)^{-1} * FD$

Where:

MFA_FD is a matrix of indirect materials used for the components of Final Demand aggregated to - domestic uses and export.

MFA_C is a matrix of coefficients relating the 100 materials used in Ton to production values in SEK millions.

I is an identity matrix with 1:s along the diagonal

A is the domestic input coefficients, i.e. inputs divided by productions values.

FD is final demand grouped into Domestic (private and public consumption, NPISH and Investments) and Export.

The use matrices where converted to Product X Product using the industry assumption.

4. Results

In accordance with the steps defined in this study the results first present data from the account of total material flows of raw materials for Sweden 2004. These results are then compared with earlier data on Swedish material flows and a number of indicators are shown. Flows of waste and flows of chemical products (i.e. key substances) are then shown and put in relation to the overall material flow. Finally, the indirect flows of the domestic material input together with the DMI per industry are shown.

4.1 Total Material Flows for Sweden 2004

The domestic material flows for Sweden are dominated by the extraction of minerals. About two-thirds of the domestic material flow are minerals, mainly construction minerals such as sand and clay but also iron ores. Looking at the physical trade balance (PTB, defined as imports minus exports) Sweden is a net exporter of minerals and most of the extracted iron ores are exported, Table 2.

Table 2. Summary table, MFA for Sweden 2004, tonnes**.** The detailed tables on MFA for Sweden 2004, are found in Appendix C and D.

MFA, Sweden 2004	Domestic	Import	Export	PTB
Biomass	**46 284 972**	**10 694 924**	**2 923 552**	**7 771 372**
Crops, products of market gardening and horticulture	14 527 432	1 500 144	1 187 809	312 334
Hunting gathering	0	2 610	34	2 576
Wood and other forestry products	31 479 483	9 019 257	1 512 224	7 507 033
Fish and other fishing products, non cultivated	278 057	172 914	223 484	-50 571
Fossil Fules	**1 671 214**	**24 856 098**	**167 968**	**24 688 129**
Hard coal	3 238	3 057 291	8 677	3 048 613
Lignite	0	4 569	2 306	2 263
Peat	1 662 546	425 613	156 901	268 712
Petroleum, Natural Gas	5 430	21 368 625	84	21 368541
Minerals	**91 387 404**	**5 298 115**	**22 996 168**	**-17 698 053**
Uranium and thorium ores	0	0	0	
Iron ores	22 866 996	102 101	17 336 835	-17 234 734
Non-ferrous metal ores, except uranium and thorium	4 315 295	1 610 693	3 172 013	-1 561 320
Sand and clay	63 802 656	1 949 150	2 335 273	-386 123
Chemical and fertilizer minerals	275 651	519 590	77 429	442 161
Salt	625	937 287	10 357	926 930
Other mining and quarrying products n.e.c.	126 182	179 294	64 262	115 032

Sweden only has a small extraction of fossil fuels, mainly consisting of peat. However, the import of raw materials is dominated by fossil fuels (61%) with for example imports of over 20 000 000 tonnes of petroleum in 2004 (cf. Appendix C, Table C1).

The material flows of biomass are to some extent, harder to follow than the other materials flows. For hunting, the data sources used in this study are not complete, which

is why the domestic material flows shown are most likely underestimated. In the case of fishery flows, it its not clear whether the flows are domestic or imported. The results on domestic flows of the fishery industry include fishing from Swedish boats that were unloaded in foreign harbours. Following from the definition of material flow accounting, only the non-cultivated share of the fishery flows are included, leading to a negative PTB on the fishery flows. Furthermore, it is not possible to distinguish in the export data the share of the fishing that is cultivated.

As indicated in the method section, the quantities of wood are originally presented as m^3 under bark. The conversion of these data into tonnes with a water content of 15% adds an extra dimension of uncertainty to the results. For the future work on MFA for Sweden, the flows of biomass (especially for fishery) need to be further investigated.

The MFA for Sweden 2004 presented in this report is a snap shot of the material flows. We have made comparisons with some of the results from the Swedish MFA that were carried out in the late 1990ies (c.f. Statistics Sweden, 2000 and Isacsson et al. 2000), as well as from the summary report on MFA for the EU 15 (1970-2001) by Eurostat/IFF (2006). Some data from these two studies are provided in Appendix E and F.

When comparing the absolute numbers of the present MFA study with the other MFA studies for Sweden it is important to understand that the data sources used to some extent have differed in the three approaches. The fist Swedish study was based on a thorough investigation of data from other national authorities, making international comparisons more difficult. One reason for this could be that the quality of the data was thus higher. The studies also differed in their way of treating biomass. It can, however, still be of interest to compare the distributions between materials which is what we primarily have done in this study.

In the data set for 1997 (Statistics Sweden, 2000 and Isacsson et al. 2000), the overall picture of the national material flow was similar to the one illustrated for 2004 mentioned above. In 1997, more that half of Swedish imports consisted of fossil fuels. The major share of the domestic production was concentrated in industries related to construction minerals, forestry as well as industrial minerals and ores. Most of the produced ores and products from forestry were exported. In all, 70% of the Swedish exports consisted of ores and minerals. Imports of fossil fuels and renewable resources were rather constant during the time frame of the Swedish study 1987-1997. The difference between the years was mainly due to the import of ores and minerals. A significant decrease of the use of gravel, something that was connected in the report to the introduction of a tax on gravel together with decrease in construction work, can be seen for the period (for detailed data see Appendix E).

The development of material use in the EU15 has been analysed in a study by Euorstat and IFF-Social Ecology (Eurostat/IFF, 2006). The data set presented in the report is an extension of previous work on MFA for the EU15, (Eurostat 2002). National MFA, data from Eurostat's databases, international statistics from the FAO, for example, have been used as sources of data for the calculations. The results presented in the report show that the material use is very different in the EU15. Industrial minerals and ores are technically and economically the most important materials for industrial production. For most EU15 countries, DE of industrial minerals are low although Sweden is an exception. Of the EU15 member states Sweden is the only net exporter of materials (cf. Appendix F).

4.2 MFA indicators

The data set on national MFA can be used for calculation of indicators. In the present study some indicators on DMC and DMI have been calculated (Table 3). In addition to these the indicator GDP/DMC and GDP/DMI which sometimes is used as a measure of resource productivity has been calculated. Based on the total material flows, the GDP/DMC for 2004 was 0,02 SEK million/tonnes and the GDP/DMI for the same year was 0,014 SEK million/Tonnes.

Table 3. Summary table, MFA Indicators of raw materials for Sweden 2004, [tonnes]. Indicators/capita is calculated on an approximated population of 9 107 649 people (Statistics Sweden, 2006-10-31 (www.scb.se). GDP in current prices 2004, SEK 2 565 056 million (www.scb.se).

	DMC tonnes	DMC/ capita tonnes/ cap	DMC/ GDP tonnes/ SEKm	DMI tonnes	DMI/ Capita tonnes/ cap	DMI/ GDP tonnes/ SEKm
TOTAL MFA indicator	**148 806 922**	**16,34**	**58,01**	**180 192 727**	**19,78**	**70,24**
Biomass	**54 056 344**	**5,94**	**21,07**	**56 979 896**	**6,26**	**22,21**
Crops, products of market gardening and horticulture	14 839 766	1,63	5,79	16 027 576	1,760	6,25
Hunting	2 576	0,00	0,00	2 610	0,000	0,00
Wood and other forestry products	38 986 516	4,28	15,20	40 498 740	4,447	15,79
Fish and other fishing products, non cultivated	227 486	0,02	0,09	450 971	0,050	0,18
Fossil Fules	**26 359 343**	**2,89**	**10,28**	**26 527 312**	**2,91**	**10,34**
Hard coal	3 051 851	0,34	1,19	3 060 529	0,336	1,19
Lignite	2 263	0,00	0,00	4 569	0,001	0,00
Peat	1 931 258	0,21	0,75	2 088 160	0,229	0,81
Petroleum, Natural Gas	21 373 971	2,35	8,33	21 374 055	2,347	8,33
Minerals	**68 391 235**	**7,51**	**26,66**	**96 685 519**	**10,62**	1,19 **37,69**
Uranium and thorium ores	0	0,62		0	0,000	
Iron ores	5 632 262	0,30	2,20	22 969 097	2,522	8,95
Non-ferrous metal ores, except uranium and thorium ores	2 753 975	6,96	1,07	5 925 988	0,651	2,31
Sand and clay	63 416 533	0,08	24,72	65 751 806	7,219	25,63
Chemical and fertilizer minerals	717 812	0,10	0,28	795 241	0,087	0,31
Salt	927 554	0,03	0,36	937 911	0,103	0,37
Other mining and quarrying products n.e.c.	241 214	0,62	0,09	305 476	0,034	0,12

4.2.1 Domestic Material Consumption, DMC

The total DMC for Sweden in 2004 is 16,3 tonnes/capita. This can be compared with the results from Statistics Sweden (2000) with a variation of DMC between 18-22 tonnes/capita for the period 1987-1998. Together with Denmark, France, Germany, the Netherlands and the United Kingdome, a decrease in DMC/capita can be seen for Sweden for the data set for the EU15 (Eurostat/IFF, 2006). All other EU15 member states have increased their DMC/capita.

Of the material flow of DMC for Sweden in 2004, 36% originate from biomass, 18% from fossil fuels and 46% from minerals. In the Swedish study by Statistics Sweden (2000) the distribution of DMC in 1997 was 33% of biomass, 12% of fossil

fuels and 55% of minerals. Based on the figures in Eurostat/IFF (2006) the distribution in 2001 was 37% for biomass, 11% for fossil fuels and 52% for minerals. The reason why the share differs is most likely due to differences in the methods for data collection. In the first economy wide MFA for Sweden data for minerals were collected on a detailed level from the Geological Survey of Sweden. In the present study, we have instead used data reported to national statistics on the production of commodities and industrial services, cf. Method section above. Further investigation is needed, to explain the differences with distribution in Eurostat/IFF (2006) One reason might be that parts of the dataset for Sweden in the Eurostat/IFF are an adjustments of the data set for Sweden 1987-1997. It may also be due to different methods for calculation the other material flows of biomass and fossil fuel.

The results of Eurostat/IFF(2006) show that for most countries, in the EU15, the share of biomass in the overall DMC is between 20-30%. However, Sweden together with Finland, France and Ireland, have a higher share with about 40-50% originating from biomass in the overall DMC, (cf. Appendix F, Table F1). The Eurostat/IFF report connects this to parameters such as the low population density of Sweden and the importance of forestry (in the data set from Eurostat/IFF, wood contributes to over 70% of DE of biomass).

Sweden is one of the highest energy consuming countries per capita in the EU-15, due to energy-intensive industries and high transport demand (Eurostat/IFF 2006). However, compared with the results of the EU15 countries in 2001, the DMC of fossil fuels/capita for Sweden is in the middle range (Appendix F, Table F4). This is a result of an energy mix with a comparably high share of nuclear power, hydro power and biomass. Compared with the results in the Swedish study from 1997 there has also been a decrease in the amount of DMC of fossil fuels/capita. In 2004, the DMC of fossil fuels was 2.89 tonnes/capita and the same parameter for 1997 was 3.6 tonnes/capita. (In absolute figures the DMC of fossil fuels for Sweden in 2004 was 26.3 million tonnes and the population was 9.1 million (www.scb.se). In 1997 DMC of fossil fuels were about 22.1 million tonnes and the population was 8.8 million (www.scb.se)).

The material intensity for the total MFA, i.e. the DMC/GDP, is in the present study 58.0 tonnes/MSEK[5]. In future MFA for Sweden, with data in time series, an index of the ratio DMC/GDP can be more interesting.

The material productivity, GDP/DMC, i.e. the amount of SEK generated from one tonne of material, was in the data set for 2004 0.02 SEK milliond/tonnes, or about 2192 EUR/tonnes [6]. Even for this indicator future time series are of more relevance.

4.2.2 Domestic Material Input, DMI

Domestic Material Input (DMI) refers to the Domestic Extraction plus the Imported flows of materials (i.e. is a part of the DMC indicator (DMC=domestic+import-export). Thus, DMI is of interest for indicating the material flow that is used for production. The use of construction minerals is most often narrow and DMI is also dominated by construction minerals of which the major share originate from domestic sources. Flows

[5] This is approximately 1889,23 euro/tonnes, based on the average course in 2004 of 1 SEK = 0,1096 EURO (www.riksbanken.se).
[6] based on the average course in 2004 of 1 SEK = 0,1096 EURO (www.riksbanken.se).

of biomass in DMI are, to a large extent also a result of domestic sources (over 80%), and the category is totally dominated by wood and other forestry products. This corresponds well to the distribution of DMI in the time series for Sweden 1987-1998 (Appendix E).

The material productivity expressed as GDP/DMI, was for 2004 0.014 SEKmillions/tonnes. In this study the DMI per industry has also been calculated and the result there of is presented later in this report. As indicated above for the indicator GDP/DMC, it will be interesting to follow the future development of the indicator (preferable as an index) to obtain information on the development of the industrial productivity.

4.3 Material flows in waste management

Data on waste and data on material flows are not easily comparable. Statistics on waste do not report the actual amount of primary waste generated each year. Instead it is the gross product of primary and secondary waste (resulting from waste treatment) that is shown. Furthermore, the discrepancy between what is waste and what is a by-product is for instance not self-evident. Data on amounts of waste generated are also classified according to EWC-stat[7], and there is today no conversion key between the product groups (often CPA codes) used in MFA and the EWC-stat codes. Another issue of concern is the double counting of mass that occurs in the waste statistics when a waste is first registered as one waste category and then after waste treatment shifted into another category. This is, for instance the case with 258 000 tonnes of end of life vehicles reported for 2004. The whole quantity is first registered as hazardous waste, but after reassembling, 219 000 tonnes of non-hazardous waste is generated (Naturvårdsverket, 2006). Hence, the figures in Table 4 include both the hazardous and non-hazardous waste.

