Statistics Norway
Statistisk sentralbyrå

Statistics Norway
Department of Economic Statistics

Julie L. Hass, Knut Ø. Sørensen and Kristine Erlandsen

Norwegian Economic and Environment Accounts (NOREEA) Project Report - 2001

Documents 2002/15 • Statistics Norway, August 2002

Julie L. Hass, Knut Ø. Sørensen and Kristine Erlandsen

Norwegian Economic and Environment Accounts (NOREEA) Project Report - 2001

Abstract:
This is the final report for the 2001 Eurostat co-financed project. It presents the work done on the NOREEA project during 2001. The NOREEA project is a cooperative project between the Divisions of National accounts and Environmental statistics. This year's work includes: expanding the solid waste NAMEA (National accounts matrix including environment accounts) to include seven fractions with a time series for 1990-1999, presenting detailed new data for energy and environment-related taxes, input-output analysis results for households showing indirect emissions connected to household consumption, an examination of the problem of using constant chained prices in input-output analyses using households as an example, further coordination between national accounts and energy statistics with regards to energy categories, establishing regular publication routines for NAMEA-air emissions data, an examination between the NAMEA-air emissions data and the national air emissions data to set up a calculation method to reconcile the differences, and an outline of the major topics covered in a technical report that will be published separately that details the procedures used for developing the NAMEA-air matrices.

Keywords: Environmental accounts, NAMEA, input-output analysis, households, air emissions

Acknowledgement: The 2001 NOREEA project was co-financed by the European Commission (Eurostat) under contract no. 200041200016.

Address: Julie L. Hass, Statistics Norway, Division for Environmental Statistics,
P.O. Box 8131 Dep, N-0033 Oslo, Norway. E-mail: julie.hass@ssb.no
Knut Ø. Sørensen, Statistics Norway, Division for National Accounts,
P.O. Box 8131 Dep, N-0033 Oslo, Norway. E-mail: knut.o.sorensen@ssb.no

Table of Contents

1 Summary

The ***NOR***wegian ***E***conomic and ***E***nvironmental ***A***ccounts Project (NOREEA) was first established in 1997 as a cooperative project between the Division for National Accounts and the Division for Environment Statistics at Statistics Norway. Funding for this project has come from Eurostat, Statistics Norway and the Norwegian Ministry of the Environment.

There are three major areas that are included in the larger NOREEA system. One area of development focuses on connecting the environmental statistics to the economic statistics (NAMEA). A second area involves separating out environment related information already included in the economic statistics. A final area includes the valuation of important natural resources. This report describes the results of the work done during 2001 with respect to the NOREEA project.

The project objectives for this year included:

1. Solid waste NAMEA (National accounts matrix including environmental accounts)
    a. Extending the Norwegian solid waste NAMEA to cover several additional types of waste and to include the newly available data from the 1999 survey of the manufacturing industry.
    b. Increasing the time series of the Norwegian solid waste NAMEA based on the Norwegian solid waste accounts.
2. Expanding earlier work on environmental taxes based on national accounts revision and new categories for oil products.
3. Using input-output analyses, analyse changes over time in households indirect air emissions.
4. Investigate the effect of constant prices on input-output analyses for households.
5. Implement improvements to the National Accounts and to the Energy Accounts to harmonise and improve the quality of data on energy use.
6. Implement regular production routines for NAMEA air emission accounts.
7. Follow up on Table 3 of the NAMEA-2000 air emissions Eurostat reporting tables.
8. Producing a technical report describing in detail how the Norwegian NAMEA is developed and how the different data sets are connected.

The solid waste NAMEA has been extended to include a time series of data from 1990-1999 and includes seven fractions. The newly published waste statistics for industry for 1999 and several new waste fractions are included in these data tables.

In the present revision of the National Accounts, to be early summer 2002, steps have been taken to harmonise the product classifications for energy products in the supply and use tables in monetary terms and in the energy accounts in physical units. The object is to improve consistency between the two data sets.

More harmonised energy product classifications between the energy accounts and the national accounts will allow for improving the quality of the environment related taxes and their distribution to the uses of energy products. A time series from 1990 - 2000 was developed showing the detailed new data available for Norwegian environment taxes.

Input-output analyses have been made for households for 1993 and 1997. Significant increases in indirect emissions were initially expected since the Norwegian economy improved greatly between 1993 and 1997. It was expected that increases in household consumption would correspond to increases in air emissions, however, this was not the case. The increase in emissions came from industries producing products that households do not purchase directly. Consequently, household consumption did not influence the emissions profile to any large extent. In addition Norwegian households purchase a great deal of imported goods. The emissions from the production of these goods are not included in the emissions of Norway.

When making input-output analyses over time it is necessary to use constant prices. The problems connected with constant prices and emissions are investigated related to households.

