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

Viveka Palm & Annica Carlsson

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Environmental accounts

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– fossil fuels, cement and other chemical products classified as hazardous to health or environment 1996-2001

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Preface

This report has been prepared on commission from EUROSTAT, which supports and co-ordinates the development of environmental statistics in the EU Member States. The study is based on two former studies in which the methodology of chemical indicators connected to the Swedish System for Environmental and Economic Accounts (SEEA) where developed (Palm and Jonsson, 2001; Palm, 2002).

Ola Holmgren, Eva Ljung and Margareta Östman, at the Swedish Chemicals Inspectorate have kindly provided data and helpful advice during the work and are gratefully acknowledged. Anders Wadeskog, Environment Statistics, is especially acknowledged for data and discussions about the intensities.

Viveka Palm has been leader of the project and is together with Annica Carlsson responsible for the content of the report.

Viveka Palm and Annica Carlsson
Statistics Sweden, Stockholm

Summary

Today, there is lack of knowledge regarding the amounts of single substances and mixtures of substances that are included in products and the distribution of these products in society. A chemical product is defined in Swedish legislation as a substance or a preparation (mixture of substances). This study aims to further develop the methodology for chemical product indicators, within the SEEA framework, by also considering the chemical products field of application. Earlier studies have included chemical products used for synthesis in the indicators, but in this study the quantities used for synthesis have been identified and are shown separately. The amounts of chemical products being labelled as dangerous for health and/or environment that follows the goods after production is quantified, by industry. The information is also expressed as intensities, i.e. the use of chemical products is related to the value added of different industries. The intensities provide an opportunity to use the results as basis for chemical product indicators in other environmental system analyses studies, such as environmentally extended input-output analyses and LCAs.

The results presented are based on data from energy statistics and from the Product Register at the National Chemical Inspectorate in Sweden. The Product Register in Sweden is to some extent unique in Europe. There are registers in Norway, Denmark and Finland as well, but with different scope and system boundaries. In connection to the introduction of EU:s new chemical policy, REACH[1], a European Chemicals Agency will be established. With time, registration of single substances at the Chemical Agency will generate databases including data of import, manufacturing and use of substances(but not preparations) in EU. However, since the register will not be updated yearly, it is doubtful that indicators similar to those suggested in this report can be developed based on that data.

Fossil fuels are presented separately in the report. This data is being collected for the environmental accounts and is based on energy data that is available in other countries as well. Thus, this part of the chemical product indicator is possible to measure in any country with energy statistics. The fossil fuels presented here amount approximately to 50% of the magnitude of chemical products being labelled as dangerous for health and/or environment or being attached with a risk phrase. The fossil fuels included in the study are all labelled as being dangerous to health according to several aspects, and at least attached with one risk phrase (Table A). The major part of fossil fuels is used for heat generation and transport.

Table A: Classification and labelling of those fossil fuels that are included in the study.

Heating oil 01	C, Xn (corrosive, harmful)	R40 Possible risks of irreversible effects
Heating oil 02-05	C, Xn	R40
Diesel	C, Xn	R40
Air fuel and Jet fuel	C, Xn	R40
Petrol	C, Xn, T (corrosive, harmful, toxic)	R45 May cause cancer and R65 Harmful: May cause lung damage if swallowed

Industries with the largest amount of non-fossil chemical product labelled as dangerous for health and/or environment are ‘Manufacturing of basic chemicals’ followed by ‘Manufacturing of other non-metallic mineral products’ and ‘Pulp and paper industry’. Together these three represents 65% of the total amount of non-fossil chemical products classified as dangerous for health in 2001.

[1] REACH – Registration, Evaluation, Authorisation of Chemicals, COM 2003 644 (final), 2003/0256 (COD), 2003/0257 (COD).

For the majority of the industries, most of the chemical products used are included in the final product. However, for ‘Manufacturing of basic chemicals’ and ‘Refineries’, the situation is the opposite with the major part used for synthesis, i.e. the chemical product are not included in the final product.

The three largest functions of chemical products used per industry are presented in the report. This is based on the information given by the industries to the Product Register.

It is our intention to include these indicators in the database of SEEA on a yearly basis:

- Chemical products labelled for inherent properties as dangerous for health and or environment in tonnes. The categories we include are very toxic (T+), toxic (T), corrosive (C), harmful (Xn), irritant (Xi) or Dangerous for the environment (N). Data will be included both for fossil fuels and non-fossil chemical products. The quantities used for synthesis will most likely not be included.
- Chemical products attached with risk-phrases for chronic diseases R340, R40, R41, R42, R43, R45, R46, R49, R60-64, as well as risk phrases for environmental damage R50-59. 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. The intention for the future is also to be able to present data about each risk-phrase individually. Similar to data about ‘Chemical products labelled as dangerous for health and or environment’ data will included both for fossil fuels, non-fossil chemical products.

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1. Introduction

Substantial amounts of chemical products are used in society. Chemicals (single substances or preparations) may occur in various forms in products, for example added to a product in order to provide a certain function or as a contaminant due to production processes (cf. Table 1). Today there is a lack of knowledge regarding the amounts of substances that follows certain products and their distribution in society. This information is of great importance for the possibilities of making adequate risk assessment as well as for strategic environmental planning on both national and local level. For instance, waste management would be supported by knowledge about chemical content in the waste streams to be handled. It also becomes more and more important to be able to follow flows of substances and chemical products in society in relation to the continuing work of the Swedish national environmental objectives[2].

Table 1. Examples of different categories of chemical uses in industrial processes and in products.

Chemicals for synthesis	Chemicals used for synthesis. The intention is that these substances should be transformed in the synthesising process and thus not be included in the final product in a non-reacted form.
Chemicals used as additive	Chemicals added during production and aimed to be included in the final product, e.g. chemicals added in order to provide a certain function of a product, such as colour, flame protection and softness.
Supporting chemicals	Chemicals used in order to enhance a certain activity, accelerate a step of production or change physical conditions. Supporting chemicals are not intended to be a part of the final product. Acids, bases and surface active substances are typical supporting chemicals.
Unintentional synthesised substances	Substances that are formed as by-products during industrial processes or during combustion, e.g. PAH (polyaromatic hydrogen) and dioxins.
Chemical as contaminants	Chemicals that are not intentional added during the production process or chemicals that do lack function in the product.

The Product Register kept by the National Chemical Inspectorate in Sweden was created in the end of the 1970-ies and has gradually been extended. A chemical product is defined in Swedish legislation as a substance or a preparation (mixture of substances). The register was constructed mainly as a tool for the superintendence of companies (both producers and importers) that use or handles chemical products. But it has also become a source of information for evaluating the work with the Swedish national environmental objectives. Basically, the Product Register is used for supporting risk assessments made by the Chemical Inspectorate and other authorities. Each manufacturer of chemical products, or importer[3], that exceeds the amount of 100 kilo annually 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 (cf. Appendix 1 for a copy of the registration form). The companies also pay an annual fee for the amount of chemicals that are being recorded.

The Product Register in Sweden is to some extent unique in Europe. There are registers in Norway, Denmark and Finland as well, but with different scope and system boundaries. Within EU it would thus be of great support if the national Product Register in Sweden could be utilised as a source of

[2] The Swedish Parliament has established 15 environmental quality objectives, such as A Non-Toxic Environment and Clean Air, to guide Sweden towards a sustainable society.

[3] In special cases a commercial agent can be authorised to submit the report instead of the importer.

information for other member states as well. Since information about composition of a certain product might be sensitive for a company, request for information from the Product Register are always treated on a case-by-case basis. However, researchers, organisations and the public may request to use non-confidential data.

In connection to the introduction of new chemical policy of the EU, REACH[4], a European Chemicals Agency will be established. All companies within EU that imports or manufacture single substances over the amount of 1 tonnes per year are obligated to report to the Agency. The task of the new authority will be to handle technical, scientific and administrative issues of substances used. The registration of chemicals will generate new databases including data of import, manufacturing and use of single substances (but not preparations) in EU. It is not clearly expressed in the writings of the proposal[5] if, or to what extent, the databases can be used for statistical purposes, such as for instance development of similar indicators as suggested in this report (but on single substance basis rather than on chemical product basis). However, since the register is not intended to be updated yearly it is doubtful that indicators can be provided.

There is a need for chemical indicators in EU, and research on this issue has for instance been conducted by The Öko-Institute in Germany (Öko-Institute e.V., 2002). They have suggested an indicator index from which "areas of interest" could be selected and then later be filled with a relevant indicator. Most of this work is focused on following particular substances, which makes data requirement and presentation difficult. However, also some approaches which are similar to the ones in this report, based on ordinary production statistics are being discussed. In Sweden the National Chemical Inspectorate has discussed the need of similar indicators on a substance basis as will be discussed in this report (NV and KEMI, 1999).

The study presented in this report is based on two former studies of chemical product indicators within the SEEA framework (System for Environmental and Economic Accounts), cf. Palm and Jonsson (2001) and Palm (2002). For both studies it can be concluded that the largest groups are chemical products with carcinogenic and health hazardous properties, mainly petrol and diesel.

The indicators show the input of chemical products in society. It would be of interest to be able to follow the chemical products that follows the goods. To do this, the amount of chemical products in various categories of chemical uses must be identified and accounted for.

1.1. Aim

The aim of this study is to further develop the methodology for chemical product indicators within the SEEA framework by also considering the chemical products field of application. The amount of chemical products that follow the goods after production will thus be separated from those chemical products that are used for synthesis.

[4] REACH – Registration, Evaluation, Authorisation of Chemicals, COM 2003 644 (final), 2003/0256 (COD), 2003/0257 (COD).

[5] Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency and amending Directive 1999/45/EC and Regulation (EC) {on Persistent Organic Pollutants} Proposal for a DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL amending Council Directive 67/548/EEC in order to adapt it to Regulation (EC) of the European Parliament and of the Council concerning the registration, evaluation, authorisation and restriction of chemicals.