The total amount of waste in 2004 is estimated to 119.3 million tonnes and include both the hazardous and non-hazardous waste. The amount of waste that was initially classified as hazardous waste was about 1.5 million tonnes (1 493 158) in 2004 (Naturvårdsverket, 2006). If the mineral waste, about 58.6 million tonnes or about 50% of the waste flow is excluded from the total waste flow, approximately 60,6 million tonnes 60 660 000) of waste was generated in 2004. In relation to the total material flow expressed as DMI (i.e. domestic + import) that in 2004 was 180.2 million tonnes the ratio of total waste generated /total material flow was 0.34. It is however important to note that the waste flow also includes waste from semi- and finished products.

[7] Guidance on classification of waste according to EWC-Stat categories. Statistics on generation of waste. Annex to manual on waste statistics. http://www.avfall.scb.se/Pdf/EWCStat.pdf / .http://waste.eionet.europa.eu/definitions/low

Table 4. Waste flows per industry (non-hazardous + hazardous), 2004, [tonnes] and [%]Since data on waste are reported in EWC-stat codes and no conversion key into MFA categories is available we have chosen to present data as total amount of waste per industry together with a distribution of the major waste categories. (For an explanation of the NACE codes see Appendix G).

Nace	Total amount [tonnes]	Major waste category (included EWC-stat codes)	% / Nace group
10-12	12 623	Mineral wastes (12. (excl. 12.4 ,12.6))	49%
		Common sludge[1] (11 (excl. 11.3)	43%
13-14	58 623 621	Mineral wastes (12. (excl. 12.4 ,12.6)	100%
15-16	1 141 239	Animal and vegetal wastes (09. (excl 09.11, 09.3))	33%
		Industrial effluent sludge[1](03.2)	24%
		Mineral wastes (12. (excl. 12.4, 12.6))	17%
		Common sludge[1] 11 (excl. 11.3)	9%
		Animal wastes of food preparation(09.11)	7%
17-19	32 232	Textile wastes (07.6)	59%
		Mixed and undifferentiated materials (10.2)	28%
		Household and similar wastes (10.1)	6%
20	15 242 880	Wood wastes (07.5)	99%
21	6 255 575	Wood Wastes (07.5)	47%
		Industrial effluent sludge[1](03.2)	18%
		Common sludge[1] (11 (excl. 11.3))	13%
		Paper and cardboard wastes (07.2)	6%
		Combustion Wastes (12.4)	5%
		Chemical deposits and residues (03.1)	3%
22	210 997	Paper and cardboard wastes (07.2)	93%
23	19 178	Chemical deposits and residues (03.1)	29%
		Industrial effluent sludge[1](03.2)	16%
		Used oils (01.3)	12%
		Mixed and undifferentiated materials (10.2)	9%
		Chemical preparation wastes (02)	7%
		Metallic wastes (06)	7%
		Spent chemical catalyst (1.04)	5%
		Acid or alkaline or saline waste (01.02)	3%
		Chemical deposits and residues (03.1)	3%
24	305 854	Chemical deposits and residues (03.1)	31%
		Industrial effluent sludge[1] (03.2)	13%
		Spent solvent (01.1)	10%
		Mixed and undifferentiated materials (10.2)	7%
		Common sludge[1](11 (excl. 11.3))	6%
		Chemical preparation Wastes(02)	5%
		Mineral wastes (12. (excl. 12.4, 12.6))	4%
		Animal and vegetal Wastes (09. (excl 09.11)	4%
		Health care and biological wastes (05)	4%
		Contaminated soil and polluted dredging soil(12.6)	3%
		Plastic waste (7.4)	2%
		Metallic wastes (06)	2%
25	92 094	Plastic waste (07.4)	31%
		Rubber waste (07.3)	16%
		Mixed and undifferentiated materials (10.2)	15%
		Paper and cardboard wastes (07.2)	9%
		Metallic wastes (06)	8%
		Chemical preparation wastes (02)	7%
		Wood wastes (07.5)	7%
26	268 308	Mineral wastes (12. (excl. 12.4,12.6))	72%
		Glass wastes (07.1)	7%
		Industrial effluent sludge[1] (03.2)	5%
		Metallic wastes (06)	4%
		Wood wastes (07.5)	2%
		Combustion Wastes(12.4)	2%
27	3 610 273	Combustion Wastes (12.4)	63%
		Metallic wastes (06)	19%
		Mineral wastes (12. (excl. 12.4, 12.6))	7%
		Chemical deposits and residues (03.1)	5%
28	1 361 173	Metallic wastes (12.4)	87%
		Paper and cardboard wastes (07.2)	2%
29	262 663	Metallic wastes (06)	67%
		Mixed and undifferentiated (10.2)	6%
		Paper and cardboard wastes (07.2)	6%
		Wood wastes (07.5)	5%
		Mineral wastes (12. (excl. 12.4, 12.6))	3%
		Used oil (01.3)	3%
30	Not estimated	Not estimated	-

31	33 003	Metallic wastes (06) Wood wastes (07.5) Mixed and undifferentiated materials (10.2) Plastic waste (06) Paper and cardboard wastes (07.2) Spent solvent (01.1)	59% 9% 7% 6% 6% 3%
32	Not estimated	Not estimated	-
33	Not estimated	Not estimated	-
34	629 881	Metallic wastes (06) Mineral wastes (12. (excl. 12.4, 12.6)) Mixed and undifferentiated materials (10.2) Industrial effluent sludge[1] (03.02)	67% 16% 4% 3%
35	34 546	Metallic wastes (06) Mixed and undifferentiated materials (10.2) Mineral wastes (12. (excl. 12.4, 12.6)) Chemical deposits and residues (03.1) Wood wastes (07.5) Household and similar wastes (10.1) Paper and cardboard wastes (07.2) Acid alkaline or salin waste (01.2)	35% 12% 12% 8% 6% 6% 6% 5%
36	88 060	Mixed and undifferentiated materials (10.2) Metallic wastes (06) Plastic waste (07.4) Wood wastes (07.5) Household and similar wastes (10.1) Industrial effluent sludge[1] (03.2)	64% 11% 6% 6% 2% 2%
37	884 497	Metallic wastes (06) Combustion Wastes (12.4) Sorting residues (10.3) Discarded Vehicles (08.1)	48% 27% 11% 6%
40-41	2 164 618	Common sludge[1] (11 (excl. 11.3)) Combustion Wastes (12)	49% 45%
45	11 271 506	Mineral wastes (12. (excl. 12.4, 12.6)) Mixed and undifferentiated materials (10.2) Dredging spoils (11.3)	54% 21% 18%
51.57	214 690	Discarded Vehicles (08.1) Sorting residues (12.4) Metallic wastes (06)	79% 8% 3%
90	11 703 661	Industrial effluent sludge[1] (03.2) Dredging spoils (11.3) Common sludge (wet weight) (11 (excl. 11.3))	71% 12% 8%
PC*	4 831 347	Household and similar wastes (10.1) common sludge[1] (11 (excl. 11.3)) Paper and cardboard wastes (07.2) Animal and vegetal wastes (09. (excl 09.11; 09.3)) Glass Wastes (07.1) Discarded Vehicle (08.1)	47% 17% 11% 7% 6% 5%

[1] all sludge in wet weight
* private consumption

The industries NACE 13-14 (Mining and quarrying) has the most homogenous waste flows, with all waste being mineral waste. This is also the largest waste flow in order of magnitude. For the industries NACE 23 (Refineries), NACE 24 (Manufacturing of Chemicals) and NACE 35 (Manufacture of other transport equipment), more heterogeneous waste flows are shown. About one third of these industries waste flow is related to a specific waste fraction, whereas the remaining share is spread over a large number of categories.

Metallic wastes are the largest waste fraction for six of the industry groups in Table 4. In total almost 3 000 000 tonnes (2 965 985 tonnes) of the waste included in the table is metallic waste. If waste from mining and quarrying is excluded from the total, metallic waste represents about 5% of the waste flow.

In the national reporting on waste flows, waste is divided between hazardous and non-hazardous waste. The largest volumes of non-hazardous waste in Sweden 2004 were mining waste 58.4 million tons and wood waste 18.6 million tonnes, of which 15.1 million tones were wood residues from manufacture of wood and wood products (Naturvårdsverket, 2006). If treatment of mining waste is included, 66% of the non-hazardous waste is land filled, see Figure 1a. However, most of the mining waste is put back at the same location as it was excavated. Energy has been used for mining and it is relevant to consider the total amount of material that is necessary in order to obtain the sought-after metals or minerals. If the mineral waste is not included, 9% of the non-hazardous waste generated in 2004 was land filled, see Figure 1b.

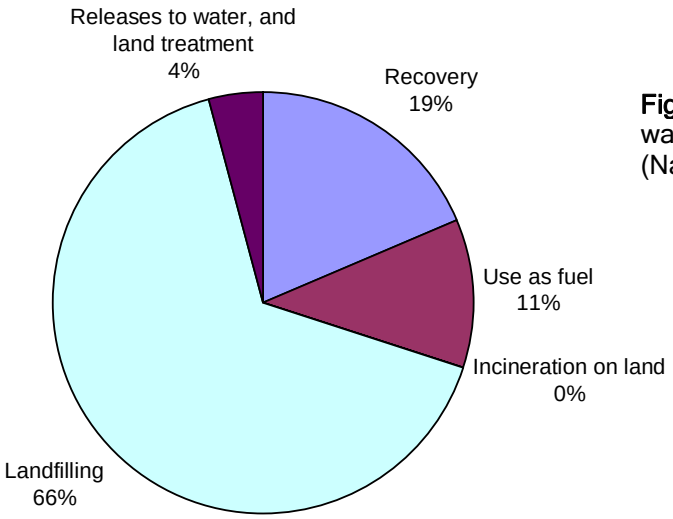

Figure 1a Treatment of non-hazardous waste, including mining waste (Naturvårdsverket, 2006)

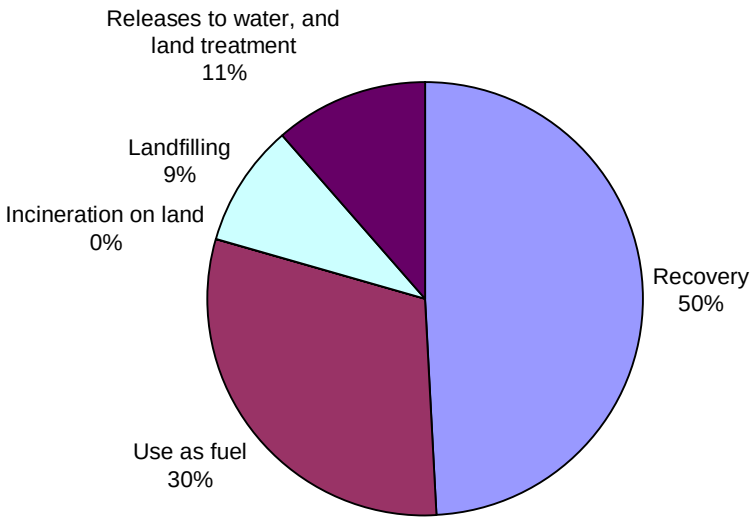

Figure 1b. Treatment of non-hazardous waste, excluding mining wastes (Naturvårdsverket, 2006)

Our initial ambition of this study was relate the material flows per industry with the amount of materials being recycled per industry. However, so far the available statistics on waste management had not made such comparison possible. As mentioned above the classification systems of MFA data and data of waste flows are not yet fully comparable. The level of recycling of materials is though of great interest when analysing national material flows. For future MFA studies new efforts in this field will be taken.

4.4 Key-substances in the material flow

Based on data from the Product Register at the National Chemical Inspectorate we have investigated key substances that contaminate, or may contaminate, the material flows. The total amount of chemical products labelled as dangerous for health (i.e. Very Toxic (T+), Toxic (T), Corrosive (C), Harmful (Xn) and Irritant Xi) amounted to approximately about twelve million tonnes (11 756 953tonnes, Table 5 + the amount of labelled fossil fuels 12 478 076[8]). This is the equivalent to 13% of the total material flow measured as DMI (180 192 727 tonnes).

To some extent chemical indicators were also included in the MFA study of 1987-1998 (Statistics Sweden, 2000). At that time about 20% of the annual flows of natural resources consisted of flows of chemical products labelled as environmental dangerous and/or hazardous to health. The main share of these consisted of petroleum products.

The largest amounts of labelled chemical products (excluding fossil fuels) are found in NACE 24.1 'Manu. of basic chemical products', 'NACE 26 Manu. of other non-metallic mineral products', and NACE 21 'Pulp and paper industry' (Table 5). Together, these three account 50% of the total flow. To what extent the chemical products may risk contaminating the overall material flow is dependent on their intended use. As a first step to link this information to the data on total material flows we have added examples of the field of application for the labeled chemical products per industry in the table. Due to data confidentiality, i.e. as a result of a single manufacturer dominating the industry, examples of function cannot be showed for all industries. As seen in Table 5, raw materials/chemicals used for synthesis is a common field of application in several industries. Since the chemical products in that case are transformed in the manufacturing process, this can lead to application were there is minor risk of finding the chemical product in the final use stage. Other chemical products, might though cause greater risk of contaminate other material flows. Examples hereof are 'Fertilizers' and 'Preservatives for food or feed stock' in the agriculture industry. Chemical products for 'Paint and vanish' and 'solvents', found in several industries, exemplify fields of application that may cause emissions during use, and or waste management.

[8] This figure is the amount of fossil fuels in tonnes for 2002. Due to changes in the method of the energy statistics the data for 2003 and 2004 is not yet available. However, the amount of fossil fuels have been about the same during 1993-2002.

