MILJÖRÄKENSKAPER

Report 2010:1

Domestic Inflow of Hazardous Substances

Statistiska centralbyrån
Statistics Sweden

ENVIRONMENTAL ACCOUNTS
REPORT 2010:1

Domestic Inflow of Hazardous Substances

Statistics Sweden
2010

Environmental accounts: Report 2010:1

Domestic Inflow of Hazardous Substances

Statistics Sweden
2010

Producer

Statistics Sweden, Unit for environmental accounts and natural resources
Box 24300
SE-104 51 Stockholm

Inquiries

Annica Carlsson
+46 8 506 945 52
annica.carlsson@scb.se

Louise Sörme
+46 8 506 947 92
louise.sorme@scb.se

ISSN 1654-6822 (online)
URN:NBN:SE:SCB-2010-MI71BR1001_pdf (pdf)

This publication is only available in electronic form on www.scb.se

Preface

This is the final report from the project Economy Wide Material Flow Analysis and Health Hazardous Products Statistics, Eurostat ID of Agreement: 50304.2008.001-2008.339.

The Environmental Accounts, Statistics Sweden has for several years have had an interest in accounting the use of hazardous substances. The result thereof, chemical indicators per industry, is among all integrated in the analysis tool for the Swedish Environmental Accounts that is available on the website of Statistics Sweden, www.scb.se. In this project the interest has been to what extent hazardous substances can be high-lighted in the context of Economy Wide Material Flow Account by using already available sources of statistics.

The project has mainly been performed by Annica Carlsson and Louise Sörme, both Statistics Sweden, the Unit of environmental economy and natural resources, the Environmental Accounts. Viveka Palm also the Unit of environmental economy and natural resources, the Environmental Accounts is gratefully acknowledged for discussions on the content of the report.

Statistics Sweden, January 2010

Inger Eklund

Leif Norman

A note of thanks
We would like to express appreciation to our survey respondents – the people, enterprises, government authorities and other institutions of Sweden – with whose cooperation Statistics Sweden is able to provide reliable and timely statistical information meeting the current needs of our modern society.

Content

Summary

In Europe, most EU member countries are now compiling statistics on material flows regularly, based on Eurostats Compilation Guide for Economy Wide Material Flow Accounts (EW-MFA). Data is presented with a high level of aggregation. Even though large flows of material are of concern for the management of resources, it is also important to keep record of the hazardous substances. Use of hazardous substances in chemicals or products implies a potential risk of environmental impact and/or threats to human health. Emission of hazardous substances in products during use are now the dominating source of emission to the environment in developed countries like Sweden (Brunner, 2007). This makes it relevant to get more information of the use of hazardous substances in chemicals and products. This project deals with method development to retrieve data of the inflows of hazardous substances in chemicals using different available statistics.

The aim of this project was to apply the perspective of EW-MFA and show the amount of domestic production, import and export of a selection of hazardous substances. Indicators such as DMC, domestic material consumption (import-export + domestic production) per group of hazardous substances was accounted for. The study also aimed to illustrate the use of some specific chemical products, such as petrol, diesel, polyaromatic hydrocarbons, flame retardants and alcylphenols. For certain chemical products such as petrol and diesel specific DMC (netinflow) indicators were accounted for. Data also included mapping of different types of waste.

The method used has been to collect data from International trade and Production of commodities and industrial services for groups of chemicals and specific chemicals. Data is presented using the combined nomenclature system (CN), which is one of the classification systems used in EW-MFA. CN is the most detailed classification system, with about 10 000 different codes. Production of commodities and industrial services usually uses PRODCOM (CPA) codes, but there is a connection between CN and PRODCOM which makes it possible to present all data at the CN level. Specific hazardous substances or compounds have been identified by searching in the Eurostat database ECICS which has a connection between CAS (Chemical Abstract Services) which identifies specific compounds and CN numbers.

The result shows that it is possible to calculate the DMC, or net inflow, for groups of chemicals, using available statistics. The data comes from Trade statistics (import and export) and Production of commodities and industrial services (domestic production). Data of domestic production nationally and internationally seems to be available for most of the chemicals that is discussed in this report, since they are part of the PRODCOM and hence obligatory statistics in according to EU legislation.

One part of the project was to select relevant hazardous substances. There are different ways to achieve this. The project has used a former used method to rank the chemicals with an environmental hazard assessment.

This environmental hazard assessment used accounts for hazardous content and exposure. This method gives a possibility to prioritise between chemicals, this is something that otherwise may be difficult. When using the environmental hazard assessment halogenated chemicals (that includes chlorine, fluorine or bromine) gets the highest rating. The list is ranked according to CAS number (CAS - Chemical Abstract Services. Many different CAS are often included in one CN. This makes it difficult to get data for a single compounds (CAS) in EU member countries that do not hold specific registers on chemicals. On the other hand, the net inflow of many of the halogenated compounds can be followed in Sweden using a few CN numbers, for example CN 29036990 which includes 25 compounds (CAS). The DMC (netinflow) of the overall group of halogenated substances, CN 2903, was in Sweden 7.8 kg/year and capita in 2005. More detailed, the CN 29036990 that includes CAS with very high rating, has a DMC (netinfow) of about 5 g per capita and year.

All of the identified top ranked hazardous substances discussed in this report are based on petroleum products. In the structure of EW-MFA they therefore could be found in the group of '4.3 Products mainly from petroleum products'. In EW-MFA, data for this group is only compiled for import and export. Hence, data from EW-MFA had to be complemented with domestic production of these chemicals to be able to calculate the net inflow of substances.

Alcylphenols, flame retardants and polyaromatic hydrocarbons were identified in the CN classifications system by their correlation to CAS numbers. The relevant CN numbers are: Alcylphenols (CN 29071300), Flame retardants (CN 29093031, 29093038) and polyaromatic hydrocarbons (CN 29029000). For alcylphenols the data showed a DMC (netinflow) of 1500-3500 tonnes, which corresponds to 0.2-0.4 kg/capita. This shows that it is possible to illustrate the use of some specific chemical products. Using international data sources could influence the level of data possible to obtain.

Data on inflows of hazardous substances to a system can contribute to valuable information in order to understand flows of hazardous waste in the same system. In EW-MFA, waste is in most cases considered in the same way as all other materials. Waste is therefore to be found in all the included material categories of EW-MFA. This is also illustrated in the project by the search for waste in those CN codes that is included in EW-MFA. However, halogenated organic substances (in this report highest rated in an environmental hazard assessment) is listed itself in the structure of EW-MFA under the category 6. Waste imported/exported for final treatment. This generates a possibility to relate the inflow and outflows of hazardous substances.

To follow hazardous substances in chemicals and other products is environmentally important. As a first step the magnitude of hazardous substances in chemicals can be understood by using EW-MFA statistics added with domestic production.

Introduction

In order to identify a level of sustainable use of materials, material flow data and material flow indicators are needed. The principles of statistical approaches towards material flows have been formulated in the 1970s. The first countries to put aggregated material flow accounts in practice were in the early 90s, Austria, Germany and Japan. In Europe, most EU member countries are now compiling statistics on material flows regularly based on Eurostat's Compilation Guide for Economy Wide Material Flow Accounts (EW-MFA). Data on national material flows is also sent by the member countries to Eurostat by reporting of the EW-MFA questionnaires. In the ongoing discussions on a Legal Base for Environmental Economic Accounts within EU one part is also focusing on the statistics for EW-MFA[1].

Statistics on EW-MFA covers data on domestic production, import (intra- and extra EU) and export (intra- and extra EU). The indicator Domestic Material Consumption (DMC) could then be formed from the data on import + domestic production – export. Data is also organised into groups; Biomass and biomass products, Metal ores and concentrates, Non metallic minerals, primary and processed; Petroleum resources, Other products; and Waste. Even though large flows of materials are of interest for management of resources, it is also of importance to keep record of hazardous substances. Use of hazardous substances implies a potential risk of environmental impact and/or threats to human health. Hazardous substances are included in some of the material flow groups above but they are not shown specifically since information is presented on an aggregated level.

Substantial amounts of chemical products are today used in society. Chemical products, as single substances, or preparations, is used for example for synthesis, added as additive or for supporting properties in manufacturing of products. Due to environmental legislation and actions of authorities in most western countries in the late 1960s, the importance of emissions from point sources such as production facilities have decreased. Parallel to this, emissions from products and construction materials have increased with increasing consumption and growing cities. In population centers such Stockholm, they are now the dominating sources of emissions (Brunner, 2007). Hence, it becomes important to follow the inflow to a country or a region to be able to understand the emissions to the environment.

The central idea of why there is a need for accounting material flows is simplified the perspective that *in* is equivalent to *out* (Klein, 2000). All material inputs into a system over a certain time period equal all outputs over the same period plus the stock increases minus the releases from stock. Or, everything that once enters the society, will sooner or later result in outflows for example as waste and or pollutants released to the

1 http://circa.europa.eu/Public/irc/dsis/envirmeet/library?l=/dimesa_231109_241109/env_dimesa_basepdf/_EN_1.0_&a=d

environment. For the possibility of making risk assessment and for strategic environmental planning and waste management knowledge about quantities and flows of hazardous substances in society is essential. But at the same time knowledge on content, lifetime, emission factors and the amounts of products that are entering the market is today limited.

In the end of 2006, the EU council and the European Parliament reached an agreement on new EU legislation on chemicals, known as REACH (Registration, Evaluation, Authorisation and Restriction of Chemicals). One of the goals is to strengthens protection of human health and environment. REACH will generate company data on imports, manufacturing and use of single substances. However, the structure of data that will be registered at the European Chemicals Agency will not enhance accounting of quantities since data is reported in intervals. Nor will data be suitable for the compilation of time series. Hence, it will not be possible to assess the total quantity of chemical and its yearly change.

The Swedish Environmental Accounts at Statistics Sweden annually publish Chemical Indicators per industry. The indicators illustrate the use of chemical products labelled as hazardous for health and or environment as well as chemical products labelled with a risk phrase per industry in tonnes. The indicators is based on data from the Product Register kept by the Swedish Chemical Agency (www.kemi.se). The register was constructed mainly as a tool for superintendence of companies that use or handles chemical products and it is updated annually. Each Swedish manufacturer of chemical products or importer that exceeds the amount of 100 kilogram is obligated to report to the Product Register. Use, trade description and classification of harm for health and environment are some of those parameters that have to be reported for the chemical product. This makes the Product Register an exclusive source of information when having interest in a countries overall use of chemical products. There are similar registers in Norway, Denmark and Finland as well, to some extent with different scope and system boundaries. The Norwegian register has been used for accounting of the use chemical products with CMR[2] effects (Kittilisen, M.O. and Hansen, K.L, 2008). The use of these chemical products was also related to emissions of chemicals per industry by using emission factors for combinations of chemical products, type of industry and whether the substance are considered to be used as a raw material or not.