The aim is also to express the information as intensities, i.e. relate the use of chemical products to the value in different industry. This makes it possible to distinguish parts of a production chain that uses the largest amount of classified hazardous chemical products. Furthermore, intensities make the data suitable for environmentally extended input-output analyses and for LCAs.

2. Method

2.1. Development of chemical product indicators

This study takes departure in two former studies on chemical product indicators cf. Palm and Jonsson (2001) and Palm (2002). Thus the method used is mainly similar to the one used in these studies. But this study has been extended to include the chemical products field of application as well. This was made in order to calculate the amounts of chemical products that follow the goods from the production stage.

First, chemical products recorded in the Product Register at the National Chemical Inspectorate were divided into two groups, fossil fuels and others. This, since fossil fuels are extremely dominating according to magnitude. In the Product Register, the refineries and retailers are noted as users of fossil fuels, which is not satisfactory for SEEA purposes. Since the SEEA here gives a more detailed picture on which actor do use fossil fuels, the data in the Product Register has been complemented based on fuel statistics.

In the Product Register there is no code 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 Product 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.

Two kinds of system for classification of hazardous chemical products were then used on the data. 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) irritant (Xi) or Dangerous for the environment (N) (Figure 1). However, it should be noted that the category ‘Dangerous for the environment’ is rather new, and only a few chemical products have yet been labelled based on the criteria of this category.

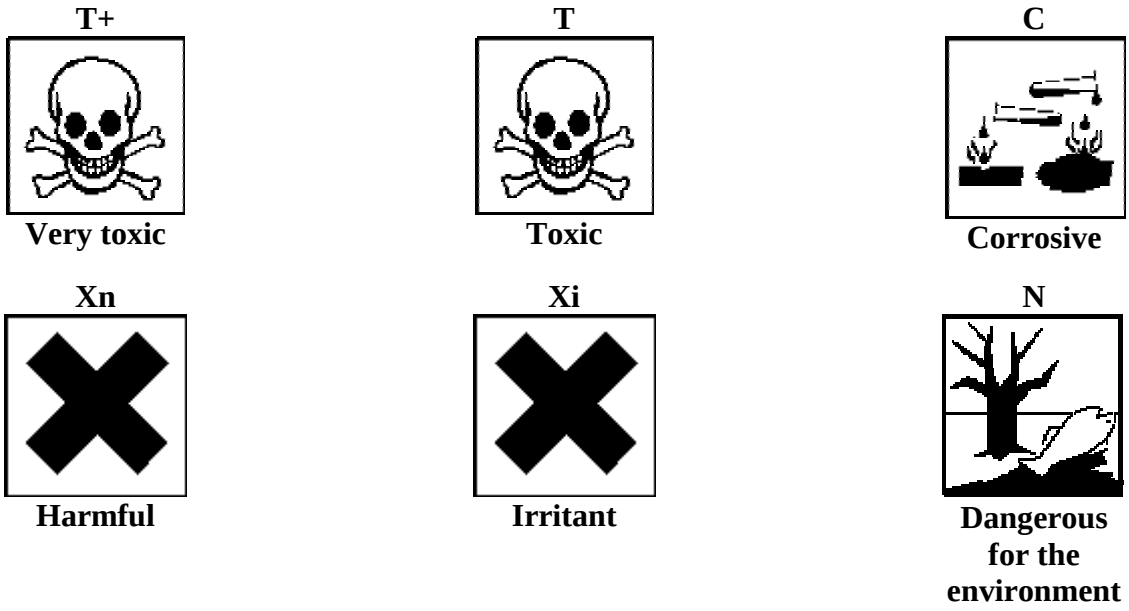

Figure 1. Classification and labelling of dangerous substances (Directive 67/548/EC)

The second classification system used, focuses on the chemical products that are labelled with risk-phrases for cancerogenic, sensitisation (allergy) either by inhalation or by skin contact, mutagenic and reproductive toxicity properties. The Risk-phrases that were sought for are listed in Table 2. 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 and the companies are not obligated to report if the chemical products are to be classified according to risk for environmental damages. There are many more risk phrases than those chosen for the second weighting scheme (cf. Appendix 2). The reasons for choosing the risk phrases included in Table 2 are twofold. The primary reason was to give an impression of the amount of chemical products with properties that may give chronic diseases to those exposed. The second reason is to focus on categories where the underlying data classification is available for many chemical products.

Table 2. List of risk and safety advice phrases included in the study

R 40	Possible risks of irreversible effects
R 42	May cause sensitisation by inhalation
R 43	May cause sensitisation by skin contact
R 45	May cause cancer
R 46	May cause heritable genetic damage
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 340	Some risk of cancer cannot be excluded after frequently repeated exposure

The two classification systems used in this study are especially suitable for international comparison. This since regulation of labelling chemical products is widely harmonized. In a comparison of the product register of Sweden, Norway, Denmark and Finland it was for example shown that the core of chemical products being register in those registers where products which are obligated to be labelled according to common rules in the European Union (Brånvall, 2002).

In this study we will separate the downstream users by the assumption that chemical products used for synthesis to a large extent are transformed during the production process, and hence not included in the final goods (cf. Table 1). Thus, in order distinguish the amount of chemical products that are included in goods, chemicals used for synthesis were presented separately in the data collected from the Product Register.

The data from the Product Register was aggregated based on the type of industry the manufactures and/or the producers belong to (cf. for example Table 7). This generates the possibility to compare use of chemical products as well as changes over time for different industrial sectors. Since the aggregation is based on the same classification of industries as in the SEEA framework the results can also easily be related to other environmental data about the industry.

In order to analyse the distribution of chemical products by including substances labelled as dangerous for humans and or environment, the three quantitatively largest product categories per industry were searched for. This data was then compared with the total amount of chemical products being classified with a risk phrase per industry.

Finally, the use of chemical product per industry was related to the value added of the industry (see section 3.4).

Chemical product indicators have then been calculated for the years 1996-2001.

2.2. Uncertainties in the Product Register

The Product Register at the National Chemical Inspectorate in Sweden contains data about over 60 0000 different chemical products. The data registered has been reported from about 2500 companies. Such a large register of course contains uncertainties resulting from for instance incorrect information from the reporting companies or mistakes during registration. The major part of the information in the Product Register is confidential due to business secrets. This prevents external revision of the data, and therefore expert users at the Chemical Inspectorate itself make examination and search for improvement of the data.

Potential uncertainties might also exist in the labelling and classification of chemical products as well as uncertainties in the reported function of a certain product. These uncertainties are both relevant for this study since the method used is based on labelling and classification of chemical products. The standard for labelling and classifying chemical products do as far as possible aim to distinguish the major hazard with a certain product. But in some cases a chemical product is labelled with several symbols in the Product Register. However, it is important to notice that about half of the chemical products are not labelled at all. The major parts of these are likely to be correct, but it may also be companies that have forgotten or are leaving out the labelling. In Brånvall (2002) registration of risk phrases for the year 2000 were examined. In total 6230 chemical products were registered labelled with at least one risk phrase for chronic health risk and of these 4533 chemical products only had one risk phrase. The distribution between various risk phrases is illustrated in Table 3 and Table 4.

Table 3. Number of products being labelled for one or several risk phrases, and the total quantity of chemical products per number of risk phrases (including fossil fuels). The table is based on the risk phrases: R322, R340, R36, R38, R40, R41, R42, R43, R45, R46, R49, R50, R52, R53, R59, R61, R62, R63, and R67. However, the risk phrases R322, R36, R38 and R67 are not included in this study. (Data from Brånvall, 2000).

Number of risk phrases	Number of chemical products	Total quantity
1	4 553	45 257 264
2	1 385	233 098
3	278	82 259
4	13	11 584
5	1	0
Sum	**6 230**	**45 584 205**

Table 4. Occurrence of unique risk phrases and their distribution among chemical products registered in the Product Register at the Chemical Inspectorate (including fossil fuels) (Brånvall, 2002). (The risk phrases R322, R36, R38 and R67 noted in the table are not included in this study).

Risk phrases	**Number of products**	**Quantity**
R322 - May be harmful if swallowed	1	50
R340 - Some risk of cancer cannot be excluded after frequently repeated exposure	338	10 261 175
R36 - Irritating to eyes	2	37 969
R38 - Irritating to skin	1	1
R40 - Possible risks of irreversible effects	2	300
R41 - Risk of serious damage to eyes	2	7
R42 - May cause sensitisation by inhalation	242	1 505
R43 - May cause sensitisation by skin contact	3 495	3 194 534
R45 - May cause cancer	289	28 038 955
R46 - May cause heritable genetic damage	3	0
R49 - May cause cancer by inhalation	19	161
R50 - Very toxic to aquatic organisms	16	1 306
R52 - Harmful to aquatic organisms	4	193
R53 - May cause long-term adverse effects in the aquatic environment	18	400
R59 - Dangerous for the ozone layer	2	0
R61 - May cause harm to the unborn child	70	3 628 048
R62 - Possible risk of impaired fertility	7	25
R63 - Possible risk of harm to the unborn child	40	92 617
R67 - Vapours may cause skin dryness or cracking	2	18
Sum	**4 553**	**45 257 264**

Most products are labelled as R43, sensitisation by skin contact. In quantities the risk phrases R45 and R340 are the most dominating and it is likely that this is depending on the petrol and diesel quantities. Also R61, is noted as a rather large. This is due to that the figure of 3 194 534 also includes the fossil fuel blast furnace gas (a by-product of the reduction process of iron, consumed as a fuel in heat production for dwellings). Note that blast furnace gases are not included in the overview of fossil fuels in section 3.1, but are regarded as chemical products which are not sold as final products.

When filling in the registration form to the Product Register (cf. Appendix 1) the company may choose between different types of users for the chemical products. If there are several, the share of the three major ones should preferably be specified. However, this information is not always given, and then the distribution is split equally between the users. Sometimes, the company only report the next step in the handling of the chemical product but not the industry in which the chemicals ends. The user (or industry) “wholesale trade of products” (NACE 50-52, cf. Table 7, Table 8 and Table 9) is a common answer for the major uses of the chemical products, even if the chemicals in fact end up in other industries. Similarly, there are difficulties when a certain product has both several functions and several potential industries to be used in.