Table 5. Chemical products labelled as dangerous for health (T+, T, C, Xn and Xi), excluding fossil fuels 2004 [tonnes], The column 'Example of field of application' does not show functions in order of size, the total amount per industry includes for most cases more chemical products than those shown, [¨] indicates that the field of application can not be showed due to data confidentiality.

SNI	Type of industry	Tonnes	Example of field of application
01	Agriculture	30 700	Fertilizers; Preservatives for food or feedstock, pH-regulating agents
02	Forestry	219	¨
05	Fishing	15	¨
10-14	Mining and quarrying	44 496	Raw material/Chemicals used for synthesis
15-16	Manu. of food products and beverages	37 872	pH-regulating agents, Raw materials, other, Cleaning/washing agents, other
17-19	Textile and clothing	10 798	Binding agents for paints, adhesives etc.; Colouring agents, other; Tanning agents, other
20	Manu. of wood and products of wood	28 818	Wood preservatives, Paint and varnish
21	Pulp and paper	1 416 486	Raw materials, other
22	Publishing, printing and reproduction	6 097	Solvents, Offset developers
23	Refineries	247 156	Raw material/Chemicals used for synthesis
24.1	Manu. of basic chemicals	2 676 049	Raw material/Chemicals used for synthesis
24.2	Manu. of pesticides	1 028	
24.3	Manu. of paint	99 564	Solvents; Raw materials, other
24.4	Manu. of pharmaceuticals	12 747	Solvents, Raw materials for production of medicament/medicine
24.5,7	Manu. of soap and detergents and synt. fibre	24 587	Surface active agents, other, Solvents
24.6	Manu. of other chemicals and chemical products	122 803	Raw material/Chemicals used for synthesis Explosives, other
25	Manu. of rubber and plastic products	166 485	Raw materials for production of rubber products Raw material/Chemicals used for synthesis
26	Manu. of other non-metallic mineral product	1 920 777	Raw materials for production of glass and ceramics Binding agents, other
27	Manu. of basic metals	302 656	Raw materials for production of metals, Broaching oils
28	Manu. of fabricated metal products, tools	53 852	Binding agents, other Raw materials for production of metals,
29	Manu. of fabricated metal products	3 367	Broaching oils; Degreasers (cold degreasing, dewaxing,de-polishing)
30	Manu. of office machinery and equipment	129	¨
31	Manu. of electrical machinery, radio television	8 554	Electrolytes Paint and varnish
32	Manu. of teleproducts	98	¨
33	Manu. of medical and optical instruments	26	Laboratory chemicals, other Dental products
34-35	Manu. of vehicles, trailers and other transport	11 756	Raw materials for production of plastics Paint and varnish
36-37	Manu. of furniture and recycling	7 451	Paint and varnish
40-41	Electricity and water supply	118 530	Reduction agents; pH-regulating agents

45	Construction	240 973	Cement/concrete/mortar, Filling
50-52	Wholesale and retail trade; repair of goods	189 795	Cleaning/washing agents, other Degreasers (cold degreasing, dewaxing, de-polishing)
55	Hotels and restaurants	4 535	Cleaning/washing agents for washing machines, Cleaning/washing agents, other
60-64	Transport	9 330	Cooling agents
70-74	Houses and Renting companies	6 848	Cleaning/washing agents, other De-icing agents, Washing agents for textile (detergents)
75	Public sector	26 310	"
80-85	Education and health	2 365	Cleaning/washing agents for washing machines, pH-regulating agents
90-95	Other services	227 693	Precipitants, other Flocculating chemicals
S	Unspecified use	0	
Exp	Export	3 695 987	
Total	**Total, incl. exports**	**11 756 953**	
Total	**Total, excl. exports**	**8 060 966**	

4.5 Resource productivity and indirect DMI

In this report, material flows expressed as direct material input DMI per industry have been calculated for the first time for Sweden (Table 6). This makes it possible to connect the data to environmental accounts data, such as emissions and economic data per industry. For a comparison of the major waste categories included per industry see Table 4 above.

As can be seen in Table 6, the use of materials varies largely between different industries. The data are not very easy to interpret as they consists of the inputs of raw materials to the industries as expressed in the monetary product balances of the national accounts. To provide a complete picture there are also finished and semi-finished products as well as some other waste flows which are not seen in this table should be included. This explains why, for NACE industry 10-14 (Mining), there are waste flows which are considerably larger than the minerals presented. Some industries are recorded as not having any fossil fuels because petroleum and diesel used for transportation are regarded as finished products and these flows are, instead, reported in the petroleum industry.

Table 6. Material flows of DMI, waste and chemicals per industry [tonnes]. For an explanation of NACE groups see Appendix G. Value added is included as a reference for the calculations.

NACE	Value Added	DMI Biomass	DMI Fossil Fuels	DMI Minerals	Waste	Chemical
01-05	39 519	4 721 994	530 104	1 416 347	0	30 934
10-14	7 615	0	120 244	1 899 138	58 636 244	44 496
15-16	36 582	5 675 971	0	155 385	1 141 239	37 872
17-19	4 984	24 405	0	10 195	32 232	10 798
20	19 637	4 437 488	1 402	0	15 242 880	28 818
21	31 660	23 189 976	68 213	5 677 922	6 255 575	1 416 486
22	28 141	0	0	0	210 997	6 097
23	2 773	0	20 506 012	215 952	19 178	247 156
24	49 733	187 301	39 492	982 692	305 854	2 936 777
25	12 571	6 833	0	87 054	92 094	166 485
26	10 362	0	202 786	15 361 035	268 308	1 920 777
27	21 534	0	2 212 065	10 185 277	3 610 273	302 656
28	38 438	0	0	569 762	1 361 173	53 852
29	58 138	56	0	229 919	262 663	3 367
30,32-33	50 010	0	0	10 063	0	253
31	11 170	0	0	0	33 003	8 554
34	44 215	0	1 075	130 819	629 881	6 415
35	11 350	0	0	1 572	34 546	5 341
36	9 770	1 928 099	56 096	40 903	88 060	7 325
37	2 025	28	64 510	621 616	884 497	126
40-41	67 859	11 648	2 199 974	1 132 611	2 164 618	118 530
45	101 767	4 003 771	61 705	26 825 987	11 271 506	240 973
51.57	240 286	152 261	0	2 549	214 690	189 795
55-85, 91-99	825 027	1 555 325	0	5 113 238	0	83 007
90	8 898	0	12 622	734 601	11 703 661	194 074
FD	0	11 084 741	451 011	25 280 882	4 831 347	3 695 987
Tot	1734064	56 979 896	26 527 312	96 685 519	119 294 519	11 756 953
Tot DMI			180 192 726			

The detailed data can also be used as input for calculating indirect use of material in the consumption and exports of different product groups, by using input-output techniques. The results of such a calculation are presented in Table 7. The indirect flows of materials show the quantity of raw materials that follow the products to export and the quantity of raw materials that are left in the country, either consumed as products or as waste. The flows included in investments are not calculated. If we consider iron ores, for example we see that 94% of the materials in DMI are exported and 6% are left in the country. For future calculations of the indirect material flows, the share of materials that is imported/exported as raw materials and the share that is included in products will be separated.

Table 7. Indirect Domestic Material Input for Sweden, 2004 [tonnes] [%].

	DMC	DMI	Share of indirect DMI Domestic	Export
Biomass	**54 056 344**	**56 979 896**		
Crops, products of market gardening and horticulture	14 839 766	16 027 576	54%	46%
Hunting	2 576	2 610	82%	18%
Wood and other forestry products	38 986 516	40 498 740	27%	73%
Fish and other fishing products, non cultivated	227 486	450 971	18%	82%
Fossil Fules	**26 359 343**	**26 527 312**		
Hard coal	3 051 851	3 060 529	21%	79%
Lignite	2 263	4 569	13%	87%
Peat	1 931 258	2 088 160	65%	35%
Petroleum, Natural Gas	21 373 971	21 374 055	27%	73%
Minerals	**68 391 235**	**96 685 519**		
Uranium and thorium ores	0	0	70%	30%
Iron ores	5 632 262	22 969 097	6%	94%
Non-ferrous metal ores, except uranium and thorium	2 753 975	5 925 988	29%	71%
Sand and clay	63 416 533	65 751 806	71%	29%
Chemical and fertilizer minerals	717 812	795 241	28%	72%
Salt	927 554	937 911	53%	47%
Other mining and quarrying products n.e.c.	241 214	305 476	27%	73%

The DMI per industry, as well as waste and chemicals data have been used to calculate productivity figures for the different industries, Table 8. These productivity figures can be used as baseline data in coming years, when time series of material flow data will be presented. Making comparisons of industries over the period of one year is not relevant.

Table 8. Productivity per industry for DMI, waste and chemicals, 2004 [SEKm/tonnes]

NACE	DMI Biomass	Fossil Fuels	Minerals	Waste	Chemicals
01-05	0,008369	0,07455	0,027902	-	1,277522
10-14	0	0,063329	0,00401	0,00013	0,171138
15-16	0,006445	0	0,235428	0,032055	0,965941
17-19	0,204222	0	0,488882	0,154629	0,461577
20	0,004425	14,00252	0	0,001288	0,68142
21	0,001365	0,464132	0,005576	0,005061	0,022351
22	0	0	0	0,133372	4,615366
23	0	0,000135	0,012841	0,144593	0,01122
24	0,265525	1,259306	0,050609	0,162604	0,016935
25	1,839654	0	0,144404	0,136501	0,075508
26	0	0,051098	0,000675	0,03862	0,005395
27	0	0,009735	0,002114	0,005965	0,07115
28	0	0	0,067463	0,028239	0,713776
29	1042,059	0	0,252863	0,22134	17,26649
30,32-33	0	0	4,969679	-	197,3765
31	0	0	0	0,338456	1,30583
34	0	41,12829	0,337985	0,070196	6,892752
35	0	0	7,221836	0,328549	2,125109
36	0,005067	0,174167	0,238855	0,110947	1,33382
37	72,59173	0,03139	0,003258	0,002289	16,04227
40-41	5,82592	0,030845	0,059914	0,031349	0,572504
45	0,025418	1,649246	0,003794	0,009029	0,422317
51.57	1,57812	0	94,27891	1,119226	1,266026
55-85, 91-99	0,530453	0	0,161351	-	9,939203
90	0	0,704987	0,012113	0,00076	0,045849

4.6 Assessment of data quality

Even if a quantitative measure of the quality is always wished for, in reality it is often impossible to provide an overall measure for the many different aspects. In addition to the quality of the data sources used, the quality of a material flow account is to a large extent dependent on the methods used for data collection. One approach for increased data quality would thus be to carry out the studies with an established method. As follows the continuously work with national material flow accounts in Sweden from now on will improve the data quality by the means that the same statistical sources and method for aggregation will be used. For international comparisons the introduction of Eurostats standard tables for MFA and the updated version of the methodological guide are parameters that most likely will improve the quality of the results.

5. Conclusions

The work with a MFA data set for Sweden for one specific year, 2004, has generated the possibility to evaluate the methods used for data collection as well as methods for aggregation into MFA categories. The results of the study show that for the majority of material flows of raw materials, it is possible to compile data from existing sources of the Swedish statistical system. The use of CN codes as the basic unit of the data collection enable both data collection and aggregation into material flow categories. Whether this approach would also be feasible when the national material flow accounts are extended to include semi-manufactured and finished products needs further investigation. For instance, when semi-manufactured and finished products are to be aggregated into material flow categories a definition of the materials incorporated has to be done. To what extent this information can be taken from the CN codes is not yet clear.

The results of economy-wide material flow accounts are primarily not as interesting as exact figures on a certain material flow. It is instead the proportions of the flows as well as changes in the flows over time that are of more interest not at least from a policy perspective. On a national level, time series of material flows can likely constitute a base for following the strategy of 'non-toxic resource saving environmental life cycles' (Swedish Government bill 2002/03:117). The knowledge obtained in MFA can also be related to existing national environmental monitoring and work with environmental quality objectives. Internationally, data on material flows can be used to measure progress in efficiency and productivity in the overall use of natural resources.

The Swedish material flows for 2004 presented in this report are divided among the material categories biomass, minerals and fossil fuels in about the same proportions as in a former MFA for Sweden covering 1987-1997 and data for Sweden presented in a summary report on material flows of the EU15. The largest domestic material flows are minerals, mainly construction minerals, followed by iron ores. The flow of biomass in wood is also large. In comparison with the other EU15 countries, this creates a unique situation for Sweden as the only net exporter of raw materials, mainly iron ores and other metals. But, if the exports of mineral are considerable, the situation is about the opposite for fossil fuels with extensive imports of mainly petroleum. For the collection of data on trade in this report, imports and exports were divided between import/export from EU and non-EU countries. In the future this would be extended to include imports/exports divided on all counties. This would provide a valuable base for following changes in trade and the environmental impact thereof. For example, the impact of a decrease in domestic extraction of a material while the imports of products including the same material increase. This information can also be related to the indirect flows of materials. In this report the indirect flows of domestic material input in Sweden has been calculated, i.e. the quantity of raw materials that follow the products to export and the quantity of raw material that is left in the country, either consumed as products or as waste.

The large material flow of iron ores in Sweden are also reflected in the flows of waste. Mineral extraction causes considerable amounts of waste and, if included in the overall amount of waste, other waste categories reduce in significance.

The correlation between the magnitude of the material flows and environmental impact is not self-evident. This is one reason why we searched for data on key-substances; these might be small in amount but have the potential to cause large environmental impact. This is also an area with more direct environmental regulation. In this project, key substances have been defined as chemical products that are classified as hazardous to health. These substances are not included in the data set for the overall material flow, but the account for about 13% of the total material flow. The development of the use of these classified substances per industry and the chemical substances field of application will be continually followed for comparisons with the total material flow.

Data on the accumulation and stock of materials in the economy have not been calculated in this study. For a comprehensive picture of the material flows, not least to understand of the flows of materials to waste management, this is very significant. Data on the stock of materials together with relevant emission factors can also contribute to estimations on diffuse emissions from products in use.

