Eurostat Working Papers

2/2001/B/7 *22 October 2001*

Including chemical products in environmental accounts

Prepared for DG Environment and Eurostat by:
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eurostat

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The magnitude of chemical product use in different industries in Sweden 1996-1999

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Preface

Eurostat is actively developing environmental accounts linked to national accounts. In many areas of environmental accounting we have already developed frameworks and statistical manuals and published numerical results (see overleaf for a list of Eurostat publications in the field of environmental accounting).

A focus of work at Eurostat are environmental accounts using a NAMEA framework (NAMEA stands for National Accounts Matrix including Environmental Accounts). Eurostat just published *NAMEAs for air emissions – Results of Pilot Studies.* This publication includes results from 16 European countries. Several countries include not only air emissions in their NAMEA-type environmental accounts but also energy use, water use, discharges to water, waste generation, environmental expenditure or environmental taxes.

This Working Paper describes the experience with including also the use of dangerous chemical products in environmental accounts data sets undertaken by Statistics Sweden. Total use of registered chemicals is about 40 million tonnes per year in Sweden. This total is dominated by fossil fuels (in particular petroleum products) as these are cancerogenous or otherwise harmful.

Key data sources were the Swedish Chemical Product Register and the energy accounts that are part of the Swedish environmental accounts. The results obtained for Sweden also point at possible difficulties with Chemicals Registers, including that results may be biased due to changes in coverage (resulting e.g. from chemicals testing or changes in legislation) so that care is needed when interpreting trends in chemicals use.

Chemicals use is an area where the user demand for information is high but where data have been lacking in the past. Data from Chemicals Registers combined with other sources make it possible to include the use of key chemicals in environmental accounts data sets.

Eurostat distributes this Working Paper hoping that compilers of environmental accounts and researchers can benefit from the methods and data presented.

Brian Newson
Head of Unit B1
National accounts methodology,
statistics of own resources

Eurostat Environmental Accounting publications

Official publications

- NAMEAs for air emissions – Results of Pilot Studies (2001)
- Environmental Taxes – A Statistical Guide (2001)
- Economy-wide Material Flow Accounts and derived Indicators – A Methodological Guide (2001)
- Accounts for Subsoil Assets – Results of Pilot Studies in European Countries (2000)
- Valuation of European Forests - Results of IEEAF Test Applications (2000)
- Environmental Taxes in the EU – Statistics in Focus Theme 2 – 20/2000
- European Handbook for Integrated Environmental and Economic Accounting for Forests – IEEAF (2000)
- Pilot Studies on NAMEAs for air emissions with a comparison at European level (1999)
- The Environmental Goods & Services Industry – Manual for data collection and analysis (OECD/Eurostat 1999)
- The European Framework for Integrated Environmental and Economic Accounting for Forests: Results of pilot applications (1999)
- From research to implementation: policy–driven methods for evaluating macro-economic environmental performance – proceedings from a workshop, Luxembourg 28-29 September 1998 (DG Research Report 1999/1)
- The European System for the Collection of Economic Information on the Environment – SERIEE 1994 Version (1994). Also available in DE, FR and ES.

Eurostat Working Papers *(available at* http://forum.europa.eu.int/Public/irc/dsis/pnb/library*)*

- Water Satellite Accounts for Spain 1997-1999 (2/2001/B/6)
- Methods for estimating air emissions from the production of goods imported into the UK (2/2001/B/5)
- Towards a Typology of 'Environmentally Adjusted' National Sustainability Indicators (2/2001/B/4)
- Valuation of oil and gas reserves in the Netherlands (2/2001/B/3)
- Material use indicators for the European Union, 1980-1997 (2/2001/B/2)
- Uses of Environmental Accounts in Sweden (2/2001/B/1)
- Environment taxes and subsidies in Danish NAMEA (2/2000/B/12)
- Environment taxes and environmentally harmful subsidies in Sweden (2/2000/B/11)
- The environment industry in Sweden, 2000 (2/2000/B/10)
- Material flow analysis in the framework of environmental economic accounting in Germany (2/2000/B/9)
- A materiel flow account for Italy, 1988 (2/2000/B/8)
- Environment employment in France, methodology and results 1996-1998 (2/2000/B/7)
- Material flow accounts - material balance and indicators, Austria 1960-1997 (2/2000/B/6)
- The environment industry in Sweden, 1999 (2/2000/B/5)
- Environment industry and Employment in Portugal, 1997 (2/2000/B/4)
- Environment-related employment in Netherlands, 1997 (2/2000/B/3)
- Material flows accounts – DMI and DMC for Sweden, 1987-1997 (2/2000/B/2)
- Material flows accounts - TMR, DMI and material balances, Finland 1980-1997 (2/2000/B/1)
- A material flow account for sand and gravel in Sweden (2/1999/B/4)
- The Environment Industry in Sweden (2/1999/B/3)
- Industrial Metabolism (2/1999/B/2)
- The Policy Relevance of Material Flow Accounts (2/1999/B/1)
- The Economy, Energy and Air Emissions (2/1998/B/2)
- Physical Input-Output Tables for Germany, 1990 (2/1998/B/1)
- An Estimate of Eco-Industries in the European Union 1994 (2/1997/B/1)

Eurostat internal publications

- Natural resource accounts and environmental Input-Output tables for Greece 1988-1998 (9/2000)
- Statistics on Environmental taxes and other economic instruments for environmental protection in EU Member States (11/1999)
- Material Flow Accounting – Experience of Statistical Institutes in Europe (12/1997)

Internet: http://europa.eu.int/eurostat.html

Foreword

This report has been prepared on commission from EUROSTAT, which supports and co-ordinates the development of environmental accounts in the EU Member States. The European Commission DG Environment has contributed financially to the project. Margareta Östman and Johan Håkans at the Swedish Chemicals Inspectorate have kindly provided data and helpful advice. Kristina Jonsson, formerly at Statistics Sweden, succeeded in transforming the data into a form suitable for the environmental accounts. Gunnar Brånvall and Helena Rudander have also made valuable contributions to this work. Viveka Palm is responsible for the report and has been project leader for the work.