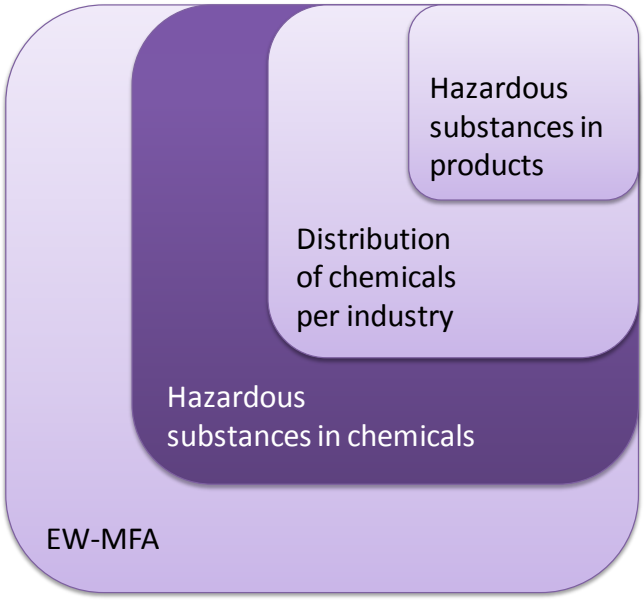
It can be concluded that for accounting on use of health hazardous substances additional methods are needed in most EU member countries. Results would likely contribute to follow the outcome of environmental policy and environmental management decisions regarding hazardous substances in the member countries.

[2] CMR (May cause cancer, be mutagenic or generate reproductive disorders.)

Aim

EW-MFA and aggregated indicators like DMC can be considered as the most aggregated level of accounting for materials. The next step is to account for, and high-light, the sub flows thereof. In addition to the mentioned categories biomass, minerals and petroleum resources etc., accounting of hazardous substances is also a subpart of the overall flow (Figure 1). For further environmental assessment the distribution of hazardous substances per industry, as done in the Swedish chemical indicators, is one approach. The next step is to consider hazardous substances in the use of final products. This as well includes mapping of their distribution and accounting of potential emissions thereof. The system boundary of this project is how to account for the sub-part of the overall material flow that consists of hazardous substances in chemicals.

Figure 1. The system boundary of this study is to account for hazardous substances in chemicals in the EW-MFA



The aim of this project is to apply the perspective of MFA and show the amount of domestic production, import and export of a selection of hazardous substances. Indicators such as DMC (netinflow) import-export + domestic production) per group of hazardous substances will be compiled. Depending on data availability the study also aims to illustrate the use of some specific chemical products, such as petrol, diesel, polyaromatic hydrocarbons, flame retardants and alcylphenols. For certain chemical products such as petrol and diesel specific DMC (netinflow) indicators will be accounted for. Data will also include mapping of different types of waste. The project will give examples of how the EW-MFA could be developed to include data on the use of health hazardous substances in different ways.

Method and data sources

Economy Wide – Material Flow Accounts

In Eurostat's the compilation guide EW-MFA is defined as "...consistent compilations of the overall material inputs into national economies, the changes of material stock within the economic system and the material outputs to other economies or to the environment" (Eurostat, 2007). Material flows within the economy of each nation, e.g. material flows in the production chains, are not represented in EW-MFA and balances.

Most of the EU member countries did in 2009 report national data on EW-MFA in time series to Eurostat. The questionnaire for EW-MFA included data on domestic production of raw materials and the physical imports and exports in tonnes. Data to be reported is aggregated into six categories of "Biomass and biomass products", "Metal ores and concentrates", "Non-metallic minerals", "Petroleum resources", "Other products" and "Waste imported for final treatment or disposal". For trade of goods data on goods from all step of the production chain, i.e. both as raw materials and as complex products are included. Products that are not possible to attach to the different categories are aggregated to the category "other products".

For compilation of data, the EW-MFA Questionnaires offer an appendix with correspondence tables between the structure EW-MFA and the Harmonized Commodity Description and Coding System (HS), Standard International Trade Classification (SITC) and the Combined Nomenclature (CN). For the Swedish time-series on EW-MFA 1998-2005 data per CN codes were searched for[3]. The Swedish EW-MFA 1998-2005 database is available at www.scb.se.

With an interest in following certain substances, CN offers the most detailed level. CN is based on the Harmonized Commodity Description and Coding System (HS) plus two additional digits. This implies that at its most detailed level, CN has eight digits and today incorporates about 10 000 codes. Collection of EC trade (Intrastat) is regulated by EU legislation and involves the monthly collection of detailed information on trade from member states. The list of codes is modified every year, especially on its most detailed level. Codes can be added, or deleted from the list. Several codes may also be put together into one new code, or one code can be divided into two or more new codes. For example, a total quantity of a certain good one year represented by one code in CN may the next year be divided into several codes. This of course has implications on the ability of producing time-series per code on the most detailed level of CN. A new version of CN is published in October each year by Eurostat.

DMC (net inflow) of selection of substances

For account of DMC (netinflow) per groups of hazardous substances we searched for data on chemicals in the CN structure. Pure chemicals are found in chapter 28 and 29 of the CN structure. In chapter 28 inorganic

[3] For the questionnaire of 2009 that also included 2006 and 2007 the correspondence tables between SITC and the EW-MFA structure was used for the all the years 1998-2007.

chemicals are included and in chapter 29 organic chemicals, for more detailed and exact definition of the chapters, see Eurostat's Metadata server RAMON (http://ec.europa.eu/eurostat/). Chemicals that are mixed can be found in other chapters, for example chapter 34 and chapter 38.

The chemicals in chapter 28 and 29 of the CN are mixtures of hazardous and non-hazardous substances. To be able determine which CN code that includes hazardous substances an environmental hazardous assessment was made. This was done in collaboration with Kalmar University, Sweden (Statistics Sweden, 2009). The study also produced a rating to determine the most hazardous substances. The study used the atmospheric persistence (half-lives) to the baseline toxicity – expressed as median lethal concentrations (in water) (LC50) – to provide a continues scale to rank and summarize the incremental environmental impacts from the simultaneous exposure to many chemicals, for more information see Öberg (2006) and Statistics Sweden, (2009).

Baseline toxicity (narcosis) is the minimum nonspecific toxicity exhibited by an organic compound (Schwarzenbach et al., 2002). Most industrial chemicals, with different sizes, shapes, and functional groups, express only baseline toxicity. Baseline toxicity results from the accumulation of chemicals and the ensuing disruption of normal functions in biological membranes, and it is thus closely related to other forms of bioaccumulation. Baseline toxicity is therefore also a measure of bioaccumulation.

Toxicity itself does not constitute an environmental risk without exposure. Exposure for chemical hazards is determined by release into the environment and removal by physical, chemical and biological processes. The degradation varies considerably between different environmental media, with air being the most reactive one (Gouin et al., 2000). Reaction with hydroxyl (OH) radicals in the troposphere is a dominant removal pathway for many industrial chemicals (Atkinson and Arey, 2003). The rate constants for this gas-phase reaction can therefore be used as an indicator of environmental persistence.

The results of the above presented environmental hazard assessment is implemented and further developed in this study.

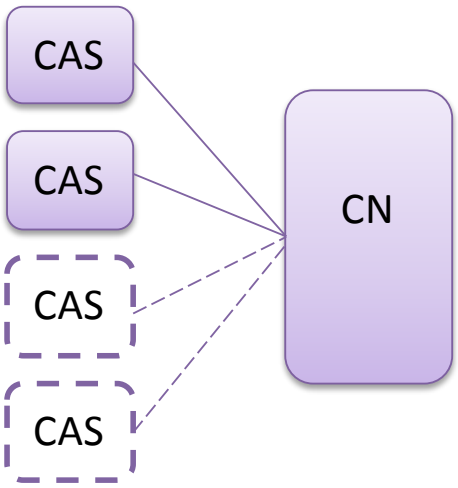
In the aim of this project we listed petrol, diesel, polyaromatic hydrocarbons, flame retardants and alcylphenols as objects to find data for. For accounting of petrol and diesel we based the method of the results of the chemical indicators that is annual compiled by the Swedish environmental accounts (Palm and Carlsson, 2003). In order to identify the hazardous substances, such as polyaromatic hydrocarbons, flame retardants and alcylphenols in the CN codes we used the correspondence between CN and CAS (Chemical Abstract Services)[4], A CAS number is a registration number for chemicals generated by the American Chemical Society. CAS number can refer to either individual substances or to mixtures. It functions as an international identification number for chemical substances. The connection between different systems, such as CN and CAS, is found at European Customs Inventory of Chemical Substances, the ECICS consultation, which is available at

[4] The CAS number is generated by the American Chemical Society. CAS number can refer to either individual substances or to mixtures.

http://ec.europa.eu/taxation_customs/dds/cgi-bin/ecics2home?Lang=EN. Some CAS numbers for polyaromatic hydrocarbons, flame retardants and alcylphenols were known.

It is important to notice that several CAS-numbers can be connected to one single CN on its most detailed level, Figure 2. From this follows that one CN code could include several CAS numbers that individually could be classified differently.

Figure 2. Connection between CAS (Chemical Abstract Services) codes and CN (Combined Nomenclature) codes. For detailed information on the cross classification c.f. ECICS consultation (2010)



Mapping of waste

In order to illustrate the connection between outflows and inflows mapping of waste has been included in the project. For example the inflow of electronics, that include hazardous substances, such as flame retardants, will sooner or later result an hazardous waste. For mapping of waste we have used the Swedish national reporting according to the WStatR (SEPA, 2008a, 2008b). We have also searched for waste in the list of CN codes that is included in the EW-MFA by using results of a German Pilot Study on import and export of waste (Wielenga and Junker (2004)) and data generated according to the Basel Convention (Basel Convention on the control of Transboundary Movements of Hazardous Waste and their Disposal).

Results and Discussion

DMC (net inflow) of selection of substances

Groups of substances

The time trends shown for some of the substances are coming from International Trade Statistics and from Production of Commodities and Industrial Services, which is also the base of EW-MFA. In the results are the production of commodities and industrial services included if existing, the method is hence net inflow = import +production of commodities and industrial services – export, for each single chemical (CN-number).

The DMC (netinflow) on the groups of substances according to chapter 28 and 29 of CN shown in Table 1. For most groups listed in the table it is possible to calculate the DMC (netinflow) per group of the substances. In chapter 28 of CN, the DMC (netinflow) can be calculated for 37 out of 50 groups and for chapter 29 of CN, DMC can be calculated for 33 out of 41 groups. DMC (netinflow) for all the groups of chapter 28 and 29 of CN, is listed in Appendix 1.

Data on DMC (netinflow) on groups of substances can be retrieved by adding data on Production of commodities and industrial services to the data already compiled in the EW-MFA. Import and export data of the chemicals are available in EW-MFA data. Note that all chemicals groups are not hazardous.