In connection with the Ministry of the Environment, regular development and publication of the NAMEA data are being discussed. It is also necessary to coordinate the NAMEA work with respect to the time frame of the energy accounts, the air emissions data production schedules and the publication of the national accounts. Developing a regular production cycle for the NAMEA-air data that uses the most current data from all sources, including preliminary data for national accounts and air emissions, is the goal.

Table 3 of the Eurostat NAMEA-air reporting for 2000 requested data that shows the differences between the NAMEA reporting and other types of international reporting. Norway submitted only a partially completed Table 3. It was not possible to locate a matched set of data extracted from the air emissions database that could be used to calculate Table 3. Instead the different categories were examined and the calculation method was set up. This calculation should be able to be made for the next NAMEA-air reporting since we now know that we need a matched set of data.

After a number of years of work, producing a separate technical report describing the development of the Norwegian NAMEA for air emissions is a priority. This is a detailed description of how the accounts are set up, how all the different categories are connected to each other and the SAS-programs that are used to extract data from the databases. The report has reached a final draft stage and is currently going through the necessary approval processes at Statistics Norway before publication.

2 Solid Waste NAMEA

In 2000 the NOREEA project included a trial NAMEA matrix for four solid waste fractions for 1996 (see Chapter 4 in Sørensen *et al.* 2001). In this current project, work has focused on extending the time series of data and increasing the number of fractions. Data for the years 1990-1999, inclusive, have been assembled for seven fractions, plastic, glass, wood, paper, textiles, metal and wet organic waste. Not all of the fractions have data available for the entire 10 year period but the data tables have included those data that are available.

2.1 Developing the waste NAMEAs

The solid waste tables presented in this report are best understood as extensions to the NAMEA air emissions tables but at a lesser level of detail. The NACE industries are shown in the rows and the waste types are given in the columns. These tables are similar to the air emissions section of the Norwegian NAMEA-air tables. Since the economic data are available from the air emissions NAMEA tables (see for examples the data tables in Sørensen *et al.* 2001, or the NAMEA tables reported to Eurostat in 2000), only the solid waste portions are included in these tables.

For all types of waste fractions there are columns listing the total waste amount. For the two fractions, metal waste and wet organic waste, there are more columns than just the totals. There are a series of columns that include amounts treated in different ways, such as recycled, composted, incineration, landfilled, etc. In theory, the totals should be the sum of the different types of handling of the waste. This is the case for wet organic waste, however, the totals in the section for metal waste do not always correspond to the sum of the columns or rows. This is due to statistical errors or amounts that are not possible to distribute to NACE categories for the recycling of metals.

The metal waste accounts also reflect the complexity of the many steps in the recycling and processing of scrap metal. The price of scrap metal can also influence the amount of scrap metal on the market since price variations can influence the storage (stock) or sale of metal waste. The metal waste statistics are also developed without strict adherence to the SEEA economic waste definition that classifies waste as waste only if there is no economic gain from the waste. Since scrap metal is bought and sold it could be considered a "product" or more likely a "bi-product" rather than waste.

Municipal waste as a category exists as a waste type in the waste statistics but are not included in the current waste tables since this would result in double counting for the six fractions. Municipal waste is not a single waste fraction. Municipal waste is defined as "waste that is collected and/or treated by or on behalf of the municipalities." It includes all household waste and parts of the industrial waste. Municipal waste is an identification of the geographic region from which waste is collected and it is not a waste fraction being collected.

The municipal waste statistics are used in the estimates for different waste fractions especially those from households. Specifically, the municipal waste statistics are combined with analyses of material composition in order to estimate different waste fractions. For example, the values given for paper waste from households are estimated from the municipal waste statistics and the material composition for paper.

The following ten data tables show the waste fractions according to the most detailed industry classification available from the waste accounts. These waste estimates are based on the "supply of goods" method of estimation.

This estimation methodology uses production, import and export statistics together with content and lifetime estimates to calculate amounts of solid waste generated based on production and supply of goods. This method is called the "supply of goods method."

The supply of goods method is based on the assumption that every new product supplied to society will end up as waste after a certain period of time. The method has four major steps.

- **Step One:** Involves the calculation of the supply of the material of interest (for example, plastic, glass, wood, paper, textiles, etc.) in goods based on Statistics Norway's external trade statistics and manufacturing statistics according to the following relationship:

  Supply of goods = primary production + imports - exports + net stock change (if available)

- **Step Two:** Involves the calculation of the supply of the material of interest (for example, plastic, glass, wood, paper, textiles, etc.) by multiplying the weight of the products by their percentage content of the material of interest according to the following relationship:

  Supply of material "a" = supply of goods * content of material "a" in percent / 100

- **Step Three:** Involves the estimation of the annual waste generated as determined by the lifetime intervals of the different products. It is assumed that equal amounts of a product are discarded each year during the product lifetime (a rolling average approach). The following relationship shows this calculation:

  Product waste generation = supply of material "a" / (maximum lifetime - minimum lifetime)

To avoid double counting, only end-use products are included. There is a time-lag between supply of materials and waste generation ranging from the minimum to the maximum lifetime.