Table of contents

1 Introduction

1.1 Chemical product use

Information about the use, spreading and waste handling of chemical products is an important tool for decreasing environmental and health risks. The Product Register, kept by the Chemicals Inspectorate, plays an important role in Swedish control of chemical products.

In 1986, the Chemicals Inspectorate was formed as an authority responsible for minimising risks to humans and environment from the use of chemicals. Sweden has since 1992 registered components of chemical products in the Product Register. The register was constructed mainly as a tool for the superintendence of importing and manufacturing companies, but it also contains chemical information of the registered products as well as quantities used.

Earlier, the register has only been available for one year at a time. Now, a database with all years has been constructed, so that it is possible to work with time series. Since reporting and labelling can vary from one year to the next, the database is rather difficult to use. However, this project has established some routines that will facilitate future data collection for use in the System of integrated Environmental and Economic Accounts (SEEA). Even though data from 1992-1999 was available in the database, changes in reporting make comparisons between early years difficult. For environmental accounting purposes, the data series from 1996 and onwards seem consistent.

The Product Register in Sweden is one of a kind. Norway, Denmark and Finland have similar registers but with different scope and system boundaries[1]. In Sweden the declaration requirements are based on the customs tariff codes, so that as a general rule, they apply to all chemical products (substances and preparations).

All four countries exempt products that come under legislation on foodstuffs and medical products from mandatory declaration. Furthermore, the duty to declare products to the product registers does not apply to cosmetic products in Sweden, Norway and Finland.

[1] A comparison of the Nordic Product Registers, TemaNord 1999:586

1.2 The System of integrated Environmental and Economic Accounts

In 1993, Statistics Sweden, the National Institute of Economic Research and the Swedish Environmental Protection Agency were instructed by the Government to prepare a study covering the physical links between the economy, the environment and natural resources, the monetary reflection of these relations, and the state of the environment. The aim of the work on environmental accounts at Statistics Sweden is to develop a system of physical accounts that are linked to the economic 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, thus forming a satellite system of accounts around 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[2] 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 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.

The environmental accounts describe the environmental pressures from a nations economic activity through its producers and consumers. The producers purchase energy, materials, labour and capital to produce goods and services. This production process also produces waste, air emissions and water emissions (Figure 1). The use of chemicals can be seen as part of the use of materials.

[2] 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. Just as a SAM is a way of presenting national accounts data, NAMEA is a way of presenting environmental accounts data.

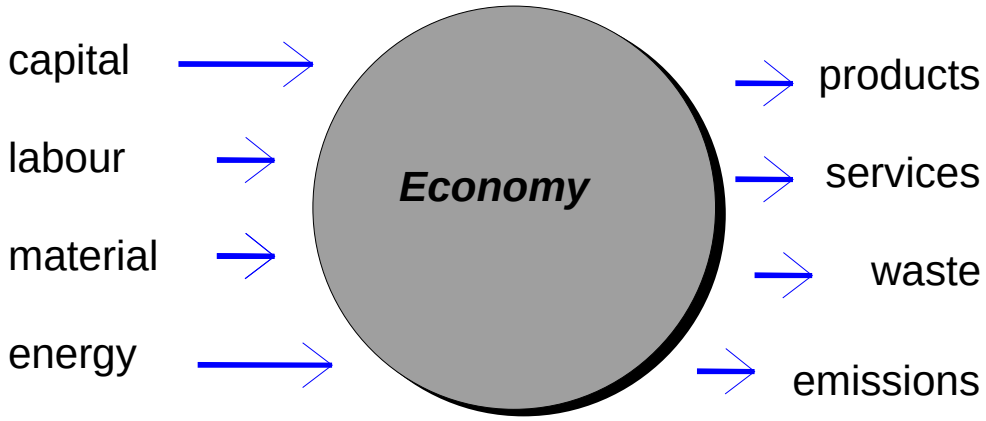


Figure 1. Input to and output from the economy

The tools that government has at its disposal for influencing the actors in the economy are information, and administrative and economic instruments. The administrative instruments include laws, standards and ordinances. The economic instruments consist primarily of charges, taxes and subsidies.

The work on physical environmental accounting at Statistics Sweden is carried out by the Programme of Environment Statistics, in collaboration with the Programme of National Accounts.

2 Method

2.1 Classification and labelling

In this project the amount of registered chemical products in the Product register, for the years 1996 to 1999, has been calculated by industry. The chemical products have been divided into two groups, the fossil fuels and the rest. This is due to the fact that the fossil fuels are so dominating that other chemical products almost disappear when the two groups are shown together.

The companies that report to the register, mainly importers or producers of chemical products, give information on what type of industry will use the chemical product. For the fossil fuels the refineries and retailers are noted as users. Since the environmental accounts gives a more detailed picture on which actors do use the fossil fuels, based on other statistical sources, that information is not taken from the Product register.

For each group two different aggregation methods have been used.

Method 1. Aggregation based on labelling of inherent properties

The first one, which is the broadest category and focuses on direct inherent properties, sorts out those chemical products that are labelled as very toxic (T+), toxic (T), corrosive (C), harmful (Xn) or irritant (Xi) (Figure 2). The category 'Dangerous for the environment' is rather new and only a few chemicals have yet been tested. Therefore, it is not included as the trends in the time series the coming years will be a measure of the testing situation rather than the amount of chemicals used (Margareta Östman, Personal communication). The category Moderately Harmful is a Swedish category, which has now been phased out.

Method 2. Aggregation based on labelling of risks for chronic diseases

The second category focuses on the chemical products that are labelled as being able to cause cancer, sensitisation (allergy) either by inhalation or by skin contact, mutagenic and reproductive toxicity. The Risk-phrases that were sought for are listed in Figure 3. Risk-phrases R40 and R46 indicate mutagenic risks, R42 and R43 indicate sensitising risks, R45, R49 and R340 indicate cancer risks and R60 – R63 reprotoxic risks. R50-R59 indicate risks for environmental damage, but this labelling practise is not yet well developed.