Table 1. DMC(netinflow) of chemicals in chapter 29 of CN, Sweden 2005, tonnes and DMC/capita (kg), a selection. ".." in the table indicate that the net inflow cannot be calculated due to lack of information

CN4	ORGANIC CHEMICALS	DMC (tonnes)	kg/capita
2902	Cyclic hydrocarbons	121 270	13.4
2903	Halogenated derivatives of hydrocarbons	70 762	7.8
2904	Sulphonated, nitrated or nitrosated derivatives of hydrocarbons, whether or not halogenated	1 522	0.2
2905	Acyclic alcohols and their halogenated, sulphonated, nitrated or nitrosated derivatives	231 680	25.6
2906	Cyclic alcohols and their halogenated, sulphonated, nitrated or nitrosated derivatives	466	0.1
2907	Phenols; phenol-alcohols	13 736	1.5
2908	Halogenated, sulphonated, nitrated or nitrosated derivatives of phenols or phenol-alcohols	146	0.0
2909	Ethers, ether-alcohols, ether-phenols, ether-alcohol-phenols, alcohol peroxides, ether peroxide, ketone peroxides, whether or not chemically defined, and their halogenated, sulphonated, nitrated or nitrosated derivatives	..	..
2910	Epoxides, epoxyalcohols, epoxyphenols and epoxyethers, with a three-membered ring, and their halogenated, sulphonated, nitrated or nitrosated derivatives	47 945	5.3
2911	Acetals and hemiacetals, whether or not with other oxygen function, and their halogenated, sulphonated, nitrated or nitrosated derivatives	..	..
2912	Aldehydes, whether or not with other oxygen function; cyclic polymers of aldehydes; paraformaldehyde	103 481	11.4
2913	Halogenated, sulphonated, nitrated or nitrosated derivatives of cyclic polymers of aldehydes or paraformaldehyde	1	0.0
2914	Ketones and quinones, whether or not with other oxygen function, and their halogenated, sulphonated, nitrated or nitrosated derivatives	13 351	1.5
2915	Saturated acyclic monocarboxylic acids and their anhydrides, halides, peroxides and peroxyacids; their halogenated, sulphonated, nitrated or nitrosated derivatives	87 995	9.7
2916	Unsaturated acyclic monocarboxylic acids, cyclic monocarboxylic acids, their anhydrides, halides, peroxides and peroxyacids; their halogenated, sulphonated, nitrated or nitrosated derivatives	49 438	5.5
2917	Polycarboxylic acids, their anhydrides, halides, peroxides and peroxyacids; their halogenated, sulphonated, nitrated or nitrosated derivatives	..	..
2918	Carboxylic acids with additional oxygen function and their anhydrides, halides, peroxides and peroxyacids; their halogenated, sulphonated, nitrated or nitrosated derivatives	8 410	0.9

Identification of hazardous substances and rating among them

The chemicals in chapter 28 and 29 of the CN are mixtures of hazardous and non-hazardous substances. To be able determine which of the CN codes that includes hazardous substances an environmental hazardous assessment was made (cf. Method). According to the method all chemicals from chapter 28 and 29 of CN was matched to a relevant CAS number. This

resulted in a rating, in this report further referred to Toxic Persistence Rating.

The top 20 CAS according to the rating is listed in Table 2. The rating is calculated as t½ divided by LC50, see Table 2. TPRAs seen in the table many of these environmentally relevant compounds belong to the same CN code. For example the, the Halogenated derivatives of aromatic hydrocarbons, other (CN 2903 69 90). Among the top 100 of the rated compounds, in all 25 CAS belong to this CN code, followed by halogenated derivatives of methane, ethane or propane (halogenated only with fluorine and chlorine) with 20 CAS (c.f. Appendix 2).The reason for the high rating of the halogenated substances is their high persistence. The top rank CAS are all found in Chapter 29 of CN. These are in turn included in the list of CN codes that is adding up to the MFA category "4.3 Products mainly from petroleum products" in the European EW-MFA.

Table 2. The 20 CAS with highest Toxic Persistence Rating. The method for Toxic Persistence Rating is further presented in the Method section and in Statistics Sweden (2009) and Öberg (2006)

Chemical name	CAS	CN	t½ (days)	LC_{50} (mg/L)	TPR
Dichloro((dichlorophenyl)methyl) methylbenzene	76253-60-6	29036990	13.2	0.0317	417
2,4,2',4'-Tetrachlorobiphenyl	2437-79-8	29036990	28.9	0.106	273
Polychlorinated biphenyls	1336-36-3	29036990	28.9	0.106	273
DDE	72-55-9	29036990	15.0	0.0585	257
2,2-(2-Chlorophenyl-4'-chlorophenyl)-1,1-dichloroethene	3424-82-6	29036990	11.9	0.0618	193
DFDT	475-26-3	29036990	20.8	0.152	137
TDE	72-54-8	29036990	11.6	0.0874	132
Mitotane	53-19-0	29036990	9.29	0.0914	102
2-Butenoic acid, 2,3,4,4,4-pentachloro-, butyl ester	21824-93-1	29161980	35.9	0.447	80.3
Perthane	72-56-0	29036990	2.19	0.0298	73.6
HCFC 222	422-49-1	29034910	405	6.58	61.5
4-(Trifluoromethyl)benzophenone	728-86-9	29147000	23.5	0.389	60.4
PCB 28	7012-37-5	29036990	13.2	0.234	56.6
Decane, 1,10-dibromo-	4101-68-2	29033036	6.29	0.143	44.1
HCFC 231	421-94-3	29034910	358	8.41	42.5
2,3,4,5,6-Pentafluorobenzophenone	1536-23-8	29147000	30.1	0.776	38.8
Nonane, 1,9-dibromo-	4549-33-1	29033036	8.12	0.221	36.7
2,4,5,6-Tetrachloro-m-xylene	877-09-8	29036990	15.4	0.453	33.9
alpha,alpha,alpha-Trichloro-4-chlorotoluene	5216-25-1	29036990	25.3	0.789	32.0
Propyl 2,4,5-trichlorophenoxyacetate	1928-40-1	29189090	8.32	0.264	31.5

For the six CN codes that is represented in the top 20 of the rating (Table 2) we searched for data on the import, export and domestic production of Sweden. The results are shown in. Table 3 – Table 5. As seen in the tables there is no, or limited production, on the CN codes of interest in Sweden. Based on the results in Table 3 – Table 5 the net inflow per individual CN codes were calculated för Sweden 1998-2005, Figure 3. The DMC (netinflow) of CN 29036990, that have individual CAS with very high rating, is about 5 g/capita and year in Sweden in 2005. This is calculated from data in Table 3 – Table 5. There are several potential explanations to the negative values of DMC (netinflow) for CN 29034910 seen in Figure 3. It could for example be explained by re-export of imported refrigerants HCFC to final treatment (destruction) outside Sweden.

Table 3. Import to Sweden tonnes/year for those CN code that includes compounds (CAS numbers) with the highest Toxic Persistence Rating. Data from foreign trade statistics, Statistics Sweden

CN (2005)	1998	1999	2000	2001	2002	2003	2004	2005
29033036	0	24	2	10	7	15	12	9
29034910	357	185	104	17	1	4	24	18
29036990	109	11	12	11	3	23	67	48
29147000	0	0	0	0	0	0	4	3
29161980	362	363	302	302	264	366	383	550
29189090	253	257	138	190	278	237	138	44

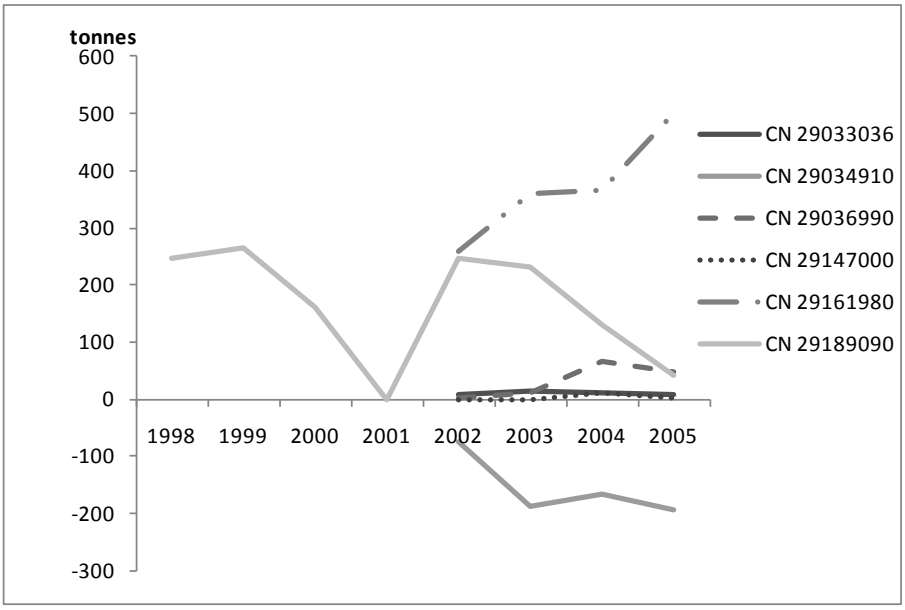
Table 4. Export to Sweden tonnes/year for those CN code that includes compounds (CAS numbers) with the highest Toxic Persistence Rating. Data from foreign trade statistics, Statistics Sweden

CN (2005)	1998	1999	2000	2001	2002	2003	2004	2005
29033036	0	0	0	0	0	1	0	0
29034910	168	206	269	191	75	192	190	213
29036990	0	3	1	0	0	11	0	0
29147000	0	0	0	0	0	0	8	0
29161980	18	9	6	5	5	6	16	50
29189090	12	17	6	12	32	7	7	2

Table 5. Data on domestic production in Sweden tonnes/year for those CN codes that include compounds (CAS numbers) with the highest Toxic Persistence Rating. Data from Swedish statistics on production of commodities and industrial services)

CN (2005)	1998	1999	2000	2001	2002	2003	2004	2005
29033036	0	..	..	..	0	0	0	0
29034910	..	..	..	..	0	0	0	0
29036990	..	..	..	..	0	0	0	0
29147000	0	0	0	0	0	0	15	0
29161980	..	..	..	..	0	0	0	0
29189090	5	25	29	..	0	0	0	0,2

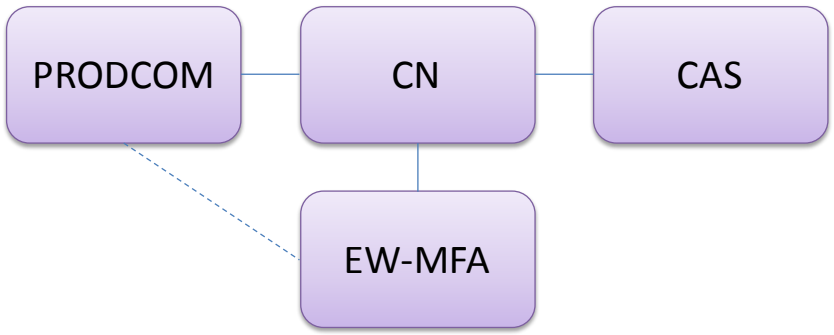
Figure 3. Netinflow for Sweden for those CN codes that includes compounds (CAS numbers) with the highest Toxic Persistence Rating, 1998-2005 tonnes



As illustrated in Figure 4 there is a connection between PRODCOM and CN and further between CN and CAS. Data needed for EW-MFA on domestic production could to a large extent also be compiled from the PRODCOM statistics. Chemicals of chapter 29 is CN is included in the statistics. This implies that EU member countries that report according to PRODCOM are able to calculate DMC (net inflow) of chemicals. However, the use of PRODCOM data can cause a decrease in the level of detail.