2.3. Intensities - the use of chemical products related to the value added in the industry

The data about use of chemical products is also expressed as intensities. This means, that tonnes of used chemical products reported are normalised with the production value or value added of the given industry. The intention is that these intensities based on Swedish data, can be used in modelling as an approximation for chemical product use when other data is lacking (for example in

other EU member countries). We recognise that for specialised chemical products this may not be ideal. However, many chemical products in the register are not that unique.

Calculations of the intensities are based on value added for the period 1996-2001. The classification of industries is based on the Swedish Standard Industrial Classification (SNI), which is harmonised with NACE.

3. Results and interpretation

3.1. Fossil fuels

Fossil fuels are most interesting from the perspective of chemical products being classified as hazardous for health and or environment, or labelled with a risk phrase. They are the most dominating consumer available chemical products with health damaging properties. All fossil fuels are attached with several categories (Table 5). The use of fossil fuels[6] per industry for 1996-2001 is presented in Table 6. As seen in the table, the major part of fossil fuels result from use due to private consumption (includes heating and driving) (33%) or transport industry (29%) (data from 2000).

In order get an indication about the distribution between various types of fuels, their average share of the total amount used between 1996-2000 is shown in Figure 2. From this we can conclude that Petrol, Heating oil and Diesel approximately represents one forth each of the total amounts used.

Table 5. Classification and labelling of fossil fuels included in the study.

	Classification and labelling of dangerous substances (Directive 67/548/EC)	**Risk-phrase**
Heating oil 01	C, Xn	R40
Heating oil 02-05	C, Xn	R40
Diesel	C, Xn	R40
Air fuel and Jet fuel	C, Xn	R40
Petrol	C, Xn, T	R45 and R65

[6] This study only consider the fossil fuels Heating oil 01-05, Diesel, Air fuel and Jet fuel, and Petrol. Solid fossil fuels or gaseous fossil fuels are not included.

Table 6. Use of classified fossil fuels (Heating oil 01-05, Diesel, Air fuel & Jet fuel, and Petrol) per industry in Sweden 1996-2000 [Tonnes] (solid fossil fuels or gaseous fossil fuels are not included).

NACE		1996	1997	1998	1999	2000
01	Agriculture	418 611	408 515	411 548	419 202	407 120
02	Forestry	138 910	139 587	151 651	145 064	142 984
05	Fishing	62 600	64 585	63 279	62 654	60 532
10-14	Mining and quarrying	107 968	104 062	98 860	92 212	88 258
15-16	Manu. of food products and beverages	190 321	169 175	167 693	165 052	153 904
17-19	Textile and clothing industry	31 579	22 696	23 478	21 911	19 766
20	Manu. of wood and products of wood	70 990	72 098	73 595	74 573	76 471
21	Pulp and paper	718 073	644 617	645 187	621 701	541 880
22	Publishing, printing and reproduction	22 414	20 270	20 047	19 282	17 128
23	Refineries	525 392	529 932	552 861	534 987	539 932
24.1-24.2	Manu. of basic chemicals and pesticides	45 258	41 771	43 274	43 427	34 979
24.3	Manu. of paint	3 669	3 572	3 571	3 768	3 368
24.4	Manu. of pharmaceuticals	16 318	15 416	16 229	16 518	15 204
24.5-24.7	Manu. of other chemicals and chemical prod., soap and detergents	31 926	27 874	27 075	28 014	29 253
25	Manu. of rubber and plastic products	30 180	30 574	31 501	31 701	28 671
26	Manu. of other non-metallic mineral products	107 902	94 848	94 257	112 826	145 210
27	Manu. of basic metals	176 028	169 968	153 335	159 307	178 624
28	Manu. of fabricated metal products, tools	68 506	66 552	68 727	67 505	63 520
29	Manu. of machinery and equipment	80 294	72 376	74 200	72 674	64 801
30	Manu. of office machinery and computers, electric	1 461	1 962	2 553	2 283	1 853
31	Manu. of electrical machinery, radio, television etc.	12 255	11 818	12 757	12 361	12 826
32	Manu. of telecom products	7 486	9 045	10 559	13 156	11 077
33	Manu. of medical and optical instruments.	7 367	7 545	8 419	8 543	6 703
34-35	Manu. of vehicles, trailers and other transport equipment	88 121	85 732	82 535	81 863	82 271
36-37	Manu. of furniture and consumer products. Recycling	26 742	28 357	30 309	34 976	35 431
40-41	Electricity and water supply	1 896 025	952 703	1 024 794	782 811	454 021
45	Construction	445 896	449 815	461 153	499 636	489 158
50-52	Wholesale and retail trade; repair of goods	456 069	454 515	501 885	545 942	497 776
55	Hotels and restaurants	25 893	27 387	25 244	28 749	28 820
60-64	Transport	3 956 657	3 971 983	4 322 508	4 424 007	3 907 889
70-74	Houses and Renting companies	405 086	419 387	366 478	392 973	408 332
75	Public sector	583 968	546 611	458 222	445 629	400 941
80-85	Governmental services	21 355	21 575	29 686	32 765	37 422
90-95	Education and health	115 243	112 195	108 364	116 152	160 852
PC	Private consumption	5 092 973	4 837 857	4 726 892	4 814 874	4 531 264
Export		0	0	0	0	0
Total		**16 011 990**	**14 655 578**	**14 906 514**	**14 948 394**	**13 697 270**

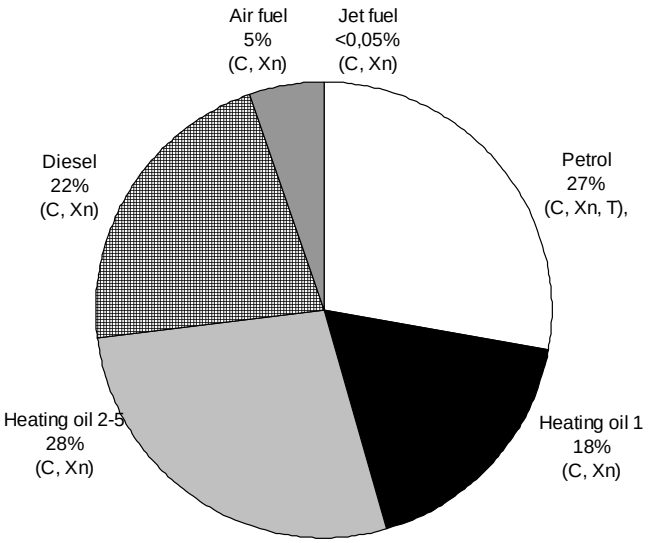

Figure 2. Average distribution between fossil fuels used in Sweden 1996-2000.

3.2. Chemical products per industry 1996-2001, excluding fossil fuels

In this section a number of tables illustrating time series of chemical product indicators per industry for 1996-2001 are presented. The data shown only consider if the chemical product has a risk phrase or a classification code, i.e. it is not shown if several risk phrases or codes occur for the same chemical product. This approach is chosen in order to avoid counting the same product twice (cf. section 2.1). This approach has some limitations as it counts chemicals products with several risk phrases equal to those with one risk phrase.

As mentioned, the labelling of products being classified as 'Dangerous for the environment' (N) is rather new, and there is no obligation to report the risk phrases of R50-R59. For that reason, it might be possible that other industries than those seen in the tables dominate these categories. Indicators for chemical products labelled 'Dangerous for the environment' (N) and or with the risk phrase R50-59 are therefore presented in separate tables.

In Table 7 indicators of chemical product classified as dangerous for health is presented per industry for the years 1996-2001. Export of chemical products is not accounted for by industries, but is included as an own sector in the end of the table. The industries with largest amount of classified non-fossil chemical products are Manufacturing of basic chemicals' (NACE 24.1 in the table), followed by 'Manufacturing of other non-metallic mineral products' (NACE 26) and 'Pulp and paper industry' (NACE 21). Together these three represents 65% of the total amount of non-fossil chemical products classified as dangerous for health in 2001 (excluding export).

Analysing the trends over time in Table 7 show that for most the industries the magnitude of non-fossil products classified as dangerous for health has been rather constant. However, for 'Fishing' (NACE 05), 'Manufacturing of basic chemicals' (NACE 24.1), 'Manufacturing of pesticides' (NACE 24.2), 'Manufacturing of electrical machinery, radio television' (NACE 31), 'Manufacturing of furniture and recycling' (NACE 37) and 'Transport' (NACE 60-64) there has to a varying degree

been a decrease of the amounts. However, in order to distinguish when the changes depends on a change in production, or an actual change of the amount of chemical products used they have to be seen in relation to the value added per industry (c.f. section 3.4).

Industries that show an increase of labelled chemical products are ‘Refineries’ (NACE 23), ‘Manufacturing of other non-metallic mineral products’ (NACE 26), ‘Electricity and water supply’ (NACE 40-41), ‘Hotels and restaurant’ (NACE 55) and Exports.

Table 7. Use of chemical products in Sweden, labelled as dangerous for health (T+, T, C, Xn, and Xi), excluding fossil fuels, 1996-2001 [Tonnes].