There are many more risk phrases than those chosen for the second weighting scheme, as can be seen in Annex 1. The reasons for choosing the categories in Figure 3 are twofold. The primary reason is to focus on categories where the underlying data classification is available for many chemical products. The second reason is to give an impression of the amount of chemical products with properties that can give chronic diseases to those exposed.

In the future, we would also like to include the risk phrases that indicate risks for the environment. Tentatively we would like to include it in two years time from now. There

is coming legislation that helps to interpret how information of environmentally dangerous substances can be translated into information on the preparations or chemical products where the substances are included. Up to now, this type of translation is only available for health hazardous substances, so that companies have a duty to report on chemical products containing carcinogenic, mutagenic or reprotoxic substances.

Ideally, the information should of course also give an estimate of the risks involved, and the number of people exposed etc. This type of information is unfortunately too difficult to attain on a yearly basis. It is in fact difficult to get even the properties of many used substances, since testing is costly and the incentives to test have not been that great. In the future, more information will hopefully become available and used to improve general chemical indicators.

Classification and labelling of dangerous substances (Directive 67/548/EC)
Figure 2. Classes and labelling

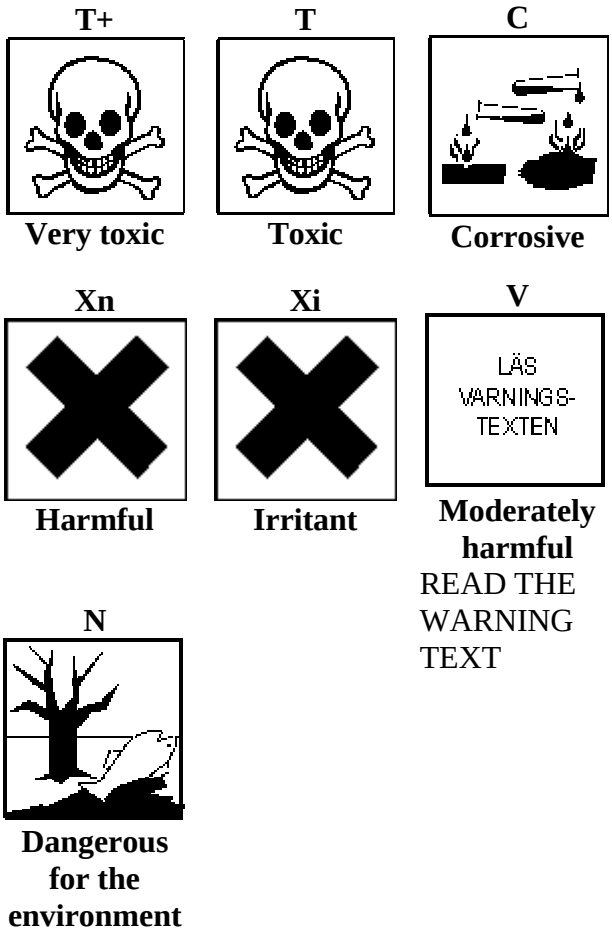


Figure 3. Labelling of risks, with the risk phrases used in the search for chemicals[3].

R 40	Possible risks of irreversible effects
R 46	May cause heritable genetic damage
R 42	May cause sensitisation by inhalation
R 43	May cause sensitisation by skin contact
R 45	May cause cancer
R 49	May cause cancer by inhalation
R 340	Some risk of cancer cannot be excluded after frequently repeated exposure
R 60	May impair fertility
R 61	May cause harm to the unborn child
R 62	Possible risk of impaired fertility
R 63	Possible risk of harm to the unborn child
R 50	Very toxic to aquatic organisms
R 51	Toxic to aquatic organisms
R 52	Harmful to aquatic organisms
R53	May cause long-term adverse effects in the aquatic environment
R 54	Toxic to flora
R 55	Toxic to fauna
R 56	Toxic to soil organisms
R 57	Toxic to bees
R 58	May cause long-term adverse effects in the environment
R 59	Dangerous for the ozone layer

2.2 Fossil and non-fossil chemical products

In the Product register there is unfortunately no special coding separating the fossil fuels from the rest of the chemical products. Therefore, a selection was first made on those chemical products with functions that are marked as fuels (function number 290-294 in the register).

Since there are both bio fuels and fossil fuels in the register, this selection did not give the expected result. Our next approach was then to look for words that were common for the fossil fuels. By searching for these words (oil, diesel etc) a list of product numbers was established. This list was then used to include or exclude fossil fuels.

However, it is important to note that this procedure will have to be updated every year, since new product numbers will be added to the list. In order to avoid double counting, the amount of fossil fuels imported by the refineries has not been included. Since fossil fuels are not produced in Sweden it is possible to use the import statistics to check that the magnitude of fossil fuels is correct.

[3] The results from searching for R50-R59 are not shown in the results as the reporting has only just started and thus the data series are not representative of the use.

Blast furnace gas

One fossil fuel that is not recorded regularly in the product register is the blast furnace gas, which is labelled with an R-phrase as toxic for reproduction. It has been recorded for some years, but not all. It is a by-product of the reduction process for iron, and it is consumed as a fuel in heat production for dwellings. We have chosen not to record it in the SEEA for chemicals since it is not reported regularly. Blast furnace gas can however contribute with about 4 million tonnes, so it is important to know if it is included or not.

2.3 Allocation by industry

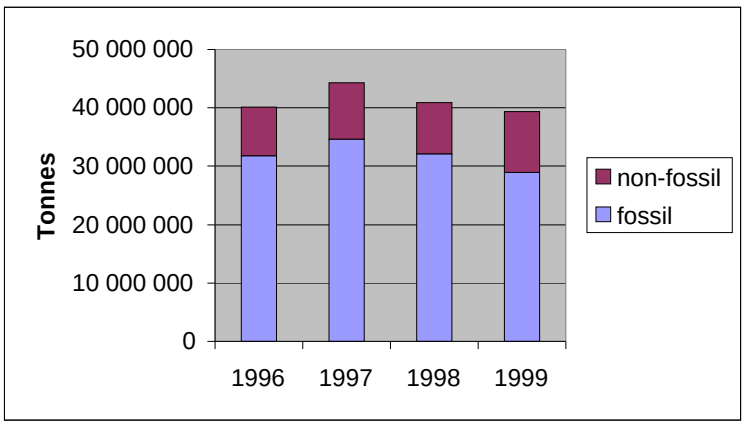
The Product register includes information from the producers etc on to which industry the chemical products are sold. The company can name three different types of industries per chemical product. Some companies, but not all, include information on the amount sold to each industry. Earlier, this lead to severe problems with double counting. However, now the chemicals inspectorate has made a routine that allocates the amount of chemicals equally between the industries when information is lacking. In this way, the problem with double counting is less apparent.