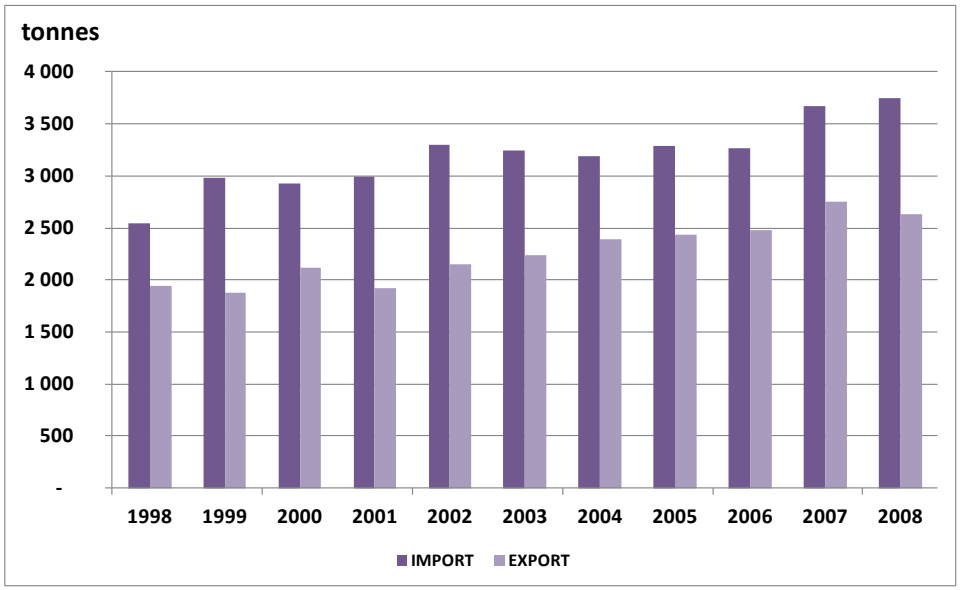
Data from PRODCOM is also used in 'The REACH baseline study' (Eurostat, 2009). In that study one of the "Supplemental indicators" is suggested to be "Production of toxic chemicals". For the indicator PRODCOM data is used and a connection is made to risk phrase. In the REACH Baseline study the PRODCOM data is classified into categories such as toxic, very toxic and CMR. Hence, these categories do not give a rating between chemicals.

Figure 4. Connection between classification systems of PRODCOM, CN, CAS and EW-MFA. The dotted line illustrate that the EW-MFA could be compiled from PRODCOM data partly



The project has used the EW-MFA as a base. Hence, we have searched for how the rated substances could be found in aggregates of the EW-MFA It could be concluded that all the rated chemicals were found in "4.3 Products mainly from petroleum products" in the EW-MFA structure. The import and export data could thus be found in the EW-MFA data from the individual countries. The Import and Export to Sweden 1998-2007 of the EW-MFA category 4.3 Products mainly from petroleum products is shown i Figure 5. The category summarizes 826 CN codes. However to account for DMC (net inflow) of groups of hazardous substances, data on domestic production has to be added. For this could the correspondence between PRODCOM and the EW-MFA structure be utilized.

Figure 5. Import and Export total trade (intra+extra EU-27 trade) of EW-MFA category "4.3 Products mainly from petroleum products" to Sweden 1998-2005, tonnes. Data from Swedish reporting of 2009 Questionnaire for EW-MFA



Alcylphenols, Flame retardants, Polyaromatic hydrocarbons

The major environmental risks in the centre of Stockholm, the capital of Sweden, are associated with polyaromatic hydrocarbons (PAH), tributyltin, alcylphenols (octylphenol and nonylphenol), chlorinated paraffins, pentachlorophenol together with PCB and DDT according to Jonsson et al

2008. It is interesting to find systems to track the use of these substances. Therefore some of these were included in this study; alcylphenols, flame retardants and polyaromatic hydrocarbons.

Alcylphenols is a group of substances consisting of for example nonylphenol and octylphenol. In products, alcylphenolethoxylates are often used which can be transformed to alcylphenols. Polycyclic aromatic hydrocarbons (PAHs) are the largest group of carcinogenic substances we know of today. The PAH group is made up of several hundred individual chemical substances, more than 500 different PAHs for example having been detected in air samples. The majority of all PAHs are not used as individual compounds but occur in various mixtures, e.g. in various types of coal and oil products (http://www.kemi.se/templates/PRIOEngpage.aspx?id=4217).

It is possible to find information about the above mentioned chemicals in the CN codes, Table 6. As discussed above it is sometimes more than one CAS number included in the corresponding CN number. If one is interested in details about a specific chemical this can be a disadvantage. For example to follow the development in the use of specific flame retardants, as it is now, the penta BDE has one CN number, 29033031, but octa and dekaBDE are both included in 29033038. This makes it impossible to follow the development of okta- or decaBDE as a group by using CN numbers. In other cases it can be beneficial because it makes it easier to follow the use of a group of chemicals as discussed above. These substances are found in the aggregates of the EW-MFA in "4.3Products mainly from petroleum products", as seen in Table 7.

Table 6. The correlation between some of the CAS of Alcylphenols, Flame retardants and Polyaromatic hydrocarbons (PAH) and the CN number that the CAS is included in. Based on ECICS

Name	CN	Examples of CAS in CN
Alcylphenols (Nonylphenol)	29071300	25154-52-3
Alcylphenols (Octylphenol)	29071300	140-66-9
Flame retardant (pentaBDE)	29093031	32534-81-9
Flame retardant (octaBDE)	29093038	32536-52-0
Flame retardant (dekaBDE)	29093038	1163-19-5
PAH (benzo[a]pyrene)	29029000	50-32-8
PAH (benzo[e]pyrene)	29029000	192-97-2
PAH (benzo[a]anthracene)	29029000	56-55-3
PAH (benzo[def]chrysene)	29029000	50-32-8
PAH (dibenz[a,h]antracene)	29029000	53-70-3
PAH (7,12-dimetylbenz[a]antracene	29029000	57-97-6

Table 7. Text from RAMON at Eurostat, Combined Nomenclature 2010. The table also illustrate the CN codes correlation to the EW-MFA Questionnaire 2009, Table B-E

CN	Explanatory text to the CN codes of some chemicals; from RAMON at Eurostat, Combined Nomenclature 2010.	In the Structure of the EW-MFA Questionnaire, Table B-E
29029000	Cyclic hydrocarbons (excl. cyclanes, cyclenes, benzene, toluene, xylenes, styrene, ethylbenzene and cumene)	4.3. Products mainly from petroleum products
29071300	Octylphenol, nonylphenol and their isomers; salts thereof	4.3. Products mainly from petroleum products
29093031	Pentabromodiphenyl ether; 1,2,4,5-tetrabromo-3,6-bis"pentabromophenoxy"benzene	4.3. Products mainly from petroleum products
29093038	Brominated derivatives of aromatic ethers (excl. pentabromodiphenyl ether, 1,2,4,5-tetrabromo-3,6-bis"pentabromophenoxy"benzene and 1,2-bis"2,4,6-tribromophenoxy"ethane for the manufacture of acrylonitrile-butadiene-styrene [ABS])	4.3. Products mainly from petroleum products
29095000	Ether-phenols, ether-alcohol-phenols and their halogenated, sulphonated, nitrated or nitrosated derivatives	4.3. Products mainly from petroleum products

Table 8 shows a time series of import, export, domestic production, DMC (net inflow) for alcylphenols, CN 29071300. Data is retrieved from Trade statistics (import and export) and Production of commodities and industrial services (domestic production). It shows that the DMC (net inflow) is 1500-3500 tonnes in the years 2000-2008. The DMC per capita is 0.2-0.3 kg for most of the years. This shows that it was possible to retrieve data also for these substances based on EW-MFA data if it is complemented with data for Industrial production.

Table 8. Import, export, domestic production and DMC (net inflow) for alchylphenols (CN 29071300) in Sweden 2000-2008. Data from Trade statistics (import and export) and Production of commodities and industrial services (domestic production), Statistics Sweden

	2000	2001	2002	2003	2004	2005	2006	2007	2008
Import (tonnes)	3571	2107	2219	1852	2511	1466	2141	2670	2265
Export (tonnes)	16	5	0	1	1	0	0	1	0
Industrial production (tonnes)	0	0	0	0	0	0	0	0	0
DMC, net inflow (tonnes)	3555	2102	2219	1851	2510	1466	2141	2669	2265
DMC, net inflow (kg/capita)	0.40	0.23	0.25	0.21	0.28	0.16	0.24	0.30	0.25

* Domestic production data for the year 2000 and 2001 was set to ".." for quantity in the primary data set. Since the value (in SEK) for these years was zero, the quantity of domestic production was assumed to be zero.

Petroleum products

In the chemical indicators of the Swedish Environmental Accounts it is shown that about half of the flow of classified chemical products constitutes of petroleum fuels, used for heating and transport, cf. Figure 6. The use of petroleum fuels in Sweden have been around 13 million tonnes between 1997-2008 and the trend is rather constant over the years. From this follows that one of the largest classified chemical products according to quantity (tonnes) being used in Sweden has carcinogenic and health hazardous properties (c.f. Table 9). Classification of and labeling of substances or groups of substances can for example be searched for in the database of EX-EUROPEAN CHEMICALS BUREAU, http://ecb.jrc.ec.europa.eu/classification-labelling/search-classlab/.[5]

In the chemical indicators for Sweden the focus is to show the use of chemical products. Therefore as a data source for compilation of the chemical products petrol, diesel, air fuels and fuel oils the energy statistics is used, i.e. to account the amounts that actually is used per year. National data on the energy consumption of petroleum products can hence be transformed into an estimate of the amounts of classified chemical products that is used. For example are the "Final energy consumption of petroleum products" as well as the "Net imports of crude oil and petroleum products" in EU and per member country available at the website of Eurostat, http://epp.eurostat.ec.europa.eu. Please note that "netinflow" in that case only is accounted as import-export.

[5] The Council Directive 67/548/EEC (Dangerous Substances Directive, DSD) and Directive 1999/45/EC (Dangerous Preparations Directive, DPD) will in a stepwise approach be replaced by the new European Regulation on Classification, Labelling and Packaging of chemical substances and mixtures (CLP) 1272/2008/EC. The legislation introduces throughout the EU a new system for classifying and labelling chemicals, based on the United Nations' Globally Harmonised System (UN GHS).

We also considered were the petroleum products are to be found in the structure of CN. These types of products are in chapter 27 of the CN, "Mineral fuels, mineral oils and products of their distillation, bituminous substances; mineral waste". On a more detailed level in the group 2710 of CN. Petroleum products like petrol and diesel are accounted for in the EW-MFA for the import and export. In the EW-MFA structure they are found in'4.2. Liquid and gaseous petroleum resources, primary and processed'. There is as well an adjustment for fuel bunkered by the specific nation in other countries. EW-MFA do not account for Domestic Production of petrol and diesel, only the extraction of crude oil that petrol and diesel is refined from. To avoid that the quantity is accounted twice the DMC (netinflow) for petroleum products can only be accounted for per individual CN numbers and not summarized.