NACE	Type of industry	1996	1997	1998	1999	2000	2001
01	Agriculture	23 578	18 976	24 797	23 303	23 427	24 089
02	Forestry	50	184	48	46	77	70
05	Fishing	46	50	4	5	4	9
10-14	Mining and quarrying	106 138	98 835	108 183	128 339	8 643	4 605
15-16	Manu. of food products and beverages	44 015	45 910	46 233	46 184	42 204	42 250
17-19	Textile and clothing	4 602	4 287	3 847	3 865	4 027	3 250
20	Manu. of wood and products of wood	35 415	33 468	32 575	37 083	38 643	26 888
21	Pulp and paper	846 780	1 008 110	994 671	1 015 965	1 083 321	1 047 799
22	Publishing, printing and reproduction	6 331	5 926	5 666	6 049	12 960	5 683
23	Refineries	182 126	277 851	275 482	454 022	603 571	616 980
24.1	Manu. of basic chemicals	2 110 314	2 244 569	2 196 901	1 495 957	1 818 536	1 644 940
24.2	Manu. of pesticides	505	457	285	306	247	137
24.3	Manu. of paint	105 770	104 764	67 461	65 727	70 370	77 059
24.4	Manu. of pharmaceuticals	3 949	5 114	20 218	5 203	8 717	9 288
24.5,7	Manu. of soap and detergents and synthetic fibre	26 665	53 975	44 618	62 786	56 884	53 675
24.6	Manu. of other chemicals and chemical products	136 748	158 396	182 090	209 315	261 057	220 841
25	Manu. of rubber and plastic products	177 278	146 217	174 971	179 797	156 825	203 845
26	Manu. of other non-metallic mineral product	1 582 262	2 522 247	1 725 966	2 776 266	1 829 887	1 970 516
27	Manu. of basic metals	231 856	331 462	365 218	248 897	304 838	297 451
28	Manu. fabricated metal products, tools	40 901	44 612	46 525	45 957	55 140	53 927
29	Manu. of fabricated metal products	2 375	2 985	3 249	2 946	2 839	3 574
30	Manu. of office machinery and equipment	4 151	4 504	4 029	3 961	3 611	2 305
31	Manu. electrical machinery, radio television	26 519	17 521	18 348	8 394	8 025	6 539
32	Manu. of teleproducts	644	737	631	490	742	561
33	Manu. of medical and optical instruments	119	16	16	28	22	25
34-35	Manu. of vehicles, trailers and other transport	9 474	9 242	10 007	10 424	7 756	11 831
36-37	Manu. of furniture and recycling	6 658	5 592	3 868	3 300	3 289	2 308
40-41	Electricity and water supply	74 519	85 959	96 459	132 595	150 213	153 048
45	Construction	313 117	318 335	181 818	208 508	216 208	329 888
50-52	Wholesale and retail trade; repair of goods	136 654	148 514	140 960	152 836	185 265	141 072
55	Hotels and restaurants	2 209	3 864	3 671	4 005	4 501	5 005
60-64	Transport	31 775	36 265	63 214	4 631	5 310	5 707
70-74	Houses and Renting companies	3 252	3 155	2 971	3 150	2 923	3 026
80-85	Education and health	4 063	1 613	1 573	1 849	1 760	2 728
90-95	Other services	153 047	116 501	165 992	205 130	199 825	195 040
	The public sector (NACE75)	1 278	927	1 669	239	409	4 590
Exp	Export	1 242 445	1 125 751	1 251 436	1 969 666	3 518 878	4 159 546
Total	**Total, incl. exports (rounded)**	**7 678 000**	**8 987 000**	**8 266 000**	**9 517 000**	**10 691 000**	**11 330 097**
Total	**Total, excl. exports (rounded)**	**6 435 000**	**7 861 000**	**7 014 000**	**7 547 000**	**7 172 000**	**7 170 000**

One of the aims with this study was to distinguish the amounts of chemical products per industry that are included in the final goods, i.e. follow the produced goods after manufacturing. In order to do this, we have identified the amounts of chemical products used for synthesis per industry. This is based on the assumption that chemicals used for synthesis are not included in the final product, but are consumed during the production process. Comparing these amounts with the total amounts per industry generates a measure of the quantity of chemical products that will end up in final goods in Sweden being classified as dangerous for health (Table 8).

For the majority of the industries, most of the chemicals used are included in the final goods, so that more than 80% are not used for synthesis (the right column of Table 8). However, for a few industries, ‘Refineries’ (NACE 23) and ‘Manufacturing of basic chemicals’ (NACE 24.1), the situation is the opposite with less than 20% not used for synthesis. A large share of chemicals used for synthesis can also be seen in ‘Manufacturing of other chemicals and chemical products’ (NACE 24.6) and ‘Manufacturing of rubber and plastic products’ (NACE 25). The share of chemical products used for synthesis is of special interest related to the fact that ‘Manufacturing of basic chemicals’ (NACE 24.1) is one of the industry sectors representing the largest amounts of products being classified as dangerous for health (cf. Table 7, or the column ‘Total amount of chemicals labelled as dangerous for health’, in Table 8). The large share of chemicals for synthesis thus changes this position when discussing the amount following the final goods.

Table 8. Chemical products classified as dangerous for health (T+, T, C, Xn and Xi) and used for synthesis in 2001, excluding fossil fuels. (An empty space indicates that there is no reported use of chemical products for synthesis in that industry).

NACE	Type of industry	Chemical products for synthesis [tonnes]	Total amount of chemical products labelled as dangerous for health [tonnes]	Chemical products per industry not used for synthesis [%]
01	Agriculture	90	24 089	100
02	Forestry		70	100
05	Fishing		9	100
10-14	Mining and quarrying	11	4 605	100
15-16	Manu. of food products and beverages	4 632	42 250	89
17-19	Textile and clothing	55	3 250	98
20	Manu. of wood and products of wood	2 069	26 888	92
21	Pulp and paper	384 585	1 047 799	63
22	Publishing, printing and reproduction	13	5 683	100
23	Refineries	598 865	616 980	3
24.1	Manu. of basic chemicals	1 386 271	1 644 940	16
24.2	Manu. of pesticides	67	137	51
24.3	Manu. of paint	12 091	77 059	84
24.4	Manu. of pharmaceuticals	1 602	9 288	83
24.5,7	Manu. of soap and detergents and synthetic fibre	24 400	53 675	55
24.6	Manu. of other chemicals and chemical products	169 610	220 841	23
25	Manu. of rubber and plastic products	134 117	203 845	34
26	Manu. of other non-metallic mineral product	8 202	1 970 516	100
27	Manu. of basic metals	5 975	297 451	98
28	Manu. fabricated metal products, tools	1 493	53 927	97
29	Manu. of fabricated metal products		3 574	100
30	Manu. of office machinery and equipment		2 305	100
31	Manu. electrical machinery, radio television	73	6 539	99
32	Manu. of teleproducts	58	561	90
33	Manu. of medical and optical instruments		25	100
34-35	Manu. of vehicles, trailers and other transport	5	11 831	100
36-37	Manu. of furniture and recycling	0	2 308	100
40-41	Electricity and water supply	75 201	153 048	51
45	Construction	21 153	329 888	94
50-52	Wholesale and retail trade; repair of goods	17 584	141 072	88
55	Hotels and restaurants		5 005	100
60-64	Transport	790	5 707	86
70-74	Houses and Renting companies	13	3 026	100
80-85	Education and health	18	2 728	99
90-95	Other services	42 288	195 040	78
	The public sector (NACE 75)		4 589	100
Export		2 137 301	4 159 546	49
Total including export		**5 028 632**	**11 330 097**	**56**
Total excluding export		**2 891 331**	**7 170 551**	**60**

As mentioned in the method, the obligation to report chemical products labelled as 'Dangerous for the environment' (N) is rather new, and chemical products being classified for the risk phrase R50-R59 are not obligated to be reported at all. Data about chemical products being labelled in these categories are therefore presented in separate tables (Table 9 and Table 12). For the same reason, it might also be possible that other industries than those seen in the tables are the most important for these classifications. According to the National Chemical Inspectorate it is likely that the quality of data will be improved successively for the categories 'N' and risk phrases R50-R59. However, based on the data available today, chemical products being labelled as dangerous for the

environment is mainly found in the 'Manufacturing of basic chemicals' (> 50%) followed by the 'Manufacturing of paint' (about 10%) (cf. Table 9).

Table 9. Use of chemical products in Sweden labelled as dangerous for the environment (N), 2001 [Tonnes] excluding fossil fuels, chemical used for synthesis are included in the figures. (An empty space indicates that no data has been reported).

NACE	Type of industry	2001
01	Agriculture	4
02	Forestry	
05	Fishing	
10-14	Mining and quarrying	6 409
15-16	Manu. of food products and beverages	155
17-19	Textile and clothing	23
20	Manu. of wood and products of wood	205
21	Pulp and paper	5 679
22	Publishing, printing and reproduction	7
23	Refineries	698
24.1	Manu. of basic chemicals	69 345
24.2	Manu. of pesticides	
24.3	Manu. of paint	10 793
24.4	Manu. of pharmaceuticals	284
24.5,7	Manu. of soap and detergents and synthetic fibre	463
24.6	Manu. of other chemicals and chemical products	4 683
25	Manu. of rubber and plastic products	2 035
26	Manu. of other non-metallic mineral product	7 755
27	Manu. of basic metals	101
28	Manu. fabricated metal products, tools	319
29	Manu. of fabricated metal products	17
30	Manu. of office machinery and equipment	0
31	Manu. electrical machinery, radio television	59
32	Manu. of teleproducts	0
33	Manu. of medical and optical instruments	0
34-35	Manu. of vehicles, trailers and other transport	6
36-37	Manu. of furniture and recycling	270
40-41	Electricity and water supply	12
45	Construction	397
50-52	Wholesale and retail trade; repair of goods	4 962
55	Hotels and restaurants	
60-64	Transport	2
70-74	Houses and Renting companies	16
80-85	Education and health	3
90-95	Other services	157
Exp	Export	18 477
Total, including exports (rounded)		133 000
Total, excluding exports (rounded)		115 000

The classification related to chemical products varies between industries. The data allows for presentation of the division of non-fossil chemical products being classified as dangerous for health and/or environment between different types of industries (Table 10, figure 3).

For chemical products labelled as corrosive (C) the majority is found in the industry of ‘Pulp and paper’, NACE 21, with more than 480 000 tonnes or 35% of the C classified products.

Chemical products being classified as dangerous for the environment (N) is mainly found in industry of ‘Manufacturing of paint’, NACE 24.3, having over 10 000 tonnes or approximately 25% of this category (or this is at least the industry that dominates the reporting of N classified chemical products).