3 Results

3.1 The total amount of chemical products labelled for inherent properties

The total amount of chemical products labelled for inherent properties (LIP) imported to or produced in Sweden is around 40 million tonnes per year (Figure 4), or roughly 4 tonnes per capita. Around 80% of this amount of chemical products is fossil fuels, used mainly for transportation and for heating.

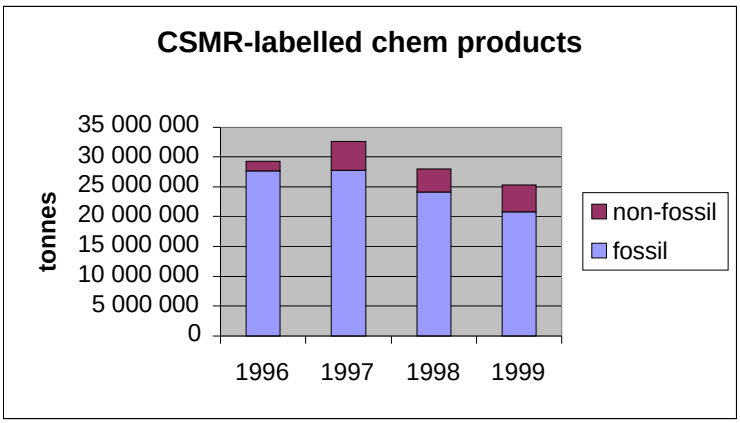
Figure 4. Total import + production of fossil fuels and non-fossil chemical products 1996-1999, labelled for inherent properties (LIP)



3.2 The total amount of CSMR-labelled chemical products

The total amount of chemical products labelled for risk of chronic diseases amount to 30 million tonnes per year (Figure 5), or roughly 3 tonnes per capita. The carcinogenic substance benzene in petrol is a major reason why petrol is labelled as carcinogenic. For the non-fossil chemical products the category ‘sensitisation to skin’ dominates.

Figure 5. Totals of fossil fuels and non-fossil chemical products 1996-1999, labelled for risk of chronic diseases (CSMR-labelled)



3.3 Non-fossil chemical products labelled for inherent properties, use by industry

The results by industry are presented in Table 2 and 4.

There are a few industries dominating the use of non-fossil chemical products labelled for inherent properties as recorded in the Product register: paper and pulp (NACE code 21), chemical industry (NACE code 24.1) and cement industry (NACE code 26), all registering more than 1 million tonnes of non-fossil LIP chemical products.

There are also a few industries that do not report many non-fossil LIP chemical products to the register: forest industry (NACE code 02), fishing (NACE code 05), and manufacture of medical, precision and optical instruments (NACE code 33) and governmental services (NACE code 75) all report less than 300 tonnes.

Table 1. Non-fossil chemical products, totals of LIP chemical products 1993-1999 (Tonnes)

Year	C	T	Tx	Xi	Xn	Total
1993	3 592 000	1 128 000	15 000	847 000	1 345 000	6 928 000
1994	3 748 000	1 237 000	16 000	674 000	977 000	6 652 000
1995	3 387 000	1 525 000	15 000	937 000	1 933 000	7 797 000
1996	3 552 000	1 573 000	14 000	1 374 000	1 816 000	8 329 000
1997	2 432 000	2 433 000	15 000	3 643 000	1 146 000	9 669 000
1998	2 618 000	2 205 000	16 000	2 868 000	1 151 000	8 858 000
1999	2 331 000	1 924 000	20 000	4 146 000	2 014 000	10 435 000

The non-fossil chemical products are labelled as shown in figure 6 and Table 1.

Figure 6. Non-fossil chemical products labelled for inherent properties 1993-1999.