In environmental policy it is essential to connect information from several areas with each other – e.g. for management of natural resources the overall energy consumption is also important. In this report, the material flows expressed as direct material input DMI per industry have been calculated. This is a first step to connect the data set of MFA to the environmental accounts data. By doing this, the overall emissions and economic data per industry could be followed.

For international comparisons on the use of resources a number of MFA indicators are calculated in the report. For both DMC and DMI a decrease in comparison with former MFA studies for Sweden (for the years 1997 and 2001) can be seen. To what extent this is due to differences in the method for data collection in the first place, or if it is an absolute decrease that had occurred, is not clear. As with the situations on the results of the overall material flow, the indicators are more interesting considered as time series. This is especially true for the indicators referring to productivity (e.g. GDP/DMI or value added/DMI per industry).

6. Method development and planned MFA activities

The work with MFA for Sweden restarted at Statistics Sweden in 2006 with a commission from the Swedish Government to develop statistics for material flows based as far as possible on existing statistical sources. This work is underway and a database for Swedish material flows is planed by the end of 2008. The aim of constructing a database for Swedish material flows is to create a tool that can be useful for several actors and purposes, Thus it needs to be possible to aggregate the data in the MFA database per material, per industry and over time (in order to put together time series). It must also be possible to calculate material flow indicators, such as domestic material consumption (DMC) and Domestic Material Input (DMI) for international comparisons should also be possible to calculate from the data in the database.

The starting point for the work with the database is to, as possible, make use of already existing sources of statistics. The work with a data set on Swedish material flows for one specific year, as described in this report, has generated the possibility of analysing the methods used for data collection as well as aggregation into MFA categories. Based on the experiences from this study, a number of subprojects that will be running parallel with the MFA database project have been identified. These projects are of importance for the creation of the database as well as the possibilities of making relevant analysis of the results.

List of sub-projects running in parallel with the construction of a MFA database for Sweden:

- **Extension of included CN codes and level of aggregation for the collection of data.** Based on the up-coming standard tables on MFA from Eurostat, there may be a need for new data to be added to the MFA data set, for example when semi-manufactured products (and eventually also finished products) should be added to the MFA data set. It is also important to consider whether there are certain material flows, that are not included in the standard tables of Eurostat, which would be interesting to follow from a national perspective. An extension of included CN can, for obvious reasons not be done for all CN codes so a selection process of the most important CN codes to quantify will be necessary. This project will be running during the first half of 2007.

- **Estimations of the stock of materials.** This project has only included data on material flows for one year. However, for many material flows a large share of the flow is accumulated in society causing environmental concerns several years later. In order to get a comprehensive picture of the national material flows the stock of materials and the material flows due to investments have to be estimated. This project will be running during Aug 2007 – Aug 2008.

- **Future comparisons of material flows and flows of waste.** In the present study, some first attempts to compare material flows and flows of waste per

industry have been made. But this has only been done partially, because the statistical code systems for material flows (CN codes, CPA) and for waste (EWC-Stat codes) are barely comparable. For improved information on the relationship between the inflow of materials and the materials reaching waste management, the method needs to be improved. One interesting approach is to consider the amount of materials that are recycled and/or reused in relation to the domestic material input. A project on MFA and waste will be running during 2007.

- **Emission from production per industry in relation to material flows.** In this report the material flows of Domestic Material Input (DMI) per industry have been calculated for the first time. This is a first step in integrating the national material flows with other environmental and economical data in the environmental accounts. For the future work on the national material flow accounts, integration should be extended to enhance the analysis of the results of the national material flow accounts. One example of possible analysis would be to study the impact of management strategies such as taxes and subsidies on the material flows. Another interesting issue would be to connect the flows of materials per industry with the companies that are defined part of the environmental industry. One step towards closer integration with the environmental accounts is to include data on emissions from production per industry in relation to the material flows. A project on these issues will be running from 2007 to the beginning of 2008.

- **International reporting on MFA.** As previously mentioned, both Eurostat and OECD are continuously working with methodological guidance and establishing standard tables for member countries in order to improve the national reporting on material flows. Statistics Sweden follows this work and will as far as possible fill in the standard tables suggested by Eurostat. However, Sweden will not balance the calculations with flows of oxygen and water, something that is sometimes suggested.

- **Chemical products' field of application as data source for following key-substances.** This study makes an initial connection of data on the chemical products field of application and the overall material flows per industry. If developed this would enhance the possibilities to follow flows of substances of certain interest by industries and products. If necessary staff resources are available for additional work on this method at the end of 2007.

- **Examples of other areas of interest,** not included as subprojects at this time are; 'Accounting for the flows of packaging materials within the material flow', 'Identifying emissions factors for goods, materials and substances during different phases of their life cycle', 'Detailed analysis of the material flows in some industries (e.g. construction)', 'Disaggregating the data set into local/regional MFAs'.

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8. List of Abbreviations

CN	Combined Nomenclature (>10 000 product groups)
CPA	Classification of Products by Activity
DE	Domestic Extraction
d.m.	dry matter
DMC	Domestic Material Consumption
DMI	Direct Material Input
FAO	Food and Agricultural Organisation of the United Nations
FAOSTAT	FAO Statistical database
HS	Harmonized Commodity Description and Coding Syste)
IFF	Faculty for Interdisciplinary Studies, University of Klagenfurt (Austria)
MIG	Main Industrial Groupings
MIOT	Monetary input-output table
NACE	Classification of Economic Activities in the European Community
NAMEA	National Accounting Matrix including Environmental Accounts
PIOT	Physical input-output table
PTB	Physical Trade Balance
SAM	Social Accounting Matrix
SITC	Standard International Trade Classification
SNI	Svensk Näringsgrensindelning (classification based on NACE)

For more detailed list of terms related to the concept of MFA we refer to an OECD report “Glossary of terms related to material flow analysis and resource productivity” ENV/EPOC/SE/RD(2005)2/REV1

Key CPA – codes and included CN codes

CPA –codes					included CN-codes
Biomass					
Crops, products of market gardening and horticulture					
	01.11	Cereals and other crops n.e.c.			
		01.11.1	Cereals		
			01.11.11	*Durum wheat*	*10011000*
			01.11.12	*Soft wheat and meslin*	*10019010, 10019091, 10019099*
			01.11.13	*Maize (corn)*	*10051011, 10051013, 10051015, 10051019, 10051090, 10059000*
			01.11.14	*Rice, not husked*	*10061010, 10061021, 10061023, 10061025, 10061094, 10061096*
			01.11.15	*Barley*	*10030010, 10030090*
			01.11.16	*Rye, oats*	*10020000, 10040000*
			01.11.17	*Other cereals*	*10070090, 10081000, ,10082000, 10083000, 10089010, 10089090*
		01.11.2	Potatoes; dried leguminous vegetables; edible roots and tubers		
			01.11.21	*Potatoes*	*07011000, 07019010, 07019050, 07019090*
			01.11.22	*Dried leguminous vegetables, shelled*	*07131010, 07131090, 07132000, 07133100, 07133200, 07133310, 07133390, 07133900, 07134000, 07135000,07139000*
			01.11.23	*Edible roots and tubers with high starch or inulin content*	*07141010, 07141091, 07141099, 07142010, 07142090, 07149011, 07149019, 07149090*
		01.11.3	Oil seeds and oleaginous fruits		
			01.11.31	*Soya beans*	*12010010, 12010090*
			01.11.32	*Ground nuts*	*12021090, 12022000*
			01.11.33	*Sunflower, sesamum, safflower, rape, colza and mustard seeds*	*12060010, 12060091, 12060099, 12074090, 12075010, 12075090, 12076090, 12051010, 12051090, 12059000*
			01.11.35	*Oil seeds and oleaginous fruits n.e.c.*	*12030000, 12040010, 12040090, 12079190, 12079920, 12079991, 12079998*
		01.11.4	Unmanufactured tobacco		
			01.11.40	*Unmanufactured tobacco*	*24011010, 24011041, 24011049, 24011050, 24011060, 24011070, 24011090, 24012010, 24012020, 24012041, 24012050, 24012060, 24012070,24012090*
		01.11.5	Plants used for sugar manufacturing		
			01.11.51	*Sugar beet*	*12129120, 12129180*
			01.11.52	*Sugar cane*	*12129920*
		01.11.6	Straw and forage		
			01.11.60	*Straw and forage*	*12130000, 12149010,12149090*
		01.11.7	Raw vegetable materials used in textiles		
			01.11.71	*Cotton, whether or not ginned*	*52010010, 52010090*
			01.11.72	*Jute and other textile bast fibres, except flax, true hemp and ramie*	*53031000*
			01.11.73	*Flax and true hemp; sisal and other textile fibres of the genus Agave, raw*	*53011000, 53021000, 53041000, 53051100*
		01.11.8	Natural rubber		
			01.11.80	*Natural rubber*	*40011000, 40012100, 40012200, 40012900*
		01.11.9	Plants for perfumery, pharmacy and the like; sugar beet seeds, seeds of forage plants; other raw vegetable materials		
			01.11.91	*Plants used primarily in perfumery, in pharmacy, or for insecticidal, fungicidal or similar purposes*	*12111000, 12112000, 12113000, 12114000, 12119030, 12119097*
			01.11.92	*Sugar beet seeds and seeds of forage plants*	*12091000, 12092100, 12092210, 12092280, 12092311, 12092315, 12092380, 12092400, 12092510,*

					12092590, 12092600, 12092910, 12092950, 12092960,12092980
			01.11.93	*Other raw vegetable materials*	*12101000, 12102010, 12102090, 12129980*
	01.12	Vegetables, horticultural specialities and nursery products			
		01.12.1	Other vegetables, fresh or chilled		
			01.12.11	*Root and tuber vegetables*	*07031011, 07031019, 07031090, 07032000, 07039000, 07061000, 07069010, 07069030, 07069090*
			01.12.12	*Vegetables cultivated for their fruits*	*07020000, 07070005, 07070090, 07081000, 07082000, 07089000, 08071100, 08071900*
			01.12.13	*Other vegetables n.e.c.*	*07041000, 07042000, 07049010, 07049090, 07051100, 07051900, 07052100, 07052900, 07091000, 07092000, 07093000, 07094000, 07095100, 07095200, 07095910, 07095930, 07095990, 07096010, 07096091, 07096099, 07097000, 07099010, 07099020, 0709904, 07099050, 07099060, 07099070, 07099090*
		01.12.2	Live plants; cut flowers and flower buds; flower seeds and fruit seeds; vegetable seeds		
			01.12.21	*Live plants; bulbs, tubers and roots; cuttings and slips; mushroom spawn*	*06011010, 06011020, 06011030, 06011040, 06011090, 06012010, 06012030, 06012090, 06021010, 06021090, 06022090, 06023000, 06024010, 06024090, 06029010, 06029020, 06029030, 06029041, 06029045, 06029049, 06029051, 06029059, 06029070, 06029091, 06029099*
			01.12.22	*Cut flowers and flower buds*	*06031010, 06031020, 06031030, 06031040, 06031050, 06031080, 06039000*
			01.12.23	*Flower seeds and fruit seeds*	*12093000, 12099910, 12099991, 12099999*
			01.12.24	*Vegetable seeds*	*12099110, 12099130, 12099190*
	01.13	Fruit, nuts, beverage and spice crops			
		01.13.1	Grapes		*08061010*
				Table grapes	*08061090*
				Other grapes, fresh	
			Other fruit and nuts		
				Dates, figs, bananas, coconuts, Brazil nuts, cashew nuts, pineapples, avocados, mangoes, guavas	*08011100, 08011900, 08012100, 08012200, 08013100, 08013200, 08030011, 08030019, 08030090, 08041000, 08042010, 08042090, 08043000, 08044000, 08045000*
				Citrus fruit	*08051010,08051030,08051050, 08051080, 08052010, 08052030, 08052050, 08052070, 08052090, 08054000, 08055010, 08055090, 08059000*
				Other fruit, locust beans	*08072000, 08081010, 08081020, 08081050, 08081090, 08082010, 08082050, 08082090, 08091000, 08092005, 08092095, 08093010, 08093090, 08094005, 08094090, 08101000, 08102010, 08102090, 08103010, 08103030, 08103090, 08104010, 08104030, 08104050, 08104090, 08105000, 08106000, 08109030, 08109040, 08109095, 12121010., 12121091, 12121099*
				Olives and other nuts	*08021110, 08021190, 08021210, 08021290, 08022100, 08022200, 08023100, 08023200, 08024000, 08025000, 08029020, 08029050, 08029060, 08029085, 07099031*
			Beverage crops		
				Coffee, not roasted, not decaffeinated	*09011100*