Figure 6. Use of health hazardous products and petroleum fuels in Sweden 1997-2007, www.scb.se. Petroleum fuels include petrol, diesel, air fuels and fuel oils

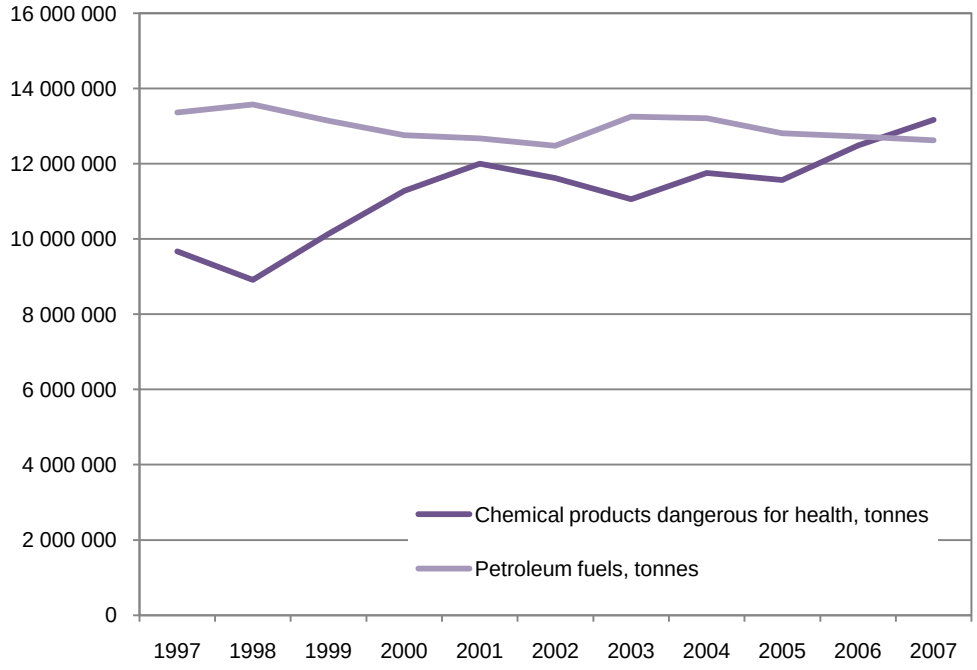


Table 9. Examples of risk phrases and label of classification for petroleum products: The table is based on some CAS that here has been used to exemplify the petroleum products

	Example of Risk phrases	Example of Label of classification
Heating oil 1	R40 Limited evidence of a carcinogenic effect	Xn, Harmful
Heating oil 2-5	R40 Limited evidence of a carcinogenic effect	Xn, Harmful
Diesel oil	R40 Limited evidence of a carcinogenic effect.	Xn, Harmful
Air fuel	R40 Limited evidence of a carcinogenic effect.	Xn, Harmful
Petrol(Gasoline)	R45 May cause cancer, R51/53 Toxic to aquatic organisms/May cause long.ter, adverse effects in the aquatic environment	T, Toxic, Xn, Harmful and N, Dangerous for the Environment

Health hazardous substances in flows of waste

Health hazardous substances may be found in the waste flows. Either as a health hazardous substance in itself, or integrated in products for recycling and or final disposal. The content of health hazardous substances in the flows of waste is related to the inflow and stock of health hazardous substances. Hazardous waste flows can for example be both flows of specific metals such as cadmium and mercury (that can be recycled) or products containing hazardous organic substances (such as flame retardants) that need to go to final disposal.

Statistics on waste is regulated in the Waste Statistics Regulation (WStatR) The list of EWC stat codes incorporates 48 different groups of waste divided into hazardous and non-hazardous (The European Commission (2004/574/EC)). It applies to all wastes, irrespectively of whether they are destined for disposal or for recovery operations. Data is also presented for in total 20 different sectors including A-Q according to NACE Rev1), waste from recycling and waste from households.

Transboundary shipment of waste is regulated both at EU level and internationally in the Basel Convention (Basel Convention on the Control of Transboundary Movements of Hazardous Waste and Their Disposal). The latter is a global environmental agreement on hazardous and other wastes. The basic principle of the convention is that transboundary movements of hazardous waste should decrease to a minimum, and that waste should be treated close to where it has been generated. Every year the amounts of hazardous waste generated, imported and exported per country are to be reported to the Secretariat of the Basel Convention. The aggregated list of the Basel Convention is divided into 47 codes of which 45 covers hazardous waste. (The detailed list includes 120 codes of which 60 cover hazardous waste). Data on export and import of hazardous waste included in the Basel Convention per reporting country is available on the website of the Basel Convention www.basel.int. As an example, data from Sweden is included in Appendix 4.

In this project one interest has been identifying hazardous waste in the EW-MFA. Within EW-MFA both recycled materials and "waste" is integrated in the material flows accounted for (Eurostat, 2007). When the waste is identified in the trade statistics as being mostly of a certain type of material (e.g. scrap) then it should be classified together with products closest to that EW-MFA material category. According to the Compilation guide (Eurostat, 2007) only SITC 599 (trade statistics) and waste from waste statistics not included in the trade statistics should be put into category "6. Waste imported / exported for final treatment and disposal". Furthermore, only waste that is aimed for final disposal in uncontrolled landfills is accounted for separately as part of the Domestic Processed Outputs (DPO). Other flows included in the DPO are the amount of materials resulting from emissions to air, wastewater and dissipative flows.

There is no official correspondence table on the classification of EWC-STAT and CN available in the meta-database RAMON on the website of Eurostat that can be further converted into the classification of the material flows categories used in the Eurostat Questionnaire for EW-MFA. Halogenated organic substances (in this report discussed as the highest rated in an environmental hazard assessment) is found in the code of Y41 of the Basel Convention (c.f. www.basel.int). That in turn corresponds to the code 382541 of CN. This code is in the EW-MFA structure as expected found in "6. Waste imported/exported for final treatment and disposal". According to the Swedish reporting to the Basel Convention, Sweden for example exported 106 tonnes of halogenated solvents to Denmark in 2005 (c.f. Appendix 4). The import and export of this substance can thus be accounted for but the domestic generated waste treated in the nation is not accounted for.

In Wielenga and Junker (2004) correspondence tables on EWC-STAT codes, Basel-Convention and CN is used. This list has been related to the CN codes in table B-E of the 2009 EW-MFA questionnaire aware of that it might have been changes in the CN codes since the German study was accomplished. Those codes that is representing waste The result of applying the list of CN-EW-STAT – Basel Codes on the categories can be seen in Appendix 3. As can be concluded waste is represented in several of the categories of EW-MFA. In the dataset for EW-MFA this connection is seen for some of the materials within 2.2.9. Other metals, 2.3 Products mainly from metals, 4.2.1.1 Crude Oil 6. And of course for the category 6. Waste imported/exported for final treatment and disposal. However, it can be concluded that the connection

Assessment of data quality

All import, export and domestics production data in this report is coming from official statistics from Statistics Sweden, if nothing else is indicated.

Import and export data is based on Foreign Trade Statistics, for more information and assessment of data quality, see http://www.scb.se/Pages/Product 7232.aspx. For more detailed description about the statistics and assessment of data quality, see http://www.scb.se/Pages/ProductDocumentations 17842.aspx.

Domestic production is based on Production of Commodities and Industrial Services, for more information and addessment of data quality,

see http://www.scb.se/Pages/Product____11292.aspx. For more detailed description about the statistics and assessment of data quality, see http://www.scb.se/Pages/ProductDocumentations____19165.aspx.

Data in Figure 5 is based on the Swedish reporting of Material Flow Accounts to Eurostat, which in turn mainly is based on import, export and domestic production, see above. More detailed description of the statistics is however found at http://www.scb.se/Pages/ProductDocumentations____180299.aspx.

The data in Figure 6 is coming from the chemical indicators of the Swedish Environmental Accounts, Statistics Sweden. For more information about the statistics and the quality, see http://www.scb.se/Pages/ProductDocumentations____38173.aspx. Most data is originally coming from the Swedish Chemical Agency www.kemi.se and its Product Register, http://www.kemi.se/templates/Page____2972.aspx.

Conclusions and future work

The results show that it is possible to calculate the net inflow (DMC) for groups of chemicals using available statistics. The data comes from Trade statistics (import and export) and Production of commodities and industrial services (domestic production). If the EW-MFA is complemented with data on the domestic production of chemicals it is possible to calculate DMC per groups of chemicals. Domestic production nationally and internationally seems to be available for most of the chemicals since they are part of the PRODCOM which the countries are obliged to turn in according to EU legislation.

There are different ways to select chemicals that are hazardous substances. The project has used a method to rank compounds (CAS) with an environmental hazard assessment. This method gives a possibility to prioritise between all the compounds (CAS) used, which is difficult otherwise. When using the environmental hazard assessment the halogenated compounds (that include chlorine, fluorine or bromine) obtain the highest rating. Often many different CAS are included in one CN, which makes it difficult to get data for a single compound (CAS). On the other hand, the net inflow of many of the halogenated compounds can be followed using a few CN numbers, for example CN 29036990 which includes 25 compounds. The DMC (netinflow) in the overall group of halogenated substances, CN 2903, is 7.8 kg/year and capita 2005 in Sweden. More detailed, the CN 29036990 that includes CAS with very high rating, has a DMC (netinflow) of 5 g per capita and year.

Alcylphenols, flame retardants and polyaromatic hydrocarbons were identified in the CN classifications system by their correlation to CAS numbers. The relevant CN numbers are: Alcylphenols (CN 29071300), Flame retardants (CN 29093031, 29093038) and Polyaromatic hydrocarbons (CN 29029000). For alcylphenols the data showed a DMC (netinflow) about 1 500-3 500 tonnes, which corresponds to 0.2-0.4 kg/capita. This shows that it is possible to find data and time series for some environmentally interesting substances in statistical sources. Using international data sources could influence the level of data possible to obtain.

All of the identified hazardous substances discussed in this report are based on petroleum resources. Hence, they are in the structure of EW-MFA found in the group of '4.3 Products mainly from petroleum products. In EW-MFA this group is only compiled for import and export data. To be able to calculate the net inflow both of groups of substances, substances with a high rank and identified substances of environmental concern, data on EW-MFA has to be complemented with domestic production.

Future work could include to investigate PRODCOM data for the identified top ranked groups of hazardous substances for EU27 in total and per individual member country. If data is available, trends could be accounted for.

References

Atkinson, R. and Arey, J. (2003) *Atmospheric degradation of volatile organic compounds.* Chemical Reviews, vol. 103:4605-4638.

Brunner, P. H. (2007). *Reshaping Urban Metabolism.* Journal of Industrial Ecology, 11 (2):11-13.

ECICS consultation (2010) *European customs inventory of chemical substances*. http://ec.europa.eu/taxation_customs/common/databases/ecics/index_en.htm

Eurostat (2007) *Economy Wide Material Flow Accounting "A compilation Guide"* Helga Weisz and others. http://circa.europa.eu/Public/irc/dsis/pip/library?l=/material_accounts&vm=detailed&sb=Title

Eurostat (2009). *The REACH baseline study. A tool to monitor the new EU policy on chemicals – REACH* (Registration, Evaluation, Authorisation and restriction of Chemicals). ISSN 1977-0375.