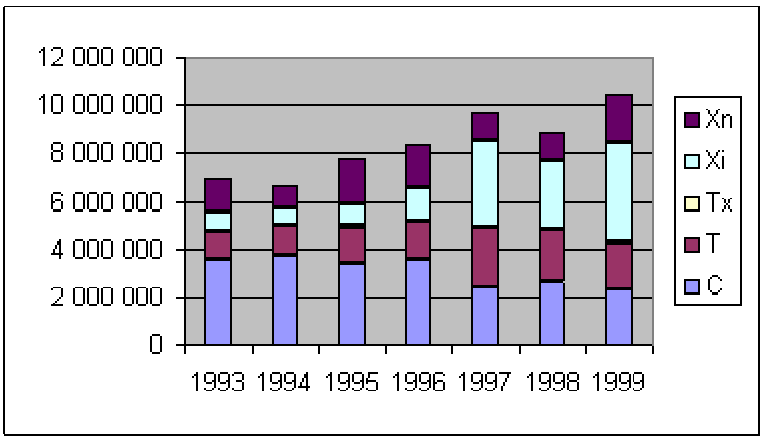


Table 2. Non-fossil chemical products, labelled for inherent properties. Tonnes

	NACE Rev 1	1996	1997	1998	1999
Agriculture	01	25 236	20 089	26 245	59 142
Forestry	02	50	184	49	46
Fishing	05	112	141	4	6
Mining and quarrying	10-14	106 172	98 874	108 188	128 539
Manufacture of food products and beverages	15-16	49 998	52 356	65 622	53 722
Textile and clothing industry	17-19	5 104	4 999	4 509	4 550
Manufacture of wood and products of wood	20	37 998	35 932	35 325	40 412
Pulp and paper	21	961 947	1 071 929	1 105 058	1 099 193
Publishing, printing and reproduction	22	7 205	6 295	6 002	6 536
Refineries	23	167 734	323 505	233 066	434 643
Manufacture of basic chemicals	24.1	2 436 920	2 557 657	2 482 421	2 125 823
Manufacture of pesticides	24.2	505	457	285	306
Manufacture of paint	24.3	110 391	108 465	71 703	82 473
Manufacture of pharmaceuticals, soap and detergents.	24.4	5 294	6 004	21 132	6 053
Manufacture of other chemicals and chemical products	24.5,7	35 139	86 935	61 761	94 922
Manufacture of other chemical products	24.6	144 337	187 522	194 355	235 375
Manufacture of rubber and plastic products	25	178 298	180 652	205 471	211 527
Manufacture of other non-metallic mineral products	26	1 702 399	2 638 530	1 837 485	2 920 003
Manufacture of basic metals	27	237 837	335 724	368 423	252 176
Manufacture of fabricated metal products, tools	28	43 040	47 270	49 533	50 544
Manufacture of fabricated metal products	29	2 530	3 066	3 310	3 002
Manufacture of machinery and equipment	30	4 151	4 504	4 029	3 961
Manufacture of office machinery and computers, electric	31	27 948	18 208	20 259	10 838
Manufacture of electrical machinery, radio, television etc.	32	654	750	642	495
Manufacture of medical and optical instruments	33	120	17	17	34
Manufacture of vehicles, trailers and other transport equipment	34-35	9 860	9 507	10 326	10 671
Manufacture of furniture and consumer products. Recycling	36-37	6 682	5 614	3 890	3 300
Electricity and water supply	40-41	86 682	98 883	113 853	148 767
Construction	45	334 746	333 687	199 995	223 834
Wholesale and retail trade; repair of goods	50-52	144 640	157 063	156 138	164 718
Hotels and restaurants	55	2 215	3 872	3 682	4 014
Transport	60-64	32 068	36 680	63 693	5 113
Houses and Renting companies	70-74	3 409	3 318	3 138	3 306
Governmental services	75	4 497	3 169	3 171	241
Education and health	80-85	4 193	1 785	1 714	1 975
Other services	90-95	160 511	119 966	171 217	210 389
Total industries (use in Sweden)		7 080 622	8 563 609	7 635 711	8 600 649
Export		1 248 171	1 105 724	1 222 657	1 834 313

3.4 Non-fossil CSMR-labelled chemical products

As can be seen in Table 3, the categories “risk for sensitising to skin” and “risk for cancer” dominate the chemical product use, followed by products labelled with risks for reproduction, sensitising by inhalation and mutagenic properties.

Table 3. Non-fossil fuels, CSMR-labelled chemical products 1996-1999. Tonnes. (rounded figures)

Year	Sensitising skin*	Sensitising inhalation	Carcinogenic	Mutagenic	Reprotoxic	Total
1996	536 000	53 000	998 000	7 000	12 000	1 607 000
1997	2 754 000	50 000	1 866 000	41 000	85 000	4 809 000
1998	2 129 000	60 000	1 534 000	40 000	97 000	3 836 000
1999	3 023 000	76 000	1 243 000	52 000	145 000	4 555 000

*…cement products not included in year 1996 data.

In Table 4 the amounts of CSMR-labelled chemical product use is allocated by industry. The results of the non-fossil CSMR-labelled chemical products in some aspects follow the same pattern as the chemical products labelled for inherent properties, but with lower amounts. The chemical industry and the cement industry still dominate the amounts of chemical products, but the pulp- and paper industry is not dominating this time.

A substantial part of the total amount of CSMR-labelled chemical products, 3 million tonnes in 1999, are labelled as irritating to skin. A common chemical product labelled in this way is cement, and between 1 and 2 million tonnes of the CSMR-labelled chemical products are cement products. Cement products are not included in the CSMR-labelled chemical products in the 1996 data.

Table 4. Non-fossil chemical products, CSMR-labelled. Tonnes

	NACE Rev 1	1996	1997	1998	1999
Agriculture	01	2 352	2 329	3 307	4 248
Forestry	02	0	48	140	125
Fishing	05	4	6	3	6
Mining and quarrying	10-14	43	155	470	414
Manufacture of food products and beverages	15-16	469	326	465	256
Textile and clothing industry	17-19	836	967	1 084	1 149
Manufacture of wood and products of wood	20	34 423	37 712	38 967	37 745
Pulp and paper	21	29 178	21 644	20 634	29 232
Publishing, printing and reproduction	22	1 708	637	822	449
Refineries	23	143 926	294 745	212 942	126 478
Manufacture of basic chemicals	24.1	365 785	1 358 186	1 242 697	1 069 268
Manufacture of pesticides	24.2	171	184	139	186
Manufacture of paint	24.3	13 705	10 957	13 429	11 414
Manufacture of pharmaceuticals, soap and detergents.	24.4	312	347	600	1 348
Manufacture of other chemicals and chemical products	24.5,7	1 830	2 454	3 271	2 196
Manufacture of other chemical products	24.6	62 923	42 587	54 322	97 542
Manufacture of rubber and plastic products	25	21 573	20 073	30 806	25 248
Manufacture of other non-metallic mineral products*	26	134 079	2 321 260	1 519 955	2 508 874
Manufacture of basic metals	27	5 253	112 280	124 297	91 575
Manufacture of fabricated metal products, tools	28	19 266	21 105	26 967	21 276
Manufacture of fabricated metal products	29	398	967	1 175	968
Manufacture of machinery and equipment	30	6 769	7 500	6 695	6 536
Manufacture of office machinery and computers, electric	31	6 637	1 425	1 465	3 182
Manufacture of electrical machinery, radio, television etc.	32	244	297	282	187
Manufacture of medical and optical instruments	33	3	2	1	1
Manufacture of vehicles, trailers and other transport equipment	34-35	2 991	1 869	1 835	2 667
Manufacture of furniture and consumer products. Recycling	36-37	11 799	12 887	9 287	5 943
Electricity and water supply	40-41	205	124	122	142
Construction	45	142 696	142 227	97 766	128 583
Wholesale and retail trade; repair of goods	50-52	37 522	39 950	34 102	51 866
Hotels and restaurants	55				
Transport	60-64	29 978	22 184	51 094	1 760
Houses and Renting companies	70-74	390	348	362	357
Governmental services	75	17	12	11	11
Education and health	80-85	336	261	354	413
Other services	90-95	10 428	236	510	223
Total industries (use in Sweden)		1 088 249	4 478 291	3 500 378	4 231 868
Export		518 458	330 366	336 095	323 572

*…cement products not included in year 1996 data.