The majority of Toxic (T) chemical products, almost 200 000 tonnes or 52% of the category, is found in ‘Manufacturing of basic chemicals’ (NACE 24.1) compared to Very toxic (T+) chemical products that mainly is found in the industry of ‘Manufacturing of soap, detergents, and synthetic fibre’, NACE (24.5,7). But here it is a different order of magnitude for the amount of chemical products with barely 4000 tonnes used in the industry, representing 30% of the whole category.

Over 60%, or 1 782 000 tonnes, of irritant (Xi) chemical products are found in the industry of ‘Manufacturing of other non-metallic mineral products’ (NACE 26). This is mainly due to the inherent properties of cement.

For Harmful (Xn) chemical products the distribution between types of industry is larger than for the other classifications. However, about 67 000 tonnes or 16% is found in ‘Pulp and paper industry’ (NACE 21).

Table 10. Components of chemical products labelled as dangerous for health and/or environment, by industry, excluding fossil fuels and chemical products for synthesis, 2001[Tonnes] (C) Corrosive, (N) Dangerous for the environment, (T) Toxic, (T+) Very Toxic, (Xi) Irritant and (Xn) Harmful. The major classification is marked in **bold figures**.

NACE	Type of industry	C	N	T	T+	Xi	Xn
01	Agriculture	16 880	4	369	13	2 631	5 654
02	Forestry	2	0	0	0	5	64
05	Fishing	0	0	9	0	0	0
10-14	Mining and quarrying	439	6 409	1 014	0	833	2 461
15-16	Manu. of food products and beverages	40 749	155	134	1	4 179	689
17-19	Textile and clothing	894	24	3	14	1 731	947
20	Manu. of wood and products of wood	6 660	198	5 976	0	8 279	5 677
21	Pulp and paper	**481 375**	5 691	2 481	0	257 810	**67 119**
22	Publishing, printing and reproduction	284	7	28	0	2 190	3 319
23	Refineries	709	966	752	0	8 545	8 380
24.1	Manu. of basic chemicals	193 449	3 437	**196 400**	203	67 949	19 085
24.2	Manu. of pesticides	0	0	1	0	70	0
24.3	Manu. of paint	605	**11 506**	498	0	19 791	50 097
24.4	Manu. of pharmaceuticals	1 483	282	171	27	5 563	1 695
24.5,7	Manu. of soap and detergents and synthetic fibre	26 270	463	75	**3 920**	12 349	13 581
24.6	Manu. of other chemicals and chemical products	14 877	3 703	35 601	1 058	20 185	16 873
25	Manu. of rubber and plastic products	1 592	2 035	83 817	376	6 663	17 182
26	Manu. of other non-metallic mineral product	275 315	7 755	8 618	2	**1 782 517**	35 819
27	Manu. of basic metals	65 359	101	18 963	2 282	164 816	55 763
28	Manu. of fabricated metal products, tools	14 874	319	9 860	2 053	10 773	21 248
29	Manu. of fabricated metal products	119	17	36	0	1 600	1 851
30	Manu. of office machinery and equipment	94	0	1 299	0	925	30
31	Manu. electrical machinery, radio television	4 833	59	2 178	0	781	1 085
32	Manu. of teleproducts	235	0	22	12	199	43
33	Manu. of medical and optical instruments	2	0	1	0	18	9
34-35	Manu. of vehicles, trailers and other transport	696	6	98	18	1 878	9 292
36-37	Manu. of furniture and recycling	314	270	0	0	620	1 374
40-41	Electricity and water supply	59 366	8	538	0	51 997	468
45	Construction	42 352	397	1 480	0	257 391	8 905
50-52	Wholesale and retail trade; repair of goods	17 013	3 789	702	2 938	69 770	41 394
55	Hotels and restaurants	4 174	0	0	0	803	140
60-64	Transport	86	2	22	0	2 473	2 758
70-74	Houses and Renting companies	631	16	90	2	1 906	477
80-85	Education and health	1 307	3	5	0	870	659
90-95	Other services	91 868	241	2 216	0	76 111	33 849
	The public sector (NACE 75)	2	0	0	0	4 578	10
Export	Export	65 920	15 433	97 515	368	1 719 063	196 533

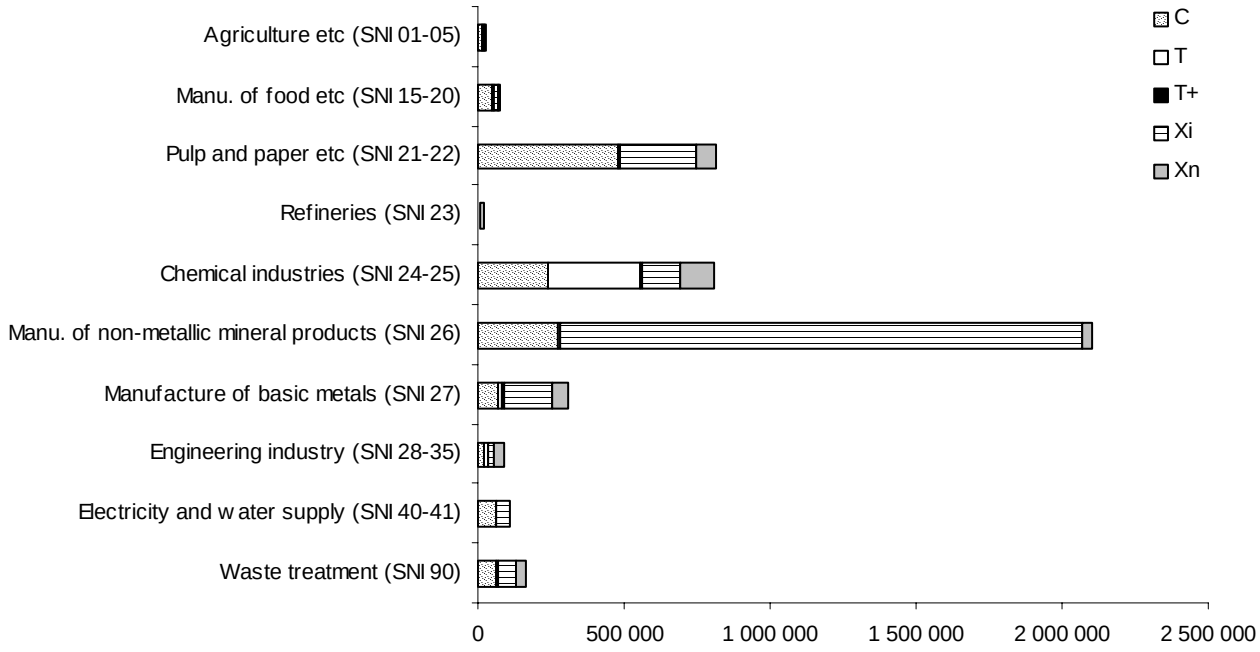

Figure 3. Components of chemical products labelled as dangerous for health and/or environment for some aggregated industry classes, 2001 [Tonnes]. Fossil fuels and chemical products for synthesis are excluded. (C) Corrosive, (T) Toxic, (T+) Very Toxic, (Xi) Irritant and (Xn) Harmful.

Changes in the total amount of CSMR – labelled chemical products[7] used per industry for the years 1996-2000 are shown in Table 11. For most industries there has only been moderate changes. However, for the industry 'Mining and quarrying' a significant increase in the total amount of used CSMR – labelled chemical products can be seen. In order to see if this result is due to changes in the produced amounts, or if it is changes in the composition of chemicals used etc, the amounts can be related to the value added in the industry. Such tables will be presented later in this section.

[7] i.e. products labelled with the risk-phrase R340, R40, R41, R42, R43, R45, R46, R49 and R60-64

Table 11. CSMR-risk labelled chemical products, excluding fossil fuels 1996-2001 [Tonnes]. (Se also Table 12 for an overview of chemical products labelled as risk for long term effects due to environmental criteria).

NACE		1996	1997	1998	1999	2000	2001
01	Agriculture	1 779	1 605	2 029	2 518	2 668	2 064
02	Forestry	0	8	9	65	56	8
05	Fishing	4	3	3	5	3	9
10-14	Mining and quarrying	39	105	376	322	275	1 492
15-16	Manu. of food products and beverages	446	308	446	231	189	102
17-19	Textile and clothing industry	791	910	993	1 039	747	672
20	Manu. of wood and prod. of wood	22 577	24 207	24 716	24 706	27 239	11 620
21	Pulp and paper	21 565	17 254	14 765	24 216	26 069	25 743
22	Publishing, printing and reproduction	1 100	585	718	380	656	468
23	Refineries	158 177	249 027	255 309	144 405	209 601	221 066
24.1	Manu. of basic chemicals	339 077	1 178 823	1 191 826	668 159	738 690	870 674
24.2	Manu. of pesticides	171	184	139	186	113	1
24.3	Manu. of paint	9 105	7 819	9 474	8 397	8 057	8 716
24.4	Manu. of pharmaceuticals	210	321	572	1 269	2 104	1 653
24.5,7	Manu. of soap, detergents and synthetic fibre	534	668	1 102	397	445	428
24.6	Manu. of other chemicals and chemical products	43 086	30 311	51 487	88 205	138 693	93 389
25	Manu. of rubber and plastic products	15 221	14 120	25 937	20 515	17 147	15 086
26	Manu. of other non-metallic mineral products	90 575	2 310 597	1 515 614	2 493 342	1 557 897	1 670 183
27	Manu. of basic metals	3 023	56 675	64 282	47 589	59 801	59 787
28	Manu. of fabricated metal products, tools	13 915	15 110	19 173	14 814	18 263	16 869
29	Manu. of fabricated metal products	377	728	856	680	647	515
30	Manu. of machinery and equipment	4 004	4 327	3 899	3 841	3 407	2 179
31	Manu. of office machinery and computers	6 458	1 239	1 264	2 031	1 933	1 352
32	Manu. of electrical machinery, radio, television etc.	178	247	237	170	118	121
33	Manu. of medical and optical instruments	3	2	1	1	1	2
34-35	Manu. of vehicles, and other transport equipment	0	1 669	1 639	2 168	2 105	2 094
36-37	Manu. of furniture and recycling	7 688	8 595	7 258	4 438	4 043	1 240
40-41	Electricity and water supply	74	78	76	89	114	85
45	Construction	124 865	127 650	80 384	84 521	65 246	91 204
50-52	Wholesale and retail trade; repair of goods	29 908	32 454	27 851	40 134	44 935	40 278
55	Hotels and restaurants					76	74
60-64	Transport	31 782	21 798	50 428	1 021	859	926
70-74	Houses and renting companies	359	326	334	318	281	210
75	Governmental services	17	12	11	11	11	11
80-85	Education and health	294	232	286	234	253	262
95-95	Other services	10 418	233	500	372	197	76
Export		486 400	358 661	361 269	466 774	1 819 280	2 078 287
Total including export		**1 424 219**	**4 466 893**	**3 715 262**	**4 147 558**	**4 752 220**	**5 218 947**
Total excluding export		**937 819**	**4 108 231**	**3 353 993**	**3 680 784**	**2 932 940**	**3 140 660**