Gouin, T., Mackay, D., Webster, E. and Wania, F. (2000) *Screening chemicals for persistence in the environment*. Environmental Science and Technology, vol 34: 881-884.

Kittilisen, M.O. and Hansen, K.L., (2008) *Use and emissions of hazardous substances in Norway, 2002-2006*. Based on data from the Norwegian Product Register. Rapport 2008/24. Statistics Norway.

Kleijn, R. (2000) *IN = OUT. The Trivial Central Paradigm of MFA?* Journal of Industrial Ecology. 3[2-3]: 8-10.

Palm and Carlsson (2003) *Chemical product indicators by industry – fossil fuels, cement and other chemical products classified as hazardous to health and or environment*, 1996-2001. Statistic Sweden report to Eurostat www.scb.se

Schwarzenbach, R., P. , Gschwend, P.M. and Imboden, D.M. (2002) *Environmental organic chemistry*. Hoboken, USA, Wiley.

SEPA (2008a) *Avfall i Sverige 2006*. Rapport 5868. (In Swedish). Summary and tables are available in English. http://www.naturvardsverket.se/sv/Nedre-meny/Webbokhandeln/ISBN/5800/978-91-620-5868-5/

SEPA (2008b) *Quality Report For statistics on generation of waste and recovery and disposal of waste in Sweden 2006*. Reporting According to EU Regulation on Waste Statistics 2008. http://www.naturvardsverket.se/sv/Nedre-meny/Webbokhandeln/ISBN/5800/978-91-620-5842-5/

Statistics Sweden (2009) *Chemicals in Statistics – Method Development*. Regional and Environment Statistics 2009:4. ISSN 1654-4390 (online) Available at www.scb.se

Wielenga and Junker (2004) *Pilot study on statistics on the import and export of waste in Germany.* Pursuant to Article 5(1) of the Regulation (EC) No 2150/2002 of the European Parliament and the Council of 25 November 2002 on waste statistics Final report Umweltbundesamt. Co-financed by EUROSTAT Berlin, April 2004

Öberg, T. (2006). *Virtual screening for environmental pollutants: Structure-activity relationships applied to a database of industrial chemicals.* Environmental Toxicology and Chemistry, 25:1178-1183.

Appendix

Appendix 1. DMC (net inflow) per groups of CN codes, 4-digits, Chapter 28 and 29 of CN, 2005

Calculations on DMC (netinflow) for the listed CN codes is based on data from the Swedish Foreign Trade Statistics and Swedish Statistics on Production of commodities and industrial services. Data is also available at the website of Statistics Sweden, www.scb.se. The [..] in the table indicate that the net inflow cannot be calculated due to lack of data, this can both be a result of confidential data and the fact that there is no data for the CN codes for quantities expressed as tonnes. (Alternative units for reporting is for example in m^3 and 1000 l).

CN	DMC for 2005, tonnes	CN	DMC for 2005, tonnes
28		29	
2801	35 902	2901	378 936
2802	-224	2902	121 270
2803	41 725	2903	70 762
2804	..	2904	1 522
2805	59	2905	231 680
2806	..	2906	466
2807	..	2907	13 736
2808	..	2908	146
2809	..	2909	..
2810	1 717	2910	47 945
2811	..	2911	..
2812	815	2912	103 481
2813	349	2913	1
2814	..	2914	13 351
2815	..	2915	87 995
2816	1 505	2916	49 438
2817	1 827	2917	..
2818	254 074	2918	8 410
2819	322	2919	560
2820	9 909	2920	456
2821	46 657	2921	9 359
2822	2	2922	19 048
2823	682	2923	1 974
2824	218	2924	2 330
2825	4 614	2925	134
2826	..	2926	9 747
2827	163 399	2927	61

CN	DMC for 2005, tonnes	CN	DMC for 2005, tonnes
2828	-1 130	2928	79
2829	..	2929	5 741
2830	-20	2930	2 368
2831	273	2931	1 752
2832	18 032	2932	653
2833	..	2933	6 938
2834	8 426	2934	..
2835	-33 143	2935	397
2836	1 965 601	2936	..
2837	11 948	2937	6
2838	48	2938	..
2839	..	2939	..
2840	..	2940	..
2841	3 094	2941	66
2842	-768	2942	825
2843	11		
2844	955		
2845	-1		
2846	25		
2847	..		
2848	28		
2849	33 902		
2850	1 655		
2851	11 385		

Appendix 2. The 100 compound (CAS) with highest Toxic Persistence Rating

For more information about the method to retrieve Toxic Persistence Rating (TPR) see Öberg 2006 and Statistics Sweden, 2009.

Chemical name	CAS	CN	t½ (days)	LC_{50} (mg/L)	TPR
Dichloro((dichlorophenyl)methyl) methylbenzene	76253-60-6	29036990	13.2	0.0317	417
2,4,2',4'-Tetrachlorobiphenyl	2437-79-8	29036990	28.9	0.106	273
Polychlorinated biphenyls	1336-36-3	29036990	28.9	0.106	273
DDE	72-55-9	29036990	15.0	0.0585	257
2,2-(2-Chlorophenyl-4'-chlorophenyl)-1,1-dichloroethene	3424-82-6	29036990	11.9	0.0618	193
DFDT	475-26-3	29036990	20.8	0.152	137
TDE	72-54-8	29036990	11.6	0.0874	132
Mitotane	53-19-0	29036990	9.29	0.0914	102
2-Butenoic acid, 2,3,4,4,4-pentachloro-, butyl ester	21824-93-1	29161980	35.9	0.447	80.3
Perthane	72-56-0	29036990	2.19	0.0298	73.6
HCFC 222	422-49-1	29034910	405	6.58	61.5
4-(Trifluoromethyl)benzophenone	728-86-9	29147000	23.5	0.389	60.4
PCB 28	7012-37-5	29036990	13.2	0.234	56.6
Decane, 1,10-dibromo-	4101-68-2	29033036	6.29	0.143	44.1
HCFC 231	421-94-3	29034910	358	8.41	42.5
2,3,4,5,6-Pentafluorobenzophenone	1536-23-8	29147000	30.1	0.776	38.8
Nonane, 1,9-dibromo-	4549-33-1	29033036	8.12	0.221	36.7
2,4,5,6-Tetrachloro-m-xylene	877-09-8	29036990	15.4	0.453	33.9
alpha,alpha,alpha-Trichloro-4-chlorotoluene	5216-25-1	29036990	25.3	0.789	32.0
Propyl 2,4,5-trichlorophenoxyacetate	1928-40-1	29189090	8.32	0.264	31.5
Sebacoyl chloride	111-19-3	29171990	6.44	0.208	31.0
2,3,4,5-Tetrachloronitrobenzene	879-39-0	29049085	55.7	1.83	30.4
1,2,3,5-Tetrachlorobenzene	634-90-2	29036990	28.6	0.940	30.4
Benzonitrile, 2,3,4,5,6-pentafluoro-	773-82-0	29269095	695	22.9	30.3
1,2,3,4-Tetrachlorobenzene	634-66-2	29036990	37.1	1.23	30.3
Propane, 2,2,3-trichloro-1,1,1,3-tetrafluoro-	139754-75-9	29034910	662	22.0	30.1
1,2,4,5-Tetrachlorobenzene	95-94-3	29036990	30.9	1.08	28.7
3,5-Dinitro-4-chloro-alpha,alpha,alpha-trifluorotoluene	393-75-9	29049085	252	9.04	27.9
2,3,5,6-Tetrachloro-p-xylene	877-10-1	29036990	15.1	0.558	27.1

Chemical name	CAS	CN	t½ (days)	LC_{50} (mg/L)	TPR
HCFC 223	422-52-6	29034910	452	17.5	25.8
Propane, 1,1,1,3-tetrachloro-2,2,3-trifluoro-	422-50-4	29034910	381	15.8	24.1
1,2,4,5-Tetrachloro-3-nitrobenzene	117-18-0	29049085	52.7	2.24	23.5
Benzene, 1-chloro-2-(trichloromethyl)-	2136-89-2	29036990	24.9	1.07	23.2
Undecane, 1-bromo-	693-67-4	29033036	1.80	0.0814	22.1
Octane, 1,8-dibromo-	4549-32-0	29033036	10.1	0.476	21.3
2-Bromotridecane	59157-17-4	29033036	1.57	0.0749	20.9
Propane, 1,1,3,3-tetrafluoro-1,2,2-trichloro-	422-32-2	29034910	400	19.5	20.5
Chloropentafluorobenzene	344-07-0	29036990	98.6	5.18	19.0
Propane, 1,1,1,2-tetrafluoro-2,3,3-trichloro-	422-47-9	29034910	667	35.1	19.0
Carbonochloridic acid, 2,4,5-trichlorophenyl ester	16947-69-6	29159020	15.0	0.840	17.8
Decane, 1,10-dichloro-	2162-98-3	29031980	3.07	0.184	16.7
HCFC 225aa	128903-21-9	29034910	475	29.1	16.3
HCFC 224	422-54-8	29034910	727	45.1	16.1
Propane, 1,1,1,3-tetrachloro-2,2-difluoro-	677-54-3	29034910	380	23.6	16.1
4-Hexylbiphenyl	59662-31-6	29029090	0.620	0.0394	15.7
3,4-Dichlorobenzotrifluoride	328-84-7	29036990	53.0	3.46	15.3
2-Bromododecane	13187-99-0	29033036	1.39	0.0912	15.2
4-Benzylphenyl chloroformate	74176-32-2	29159020	3.75	0.248	15.1
Dodecane, 1-chloro-	112-52-7	29031980	0.982	0.0652	15.1
2,4,5-T-isopropyl	93-78-7	29189090	8.71	0.590	14.8
1,1,1,2-Tetrachloroethane	630-20-6	29031980	187	13.0	14.4
Dodecanoyl chloride	112-16-3	29159080	2.43	0.171	14.2
Trichloroacetyl chloride	76-02-8	29159080	224	16.1	14.0
Benzonitrile, 4-(trifluoromethyl)-	455-18-5	29269095	296	21.3	13.9
Propane, 1,1,1,2-tetrachloro-2-fluoro-	3175-25-5	29034910	318	23.2	13.7
Propane, 1,1,2,3-tetrafluoro-1,2,3-trichloro-	422-42-4	29034910	455	33.3	13.7
Propane, 2,2-dichloro-1,1,1,3-tetrafluoro-	149329-24-8	29034910	568	41.9	13.6
alpha,alpha,alpha-Trifluoro-m-toluonitrile	368-77-4	29269095	288	21.5	13.4
Propane, 2,2,3,3-tetrafluoro-1,1,1-trichloro-	422-51-5	29034910	419	32.4	12.9
Benzene, 2,4-dichloro-1-(trifluoromethyl)-	320-60-5	29036990	50.1	3.88	12.9
Propane, 1,2,2-trichloro-1,1,3,3-	139754-76-	29034910	402	31.4	12.8