				Green tea (not fermented), black tea (fermented) and partly fermented tea, in immediate packings of a content > 3 kg	*09022000, 09024000*
				Maté	*09030000*
				Cocoa beans	*18010000*
			Spices, not processed		
				Spices, not processed	
01.5 +01.25					
			01.25.21	*Natural honey*	*04090000*
			01.25.22	*Snails, live, fresh, chilled, frozen, dried, salted or in brine except sea snails; frogs' legs, fresh, chilled or frozen*	*02082000, 03076000*
			01.25.23	*Edible products of animal origin n.e.c.*	*04100000*
			01.25.24	*Silk-worm cocoons suitable for reeling*	
			01.25.25	*Insect waxes and spermaceti*	*15219010, 15219091,15219099*
	01.50	Hunting, trapping and other gathering			
		01.50.1	Hunting, trapping and other gathering		
	02.01	Wood and other forestry products			
		02.01.1	Wood in the rough		
			02.01.11	*Logs of coniferous wood*	*44032011, 44032019, 44032031, 44032039, 44032091, 44032099*
			02.01.12	*Logs of non-coniferous wood*	*44039951, 44039959, 44039110, 44039190, 44039210, 44039290, 44039930, 44039995*
			02.01.13	*Logs of tropical wood*	*44034100, 44034910, 44034920, 44034940,44034995*
			02.01.14	*Fuel wood*	*44011000*
			02.01.15	*Other wood in the rough, including split poles and pickets*	*44041000, 44042000*
		02.01.2	Natural gums		
			02.01.21	*Balata, gutta-percha, guayula, chicle and similar natural gums*	*40013000*
			02.01.22	*Lac, natural gums, resins, gum-resins and balsams*	*13011000, 13012000, 13019010, 13019090*
		02.01.3	Natural cork, raw or simply prepared		
			02.01.30	*Natural cork, raw or simply prepared*	*40013000*
		02.01.4	Other forestry products		
			02.01.41	*Parts of plants, grasses, mosses and lichens suitable for ornamental purposes*	*06041010, 06041090, 06049121, 06049129, 06049141, 06049149, 06049190, 06049910, 06049990*
			02.01.42	*Vegetable materials n.e.c., for plaiting, stuffing, padding, dyeing or tanning; vegetable products n.e.c.*	*14041000, 14049000, 14011000, 14012000, 14019000, 14020000, 14030000*
	05.00	non-cultivated fish and other fishing products, non cultivated			
		05.00.1	Fish, live, fresh or chilled		
			05.00.11	*Fish, live*	*03011010, 03011090, 03019110, 03019190, 03019200, 03019300, 03019911, 03019919,03019990*
			05.00.12	*Fish, fresh or chilled*	*03021110, 03021120, 03021180, 03021200, 03021900, 03022110, 03022130, 03022190, 03022200, 03022300, 03022990, 03023110, 03023190, 03023210, 03023290, 03023390, 03023510, 03023590, 03023690, 03023990, 03024000, 03025010, 03025090, 03026110, 03026130, 03026180, 03026200, 03026300, 03026400, 03026520, 03026550, 03026590, 03026600, 03026911, 03026919, 03026925, 03026931, 03026933, 03026941, 03026945, 03026951, 03026955, 03026961, 03026966, 03026968, 03026969, 03026975, 03026981, 03026985, 03026987, 03026988, 03026991, 03026994, 03026995,*

					03026999
		05.00.2	Crustaceans, not frozen; oysters; other aquatic invertebrates, live, fresh or chilled		
			05.00.21	*Crustaceans, not frozen*	*03062100, 03062210, 03062291, 03062299, 03062310, 03062331, 03062339, 03062390, 03062430, 03062480, 03062910, 03062930, 03062990*
			05.00.22	*Oysters*	*03071010, 03071090*
			05.00.23	*Other molluscs or shellfish and aquatic invertebrates, live, fresh or chilled*	*03072100, 03073110, 03073190, 03074110, 03074191, 03074199, 03075100, 03079100*
		05.00.3	Other aquatic products		
			05.00.31	*Corals and similar products, shells of molluscs, crustaceans or echinoderms and cuttle-bone*	*05080000*
			05.00.32	*Natural sponges of animal origin*	*05090010, 05090090*
			05.00.33	*Seaweeds and other algae*	*12122000*
		05.00.4	Pearls		
			05.00.41	*Natural pearls, unworked*	*71011000*

CPA –codes					**included CN-codes**
Fossil Fuels					
10.1	**Hard Coal**				
	10.10	Hard Coal			
		10.10.1	Coal		
			10.10.11	*Coal, not agglomerated*	*27011110, 27011190, 27011210, 27011290, 27011900*
			10.10.12	*Briquettes, ovoids and similar solid fuels manufactured from coal*	*27012000*
10.2	**Lignite**				
	10.20	Lignite			
		10.20.1	Lignite		
			10.20.10	*Lignite*	*27021000,27022000*
10.3	**Peat**				
	10.30	Peat			
		10.30.1	Peat		
			10.30.10	*Peat*	*27030000, 27030000*
		11.10.1	Petroleum oils and oils obtained from bituminous minerals, crude		
			11.10.10	*Petroleum oils and oils obtained from bituminous minerals, crude*	*27090010, 27090090*
		11.10.2	Natural gas, liquefied or in gaseous state		
			11.10.20	*Natural gas, liquefied or in gaseous state*	*27111100, 27112100*
		11.10.4	Bituminous or oil shale and tar sands		
			11.10.40	*Bituminous or oil shale and tar sands*	*27141000*
Minerals					
12.0	**Uranium and thorium ores**				
	12.00	Uranium and thorium ores			
		12.00.1	Uranium and thorium ores		
			12.00.10	*Uranium and thorium ores*	*26121090*
13.1	**Iron ores**				
	13.10	Iron ores			
		13.10.1	Iron ores		
			13.10.10	*Iron ores*	*26011100, 26011200*
13.2	**Non-ferrous metal ores, except uranium and thorium ores**				
	13.20	Non-ferrous metal ores, except uranium and thorium ores			
		13.20.1	Non-ferrous metal ores, except uranium and thorium ores		
			13.20.11	*Copper ores and concentrates*	*26030000*

			13.20.12	*Nickel ores and concentrates*	*26040000*
			13.20.13	*Aluminium ores and concentrates*	*26060000*
			13.20.14	*Precious metal ores and concentrates*	*26161000, 26169000*
			13.20.15	*Lead, zinc and tin ores and concentrates*	*26070000, 26080000, 26090000*
			13.20.16	*Other non-ferrous metal ores and concentrates*	*26020000, 26050000, 26100000, 26110000, 26131000, 26139000, 26140010, 26140090, 26151000, 26171000, 26179000*
	14.11	Ornamental or building stone			
		14.11.1	Ornamental or building stone		
			14.11.11	*Marble and other calcareous ornamental or building stone*	*25151100, 25151220, 25151250, 25151290, 25152000*
			14.11.12	*Granite, sandstone and other ornamental or building stone*	*25161100, 25161210, 25161290, 25162100, 25162200,25169000*
	14.12	Limestone, gypsum and chalk			
		14.12.1	Limestone and gypsum		
			14.12.10	*Limestone and gypsum*	*25201000, 25210000*
		14.12.2	Chalk and dolomite		
			14.12.20	*Chalk and dolomite*	*25090000, 25181000, 25182000, 25183000*
	14.13	Slate			
		14.13.1	Slate		
			14.13.10	*Slate*	*25140000*
14.2	**Sand and clay**				
		14.21.1	Gravel and sand		
			14.21.11	*Natural sands*	*25051000, 25059000*
			14.21.12	*Granules, chippings and powder; pebbles, gravel*	*25081000, 25082000, 25083000, 25084000, 25085000, 25087000*
			14.21.13	*Macadam; tarred macadam*	*25172000, 25173000*
	14.22	Clays and kaolin			
		14.22.1	Clays and kaolin		
			14.22.11	*Kaolin and other kaolinic clays*	*25070020, 25070080*
			14.22.12	*Other clays, andalusite, kyantite and sillimanite; mullite; chamotte or dinas earths*	*25081000, 25082000, 25083000, 25084000, 25085000, 25087000*
14.3	**Chemical and fertilizer minerals**				
	14.30	Chemical and fertilizer minerals			
		14.30.1	Chemical and fertilizer minerals		
			14.30.11	*Natural calcium or aluminium calcium phosphates; carnallite, sylvite, other crude natural potassium salts*	*25101000, 25102000, 31041000*
			14.30.12	*Unroasted iron pyrites; crude or unrefined sulphur*	*25020000, 25030010*
			14.30.13	*Other chemical minerals*	*25111000, 25112000, 25281000, 25289000, 25292100, 25292200, 25302000, 25309020, 25309098*
14.4	**Salt**				
	14.40	Salt			
		14.40.1	Salt and pure sodium chloride		
			14.40.10	*Salt and pure sodium chloride*	*25010010, 25010031, 25010051, 25010091, 25010099*
14.5	**Other mining and quarrying products n.e.c.**				
	14.50	Other mining and quarrying products n.e.c.			
		14.50.1	Bitumen and asphalt, natural; asphaltites and asphaltic rock		
			14.50.10	*Bitumen and asphalt, natural; asphaltites and asphaltic rock*	*27149000*
		14.50.2	Precious and semi-precious stones; pumice stone; emery; natural abrasives; other minerals n.e.c.		
			14.50.21	*Precious and semi-precious stones (excluding industrial diamonds), unworked or simply sawn or roughly shaped*	*71021000, 71031000*
			14.50.22	*Industrial diamonds; pumice stone; emery; natural corundum, natural garnet and other natural abrasives*	*25131100, 25131900, 25132000, 71022100*

			14.50.23	*Other minerals n.e.c.*	*25041000, 25049000, 25061000, 25062100, 25062900, 25120000, 25191000, 25199010, 25199030, 25199090, 25251000, 25252000, 25261000, 25262000, 25291000, 25293000, 25301010, 25301090, 26211000, 26219000*

1. Calculated gross felling by assortments. m3 solid volume under bark milj.m3f ub millions Sweden, 2002-2004. Source: Swedish Forest Agency, Analysis Division

	2002	2003	2004
Coniferous sawlogs [1]	33,5	34,4	35,6
Broad-leaved sawlog	0,3	0,3	0,3
Coniferous and broad-leaved pulpwood	26,4	26,5	27,8
Fuel wood of steam wood [2],[4]	5,9	5,9	5,9
Other round wood [3]	0,5	0,5	0,5
Total net felling	**66,6**	**67,6**	**70,1**

[1] Includes beams, framing lumber, sleepers & veneers of coniferous wood.
[2] Refers primarily to forest fuel only of steam wood.
[3]. Utility poles, posts, charcoal wood, matchsticks and veneers of non-coniferous wood; also, props, mining timber, and lumber for farm use excl. saw logs.
[4]. Fuel wood figures for 1998 adjusted upward, on basis of data from Forest Impact Analyses 1999.

2. milj. m³sk, millions m3 standing volume Source: Swedish Forest Agency, Analysis Division

.	2002	2003	2004
Total net fellings	79,9	81,1	84,1
Cut whole trees left in the forest [5]	2,5	2,6	2,7
Grossfellings	82,4	83,7	86,8

[5] Fuel wood figures for 1998 adjusted upward, on basis of data from Forest Impact Analyses 1999

3. From Nylinder, M. (1979) - Conversion factors Fuel wood Oil, The Swedish University of Agricultural Sciences, Department of Forest Products, Report 110 (In Swedish)

Rådensitet = Vedens råa massa i relation till dess råa volym.		
Torr-rådensitet=100Fukthalt% *Rådensitet		
Rådensitet kg/m3 stamved under bark (m3 f ub)		
Tall	900-1000	kg/m3 f ub
Gran	800-1000	kg/m3 f ub
Björk	825-950	kg/m3 f ub
Barrmassaved	590	kg/m3 f ub
Lövmassaved	660	kg/m3 f ub

4. Calculations for 2004

	%	m3sk	m3 f ub[9]	million kg Based on the densities in Nylinder (1979)	"Water free wood", million kg The water content of raw timer is estimated to 50%	Tonnes With 15% moister content, c.f. Eurostat 2001
Coniferous sawlogs	50,8	44,08	37,028	33325,26	16662,63	19162022,48
Broad-leaved sawlog	0,4	0,371	0,312	273,03	136,51	156992,2254
Coniferous and broad-leaved pulpwood	39,7	34,422	28,915	17059,95	8529,97	9809472,308
Fuel wood of steam wood	8,4	7,305	6,137	3620,64	1810,32	2081866,425
Other round wood	0,7	0,619	0,520	468,05	234,03	269129,5292
Total net felling	100	86,8	72,9	54746,9	27373,46	31479482,97

[9] 1 m3sk = 0,84 m3f ub (avarage)

Domestic Extraction – MFA for Sweden 2004

Table C1. Domestic Extraction in Sweden 2004 [tonnes] cf. Appendix D for a detailed material categories.

Material Flows	Tonnes
BIOMASS	
Crops, products of market gardening and horticulture	**14 527 432**
Cereals and other crops n.e.c.	14 236 500
Cereals	5 507 800
Potatoes; dried leguminous vegetables; edible roots and tubers	1 082 300
Oil seeds and oleaginous fruits	239 100
Unmanufactured tobacco	0
Plants used for sugar manufacturing	2 287 100
Straw and forage	5 042 200
Raw vegetable materials used in textiles	0
Natural rubber	0
Plants for perfumery, pharmacy and the like; sugar beet seeds, seeds of forage plants; other raw vegetable materials	78 000
Vegetables, horticultural specialities and nursery products	267 118
Other vegetables, fresh or chilled	267 118
Live plants; cut flowers and flower buds; flower seeds and fruit seeds; vegetable seeds	0
Fruit, nuts, beverage and spice crops	23 814
Grapes	0
Other fruit and nuts	23 814
Beverage crops	0
Spices, not processed	0
Hunting, trapping and other gathering	**no data**
Wood and other forestry products	**31 479 483**
Wood in the rough	31 479 483
Natural gums	0
Natural cork, raw or simply prepared	0
Other forestry products	0
"Non-cultivated" fish and other fishing products, non cultivated	**278 057**
Fish, live, fresh or chilled	269 240
Crustaceans, not frozen; oysters; other aquatic invertebrates, live, fresh or chilled	8 817
Other aquatic products	-
Pearls	-
FOSSIL FUELS	
Hard Coal	**3 238**
Hard Coal	3 238
Coal	3 238
Lignite	**0**
Lignite	0
Lignite	0
Peat	**1 662 546**
Peat	1 662 546
Peat	1 662 546
Petroleum oils and oils obtained from bituminous minerals, crude	0
Natural gas, liquefied or in gaseous state	5 430
Bituminous or oil shale and tar sands	0

MINERALS	
Uranium and thorium ores	**0**
Uranium and thorium ores	0
Iron ores	**22 866 996**
Iron ores	22 866 996
Iron ores	22 866 996
Non-ferrous metal ores, except uranium and thorium ores	**4 315 295**
Non-ferrous metal ores, except uranium and thorium ores	751 358
Non-ferrous metal ores, except uranium and thorium ores	751 358
Ornamental or building stone	143 276
Ornamental or building stone	143 276
Limestone, gypsum and chalk	3 406 197
Limestone and gypsum	3 168 229
Chalk and dolomite	237 968
Slate	14 464
Slate	14 464
Sand and clay	**63 802 656**
Gravel and sand	63 659 852
Clays and kaolin	142 804
Chemical and fertilizer minerals	**275 651**
Chemical and fertilizer minerals	275 651
Salt	**625**
Salt	625
Other mining and quarrying products n.e.c.	**126 182**
Other mining and quarrying products n.e.c.	126 182
Bitumen and asphalt, natural; asphaltites and asphaltic rock	0
Precious and semi-precious stones; pumice stone; emery; natural abrasives; other minerals n.e.c.	126 182

Import – MFA for Sweden 2004

Table C2. Import of biomass, fossil fuels and minerals in Sweden 2004, cf. Appendix D for detailed material categories.