Chemical products that may cause effects due to environmental criteria (i.e. labelled with the risk phrase R50-R59) are according to the data available mainly found in 'Manufacturing of basic chemicals' (40%) and 'Manufacturing of paint' (almost 30%) (Table 12). These are the same industries reported as the major ones for chemical products labelled as dangerous for the environment (N) (cf. Table 9).

Table 12. Chemical products labelled as risk for long term effects due to risk phrase R50-R59 in 2001 [Tonnes], chemical products used for synthesis are included in the figures. An empty space indicates that no data has been reported.

NACE	Type of industry	Total
01	Agriculture	412
02	Forestry	5
05	Fishing	
10-14	Mining and quarrying	
15-16	Manu. of food products and beverages	12
17-19	Textile and clothing industry	14
20	Manu. of wood and products of wood	5
21	Pulp and paper	60
22	Publishing, printing and reproduction	7
23	Refineries	379
24.1	Manu. of basic chemicals	7 536
24.2	Manu. of pesticides	
24.3	Manu. of paint	5 112
24.4	Manu. of pharmaceuticals	14
24.5,7	Manu. of soap, detergents and synthetic fibre	253
24.6	Manu. of other chemicals and chemical products	1 215
25	Manu. of rubber and plastic products	609
26	Manu. of other non-metallic mineral products	25
27	Manu. of basic metals	322
28	Manu. of fabricated metal products, tools	43
29	Manu. of fabricated metal products	14
30	Manu. of machinery and equipment	0
31	Manu. of office machinery and computers	450
32	Manu. of electrical machinery, radio, television etc.	
33	Manu. of medical and optical instruments	
34-35	Manu. of vehicles, and other transport equipment	5
36-37	Manu. of furniture and recycling	
40-41	Electricity and water supply	0
45	Construction	106
50-52	Wholesale and retail trade; repair of goods	1 874
55	Hotels and restaurants	
60-64	Transport	
70-74	Houses and renting companies	1
75	Governmental services	
80-85	Education and health	24
95-95	Other services	7
Export		213
Total including export		**18 717**
Total excluding export		**18 505**

3.3. Functions of non-fossil chemical products per industry

In order to analyse the distribution of chemical products that are labelled as dangerous for health and or the environment, the three largest functions according to their magnitude per industry has been searched for in the Product Register (Table 13). Chemical products used for synthesis are not included in the table since that function is presented in Table 8[8]. The functions are described in a way so that at times two functions seem to be equal. However, they provide a quick way to see what is in the indicators without showing any company secrets.

As an introduction to Table 13, let us go back to the two major industries that reported chemical products being labelled as dangerous for health (cf. Table 8). These where 'Manufacturing of basic chemicals' and 'Manufacturing of other non-metallic mineral products'. The three most common functions in the industry 'Manufacturing of basic chemicals' are chemicals used as Raw materials for production of plastics; Raw materials for production of cosmetics etc; and Binding agents for paint, adhesives etc. However, these three functions only represents about 4% of the total amount used of classified products in the industry[9]. As seen in Table 8 chemical used or synthesis is the major function in the industry, representing 84% of the total amount used.

For the industry 'Manufacturing of other non-metallic mineral products' the three largest functions (Binding agents, Cement and Mortar) represent almost 80% of the total amount of chemical products. The amount of chemical products reported as used for synthesis is almost negligible in this industry. Based on the assumption that chemical products used for synthesis to a large extent are transformed during the production process and not included in the final goods (cf. Method2), a larger share of chemicals labelled as dangerous for health and/or environment are included in the final goods from the industry 'Manufacturing of other non-metallic mineral products' than from 'Manufacturing of basic chemicals'.

[8] Chemicals used for synthesis are a dominant function in several types of industry (e.g. Refineries, 'Manufacturing of basic chemicals' and 'Manufacturing of rubber and plastics').
[9] Compared with the total amount of chemical products not used for synthesis in the given industry (i.e. the sum per industry in Table 10).

Table 13. The function of the three largest chemical products labelled as dangerous for health and/or environment, by industry, (fossil fuels and chemical products for synthesis are excluded), 2001 [Tonnes]. The classification of function is taken from the Product Register at the National Chemical Inspectorate in Sweden. Also cf. Table 8 and Table 10 for a comparison of the total amount of chemical products used per industry and the amounts used for the function synthesis.

NACE	Type of industry ( ) = the total quantity of the listed products per industry, cf. with the quantity for the industry as whole, Table 5.	The three largest chemical products per industry
01	Agriculture (2 006)	Ensilage means Control of other vertebrates (pesticides) Flooring materials
02	Forestry (8)	Colouring agents Control of other vertebrates (pesticides) Lubricating agents
05	Fishing (9)	Bactericidal Disinfectants Colouring Agents, other
10-14	Mining and quarrying (1 492)	Flotation agents Lubricating agents Accelerators
15-16	Manu. of food products and beverages (73)	Additive to lubricating agents Enzyme
17-19	Textile and clothing (578)	Tanning Agents Colouring Agents Other
20	Manu. of wood and products of wood (7 727)	Wood preservatives Resin for glue Other
21	Pulp and paper (16 336)	Raw materials for production of paper Glue (others) Other
22	Publishing, printing and reproduction (392)	Developers Moisturizers Printing ink
23	Refineries (1 633)	Additive to lubricating agents Viscosity changers Catalysts
24.1	Manu. of basic chemicals (59 319)	Raw materials for production of plastics Raw materials for production of cosmetics etc Binding agents for paints, adhesives etc.
24.2	Manu. of pesticides (1)	Disinfectants
24.3	Manu. of paint (3 241)	Binding agents for paints, adhesives etc. Other Hardening agents for paint
24.4	Manu. of pharmaceuticals (1 420)	Raw materials for production of paper Solvent Raw materials for production of medicament/medicine
24.5,7	Manu. of soap, detergents and synthetic fibre (673)	Raw materials for production of cosmetics etc Industry perfumes Enzyme
24.6	Manu. of other chemicals (38 937)	Solvent Bleaching agents Binding agents, other

25	Manu. of rubber and plastic products (7 268)	Raw materials for production of plastics Softeners for plastic, rubber, paint and adhesive Other
26	M. of other non-metallic mineral product (1 650 063)	Binding agents Cement Mortar
27	Manu. of basic metals (58 269)	Alloys Raw materials for production of metals Absorbents and adsorbents
28	Manu. fabricated metal products, tools (0)	Other Binding agents Raw materials for production of plastics
29	Manu. of fabricated metal products (410)	Moulding compounds Other Fluids for removing metal chips
30	Manu. of office machinery and equipment (2 179)	Binding agents Correction lacquers (offices) Flux agents
31	Manu. of. electrical machinery, radio TV (1 136)	Softeners for plastic, rubber, paint and adhesive Dielectrics Other
32	Manu. of teleproducts (62)	Plastic hardeners Electric current insulation materials Coating agents
33	Manu. of medical and optical instruments (2)	Laboratory chemicals Dental products Moulding compounds
34-35	Manu. of vehicles, trailers and other transport (1 112)	Corrosion inhibitors Other Metal surface remedies
36-37	Manu. of furniture and recycling (1 053)	Paint and varnish Raw materials for production of metals Glue (others)
40-41	Electricity and water supply (84)	Fuel additives, others Electric current insulation materials Insulation materials, other
45	Construction (83 268)	Mortar Binding agents Concrete
50-52	Wholesale and retail trade; repair of goods (25 266)	Mortar Raw materials for production of plastics Padding materials
55	Hotels and restaurants (74)	Washing agents for washing machines
60-64	Transport (110)	Anti-corrosion paint Other Paint and varnish (others)
70-74	Houses and Renting companies (187)	Developers Laboratory chemicals Chemicals for photographic use
80-85	Education and health (207)	Chemicals for photographic use Disinfectants Developers
90-95	Other services (80)	Solvents Degreasers Cleaning products, other
	The public sector (NACE 75)	Construction materials (others)

3.4. Intensities for non-fossil chemical products

The term intensity in the report refers to tonnes reported of chemical products, normalised with value added or production value, (intensities based on production values are not shown in the report, but are available upon request) of the industry in question. Intensities per value added can be used as a normalisation factor compared to GDP, e.g. to see how a business cycle affects the use of chemical products. The production value includes the value of purchased goods and is therefore higher than value added, where purchased goods is not included. The intensities per production value can for instance be used for input-output calculations, when looking at how consumption is related to chemical product use. With the help of data on how different industries buy and sell products and services, monetary input-output matrices can be constructed to calculate the chemical products use per product group, which can be of interest for example when considering Integrated Product Policies.