Chemical name	CAS	CN	t½ (days)	LC_{50} (mg/L)	TPR
tetrafluoro-	0				
2,5-Furandione, dihydro-3-(octen-1-yl)-	26680-54-6	29171990	2.84	0.224	12.7
Bis(p-chlorophenoxy)methane	555-89-5	29093090	4.64	0.371	12.5
alpha,alpha,alpha-Trifluoro-2-toluonitrile	447-60-9	29269095	334	27.1	12.3
Octanoic acid, 4-methylphenyl ester	59558-23-5	29159080	1.21	0.0988	12.2
Triclosan	3380-34-5	29095090	2.23	0.192	11.6
Propane, 1,1,3-trichloro-1,2,2,3-tetrafluoro-	422-53-7	29034910	436	38.0	11.5
Pentafluorobenzyl bromide	1765-40-8	29036990	108	9.42	11.4
1,1,1,3,3-Pentachloroacetone	1768-31-6	29147000	94.3	8.28	11.4
2,4-D-butyl	94-80-4	29189090	3.65	0.332	11.0
Benzene, 1,1'-(1,2-dibromo-1,2-ethanediyl)bis-	5789-30-0	29036990	6.69	0.612	10.9
Trichloroethyl chloroformate	17341-93-4	29159020	51.1	4.78	10.7
Tetrachlorophthalic acid	632-58-6	29173980	9.74	0.917	10.6
Heptane, 1,7-dibromo-	4549-31-9	29033036	10.0	0.962	10.4
Haloprogin	777-11-7	29093090	15.5	1.49	10.4
Propane, 1,1,1-trichloro-2,2,3-trifluoro-	131211-71-7	29034910	508	49.6	10.2
Chlorbenside	103-17-3	29309070	2.40	0.241	10.0
HCFC 225ca	422-56-0	29034910	806	83.6	9.6
Nonanedioyl dichloride	123-98-8	29171990	5.41	0.562	9.6
Carbonic acid, 1,1-dimethylethyl 2,4,5-trichlorophenyl ester	16965-08-5	29209010	20.0	2.10	9.5
2-Chloranil	2435-53-2	29147000	23.2	2.50	9.26
Decane, 1-iodo-	2050-77-3	29033080	1.43	0.159	9.02
4,4'-Dichlorobiphenyl	2050-68-2	29036990	7.80	0.888	8.78
Decyl bromide	112-29-8	29033036	1.93	0.222	8.71
2-Bromo-2,2-diphenylacetyl chloride	17397-37-4	29163900	12.4	1.43	8.69
HCFC-225bb	422-44-6	29034910	488	57.0	8.55
2,3,4,6-Tetrachlorophenol	58-90-2	29081000	5.22	0.616	8.47
Hexanoic acid, 1,1'-anhydride	2051-49-2	29159080	1.71	0.202	8.44
4-Bromo-2-chloro-alpha,alpha,alpha-trifluorotoluene	445-01-2	29036990	54.0	6.61	8.18
2,3,4,5-Tetrachlorophenate	4901-51-3	29081000	6.26	0.774	8.09
Benzeneacetonitrile, 3-(trifluoromethyl)-	2338-76-3	29269095	166	20.6	8.07
Decylbenzene	104-72-3	29029080	0.568	0.0711	7.99
Benzoyl chloride, 4-heptyl-	50606-96-7	29163900	2.09	0.263	7.96
2,4-D sec-butyl ester	94-79-1	29189090	3.39	0.427	7.94

Chemical name	CAS	CN	t½ (days)	LC_{50} (mg/L)	TPR
Ethyl 2,4,5-trichlorophenoxyacetate	1928-39-8	29189090	7.80	0.989	7.89
HCFC 121	354-14-3	29034910	351	44.7	7.85
2,3,5,6-Tetrachlorophenate	935-95-5	29081000	5.88	0.755	7.79
Trityl chloride	76-83-5	29036990	3.00	0.387	7.74
Propane, 3-bromo-1,1,1,2,2-pentafluoro-	422-01-5	29034930	1426	188	7.60
d-Bornyl a-Bromoisovalerate	52964-40-6	29159080	2.23	0.298	7.49

Appendix 3. List of MFA codes, 1-4 digits, in EW-MFA 2009 Questionnaire Table B/C/D/E that also is classified as hazardous "H" in the Basel Convention.

List of CN codes based in Wielenga and Junker (2004)

Structure of EW-MFA 1digit 2digit 3digit 4digit	Includes the following CN codes related to waste			Classification of waste codes		
	CN	Text CN codes	Does the CN code only/partly covers waste?	EWC-stat code	Basel code	"H" if hazardous according to Basel*
2.2.9. Other metals						
	2620 19 00	Ash and residues containing mainly zinc (excl. hard zinc spelter)	only	12	A1070 B1080 B1100	H
	2620 21 00	Leaded gasoline sludges and leaded anti-knock compound sludges, obtained from storage tanks of leaded gasoline and leaded anti-knock compounds and contraining mainly lead, lead compounds and iron oxide	only	3	A1010 A1020	H
	2620 29 00	Ash and residues containing mainly lead (excl. leaded gasoline sludges and leaded anti-knock compound sludges)	only	12	A1010 A1020	H
	2620 30 00	Ash and residues containing mainly copper	only	12	A1100 A1110 A1120 A1130 A1140 A1150 B1070	H
	2620 60 00	Ash and residues, containing arsenic, mercury, thallium or their mixtures, of a kind used for the extraction of arsenic or those metals or for the manufacture of their chemical compounds (excl	only	12	A1030	H
	2620 91 00	Ash and residues, containing antimony, beryllium, cadmium, chromium or their mixtures (excl. those from the manufacture of iron or steel	only	12	A1010	H
2.3. Products mainly from metals						
	8548 10 10	Spent primary cells, spent primary batteries	only	8	A1170 B1090	H
	8548 10 21	Spent lead-acid accumulators	only	8	A1170	H
	8548 10 91	Other spent accumulators	only	8	A1160	H
	8548 10 99	Other waste and scrap of primary cells, primary batteries and electric accumulators	only	8	A1170 B1090	H
	8548 90 90	Waste and scrap of primary cells, primary batteries and electric accumulators; spent primary cells, spent primary batteries and spent electric accumulators; electrical parts of machinery or apparatus, not specified or included elsewhere in this chapter	only		A1180 B1110	H
3. Non metalic minerals primary and processed						
4.2.1.1 Crude Oil	2710 91 00	Waste oils containing polychlorinated biphenyls [PCBs], polychlorinated terphenyls [PCTs] or polybrominated biphenyls [PBBs]	only	7.7	A3180	H
	2710 99 00	Waste oils containing mainly petroleum or bituminous minerals (excl. those containing polychlorinated biphenyls [PCBs], polychlorinated terphenyls [PCTs] or polybrominated biphenyls [PBBs])	only	1.3	A3020	H

Structure of EW-MFA 1digit 2digit 3digit 4digit	Includes the following CN codes related to waste			Classification of waste codes		
	CN	Text CN codes	Does the CN code only/partly covers waste?	EWC-stat code	Basel code	"H" if hazardous according to Basel*
	2713 90 10	Residues of petroleum oil or of oil obtained from bituminous minerals for the manufacture of carbon of heading 2803	only	3	A3020	H
	2713 90 90	Residues of petroleum oil or of oil obtained from bituminous minerals (excl. for the manufacture of carbon of heading 2803, petroleum coke and petroleum bitumen)	only	3	A3020 A4062	H
6. Waste import-ed/exported for final treatment and disposal	3825 10 00	Municipal waste	only	10.1	Y46	
	3825 20 00	Sewage sludge	only	11	AC 270	H
	3825 30 00	Clinical waste	only	5	A4020	H
	3825 41 00	Waste organic solvents, halogenated	only	1	A3140	H
	3825 49 00	Waste organic solvents, non-halogenated	only	1	A3150	H

* Characterized as hazardous under Article 1, paragraph 1(a) of the Basel Convention (referens).

Appendix 4. Import and Export of Hazardous Waste and other Waste to Sweden 2005

Data reported to the Basel Convention.

http://www.basel.int/natreporting/

Y code	Import of "Waste streams	"Amount imported In metric tonnes	"Country of origin
Y5	Creosotedwoodenrailwaysleepers	1 949 000	DE
Y5	Creosotedwoodenrailwaysleepers	13 480 000	CH
Y5	Creosotedwoodenrailwaysleepers	9 095 000	IT
Y5	Creosotedwoodenrailwaysleepers	408 000	IT
Y5	Creosotedwoodenrailwaysleepers	6 533 000	CH
Y5	Creosotedwoodenrailwaysleepers	86 000	NO
Y5	Creosotedwoodenrailwaysleepers	1 134 000	DE
Y5	Creosotedwoodenrailwaysleepers	527 000	DK
Y5	Creosotedwoodenrailwaysleepers	3 700 000	NL
Y5	Creosotedwoodenrailwaysleepers	23 000	NO
Y6	Styrenewaste	24 000	FI
Y6	Styrenewaste	22 000	FI
Y8	Contaminatedfueloil	7 000	MK
Y8	Oilfilters	15 000	MK
Y8	Oilfilters	43 000	NO
Y8	Oilsludge	871 000	NO
Y11	Tarasphalt	207 000	NO
Y12	Paintdispersion	61 000	DK
Y12	Paintwaste	143 000	NO
Y15	Explosives	944 000	NO
Y15	Explosives	95 000	DE
Y15	Explosives	477 000	NO
Y16	Photographicfix	417 000	NO
Y17	sludgesfromphysicalchemicaltreatm	1 008 000	IT
Y17	sludgesfromphysicalchemicaltreatm	784 000	IT
Y17	Specialfuel	3 949 000	GB
Y18	fluff-lightshredderfraction	35 000	DE
Y18	Refusederivedfuel	1 966 000	NO
Y18	Refusederivedfuel	1 102 000	NO
Y18	Refusederivedfuel	24 000	IE
Y18	Fluedust	14 000	GB
Y18	Refusederivedfuel	4 556 000	NL
Y18	Refusederivedfuel	2 430 000	NL
Y18	Refusederivedfuel	1 883 000	NO
Y22	Copperpowder	33 000	FI
Y23	metaldustandscalefrstainlesssteel	5 933 000	IT
Y23	Solidwastefromgastreatment	144 000	DE
Y23	Solidwastefromgastreatment	369 000	DE
Y23	metaldustandscalefrstainlesssteel	2013 000	FI
Y23	metaldustandscalefrstainlesssteel	34 422 000	FI
Y23	Solidwastefromgastreatment	25 000	FI
Y23	Filterdust	49 000	FI
Y26	NiCdbatteries	36 000	FI
Y26	NiCdbatteries	28 000	DK
Y26	NiCdbatteries	23 000	DK
Y26	NiCdbatteries	29 000	NO
Y26	NiCdbatteries	141 000	NO
Y26	NiCdbatteries	47 000	FI
Y26	NiCdbatteries	31 000	ZA
Y26	NiCdbatteries	125 000	NL
Y26	NiCdbatteries	15 000	DK
Y26	NiCdbatteries	124 000	AU
Y26	NiCdbatteries	14 000	DK
Y29	Electronicscrap	31 000	NO
Y29	Amalgamwaste	1 000	DK
Y29	Amalgamwaste	1 000	DK
Y31	Leadacidbatteries	1 64 000	NO