Material Flows	Tonnes
BIOMASS	
Crops, products of market gardening and horticulture	**1 500 144**
Cereals and other crops n.e.c.	414 277
Cereals	141 091
Potatoes; dried leguminous vegetables; edible roots and tubers	80 491
Oil seeds and oleaginous fruits	173 207
Unmanufactured tobacco	2 381
Plants used for sugar manufacturing	2 418
Straw and forage	1 286
Raw vegetable materials used in textiles	1 119
Natural rubber	8 398
Plants for perfumery, pharmacy and the like; sugar beet seeds, seeds of forage plants; other raw vegetable materials	3 886
Vegetables, horticultural specialities and nursery products	391 086
Other vegetables, fresh or chilled	326 909
Vegetables cultivated for their fruits	142 181
Other vegetables n.e.c.	128 167
Live plants; cut flowers and flower buds; flower seeds and fruit seeds; vegetable seeds	64 177
Fruit, nuts, beverage and spice crops	694 781
Grapes	23 654
Other grapes, fresh	2 342
Other fruit and nuts	579 865
Beverage crops	91 262
Spices, not processed	0
Hunting, trapping and other gathering	**2 610**
Wood and other forestry products	**9 019257**
Wood in the rough	9 000 856
Natural gums	915
Natural cork, raw or simply prepared	0
Other forestry products	17 486
“Non cultivated" fish and other fishing products, non cultivated	**172 914**
Fish, live, fresh or chilled	162 698
Crustaceans, not frozen; oysters; other aquatic invertebrates, live, fresh or chilled	6 091
Other aquatic products	4 125
Pearls	0
FOSSIL FUELS	
Hard Coal	**3 057 291**
Hard Coal	3 057 291
Coal	3 057 291
Lignite	**4 569**
Lignite	4 569
Peat	**425 613**
Peat	425 613
Petroleum oils and oils obtained from bituminous minerals, crude	20 505 743
Natural gas, liquefied or in gaseous state	862 740
Bituminous or oil shale and tar sands	142
MINERALS	
Uranium and thorium ores	**..**
Uranium and thorium ores	..

Uranium and thorium ores	..
Iron ores	**102 101**
Iron ores	102 101
Iron ores	102 101
Non-ferrous metal ores, except uranium and thorium ores	**1 610 693**
Non-ferrous metal ores, except uranium and thorium ores	867 678
Non-ferrous metal ores, except uranium and thorium ores	867 678
Ornamental or building stone	22 706
Ornamental or building stone	22 706
Limestone, gypsum and chalk	719 267
Limestone, gypsum and chalk	458 765
Chalk and dolomite	260 503
Slate	1 042
Slate	1 042
Sand and clay	**1 949 150**
Gravel and sand	1 385 783
Clays and kaolin	563 366
Chemical and fertilizer minerals	**519 590**
Chemical and fertilizer minerals	519 590
Salt	**937 287**
Salt	937 287
Other mining and quarrying products n.e.c.	**179 294**
Other mining and quarrying products n.e.c.	179 294
Bitumen and asphalt, natural; asphaltites and asphaltic rock	3 086
Precious and semi-precious stones; pumice stone; emery; natural abrasives; other minerals n.e.c.	176 208

Export – MFA for Sweden

Table C3. Export of biomass, fossil fuels and minerals in Sweden 2004, cf. Annex X for a detailed presentation, tonnes.

Material Flows	Tonnes
BIOMASS	
Crops, products of market gardening and horticulture	1 187 809
Cereals and other crops n.e.c.	1 111 317
Cereals	1 055 309
Potatoes; dried leguminous vegetables; edible roots and tubers	20 469
Oil seeds and oleaginous fruits	7 253
Unmanufactured tobacco	11
Plants used for sugar manufacturing	20
Straw and forage	24 663
Raw vegetable materials used in textiles	34
Natural rubber	892
Plants for perfumery, pharmacy and the like; sugar beet seeds, seeds of forage plants; other raw vegetable materials	2 665
Vegetables, horticultural specialities and nursery products	17 807
Other vegetables, fresh or chilled	14 423
Live plants; cut flowers and flower buds; flower seeds and fruit seeds; vegetable seeds	3 384
Fruit, nuts, beverage and spice crops	58 685
Grapes	920
Other fruit and nuts	57 512
Beverage crops	253
Spices, not processed	0
Hunting, trapping and other gathering	34
Wood and other forestry products	1 512 224
Wood in the rough	1 511 409
Natural gums	390
Natural cork, raw or simply prepared	0
Other forestry products	426
"Non-cultivated " fish and other fishing products, non cultivated	223 484
Fish, live, fresh or chilled	221 285
Crustaceans, not frozen; oysters; other aquatic invertebrates, live, fresh or chilled	2 160
Other aquatic products	40
Pearls	0
FOSSIL FUELS	
Hard Coal	8 677
Hard Coal	8 677
Coal	8 677
Lignite	2 306
Lignite	2 306
Lignite	2 306
Peat	156 901
Peat	156 901
Peat	156 901
Petroleum oils and oils obtained from bituminous minerals, crude	84
Natural gas, liquefied or in gaseous state	0
Bituminous or oil shale and tar sands	0

MINERALS	
Uranium and thorium ores	**0**
Uranium and thorium ores	0
Uranium and thorium ores	0
Iron ores	**17 336 835**
Iron ores	17 336 835
Iron ores	17 336 835
Non-ferrous metal ores, except uranium and thorium ores	**3 172 013**
Non-ferrous metal ores, except uranium and thorium ores	439 473
Non-ferrous metal ores, except uranium and thorium ores	439 473
Ornamental or building stone	322 505
Ornamental or building stone	322 505
Limestone, gypsum and chalk	2 405 363
Limestone and gypsum	2 371 368
Chalk and dolomite	33 994
Slate	4 673
Slate	4 673
Sand and clay	**2 335 273**
Gravel and sand	2 293 746
Clays and kaolin	41 527
Chemical and fertilizer minerals	**77 429**
Chemical and fertilizer minerals	77 429
Salt	**10 357**
Salt	10 357
Other mining and quarrying products n.e.c.	**64 262**
Other mining and quarrying products n.e.c.	64 262
Bitumen and asphalt, natural; asphaltites and asphaltic rock	105
Precious and semi-precious stones; pumice stone; emery; natural abrasives; other minerals n.e.c.	64 157

Table D1. Detailed MFA for Sweden 2004 in CPA codes, Domestic Extraction, Import and Export of raw materials, [tonnes].

Biomass					Domestic	Import	Export
01.1	Crops, products of market gardening and horticulture				14 527 432	1 500 144	1 187 809
	01.11	Cereals and other crops n.e.c.			14 236 500	414 277	1 111 317
		01.11.1	Cereals		5 507 800	141 091	1 055 309
			01.11.11	Durum wheat	0	14 538	0
			01.11.12	Soft wheat and meslin	2 412 300	24 006	456 429
			01.11.13	Maize (corn)	no data	7 214	119
			01.11.14	Rice, not husked	0	12	1
			01.11.15	Barley	1 691 900	66 047	168 339
			01.11.16	Rye, oats	1 058 700	11 616	400 481
			01.11.17	Other cereals	344 900	17 657	29 940
		01.11.2	Potatoes; dried leguminous vegetables; edible roots and tubers		1 082 300	80 491	20 469
			01.11.21	Potatoes	980 500	73 445	10 820
			01.11.22	Dried leguminous vegetables, shelled	101 800	6 057	9 628
			01.11.23	Edible roots and tubers with high starch or inulin content	0	989	21
		01.11.3	Oil seeds and oleaginous fruits		239 100	173 207	7 253
			01.11.31	Soya beans	0	2 497	22
			01.11.32	Ground nuts	0	904	81
			01.11.33	Sunflower, sesamum, safflower, rape, colza and mustard seeds	227 500	160 745	1 398
			01.11.35	Oil seeds and oleaginous fruits n.e.c.	11 600	9 061	5 753
		01.11.4	Unmanufactured tobacco		0	2 381	11
			01.11.40	Unmanufactured tobacco	0	2 381	11
		01.11.5	Plants used for sugar manufacturing		2 287 100	2 418	20
			01.11.51	Sugar beet	2 287 100	2 417	20
			01.11.52	Sugar cane	0	1	0
		01.11.6	Straw and forage		5 042 200	1 286	24 663
			01.11.60	Straw and forage	5 042 200	1 286	24 663
		01.11.7	Raw vegetable materials used in textiles		0	1 119	34
			01.11.71	Cotton, whether or not ginned	0	1 023	34
			01.11.72	Jute and other textile bast fibres, except flax, true hemp and ramie	0	0	0
			01.11.73	Flax and true hemp; sisal and other textile fibres	0	95	0

					Domestic	Import	Export
		01.11.8	Natural rubber		0	8 398	892
			01.11.80	Natural rubber	0	8 398	892
		01.11.9	Plants for perfumery, pharmacy and the like; sugar beet seeds, seeds of forage plants; other raw vegetable materials		78 000	3 886	2 665
			01.11.91	Plants used primarily in perfumery, in pharmacy, or for insecticidal, fungicidal or similar purposes	0	722	101
			01.11.92	Sugar beet seeds and seeds of forage plants	7 400	2 992	2 559
			01.11.93	Other raw vegetable materials	70 600	171	4
	01.12	Vegetables, horticultural specialities and nursery products			267 118	391 086	17 807
		01.12.1	Other vegetables, fresh or chilled		267 118	326 909	14 423
			01.12.11	Root and tuber vegetables	157 210	56 561	1 203
			01.12.12	Vegetables cultivated for their fruits	56 683	142 181	4 143
			01.12.13	Other vegetables n.e.c.	53 225	128 167	9 077
		01.12.2	Live plants; cut flowers and flower buds; flower seeds and fruit seeds; vegetable seeds		0	64 177	3 384
			01.12.21	Live plants; bulbs, tubers and roots; cuttings and slips; mushroom spawn	0	54 759	2 638
			01.12.22	Cut flowers and flower buds	0	8 973	102
			01.12.23	Flower seeds and fruit seeds	0	236	299
			01.12.24	Vegetable seeds	0	209	346
	01.13	Fruit, nuts, beverage and spice crops			23 814	694 781	58 685
		01.13.1	Grapes		0	23 654	920
				Table grapes	0	21 313	740
				Other grapes, fresh	0	2 342	180
			Other fruit and nuts		23 814	579 865	57 512
				Dates, figs, bananas, coconuts, Brazil nuts, cashew nuts, pineapples, avocados, mangoes, guavas	0	228 228	45 310
				Citrus fruit	0	153 827	5 271
				Other fruit, locust beans	23 814	191 475	6 564
				Olives and other nuts	0	6 334	368
			Beverage crops		0	91 262	253
				Coffee, not roasted, not decaffeinated	0	90 543	145
				Green tea (not fermented), black tea (fermented) and partly fermented tea, in immediate packings of a content > 3 kg	0	667	107

					Domestic	Import	Export
				Maté	0	6	0
				Cocoa beans	0	45	0
			Spices, not processed		0	0	0
				Spices, not processed	0	0	0
01.5 +01.25					no data	2 610	0
			01.25.21	Natural honey	no data	2 582	28
			01.25.22	Snails, live, fresh, chilled, frozen, dried, salted or in brine except sea snails; frogs' legs, fresh, chilled or frozen	no data	2	1
			01.25.23	Edible products of animal origin n.e.c.	no data	1	3
			01.25.24	Silk-worm cocoons suitable for reeling	no data		
			01.25.25	Insect waxes and spermaceti	no data	24	1
	01.50	Hunting, trapping and other gathering			no data		34
		01.50.1	Hunting, trapping and other gathering		no data		34
	02.01	Wood and other forestry products			31 479 483	9 019 257	1 512 224
		02.01.1	Wood in the rough		31 479 483	9 000 856	1 511 409
			02.01.11	Logs of coniferous wood	19 162 022	4 649 269	1 457 857
			02.01.12	Logs of non-coniferous wood	156 992	4 152 454	25 672
			02.01.13	Logs of tropical wood	0	2 442	87
			02.01.14	Fuel wood	2 081 866	190 351	26 609
			02.01.15	Other wood in the rough, including split poles and pickets	10 078 602	6 340	1 183
		02.01.2	Natural gums		0	915	390
			02.01.21	Balata, gutta-percha, guayula, chicle and similar natural gums	0	176	382
			02.01.22	Lac, natural gums, resins, gum-resins and balsams	0	739	8
		02.01.3	Natural cork, raw or simply prepared		0	0	0
			02.01.30	Natural cork, raw or simply prepared	0	0	0
		02.01.4	Other forestry products		0	17 486	426
			02.01.41	Parts of plants, grasses, mosses and lichens suitable for ornamental purposes	0	2 386	336
			02.01.42	Vegetable materials n.e.c., for plaiting, stuffing, padding, dyeing or tanning; vegetable products n.e.c.	0	15 099	90
	05.00	non-cultivated fish and other fishing products, non cultivated			278 057	172 914	223 484
		05.00.1	Fish, live, fresh or chilled		269 240	162 698	221 285
			05.00.11	Fish, live	no data	258	586

					Domestic	Import	Export
			05.00.12	Fish, fresh or chilled	no data	162 440	220 699
		05.00.2	Crustaceans, not frozen; oysters; other aquatic invertebrates, live, fresh or chilled		8 817	6 091	2 160
			05.00.21	Crustaceans, not frozen	no data	4 240	343
			05.00.22	Oysters	no data	54	2
			05.00.23	Other molluscs or shellfish and aquatic invertebrates, live, fresh or chilled	no data	1 797	1 814
		05.00.3	Other aquatic products		no data	4 125	40
			05.00.31	Corals and similar products, shells of molluscs, crustaceans or echinoderms and cuttle-bone		3 951	14
			05.00.32	Natural sponges of animal origin	no data	12	0
			05.00.33	Seaweeds and other algae	no data	162	26
		05.00.4	Pearls		0	0	0
			05.00.41	Natural pearls, unworked	0	0	0

Table D1. Detailed MFA for Sweden 2004 in CPA codes, Domestic Extraction, Import and Export of raw materials, [tonnes].