3.5 Fossil chemical products labelled for inherent properties

As seen in Table 5, the Toxic (T) and Harmful (Xn) labelling dominates the fossil chemical products. There are no Very toxic (Tx) entries, only some Irritant (Xi) and very little Corrosive (C). In general, petrol is labelled as Toxic and diesel is labelled as Harmful. The amount of fossil fuels corresponds roughly to the total amount of petroleum products imported to Sweden. About one third of this amount is re-exported.

Table 5. Fossil fuels, totals of chemical products labelled for inherent properties 1996-1999. Tonnes. Rounded figures, except C and Tx.

Year	T	Tx	Xi	Xn	C	Total
1996	17 895 000	0	301 000	13 598 000	79	31 794 000
1997	20 923 000	0	215 000	13 484 000	73	34 623 000
1998	17 171 000	0	286 000	14 600 000	14	32 057 000
1999	16 408 000	0	300 000	12 178 000	42	28 886 000

3.6 Fossil CSMR-labelled chemical products, by industry

The CSMR-labelling of fossil fuels is almost entirely based on carcinogenic properties of the chemical products. In 1999, 20.5 million tonnes of chemical products were labelled as being able to cause cancer. About 3 000 tonnes of chemical products were labelled as sensitising.

In the Product register, the main part of the fossil fuels is registered on refineries or on trade. Therefore, the ordinary statistics on consumption of petrol and diesel and other oil products is a better measure on the final demand of these chemical products. As an example, we therefore complement the Product register with some other statistics, on those chemical products that are available for household use (Table 6). There are more fossil fuels than those registered in Table 6, for instance fuel for air planes (1 million m3) and fuel for heating purposes (3.5 million m3).

For petrol, private consumption accounts for 75% of the use. For diesel consumption the transportation industry use more than half of the total amount.

Table 6. Petrol and diesel used for transports, by industry for 1998. From the environmental accounts and the energy statistics.

		1000 m3 diesel	1000 m3 petrol	tonnes diesel	tonnes petrol
Agriculture	01	319.1	47.8	268 044	35 396
Forestry	02	136.5	28.8	114 660	21 296
Fishing	05	74.6	0.8	62 666	622
Mining and quarrying	10-14	47.0	1.3	39 482	952
Manufacture of food products and beverages	15-16	28.0	10.9	23 551	8 032
Textile and clothing industry	17-19	0.2	2.8	174	2 074
Manufacture of wood and products of wood	20	42.9	4.6	36 012	3 421
Pulp and paper	21	15.4	5.2	12 936	3 867
Publishing, printing and reproduction	22	0.3	16.0	237	11 836
Refineries	23	0.4	0.2	301	133
Manufacture of basic chemicals	24.1,2	5.4	1.5	4 515	1 109
Manufacture of pesticides	24.3	0.1	1.5	101	1 079
Manufacture of paint	24.4	0.0	3.4	17	2 512
Manufacture of pharmaceuticals, soap and detergents.	24.5	0.2	0.9	168	660
Manufacture of other chemicals and chemical products	24.6,7	0.4	0.6	327	479
Manufacture of rubber and plastic products	25	0.5	5.2	426	3 844
Manufacture of other non-metallic mineral products	26	13.2	3.2	11 065	2 356
Manufacture of basic metals	27	11.3	2.8	9 513	2 100
Manufacture of fabricated metal products, tools	28	5.2	21.5	4 348	15 901
Manufacture of fabricated metal products	29	7.3	22.9	6 143	16 943
Manufacture of machinery and equipment	30	0.2	1.5	200	1 098
Manufacture of office machinery and computers, electric	31	0.6	4.9	505	3 607
Manufacture of electrical machinery, radio, television etc.	32	0.1	2.2	78	1 662
Manufacture of medical and optical instruments	33	0.1	7.5	93	5 520
Manufacture of vehicles, trailers and other transport equipment	34-35	11.0	32.0	9 198	23 717
Manufacture of furniture and consumer products. Recycling	36-37	5.3	5.5	4 493	4 059
Electricity and water supply	40-41	11.2	9.4	9 424	6 927
Construction	45	276.8	161.6	232 541	119 570
Wholesale and retail trade; repair of goods	50-52	265.7	354.2	223 147	262 075
Hotels and restaurants	55	4.8	17.5	4 022	12 963
Transport	60-64	2 046.7	216.0	1 719 237	159 875
Houses and Renting companies	70-74	108.6	165.5	91 232	122 459
Governmental services	75	101.6	98.7	85 356	73 024
Education and health	80-85	5.2	20.4	4 377	15 133
Other services	90-95	74.6	17.9	62 656	13 269
Finance and insurance	65-67	0.7	14.8	600	10 924
Private consumption		190.6	4 099.8	160 113	3 033 875
SUM		3 812.1	5 412.5	3 202 142	4 005 250

4 Summary

Environmental accounting is a system designed to combine environmental and economic data. Due to the complexity of chemical use, data covering issues on toxicity are normally not included in the systems.

We would like to suggest some broad chemical product indicators, adapted to fit into environmental accounting. They give a picture of the national consumption of chemical products, divided between different branches. The information on the amounts of chemical products is mainly provided by the Product register at the National Chemicals Inspectorate, KemI.

Depending on the choice of aggregation method and system boundary the magnitude of the import and production of health hazardous chemical products in Sweden lies between 30 and 40 million tonnes, approximately equivalent to 3 or 4 tonnes/ capita and year.

Two different aggregation methods are suggested. The broadest method starts with labelling of inherent properties in chemical products, based on the EU-classification of substances and preparations. The second method is based on the risk labelling of products, according to the risk for chronic diseases.