Intensities based on Swedish data can be used in modelling as an approximation for chemical use when other data is lacking. The usefulness of the data in this respect has been tested in several Swedish projects, where intensities for non-fossil chemical products labelled as dangerous for health and CSMR – risk labelled chemical products per production value has been used. However, this report can show data where the chemical products used for synthesis are excluded. These new intensities are presented in Table 14 and Table 15.

For chemical products labelled as dangerous for health (Table 14), ‘Manufacturing of chemical products’ together with ‘Manufacturing of pesticides’ (24.1-24.2) has the highest intensity with 303-164 tonnes per MSEK per production value during the period 1996-2000. High intensities are also found in the industry ‘Manufacturing of other non-metallic mineral products’, varying between 188-319 tonnes per MSEK per production value during the period 1996-2000. For CSMR – risk labelled chemical products (Table 15) the highest intensities are found in the industry ‘Manufacturing of other non metallic mineral products’ and in the industries Manufacturing of chemical products’ together with ‘Manufacturing of pesticides’ (24.1-24.2).

When presenting the results of Table 7, it can be seen that in for example ‘Manufacturing of basic chemicals’ (NACE 24.1) and ‘Manufacturing of pesticides’ (NACE 24.2), there has to a varying degree been a decrease of the amounts of chemical products labelled as dangerous for health. If the intensities of these industries also are taken into consideration we can conclude that the decrease of chemical products used in Manufacturing of basic chemicals’ (NACE 24.1) together with ‘Manufacturing of pesticides’ (NACE 24.2) could be is a result of a change in production. However, to understand what factors lie behind the decrease a decomposition analysis would be of interest. A question to answer is for instance when there has been a switch into another similar chemical product in the industry.

Table 14. Intensities. Chemical products labelled as dangerous for health (T+, T, C, Xn, and Xi), per value added in fixed prices, reference year 2000. [tonnes/MSEK] excluding fossil fuels).Cf. Table 7 for the amounts of chemical products labelled as dangerous for health.

NACE	Type of industry	1996	1997	1998	1999	2000	2001
01	Agriculture	1,9303	1,4819	2,1326	1,9862	1,8166	1,7773
02	Forestry	0,0021	0,0077	0,0021	0,0019	0,0033	0,0029
05	Fishing	0,0782	0,0894	0,0057	0,0097	0,0067	0,0150
10-14	Mining and quarrying	21,3792	17,9679	19,3822	23,1516	1,7362	1,0023
15-16	Manu. of food products and beverages	1,3033	1,3979	1,3895	1,3613	1,2482	1,2335
17-19	Textile and clothing	0,8486	0,8551	0,7442	0,7776	0,7843	0,6350
20	Manu. of wood and products of wood	2,3685	2,1743	1,9898	2,1111	2,0796	1,3906
21	Pulp and paper	25,0876	27,6093	27,6980	26,9362	26,6664	27,1633
22	Publishing, printing and reproduction	0,2154	0,2042	0,1921	0,2042	0,4532	0,2164
23	Refineries	40,9890	58,1319	59,8194	93,8849	129,8839	137,8727
24.1 - 24.2	Manu. of basic chemicals and manu. of pesticides	303,6333	286,7471	268,6844	174,5205	174,6814	163,5916
24.3	Manu. of paint	48,9553	45,1817	29,6890	26,6625	27,5098	29,6953
24.4	Manu. of pharmaceuticals	0,2086	0,2438	0,8507	0,1921	0,3080	0,3075
24.5-24.7	Manu. of soap, detergents, synthetic fibre, other chemicals and chemical products	74,3095	89,3016	91,0324	111,0828	123,7126	86,9548
25	Manu. of rubber and plastic products	18,0403	13,6062	15,5963	15,6609	13,0113	17,0354
26	Manu. of other non-metallic mineral products	188,4037	298,2201	201,0632	319,4524	193,4342	195,1006
27	Manu. of basic metals	13,5303	17,5017	21,3849	13,6091	15,6031	15,6455
28	Manu. of fabricated metal products, tools	1,3635	1,4203	1,4149	1,3904	1,4998	1,5286
29	Manu. of fabricated metal products	0,0497	0,0619	0,0649	0,0588	0,0535	0,0650
30	Manu. of office machinery and equipment	2,0289	2,2361	1,5262	1,6144	1,6983	0,8906
31	Manu. of electrical machinery, radio, television	2,9077	1,9963	1,8820	0,8254	0,5933	0,4224
32	Manu. of teleproducts	0,1342	0,0940	0,0528	0,0276	0,0315	0,0376
33	Manu. of medical and optical instruments	0,0104	0,0013	0,0012	0,0019	0,0018	0,0019
34-35	Manu. of vehicles, trailers and other transport	0,2470	0,2284	0,2268	0,1946	0,1207	0,2013
36-37	Manu. of furniture and recycling	0,7439	0,6059	0,3745	0,3009	0,2750	0,1960
40-41	Electricity and water supply	1,6441	1,8724	2,1440	2,9171	3,2480	3,1564
45	Construction	3,9331	4,1859	2,3932	2,6599	2,7384	3,9726
50-52	Wholesale and retail trade; repair of goods	0,7707	0,8289	0,7387	0,7520	0,8896	0,6702
55	Hotels and restaurants	0,0917	0,1517	0,1329	0,1376	0,1474	0,1609
60-64	Transport	0,2606	0,2788	0,4751	0,0329	0,0358	0,0388
70-74	Houses and renting companies	0,0093	0,0089	0,0081	0,0083	0,0073	0,0074
80-85	Education and health	0,1408	0,0562	0,0493	0,0552	0,0448	0,0641
90-95	Other services	4,6577	3,4615	4,7231	5,6100	5,0249	4,7266
	The public sector	0,0032	0,0024	0,0042	0,0006	0,0010	0,0115

Table 15. Intensities. CSMR-risk labelled chemical products, excluding fossil fuels, per value added in fixed prices, reference year 2000. [Tonnes/MSEK]. c.f. Table 8 for the amounts of CSMR - labelled chemical products.

NACE	Type of industry	1996	1997	1998	1999	2000	2001
01	Agriculture	0,1456	0,1253	0,1745	0,2146	0,2069	0,1523
02	Forestry	0,0000	0,0003	0,0004	0,0027	0,0024	0,0003
05	Fishing	0,0068	0,0056	0,0047	0,0085	0,0061	0,0142
10-14	Mining and quarrying	0,0078	0,0191	0,0674	0,0580	0,0552	0,3249
15-16	Manu. of food products and beverages	0,0132	0,0094	0,0134	0,0068	0,0056	0,0030
17-19	Textile and clothing	0,1459	0,1814	0,1921	0,2090	0,1454	0,1312
20	Manu. of wood and products of wood	1,5099	1,5726	1,5098	1,4065	1,4659	0,6010
21	Pulp and paper	0,6389	0,4725	0,4111	0,6420	0,6417	0,6674
22	Publishing, printing and reproduction	0,0374	0,0202	0,0243	0,0128	0,0229	0,0178
23	Refineries	35,5990	52,1012	55,4388	29,8608	45,1045	49,4002
24.1 - 24.2	Manu. of basic chemicals and manu. of pesticides	48,7995	150,5893	145,7602	77,9541	70,9569	86,5826
24.3	Manu. of paint	4,2142	3,3722	4,1695	3,4061	3,1497	3,3586
24.4	Manu. of pharmaceuticals	0,0111	0,0153	0,0240	0,0468	0,0743	0,0547
24.5-24.7	Manu. of soap, detergents, synthetic fibre, other chemicals and chemical products	19,8353	13,0265	21,1167	36,1706	54,1395	29,7174
25	Manu. of rubber and plastic products	1,5489	1,3140	2,3119	1,7869	1,4226	1,2607
26	Manu. of other non-metallic mineral products	10,7850	273,1956	176,5587	286,8976	164,6826	165,3646
27	Manu. of basic metals	0,1764	2,9925	3,7639	2,6020	3,0609	3,1447
28	Manu. of fabricated metal products, tools	0,4639	0,4811	0,5831	0,4482	0,4968	0,4782
29	Manu. of fabricated metal products	0,0079	0,0151	0,0171	0,0136	0,0122	0,0094
30	Manu. of office machinery and equipment	1,9573	2,1486	1,4769	1,5653	1,6024	0,8418
31	Manu. of electrical machinery, radio, television	0,7081	0,1412	0,1296	0,1997	0,1429	0,0873
32	Manu. of teleproducts	0,0371	0,0315	0,0198	0,0096	0,0050	0,0081
33	Manu. of medical and optical instruments	0,0003	0,0002	0,0001	0,0001	0,0001	0,0002
34-35	Manu. of vehicles, trailers and other transport	0,0000	0,0413	0,0371	0,0405	0,0328	0,0356
36-37	Manu. of furniture and recycling	0,8589	0,9314	0,7027	0,4047	0,3380	0,1053
40-41	Electricity and water supply	0,0016	0,0017	0,0017	0,0019	0,0025	0,0018
45	Construction	1,5685	1,6785	1,0581	1,0782	0,8264	1,0983
50-52	Wholesale and retail trade; repair of goods	0,1687	0,1811	0,1460	0,1975	0,2158	0,1914
55	Hotels and restaurants	0,0000	0,0000	0,0000	0,0000	0,0025	0,0024
60-64	Transport	0,2606	0,1676	0,3790	0,0073	0,0058	0,0063
70-74	Houses and renting companies	0,0010	0,0009	0,0009	0,0008	0,0007	0,0005
80-85	Education and health	0,0102	0,0081	0,0090	0,0070	0,0064	0,0061
90-95	Other services	0,3170	0,0069	0,0142	0,0102	0,0050	0,0019

4. Conclusions

Indicators about the use of chemical products per industry have previously been presented in the SEEA framework. In this study the aim was to go a step further by also considering the chemical products field of application. By doing this, the amount of chemical products used for synthesis were excluded from the indicators, which can then say more about those chemical products that end up as final goods on the market.