Fossil Fuels							0
10.1	Hard Coal				3 238	3 057 291	8 677
	10.10	Hard Coal			3 238	3 057 291	8 677
		10.10.1	Coal		3 238	3 057 291	8 677
			10.10.11	Coal, not agglomerated	0	3 057 255	8 676
			10.10.12	Briquettes, ovoids and similar solid fuels manufactured from coal	3 238	36	2
10.2	Lignite				0	4 569	2 306
	10.20	Lignite			0	4 569	2 306
		10.20.1	Lignite		0	4 569	2 306
			10.20.10	Lignite	0	4 569	2 306
10.3	Peat				1 662 546	425 613	156 901
	10.30	Peat			1 662 546	425 613	156 901
		10.30.1	Peat		1 662 546	425 613	156 901
			10.30.10	Peat	1 662 546	425 613	156 901
		11.10.1	Petroleum oils and oils obtained from bituminous minerals, crude		0	20 505 743	84
			11.10.10	Petroleum oils and oils obtained from bituminous minerals, crude	0	20 505 743	84
		11.10.2	Natural gas, liquefied or in gaseous state		5 430	862 740	0
			11.10.20	Natural gas, liquefied or in gaseous state	5 430	862 740	0
		11.10.4	Bituminous or oil shale and tar sands		0	142	0
					Domestic	**Import**	**Export**
			11.10.40	Bituminous or oil shale and tar sands	0	142	0

Table D1. Detailed MFA for Sweden 2004 in CPA codes, Domestic Extraction, Import and Export of raw materials, [tonnes].

Minerals							
12.0	Uranium and thorium ores				0	0	0
	12.00	Uranium and thorium ores			0	0	0
		12.00.1	Uranium and thorium ores		0	0	0
			12.00.10	Uranium and thorium ores	0	0	0
13.1	Iron ores				22 866 996	102 101	17 336 835
	13.10	Iron ores			22 866 996	102 101	17 336 835
		13.10.1	Iron ores		22 866 996	102 101	17 336 835
			13.10.10	Iron ores	22 866 996	102 101	17 336 835
13.2	Non-ferrous metal ores, except uranium and thorium ores				4 315 295	1 610 693	3 172 013
	13.20	Non-ferrous metal ores, except uranium and thorium ores			751 358	867 678	439 473
		13.20.1	Non-ferrous metal ores, except uranium and thorium ores		751 358	867 678	439 473
			13.20.11	Copper ores and concentrates	300 469	332 183	29
			13.20.12	Nickel ores and concentrates	0	18	0
			13.20.13	Aluminium ores and concentrates	0	28 758	29
			13.20.14	Precious metal ores and concentrates	1	893	712
			13.20.15	Lead, zinc and tin ores and concentrates	450 888	25 506	438 687
			13.20.16	Other non-ferrous metal ores and concentrates	0	480 320	16
	14.11	Ornamental or building stone			143 276	22 706	322 505
		14.11.1	Ornamental or building stone		143 276	22 706	322 505
			14.11.11	Marble and other calcareous ornamental or building stone	13	7 689	182
			14.11.12	Granite, sandstone and other ornamental or building stone	143 263	15 017	322 322
	14.12	Limestone, gypsum and chalk			3 406 197	719 267	2 405 363
		14.12.1	Limestone and gypsum		3 168 229	458 765	2 371 368
			14.12.10	Limestone and gypsum	3 168 229	458 765	2 371 368
		14.12.2	Chalk and dolomite		237 968	260 503	33 994
			14.12.20	Chalk and dolomite	237 968	260 503	33 994
	14.1	Slate			14 464	1 042	4 673

	3						
		14.13.1	Slate		14 464	1 042	4 673
			14.13.10	Slate	14 464	1 042	4 673
					Domestic	**Import**	**Export**
14.2	Sand and clay				63 802 656	1 949 150	2 335 273
		14.21.1	Gravel and sand		63 659 852	1 385 783	2 293 746
			14.21.11	Natural sands	1 383 727	678 070	133 447
			14.21.12	Granules, chippings and powder; pebbles, gravel	62 122 528	706 902	2 131 301
			14.21.13	Macadam; tarred macadam	153 597	811	28 997
	14.22	Clays and kaolin			142 804	563 366	41 527
		14.22.1	Clays and kaolin		142 804	563 366	41 527
			14.22.11	Kaolin and other kaolinic clays	130 304	452 223	15 553
			14.22.12	Other clays, andalusite, kyantite and sillimanite; mullite; chamotte or dinas earths	12 500	111 143	25 974
14.3	Chemical and fertilizer minerals				275 651	519 590	77 429
	14.30	Chemical and fertilizer minerals			275 651	519 590	77 429
		14.30.1	Chemical and fertilizer minerals		275 651	519 590	77 429
			14.30.11	Natural calcium or aluminium calcium phosphates; carnallite, sylvite, other crude natural potassium salts	0	129	5
			14.30.12	Unroasted iron pyrites; crude or unrefined sulphur	0	59 208	129
			14.30.13	Other chemical minerals	275 651	460 252	77 295
14.4	Salt				625	937 287	10 357
	14.40	Salt			625	937 287	10 357
		14.40.1	Salt and pure sodium chloride		625	937 287	10 357
			14.40.10	Salt and pure sodium chloride	625	937 287	10 357
14.5	Other mining and quarrying products n.e.c.				126 182	179 294	64 262
	14.50	Other mining and quarrying products n.e.c.			126 182	179 294	64 262
		14.50.1	Bitumen and asphalt, natural; asphaltites and asphaltic rock		0	3 086	105
			14.50.10	Bitumen and asphalt, natural; asphaltites and asphaltic rock	0	3 086	105
		14.50.2	Precious and semi-precious stones; pumice stone; emery; natural abrasives; other minerals n.e.c.		126 182	176 208	64 157
			14.50.21	Precious and semi-precious stones (excluding industrial	0	5	0

				diamonds), unworked or simply sawn or roughly shaped			
			14.50.22	Industrial diamonds; pumice stone; emery; natural corundum, natural garnet and other natural abrasives	0	4 669	141
			14.50.23	Other minerals n.e.c.	126 182	171 534	64 015

Table E1. MFA Data for Sweden 1987-1997, (Statistics Sweden, 2000 and Isacsson et al. 200), thousand tonnes

Domestic production	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Non- renewables											
Fossil fuels											
Solid	357	955	1 011	986	814	1 027	523	1 113	792	684	1 020
Liquid	4	2	3	3	3	1	0	5	3	0	0
Gaseous	0	0	0	0	0	0	0	0	0	0	0
	361	**957**	**1 014**	**989**	**817**	**1 028**	**523**	**1 118**	**795**	**684**	**1 020**
Ores											
Iron ore	22 474	22 042	23 907	21 222	20 962	21 234	20 605	22 149	23 682	23 766	24 018
Non- iron ores	18 634	17 599	18 259	18 566	20 634	22 165	22 333	22 801	24 226	24 917	23 895
	41 108	**39 641**	**42 166**	**39 788**	**41 596**	**43 399**	**42 938**	**44 950**	**47 908**	**48 683**	**47 913**
Industrial minerals											
Industrial minerals	3 651	4 076	4 266	4 982	4 727	4 453	4 106	4 916	5 145	5 062	5 529
Peat for agricultural use	230	233	236	238	236	270	275	320	317	325	361
	3 881	**4 309**	**4 502**	**5 220**	**4 963**	**4 723**	**4 381**	**5 236**	**5 462**	**5 387**	**5 890**
Construction minerals											
Sand and gravel	63 800	63 500	70 700	69 800	63 300	53 100	51 895	43 492	44 554	33 349	26 270
Crushed stone	18 400	20 900	23 400	25 100	24 900	22 600	25 962	28 592	32 348	30 714	28 988
Morain and other	3 400	3 600	4 700	5 100	4 500	5 800	7 800	10 400	10 300	6 300	6 300
Limestones for cement	3 271	3 651	3 821	4 540	4 402	4 352	4 116	4 520	4 989	4 798	4 516
Natural stones	200	200	200	210	240	120	126	136	160	182	155
Slab of stone	30	30	30	30	30	33	33	28	30	60	60
	89 101	**91 881**	**102 851**	**104 780**	**97 372**	**86 005**	**89 932**	**87 168**	**92 381**	**75 403**	**66 289**
Renewables											
Raw material for food production											
Fodder for beef	6 578	6 561	6 652	6 789	6 571	6 810	6 829	6 831	6 723	6 733	6 743
Fodder for pork	589	595	588	590	577	593	589	681	686	727	724
Fodder for eggproduction	283	285	290	283	246	253	246	237	242	253	246
Fodder for poultry	20	20	22	23	26	32	32	38	41	43	43
Lamb,	5	5	5	5	4	4	4	4	3	4	3

Reindeer,	3	3	3	3	3	3	3	2	2	2	1
Honey	3	3	5	2	2	2	2	2	2	1	1
Cereals	1 695	1 423	2 070	2 578	1 646	1 542	1 976	1 518	1 760	2 196	2 195
Peas										68	114
Potatoes	958	1 283	1 179	1 186	1 029	1 253	976	763	1 074	1 201	1 214
Sugar beet	1 699	2 439	2 654	2 776	1 628	2 136	2 535	2 350	2 479	2 430	2 639
Oil-yielding plant	296	293	421	422	288	284	314	195	196	143	133
Fruit and vegetables	178	178	232	232	232	252	252	252	261	261	261
	12 305	**13 087**	**14 121**	**14 889**	**12 251**	**13 164**	**13 759**	**12 874**	**13 469**	**14 062**	**14 318**
Wild berries and mushrooms	**70**	**70**	**70**	**32**	**32**	**32**	**32**	**32**	**32**	**32**	**32**
hunting	**20**	**21**	**22**	**22**	**20**	**19**	**18**	**16**	**16**	**16**	**16**
fishing											
Commercial fisheries	202	237	244	251	237	307	342	387	405	371	357
				45					69		
	202	**237**	**244**	**296**	**237**	**307**	**342**	**387**	**474**	**371**	**357**
	12 597	**13 415**	**14 457**	**15 239**	**12 540**	**13 521**	**14 151**	**13 308**	**13 990**	**14 481**	**14 724**
Forestry											
logging											
	45 189	**46 457**	**48 172**	**47 352**	**46 010**	**47 799**	**48 321**	**50 036**	**56 226**	**50 484**	**54 138**

Imports	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Non-renewables											
Fossil fuels											
Solid	4 248	4 221	4 200	3 911	3 498	3 373	3 494	3 780	4 103	3 782	3 850
Liquid	22 358	21 712	21 866	22 761	22 367	23 957	23 712	24 833	23 892	25 903	25 568
Gaseous	724	*747*	*926*	*1 151*	*1 179*	*1 371*	*1 355*	*1 458*	*1 430*	*1 485*	*1 494*
	27 330	**26 680**	**26 991**	**27 823**	**27 044**	**28 700**	**28 560**	**30 072**	**29 425**	**31 170**	**30 912**
Ores											
Iron ore	70	129	255	268	442	355	588	382	184	150	120
Iron and steel products	3 149	3 353	3 216	2 814	2 285	2 463	2 756	3 598	3 470	3 299	3 923
Vehicles	917	966	963	780	635	599	513	732	713	730	855
Non-iron ores	456	601	551	313	379	471	365	472	551	540	422
Non- iron and steel products	438	480	477	476	490	462	484	635	600	570	623
White goods	40	43	49	49	47	42	38	45	42	45	57
	5 071	**5 572**	**5 512**	**4 700**	**4 279**	**4 391**	**4 744**	**5 864**	**5 560**	**5 333**	**6 000**
Industrial minerals											
	3641	**3947**	**3800**	**3608**	**3100**	**2835**	**2833**	**3117**	**3343**	**3311**	**3745**
Construction minerals											
	5186	**1636**	**1603**	**1788**	**1770**	**1410**	**1646**	**1238**	**1090**	**1237**	**943**
Renewables											
Raw material for food production											
Meat	26	30	21	21	30	37	24	29	42	55	53
Fish	56	55	60	58	59	64	65	83	97	117	124
Dairy produce	24	25	25	35	45	48	44	49	43	52	63
Vegetables	308	283	226	241	291	285	243	280	340	332	296
Fruits and nuts	477	476	486	510	549	536	529	558	477	529	557
	890	**868**	**819**	**865**	**975**	**970**	**905**	**999**	**1 000**	**1 086**	**1 094**
Forestry											
Wood and articles of wood	7 265	7 712	7 324	4 629	4 400	5 076	4 517	6 969	8 105	5 859	8 321
Pulp of wood	270	315	367	470	492	704	744	832	939	773	835
Paper and paperboard	357	400	417	466	454	482	507	620	580	629	675
	7 892	**8 427**	**8 108**	**5 566**	**5 346**	**6 262**	**5 768**	**8 421**	**9 624**	**7 261**	**9 831**