Major hazardous chemical product groups are petroleum-based products with between 25 – 30 million tonnes per year, depending on method. Major groups are chemical products with carcinogenic and health hazardous properties, mainly petrol and diesel. A large proportion of the chemical products are exported.

For environmental accounting purposes the chemical product use is registered by industry. The non-fossil chemicals products have been allocated by industries in accordance with the Product register. For the fossil products, the energy statistics on fuel consumption was used.

Annex 1. Single risk phrases

Single risk phrases

Italics indicate flammable and explosive properties. Directive 67/548/EC

R 1	*Explosive when dry*
R 2	*Risk of explosion by shock, friction, fire or other sources of ignition*
R 3	*Extreme risk of explosion by shock, friction, fire or other sources of ignition*
R 4	*Forms very sensitive explosive metallic compounds*
R 5	*Heating may cause an explosion*
R 6	*Explosive with and without contact with air*
R 7	*May cause fire*
R 8	*Contact with combustible material may cause fire*
R 9	*Explosive when mixed with combustible material*
R 10	*Flammable*
R 11	*Highly flammable*
R 12	*Extremely flammable*
R 14	*Reacts violently with water*
R 15	*Contact with water liberates extremely flammable gases*
R 16	*Explosive when mixed with oxidising substances*
R 17	*Spontaneously flammable in air*
R 18	*In use, may form flammable/explosive vapour-air mixture*
R 19	*May produce explosive peroxides*
R 20	Harmful by inhalation
R 21	Harmful in contact with skin
R 22	Harmful if swallowed
R 23	Toxic by inhalation
R 24	Toxic in contact with skin
R 25	Toxic if swallowed
R 26	Very toxic by inhalation
R 27	Very toxic in contact with skin
R 28	Very toxic if swallowed
R 29	Contact with water liberates toxic gas
R 30	*Can become very flammable in use*
R 31	Contact with acids liberates toxic gas
R 32	Contact with acids liberates very toxic gas
R 33	Danger of cumulative effects
R 34	Causes burns
R 35	Causes severe burns
R 36	Irritating to eyes
R 37	Irritating to respiratory system
R 38	Irritating to skin
R 39	Danger of very serious irreversible effects
R 40	Possible risks of irreversible effects
R 41	Risk of serious damage to eyes
R 42	May cause sensitisation by inhalation
R 43	May cause sensitisation by skin contact
R 44	*Risk of explosion if heated under confinement*
R 45	May cause cancer
R 46	May cause heritable genetic damage
R 48	Danger of serious damage to health by prolonged exposure
R 49	May cause cancer by inhalation
R 50	Very toxic to aquatic organisms
R 51	Toxic to aquatic organisms
R 52	Harmful to aquatic organisms

R 53	May cause long-term adverse effects in the aquatic environment
R 54	Toxic to flora
R 55	Toxic to fauna
R 56	Toxic to soil organisms
R 57	Toxic to bees
R 58	May cause long-term adverse effects in the environment
R 59	Dangerous for the ozone layer
R 60	May impair fertility
R 61	May cause harm to the unborn child
R 62	Possible risk of impaired fertility
R 63	Possible risk of harm to the unborn child
R 64	May cause harm to breastfed babies
R 65	Harmful: May cause lung damage if swallowed
R 66	Repeated exposure may cause skin dryness or cracking.
R 67	Vapours may cause drowsiness and dizziness.
R 313	Defatting to the skin
R 320	May be harmful by inhalation after frequently repeated exposure
R 322	May be harmful if swallowed
R 340	Some risk of cancer cannot be excluded after frequently repeated exposure

Annex 2 Environmental accounts data overview

In general, the system presents data on a national scale, concerning activities made by Swedish citizens, according to the same definition that the national accounts are using. The common level of aggregation enables about 40 industries, the public sector and private consumption to be singled out. The parentheses in the table indicate that data are more aggregated.

The data presented to date in the Swedish Environmental Accounts

		Description	Years	Comments
Resource use				
	energy	fuels and electricity, PJ	1993-1996	
	material flows	direct material input (tonnes)	1987-1998	Sum
	chemicals	indicators for hazardous substances	1996	
	water	use	1995	
Residuals				
	air emissions	CO2, SO2, NOx CO, CH4, N2O, (NH3)	1993-1996 1995 (1993)	
	water emissions	BOD, COD, nitrogen, phosphorous, metals	(1985-1998) 1995	Sum by industry
	waste		1993, 1998	
Employment				
	employment	hours worked	1993-1998	
	environment industry	number of employees, turnover, export, value added, operating profits, gross investments	1998, 1999, (1995-1999)	
Economic variables				
	value added	current and fixed prices	1993-1998	
	green taxes		1995 1993-1998 sum	by industry
	environmental costs	industry state municipalities	1997 (1985, 1988) 92/93 1995-1998	
	env. harmful subsidies		1993-1995	
Resource accounts				
	water accounts	use, emissions and costs	1995	
	forest accounts	quantity, quality	1990-1994	
Specific analyses				
	regional analysis	Stockholm County	1993	
	input-output tables		1991, 1995	
	physical input-output table	The use of wood	1993	
	households	air emissions	1995 (1991)	
	trade	air emissions due to import and export of goods and services	1995 (1991)	
	Env. Reporting for firms	Benchmark indicators for industries, in environmental reports	1995	
	Internat. Comp.		Various years	

Annex 3 Published reports

English reports and Swedish reports have been put on the web of Statistics Sweden, in order to enhance the availability (see http://www.scb.se/publkat/miljo/eu/eu.asp for the English reports and http://www.scb.se/landmiljo/annan/raken/raken.asp for the Swedish reports).

The results are published in three main publication series. The first two are possible to subscribe to. Time series are presented in the ordinary publications for official statistics, with only some comments to the tables. These are in Swedish with a very short English summary, and English names on the tables. In the future, these types of publications will be designed to be put on the web.

The more reader-friendly analyses of different areas in the environmental accounts are published in the series 'Miljöräkenskaper', mostly in Swedish, but also in English. There are English summaries available for most Swedish reports. Other English reports, dealing mostly with methodological issues, are published in Eurostat working papers. (The work with these reports has partly been financed by the European Commission.)