Y code	Import of "Waste streams	"Amount imported In metric tonnes	"Country of origin
Y31	Cablescrap	66 000	DE
Y31	Leadacidbatteries	32 000	NO
Y31	Leadashandresidues	41 000	NO
Y31	Leadacidbatteries	5 699 000	FI
Y31	Leadacidbatteries	5 586 000	NO
Y31	Leadacidbatteries	697 000	IS
Y31	Cablescrap	35 000	DE
Y31	Leadashandresidues	47 000	NO
Y31	Leadacidbatteries	76 000	NO
Y31	Leadacidbatteries	157 000	IS
Y31	Leadacidbatteries	17 337 000	DK
Y31	CRTwaste	43 000	NO
Y39	Usedfoundarysand	270 000	DK
Y39	Usedfoundarysand	938 000	DK
Y39	Usedfoundarysand	108 000	DK
Y41	activatedcarbon,chlorinatedsolvents	1 000	MK
Y45	Refrigeratorsfromhouseholds	418 000	NO
Y46	Householdwaste	1 502 000	NO
Y46	Householdwaste	415 000	NO
Y46	Householdwaste	27 535 000	NO
Y46	Householdwaste	180 000	NO
Y46	Householdwaste	4 038 000	NO
Y46	Householdwaste	11 137 000	GB
Y46	Householdwaste	10 988 000	NO
Y46	Householdwaste	104 000	NO
Y46	Householdwaste	6 744 000	NO
Y46	Householdwaste	14 626 000	NO
Y46	Householdwaste	549 000	NO
Y46	Householdwaste	2 590 000	NO
Y46	Householdwaste	21 713 000	NO
Y46	Householdwaste	5 803 000	NO
Y46	Householdwaste	3 684 000	NO
Y46	Householdwaste	4 460 000	NO
Y46	Householdwaste	226 000	FI
Y46	Householdwaste	234 000	FI
Y46	Householdwaste	11 747 000	NO
Y46	Householdwaste	4 942 000	NO
Y46	Householdwaste	1294 000	FI

Export from Sweden 2005

Y code	"Waste streams" exported"	"Amount exported in metric tonnes	"Country of destination
Y4	Pesticides	2 000	DK
Y4	Pesticides	11 000	DK
Y4	Pesticides	23 000	DK
Y4	Pesticides	4 000	DK
Y4	Pesticides	2 000	NO
Y6	Glycol	603 000	DK
Y6	activatedcarbon	2 000	DE
Y6	watercontaminatedwithsolvents	1 133 000	DK
Y6	activatedcarbon	3 000	DE
Y6	watercontaminatedwithsolvents	178 000	DK
Y8	Lubricantoil	907 000	DE
Y8	Oilfilters	9 000	DK
Y8	Oilsludge	1 661 000	NO
Y8	Oilandfat	1 683 000	DK
Y8	Usedoil	335 000	NO
Y8	Usedoil	107 000	DE
Y8	Oilfilters	263 000	NO
Y8	Fueloil	3311 000	DK
Y8	Usedoil	1 761 000	DE
Y8	Oilsludge	2 293 000	NO
Y8	Lubricantoil	3 591 000	DE
Y8	transformerwithorwithoutoil	68 000	DK
Y8	transformeroil	329 000	DE
Y8	Mineraloil	7 000	NO
Y9	Wasteoil	221 000	DK
Y9	Oilsamples	5 000	NO
Y9	oilpollutedwater	4 498 000	DK
Y9	oilpollutedwater	20 019 000	DK
Y9	Wasteoil	24 000	DE
Y9	Wasteoil	813 000	DE
Y9	Wasteoil	600 000	FI
Y10	PCBcontainingwaste	11 000	DK
Y10	laboratorYchemicals	22 000	DK
Y11	Coaltar	1 494 000	DK
Y12	Paintwaste	16 000	DK
Y12	paintdispersion	334 000	DK
Y12	paintdispersion	39 000	DE
Y12	absorbentswithpaint	39 000	DE
Y12	paintdispersion	88 000	DE
Y12	Solidpaint	227 000	DK
Y12	Organicwaste	263 000	DK
Y12	paintandplasticwaste	127 000	DK
Y12	paintandplasticwaste	5 288 000	DK
Y12	Paintsludge	87 000	NO
Y12	paintdispersion	30 000	NL
Y12	paintdispersion	92 000	DE
Y12	absorbentswithpaint	52 000	DE
Y12	Paintsludge	406 000	NO
Y12	wastefromproduction,useofinks,	242 000	NO
Y13	sealingmaterials	22 000	DK
Y13	Plasiciser	146 000	DK
Y13	isicYanates	10 000	DK
Y13	sealingmaterials	27 000	DK
Y13	isicYanates	8 000	DK
Y14	laboratorYchemicals	12 000	DK
Y15	Explosives	944 000	NO
Y15	Explosives	404 000	DE
Y15	Explosives	41 000	DE
Y15	Explosives	458 000	DE
Y15	Explosives	477 000	NO
Y15	Explosives	95 000	DE

Y code	"Waste streams" exported"	"Amount exported in metric tonnes	"Country of destination
Y16	Photographicdeveloper	793 000	DK
Y16	Photochemicals	9 000	NO
Y17	Picklingacid	119 000	FI
Y17	Picklingacid	42 000	FI
Y17	Chromiumsolution	43 000	DE
Y17	Picklingacid	431000	FI
Y17	Picklingacid	116 000	FI
Y17	Picklingacid	137 000	FI
Y17	blastinggrit	30 000	NO
Y17	picklingacid	30 000	US
Y17	picklingacid	208 000	NO
Y18	sludgesfromon-siteeffluenttreatment	480 000	DK
Y21	steelworkresidues	2 000	CH
Y22	brasswaste	246 000	DE
Y22	Cu,Sn,Pbwastes	25 000	BE
Y22	metalblue	78 000	IT
Y22	Cu,Sn,Pbwastes	39 000	BE
Y23	solidwastefromgastreatment	1 105 000	DE
Y23	solidwastefromgastreatment	6 228 000	DE
Y23	solidwastefromgastreatment	57 000	DE
Y23	zincdust	236 000	BE
Y23	solidwastefromgastreatment	9 876 000	DE
Y23	zincash	1 065 000	BE
Y23	solidwastefromgastreatment	180,000	NO
Y23	solidwastefromgastreatment	7 019 000	DE
Y24	wastecontainingarsenic	255 000	NO
Y29	fluorescenttubes	17 000	DK
Y29	fluorescenttubes	209 000	NO
Y29	electronocscrap	16 000	DE
Y29	electronocscrap	3 000	DE
Y29	amalgamwaste	6 000	DE
Y29	usedbatteries	129 000	CH
Y29	fluorescenttubes	17 000	DK
Y29	fluorescenttubes	372 000	DK
Y29	fluorescenttubes	283 000	NO
Y29	mercurYcontainingwaste	150 000	DE
Y29	fluorescentpowder	139 000	DE
Y31	tinandleaswaste	59 000	BE
Y31	CRTwaste	900 000	NL
Y31	CRTwaste	30 000	DE
Y31	CRTwaste	2 327 000	DE
Y33	cYanideswithpreciousmetals	63 000	DK
Y33	cYanideswithpreciousmetals	23 000	FI
Y33	wastecontainingcYanides	1 532 000	NO
Y33	cYanideswithpreciousmetals	56 000	DK
Y33	cYanideswithpreciousmetals	11 000	FI
Y33	wastecontainingcYanides	6 000	DE
Y34	silvernitrate,nitricacid	7 000	NL
Y34	preciousmetals	34 000	FI
Y34	phosphoricacid	303 000	GB
Y34	preciousmetals	5 000	GB
Y34	preciousmetals	2 000	GB
Y34	preciousmetals	6 000	FI
Y36	asbestoscontainingwaste	5 000	FI
Y41	chlorinatedsolvents	206 000	DK
Y41	halogenatedstillbottoms	157 000	DK
Y41	halogenatedsolvents	10 000	DK
Y41	halogenatedsolvents	106 000	DK
Y41	lightends	522 000	NO
Y42	nonhalogeantedsolvents	1 000	DE
Y45	CFC	5 000	DK
Y45	CFC	2 000	DE
Y45	refrigeratorsfromhouseholds	115 000	DE

Y code	"Waste streams" exported"	"Amount exported in metric tonnes	"Country of destination
Y45	refrigeratorsfromhouseholds	22 000	DE
Y45	refrigeratorsfromhouseholds	603 000	DE
Y45	refrigeratorsfromhouseholds	34 000	DE
Y45	refrigeratorsfromhouseholds	41 000	DE
Y45	refrigeratorsfromhouseholds	45 000	DE
Y45	refrigeratorsfromhouseholds	141 000	DK
Y45	HCFC,HFC	138 000	DK
Y45	HCFC,HFC	2 000	DE
Y45	refrigeratorsfromhouseholds	22 000	DE
Y45	refrigeratorsfromhouseholds	44 000	DE
Y45	CFC	2 000	DE
Y45	refrigeratorsfromhouseholds	562 000	DE
Y46	householdwaste	3 000	FI
Y46	householdwaste	2 539000	FI
Y46	householdwaste	1 669 000	FI
Y46	householdwaste	50 000	FI
Y47	flYash	1 404 000	NO
Y47	flYash	5 681 000	NO
Y47	flYash	432 000	NO
Y47	flYash	110 000	NO
Y47	flYash	219 000	NO
Y47	flYash	501 000	NO
11b	underearthcable	50 000	DK
11b	contaminatedsoil	4 328 000	NO
11b	underearthcable	701 000	DK

Explanatory symbols and abbreviations

CAS Chemical Abstracts Service

CN Combined Nomenclature

CPA Classification of Products by Activity

EWC European Waste Catalogue

EW-MFA Economy Wide Material Flow Account

ECICS European Customs Inventory of Chemical Substances

HS Harmonized Commodity Description and Coding System

Kg Kilograms

MFA Material Flow Account

NACE Nomenclature statistique des activités économiques dans la Communauté européenne / Statistical classification of economic activities

PRODCOM PRODucts of the European COMmunity

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 SEK Swedish Kronor

SNI Svensk Näringsgrensindelning

WStatR Waste Statistics Regulation

Most EU member countries are compiling statistics on material flows regularly. According to Eurostats Compilation Guide for Economy Wide Material Flow Accounts (EW-MFA) data is presented at a high level of aggregation. Even though large flows of material are of concern for the management of resources, it is also important to keep records of hazardous substances.

Statistics Sweden has for several years had an interest in accounting for the use of hazardous substances per industry. Chemical indicators per industry are also integrated in the web-tool for the Swedish Environmental Accounts available on the website of Statistics Sweden. In this report the interest has been to see to what extent hazardous substances can be highlighted in the context of EW-MFA by using already available sources of statistics. Hence, the aim of the project has been to apply the perspective of EW-MFA and show the amount of domestic production, import and export of a selection of hazardous substances. The result shows that it is possible to calculate the net inflow for groups of chemicals by using available statistics.

ISSN 1654-6822 (online)