Exports	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Non-renewables											
Fossil fuels											
Solid	317	169	112	99	105	96	203	141	134	183	110
Liquid	7 298	6 425	7 766	8 151	7 648	9 341	9 238	8 592	9 106	8 588	9 484
Gaseous	44	*23*	*30*	*35*	*73*	*107*	*138*	*113*	*121*	*224*	*230*
	7 659	6 617	7 908	8 285	7 826	9 544	9 579	8 846	9 361	8 995	9 824
Ores											
Iron ore	16 762	17 625	17 484	16 398	15 251	15 581	16 442	15 393	16 918	15 173	17 572
Iron and steel products	3 227	3 238	3 168	3 072	3 451	3 528	3 812	4 377	3 266	3 760	4 074
Vehicles	468	775	723	723	679	728	770	971	992	933	1 012
Non-iron ores	595	492	479	515	506	498	599	536	491	443	475
Non- iron and steel products	409	418	395	418	442	464	455	505	571	592	638
White goods	52	56	52	51	50	55	58	67	78	68	83
	21 512	**22 605**	**22 300**	**21 176**	**20 379**	**20 853**	**22 134**	**21 849**	**22 316**	**20 969**	**23 853**
Industrial minerals											
	1067	**855**	**941**	**839**	**726**	**705**	**771**	**840**	**873**	**758**	**794**
Construction minerals											
	3195	**3218**	**2868**	**3161**	**3446**	**3561**	**4041**	**5098**	**5224**	**6959**	**6041**
Renewables											
Raw material for food production											
Meat	38	39	46	44	25	17	25	20	32	56	77
Fish	50	58	69	76	78	57	39	46	110	208	186
Dairy produce	61	43	62	88	52	28	37	25	55	48	74
Vegetables	42	31	30	29	30	24	27	26	25	30	44
Fruits and nuts	13	15	14	15	14	14	15	15	15	35	36
	203	**186**	**220**	**252**	**199**	**140**	**142**	**132**	**237**	**376**	**417**
Forestry											
Wood and articles of wood	5 679	5 025	4 945	4 616	4 783	5 389	6 509	6 962	7 337	7 725	7 451
Pulp of wood	3 239	3 314	3 103	2 909	2 979	2 931	3 001	3 017	2 746	2 856	3 091
Paper and paperboard	6 448	6 770	6 859	6 910	6 893	7 116	7 552	8 282	7 996	7 971	8 725
	15 366	**15 109**	**14 907**	**14 434**	**14 655**	**15 436**	**17 062**	**18 261**	**18 079**	**18 552**	**19 267**

Table E2a. DMI/capita and DMC/capita for Sweden 1987-1997 [tonnes],(Data from Statistics Sweden, 2000and Isacsson et al. 2000).

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Fossil fuels											
DMI per capita	3,4	3,3	3,3	3,3	3,2	3,4	3,4	3,5	3,4	3,6	3,5
DMC per capita	2,4	2,5	2,4	2,4	2,3	2,3	2,2	2,5	2,4	2,6	2,5
Other non- renewables											
DMI per capita	17,6	17,4	18,8	18,6	17,7	16,4	16,7	16,7	17,6	15,8	14,8
DMC per capita	14,5	14,2	15,8	15,7	14,9	13,5	13,7	13,6	14,4	12,5	11,3
Renewables											
DMI per capita	7,9	8,2	8,4	8,0	7,5	7,9	7,9	8,3	9,1	8,3	9,0
DMC per capita	6,1	6,4	6,6	6,3	5,8	6,1	5,9	6,2	7,1	6,1	6,8
Total											
DMI per capita	28,9	28,8	30,5	30,0	28,5	27,7	28,0	28,5	30,2	27,7	27,3
DMC per capita	23,0	23,1	24,7	24,4	23,0	22,0	21,8	22,3	23,8	21,2	20,6

Table E2b. DMI and DMC/capita, 1987-1997, divided into Fossil fuels, Ores, Industrial minerals, Construction minerals, Raw material for food production and Forestry. Data from Statistics Sweden, 2000 and Isacsson et al. 2000.

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Non- renewables											
Fossil fuels											
DMI per capita	3,4	3,3	3,3	3,3	3,2	3,4	3,4	3,5	3,4	3,6	3,5
DMC per capita	2,4	2,5	2,4	2,4	2,3	2,3	2,2	2,5	2,4	2,6	2,5
Ores											
DMI per capita	5,5	5,3	5,6	5,2	5,3	5,5	5,5	5,8	6,1	6,1	6,1
DMC per capita	2,9	2,7	3,0	2,7	2,9	3,1	2,9	3,3	3,5	3,7	3,4
Industrial minerals											
DMI per capita	0,9	1,0	1,0	1,0	0,9	0,9	0,8	0,9	1,0	1,0	1,1
DMC per capita	0,8	0,9	0,9	0,9	0,8	0,8	0,7	0,9	0,9	0,9	1,0
Construction minerals											
DMI per capita	11,2	11,1	12,2	12,4	11,5	10,1	10,5	10,0	10,6	8,7	7,6
DMC per capita	10,8	10,7	11,9	12,0	11,1	9,6	10,0	9,4	10,0	7,9	6,9
Renewables											
Rawmaterial for food production											
DMI per capita	1,6	1,7	1,8	1,9	1,6	1,7	1,7	1,6	1,7	1,8	1,8
DMC per capita	1,6	1,7	1,8	1,8	1,5	1,7	1,7	1,6	1,7	1,7	1,7
Forestry											
DMI per capita	6,3	6,5	6,6	6,2	5,9	6,2	6,2	6,6	7,5	6,5	7,2
DMC per capita	4,5	4,7	4,9	4,5	4,2	4,4	4,2	4,6	5,4	4,4	5,1

Table F1. MFA parameters and indicators for biomass for Sweden and EU-15 (2000) according to Eurostat/IFF (2006)

Biomass (2000)	DE/ capita t/cap	Import/ capita t/cap	Export /capita t/cap	DMC/ capita t/cap	DMI/ capita t/cap	PTB/ capita t/cap	DMC/ km^2 t/km^2
EU-15	3,8	0,5	0,3	4,0	4,3	0,2	465
Austria	4,3	2,2	2,0	4,5	6,5	0,2	434
Belgium/Luxembur g	3,2	4,9	3,6	4,5	8,1	1,3	1579
Denmark	6,3	2,5	2,1	6,7	8,9	0,4	834
Finland	12,5	2,7	4,2	11,0	15,2	-1,5	168
France	6,1	0,9	1,5	5,6	7,0	-0,6	592
Germany	3,3	1,0	1,0	3,3	4,3	-0,0	757
Greece	3,3	1,1	0,4	4,0	4,4	0,7	317
Ireland	10,0	1,7	1,1	10,6	11,7	0,6	567
Italy	2,5	0,9	0,5	2,9	3,4	0,4	550
Netherlands	2,6	3,3	2,6	3,3	5,9	0,7	1267
Portugal	3,6	1,2	0,6	4,2	4,8	0,6	470
Spain	3,5	1,0	0,6	3,9	4,5	0,4	306
Sweden	8,7	2,3	2,8	8,3	11,0	-0,5	163
United Kingdom	2,0	0,9	0,4	2,5	2,9	0,5	620

Table F2. Selection of MFA parameters and indicators for construction minerals for Sweden and EU-15 (2000) according to Eurostat/IFF (2006)

Biomass (2000)	DE/ capita t/cap	Import/ capita t/cap	Export /capita t/cap	DMC/ capita t/cap	DMI/ capita t/cap	PTB/ capita t/cap	DE/ DMC
EU-15	7,0	0,1	0,1	7,0	7,1	-0,0	1,00
Austria	9,4	0,5	0,4	9,4	9,8	0,1	0,99
Belgium/Luxembur g	7,5	2,9	3,0	7,4	10,5	-0,1	1,02
Denmark	12,2	0,8	0,9	12,1	13,0	-0,0	1,00
Finland	17,8	0,9	0,3	18,4	18,7	0,6	0,97
France	6,8	0,4	0,3	6,9	7,2	0,0	1,00
Germany	8,8	0,5	0,4	8,8	9,3	0,0	1,00
Greece	7,1	0,1	0,6	6,7	7,2	-0,4	1,06
Ireland	6,6	0,7	0,2	7,2	7,3	0,5	0,92
Italy	5,1	0,3	0,3	5,0	5,3	-0,0	1,01
Netherlands	3,4	2,1	0,7	4,8	5,5	1,4	0,70
Portugal	7,9	0,4	0,2	8,0	8,2	0,2	0,98
Spain	7,9	0,2	0,5	7,7	8,2	-0,2	1,03
Sweden	10,3	0,4	0,7	10,6	10,6	-0,3	1,03
United Kingdom	4,5	0,1	0,3	4,6	4,6	-0,2	1,05

Table F3. Selection of MFA indicators for Industrial minerals and ores for Sweden and EU-15 (2000) according to Eurostat/IFF (2006)

Biomass (2000)	DE/ capita t/cap	Import/ capita t/cap	Export /capita t/cap	DMC/ capita t/cap	DMI/ capita t/cap	PTB/ capita t/cap	DE/ DMC
EU-15	0,4	0,8	0,3	1,0	1,3	0,6	0,42
Austria	0,6	2,0	1,5	1,1	2,6	0,5	0,53
Belgium/Luxembur g	0,0	6,0	5,2	0,7	6,0	0,7	0,00
Denmark	0,1	1,6	1,2	0,5	1,7	0,4	0,21
Finland	2,3	2,3	1,4	3,3	4,7	1,0	0,71
France	0,2	1,4	0,8	0,8	1,6	0,6	0,24
Germany	0,3	1,5	1,1	0,8	1,8	0,4	0,43
Greece	0,7	1,1	0,4	1,4	1,8	0,7	0,52
Ireland	0,9	2,2	1,1	2,0	3,1	1,1	0,44
Italy	0,2	1,9	0,6	1,5	2,1	1,3	0,1
Netherlands	0,3	4,0	2,8	1,5	4,3	1,2	0,21
Portugal	0,2	0,8	0,3	0,7	1,0	0,4	0,35
Spain	0,5	1,2	0,6	1,2	1,7	0,6	0,46
Sweden	2,7	1,4	3,1	1,0	4,1	-1,7	2,67
United Kingdom	0,4	0,8	0,4	0,8	1,3	0,4	0,53

Table F4. Selection of MFA indicators for fossil fuels for Sweden and EU-15 (2000) according to Eurostat/IFF (2006)

Biomass (2000)	DE/ capita t/cap	Import/ capita t/cap	Export /capita t/cap	DMC/ capita t/cap	DMI/ capita t/cap	PTB/ capita t/cap	DE/ DMC
EU-15	1,9	2,3	0,4	3,7	4,1	1,8	0,5
Austria	0,5	3,4	0,8	3,0	3,8	2,5	0,15
Belgium/Luxembur g	0,0	9,9	5,9	4,0	9,9	4,0	0,01
Denmark	4,7	3,5	4,0	4,2	8,1	-0,5	1,12
Finland	0,9	5,1	1,4	4,6	6,0	3,7	0,2
France	0,1	2,7	0,7	2,1	2,8	2,0	0,06
Germany	2,7	3,3	0,7	5,2	5,9	2,5	0,51
Greece	6,0	2,9	0,9	8,0	8,9	2,0	0,75
Ireland	1,7	3,5	0,6	4,6	5,2	2,9	0,38
Italy	0,3	2,6	0,6	2,3	2,9	2,0	0,14
Netherlands	3,9	9,1	8,1	4,9	13,0	0,9	0,81
Portugal	0,0	2,7	0,4	2,2	2,7	2,2	0,00
Spain	0,6	3,1	0,7	3,1	3,7	2,5	0,20
Sweden	0,2	4,0	1,7	2,4	4,1	2,3	0,06
United Kingdom	4,5	1,7	2,2	4,0	6,2	-0,5	1,12

Table G1. Industry codes used in the report - For detailed information on SNI and NACE c.f. (www.scb.se) and (http://epp.eurostat.ec.europa.eu)

aggregate from SNI /(NACE) used in the report	Type of industry
01	Agriculture
02	Forestry
05	Fishing
10-14	Mining and quarrying
15-16	Manu. of food products and beverages and tobacco
17-19	Textile and clothing
20	Manu. of wood and products of wood
21	Pulp and paper
22	Publishing, printing and reproduction
23	Refineries
24.1	Manu. of basic chemicals
24.2	Manu. of pesticides
24.3	Manu. of paint
24.4	Manu. of pharmaceuticals
24.5,7	Manu. of soap and detergents and synt. fibre
24.6	Manu. of other chemicals and chemical products
25	Manu. of rubber and plastic products
26	Manu. of other non-metallic mineral product
27	Manu. of basic metals
28	Manu. of fabricated metal products, tools
29	Manu. of fabricated metal products
30	Manu. of office machinery and equipment
31	Manu. of electrical machinery, radio television
32	Manu. of tele.products
33	Manu. of medical and optical instruments
34-35	Manu. of vehicles, trailers and other transport
36-37	Manu. of furniture and recycling
40-41	Electricity and water supply
45	Construction
50-52	Wholesale and retail trade; repair of goods (51.57 - Wholesale of waste and scrap)
55	Hotels and restaurants
60-64	Transport
70-74	Houses and Renting companies
75	Public sector
80-85	Education and health
90-95	Other services
S	Unspecified use