Statistical Reports

Na 53 SM 9601	Miljöräkenskaper, Fysiska räkenskaper för energi och utsläpp till luft 1989, 1991 och 1993 (Physical accounts for energy and air emissions 1989, 1991 and 1993.)
MI 53 SM 9901	Miljöräkenskaper, Fysiska räkenskaper för energi och utsläpp till luft 1993 och 1995. (Physical accounts for energy and air emissions 1993 and 1995.)
MI 23 SM 0001	Miljöskyddskostnader i industrin 1997. (Environmental Protection Expenditure in the industry 1997)

Reports in the series Miljöräkenskaper

1998:1	SWEEA, Swedish Economic and Environmental Accounts Svenska miljöräkenskaper, En lägesrapport från Konjunkturinstitutet och Statistiska Centralbyrån 1994	KI, SCB
1998:2	SWEEA, Swedish Economic and Environmental Accounts English version 1994	KI, SCB
1998:3	Materialflöden och kretslopp i de svenska miljöräkenskaperna - en förstudie 1995 (Material flows, bio-carbon PIOT)	SCB
1998:4	Industrins miljöskyddskostnader 1991 (Env. Prot. Exp. industry)	SCB
1998:5	Aggregering av miljödata till miljöhot – en förstudie 1996 (Aggregating data to environmental threats)	SCB
1998:6	Samband mellan miljö och ekonomi, en rapport om fysiska miljöräkenskaper i Sverige (Overview)	SCB
1998:7	Kostnader för att minska utsläpp av kväveoxider och flyktiga organiska ämnen (Costs to reduce emissions of nitrogen oxides and volatile organic substances)	NV

1998:8	Avfall 1993 (Waste)	SCB
1998:9	Svenska miljöräkenskaper för svavel och kväve samt Sveriges kostnader för kväveutsläpp (Swedish Env. Acc. For sulphur and nitrogen, and Swedish costs for nitrogen emissions)	KI
1998:10	Miljöräkenskapsprojektet vid Konjunkturinstitutet 1992-1997 med bilagorna Gröna nationalräkenskaper och Att konstruera ett miljöräkenskapssystem (Overview of KIs work)	KI
1998:11	Indikatorer för hållbar utveckling – en pilotstudie (Indicators for sustainable development- a pilot study)	SCB
1999:1	Minskade koldioxidutsläpp genom förändrad materialanvändning- en förstudie (reduced carbon dioxide emissions through changes in material use – a pilot study)	SCB
1999:2	Miljöföretag och gröna jobb i Sverige (Environment industry)	SCB
1999:3	Skogsräkenskaper - en delstudie avseende fysiska räkenskaper (Forest accounts)	SCB
2000:1	The environment industry in Sweden 1999	SCB
2000:2	Industrins miljökostnader 1997 - resultat från en svensk pilotstudie (Environmental costs for industry 1997- results from a Swedish pilot study)	SCB
2000:3	Miljöskatter och miljöskadliga subventioner (Environmental taxes and environmentally harmful subsidies)	SCB
2000:4	En framtida nationell materialflödesstatistik – användning av naturresurser, substanser och kemikalier i produktion och konsumtion. (Material flow statistics- uses of natural resources, substances and chemicals in production and consumption))	SCB
2000:5	Miljöpåverkan av svensk handel - resultat från en pilotstudie (Environmental pressure from trade – results from a pilot study)	SCB
2000:6	Vattenräkenskaper – en pilotstudie om uttag, användning samt utsläpp, fysiska och monetära data (Water accounts)	SCB

English reports on the web-site

1	Nordic Natural Resource and Environmental Accounting	Natural resources	1995
2	Testing SERIEE's Environmental Protection Expenditure Account in Sweden	Environmental protection expenditure	1996
3	The recycling industry in Sweden 1995	Environment industry	1996
4	Disaggregation and Improvement of the Swedish NAMEA	Air emission	1997
5	Forest economic environmental accounting: a pilot study of a first implementation	Natural resources (Forest accounts)	1997
6	Disaggregation and Incorporation of Environmental Protection Expenditure in the NAMEA-framework	Environmental protection expenditure	1997
7	Adaptation of Swedish data on environmental protection in the public sector to the SERIEE-system	Environmental protection expenditure	1997
8	Environmental Protection Expenditure in Industry in 1997: Results of the Swedish Pilot Study	Environmental protection expenditure	1999
9	Extended Time Series in the Swedish Environmental Accounts	Air emission	1999
10	The Environment Industry in Sweden	Environmental industry	1998
11	Environmental Accounts Households	General	1999
12	Material flow study of sand and gravel in Sweden	Material flow	1999
13	Producers of Environmental Services	Environmental protection expenditure, Environment industry	1999
14	Water Accounts: Physical and Monetary Data connected to abstraction, use and discharge of water in the Swedish NAMEA	Natural resources (Water accounts)	1999
15	Direct Material Input (DMI) for Sweden 1987-1997	Material flows	1999
16	The Environment Industry in Sweden 1999	Environment industry	1999
17	Regional Environmental Accounts for the greater Stockholm region – a first step	Regional accounts	1999
18	Environmental employment	Environment industry	2000
19	Environmental Taxes	Environmental taxes	2000
20	Uses of Environmental Accounts in Sweden	General	2001
	Forthcoming reports		
20	Including Chemical products in environmental accounts	Chemicals	2001
21	Forest accounts	Natural resources (Forest accounts)	2001

Other reports in English with a regional or local perspective
Regional Environmental Accounts for the Greater Stockholm Region - a first step. RTK 1999

Tema Nord 1996:563 Nordic Natural resources and environmental accounting - sub-report I
(The report focuses on Forest accounts, Fishery accounts, accounts for nutrients and Environmental protection expenditures, and was translated to English with financial aid from Eurostat)

Tema Nord 1997:598 Nordic Natural resources and environmental accounting- sub-report II.
(The report focuses on Energy and emission accounts, Material flows and Eco-industries)

Tema Nord 2000:515 Nordic Natural resources and environmental accounting sub-report III. Nordic Environment-Economic Indicators
In the report there is a comparison of the NAMEA information concerning economic data, use of energy and emission to air