It can be noted that fossil fuels are separated from other types of chemical products in the report. This is since fossil fuels else totally would dominate the figures of chemical products being labelled as dangerous for health or attached with a risk phrase. However, fossil fuels are most interesting seen as a type of chemical product that many people are exposed for, for instance when filling up the car or by the exhaust from engines and the evaporation from fuel tanks.

The results illustrate that with the earlier method, industries with the largest amount of labelled or classified non-fossil chemical products are 'Manufacture of basic chemical industry' followed by the industries 'Manufacturing of other non-metallic mineral products' and 'Pulp and paper industry'. Together these three represents 65% of the total amount of chemical products used in Sweden classified as dangerous for health in 2001.

For non-fossil chemical products being labelled as dangerous for the environment over 50% is found in 'Manufacturing of basic chemicals' and about 10% in the industry 'Manufacturing of paint'. A similar pattern is given if consider chemical products that may cause effects due to environmental criteria (i.e. chemical products being labelled with the risk phrase R50-R59).

One way of distinguishing the amounts of chemical products used per industry that are included in the final product is to assume that all chemical products used for synthesis is transformed during the production processes and thus not included in the product. In this study, that procedure changed the position of what industry that used the largest amounts of labelled chemical products. In the industry 'Manufacturing of basic chemicals' a large share of the chemical products used are chemical products for synthesis. So, even if the total amount of chemical products are the largest in that industry, the industry of 'Manufacturing of other non-metallic mineral products' used the largest share of chemical products that follows the final product. The reason why chemical products used for synthesis is dominant in the industry 'Manufacturing of basic chemicals' is that the industry includes several companies that manufacture (synthesises) chemical products that later is used in other industries.

Separating the chemical products into different categories of labelling (chemical products used for synthesis are here excluded) show that of the chemical products labelled as corrosive (C) the majority is found in the industry of 'Pulp and paper', Chemical products being classified as dangerous for the environment (N) is mainly found in industry of 'Manufacturing of paint', the majority of Toxic (T) chemical products is found in 'Manufacturing of basic chemicals as compared to Very toxic (T+) chemical products that mainly is found in the industry of 'Manufacturing of soap, detergents, and synthetic fibre'. Finally, chemical products classified as Irritant (Xi) and Harmful (Xn) are mainly found in the 'Manufacturing of other non-metallic mineral products' and 'Pulp and paper industry' respectively.

The study also aimed to express the information about use of chemical products as intensities, i.e. relate the use the value in different industry. This generates a picture of whenever the use of chemical products is extensive or not compared to the industries value added. Furthermore, based on

the intensities presented in the report our intention is that these can be utilised for approximately calculations about use of chemical products in other EU member countries when only financial data about different industries are available. For Sweden, high intensities where found for the industries ‘Manufacturing of chemical products’, ‘Manufacturing of pesticides’ and ‘Manufacturing of other non-metallic mineral products.

Based on this, and the former studies about chemical indicators in the SEEA framework the database of SEEA will be added the following indicators:

- Chemical products labelled as dangerous for health and or environment in tonnes. Data will be included both for fossil fuels, non-fossil chemical products and sorted according to if the chemical product is used for synthesis or not.
- Chemical products attached with the risk-phrases R340, R40, R41, R42, R43, R45, R46, R49, R60-64 and R50-59. The intention for the future is also to be able to present data about each risk-phrase individually. Similar to data about ‘Chemical products labelled as dangerous for health and or environment’ data will included both for fossil fuels, non-fossil chemical products and be sorted according to if the chemical product is used for synthesis or not.

5. References

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Palm, V. (2002) Chemical product and substance indicators in the SEEA – health and environment. Statistics Sweden, Stockholm.

Palm, V. and Jonsson, K., (2001) Including chemical products in environmental accounts – the magnitude of chemical product use in different s. Eurostat Working Papers 2/2001/B/7.

Öko-Institute e.V. (2002) Research, development: statistical and analytical work to develop appropriate environmental indicators related to chemicals. Phase 1. Report 30th November 2002. Commissioned by Eurostat Luxemburg, Darmstad, 27th of June 2003.

Appendix 1 – Registration form for the Product Register (www.kemi.se)

KEMI
KEMIKALIEINSPEKTIONEN

NATIONAL CHEMICALS INSPECTORATE

Products Register
P.O.Box 2, SE-172 13 Sundbyberg
Sweden

Tel: +46 8 519 411 83
Fax: +46 8 82 55 08

PRODUCT REPORT

Invoicing address
(if other than postal address)

1. Reporting company

Company name, postal delivery address, postcode and place name		Authority stamp
2. Municipality (in Sweden)	3. County (in Sweden)	
4. Telephone No.	5. Company identification No.	
6. Telefax No.	7. Company contact person	

8. Name of product	9. No. of variants	10. Article No.	11. Common denomination (=identical products) / Kit (i.e. if products are packed together and where one product can not be used without the other/others)	12. If the product is a pesticide, state the (Swedish) registration No.	13. TIN-type	14. Quantity (year and tonnes)
						Year _____ _____ tonnes

15. Use	16. Statistical No. according to Customs Tariff	17. Trade description. Combine industrial category with Y if product is for own use, O if product is transferred to another company or consumers in Sweden	18. For industrial category EXP or if the Customs Tariff No starts with 28 or 29 (raw materials), estimate the distribution (in %)	19. If product is intended for consumer use, state K	20. Risk phrase for cancer, allergy or reproductive disturbances	21. Classification (health). State indication of danger or symbol letter

Obligation to provide particulars apply according to Sections 10-12 of the Chemical Products and Biotechnical Organisms Ordinance (1998:941). Consultation has taken place with the Board of Swedish Industry and Commerce for Better Regulation (NNR), in accordance with Section 3 of Ordinance (1982:668).

Date _____

Signature _____

Name in typescript _____

This information may come to be used for official statistics

The form should be signed by the legal representative, usually the person authorised to sign for the company.

PRODUCT COMPOSITION

PLEASE PROVIDE AN UNAMBIGUOUS CHEMICAL NAME/CAS-No. AND CONCENTRATION:

- Substances deemed to give the product its properties dangerous to health or the environment – state H or M, respectively.
- Substances included as preservatives – state P.
- Substances known to be toxic to reproduction, carcinogenic or sensitising.
- Substances marked with * in App. 1 to KIFS 1998:8 must be stated irrespective of concentration.
- Substances which are not marked with * in App. 1 must be stated if they are included with at least 1 percentage by weight.
- Substances included in products with customs tariff Nos. 22, 28 or 29, including impurities with a concentration of 1 percentage by weight or higher
- Other substances included with more than 5 percentage by weight.

Concentrations in the interval between 0 – 1 must be stated as accurately as possible. Other concentrations may be rounded up or down to the nearest whole percentage.

22. CAS-No.	23. Included substances	24. H, M, P	25. Concentration (percentage by weight)
	Substances:		
	Impurities:		

Date _____ Signature _____ Name, in block letters _____

(by the legally responsible person, i.e. signing for the company)

Appendix 2 - List of Risk and Safety Advice Phrases

Italics indicate flammable and explosive properties for which applicable regulations are published in the Code of Statutes of the National Inspectorate of Explosives and Flammables.

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 oxidizing 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

Appendix 3 – Frequency in combination of risk phrases

Frequency in combination of risk phrases in the Swedish Product Register, the number of products and their total quantity(including fossil fuels and chemical products used for synthesis). Based on Brånvall 2002. The table only shows risk phrases included in the report (c.f. 2. Method).

Risk ID					Number of products	Total quantity
R 40	R 41				1	10
R340					338	10 261 175
R340	R40	R43			1	0
R340	R42				3	197
R340	R42	R43			125	5 852
R340	R42	R43	R45		1	0
R340	R42	R43	R49		1	16
R340	R42	R43	R60	R61	1	0
R340	R43				228	63 187
R340	R43	R61			2	6 639
R340	R45				1	0
R340	R45	R61			3	45
R340	R52	R53			9	852
R340	R60	R61			10	6
R340	R61				27	117
R340	R61	R62			28	35
R340	R62	R63			1	0
R340	R63				1	12
R40					2	300
R40	R42	R43			1	109
R42					242	1 505
R42	R43				571	77 839
R42	R43	R45			8	50
R42	R43	R49			5	3
R42	R43	R50			1	20
R42	R43	R52	R53		3	371
R42	R43	R60			1	0
R42	R43	R60	R61		1	10
R42	R43	R63			1	0
R42	R45				20	3 349
R42	R45	R46			1	1
R42	R52				3	51
R43					3 495	3 194 534
R43	R45				213	66 864
R43	R45	R46			7	4 324
R43	R45	R49			3	8
R43	R45	R60	R63		2	0
R43	R45	R61			1	0
R43	R45	R63			2	0
R43	R46				5	819
R43	R46	R49			15	123
R43	R46	R52			1	0
R43	R47				1	0
R43	R49				86	395
R43	R49	R50	R53		1	0
R43	R50				7	33
R43	R50	R52	R53		2	1
R43	R50	R53			23	119
R43	R51				1	11
R43	R51	R53			15	770
R43	R52	R53			2	17
R43	R53				3	54
R43	R60	R61			2	0
R43	R61				11	2 534
R43	R61	R62			1	11
R43	R63				9	11
R45					289	28 038 955
R45	R46				18	914
R45	R46	R60	R61		2	11 186
R45	R46	R61			1	38 270
R45	R50	R53			2	7
R45	R52	R53			1	24 981
R45	R61				1	1 917
R45	R63				1	926
R46					3	0
R46	R49				1	4
R49					19	161
R49	R52	R53			1	0
R49	R61				1	38
R50					16	1 306
R50	R52	R53			1	16
R50	R53				32	7 757
R50	R53	R61			1	0
R50	R60				1	6
R51	R53				52	3 547
R51	R53	R60			1	0
R51	R53	R63			1	0
R52					4	193
R52	R53				20	273
R53					18	400
R53	R61				1	4
R59					2	0
R60	R61				20	1 922
R60	R63				15	38
R61					70	3 628 048
R61	R62				18	46
R61	R63				2	0
R62					7	25
R62	R63				11	219