- **Step Four:** Involves making a summation of all the product waste in a specific year in order to obtain the total amount of a specific type of waste material for that particular year.

The method can be seen as an application of the perpetual inventory method used in the National Accounts to calculate consumption of capital, using a special 'survival' curve.

In the years when a specific survey has been conducted, the survey-based estimates are used. For example, when the survey of the manufacturing industry is conducted (1993, 1996, 1999), these survey-based figures are used in the supply of goods estimates for allocating waste amounts to the industry categories. For years when there is no survey providing detailed data then only estimates for NACE D as a whole are made.

2.2 Solid waste data tables, 1990-1999.

Solid waste according to fractions and NACE categories. 1990. Tons.

Solid waste according to fractions and NACE			Plastic (1)	Glass (2)	Wood (3)	Paper (4)	Textiles (5)	Metal (6)					Wet Organic (7)						
1990								Total	Used auto parts	Recycling (a)	Landfilled, deposited	Exported	Total*	Recycling	Compost	Incineration	Landfill	Ocean dumping	Other / not specified
TOTAL			**280 178**	**..**	**1 266 062**	**1 051 000**	**79 600**	**..**	**..**	**..**	**..**	**..**	**750 233**	**..**	**..**	**..**	**..**	**..**	**..**
Other industries (A, B, C, E)			8 050	..	445	31 000	..	..	..	..	..	..	324 518	..	..	..	..	..	..
	A	Agriculture, hunting and forestry	..	..	..	..	Incl in 'service'	..	..	..	..	..	..	..	..	..	..	..	..
	B	Fishing	..	..	..	..	9 000	..	..	..	..	..	296 559	..	..	..	..	..	..
	05.01	Fishing	..	..	..	..	..	..	..	..	..	..	264 349	..	..	..	..	..	..
	05.02	Operation of fish hatcheries and fish farms	..	..	..	..	..	..	..	..	..	..	32 210	..	..	..	..	..	..
	C	Mining and quarrying	..	..	..	..	Incl in 'service'	..	..	..	..	..	..	..	..	..	..	..	..
	E	Electricity, gas and water supply	..	..	..	..	Incl in 'service'	..	..	..	..	..	..	..	..	..	..	..	..
Manufacturing (NACE D)			33 668	..	953 176	186 000	4 200	..	..	..	..	..	140 727	..	..	..	..	..	..
	DA (15, 16)	Food products; beverages and tobacco	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DB (17, 18)	Textiles and textile products	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DC (19, 20)	Leather and leather products	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DD (20)	Wood and wood products	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DE (21, 22)	Pulp, paper & paper products; publishing & printing	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DF (23)	Coke, refined petroleum products & nuclear fuel	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DG (24)	Chemicals and chemical products	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DH (25)	Rubber and plastic products	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DI (26)	Other non-metallic mineral products	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DJ (27, 28)	Basic metals and fabricated metal products	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DK (29)	Machinery and equipment n.e.c.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DL (30, 31, 32, 33)	Electrical and optical equipment	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DM (34, 35)	Transport equipment	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DN (36, 37)	Manufacturing n.e.c.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Building and construction (NACE F)			8 529	..	205 157	incl in 'other industries'	200	..	..	..	..	..	Incl in 'other industries'	..	..	..	..	..	..
Service (NACE G to O)			80 366	..	30 378	480 000	6 800	..	..	..	..	..	32 102	..	..	..	..	..	..
Statistical error / Not able to distribute to NACE			..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Households (incl. NACE P)			149 565	..	76 907	355 000	59 200	..	..	..	..	..	252 887	..	..	..	..	..	..

(a) statistical error

*Numbers are rounded. Total does not always equal the sum of the detailed estimates

(1) Tabell 4.3, Rapport 2000/15 Plastavfall fordelt på opprinnelse 1990-1997
(2) ..
(3) Tabell 5.1, Rapport 2000/12 Treavfall fordelt på opprinnelse. 1990-1997. Tonn
(4) http://www.ssb.no/emner/01/05/avfall_tab_fig/t_pakits.html Papiravfall etter opphav. 1985-1999. 1000 tonn, updated 07/03/01
(5) http://www.ssb.no/emner/01/05/avfall_tab_fig/t_txkits.html Tekstilavfall etter opprinnelse. 1990-1998. Tonn
(6) ..
(7) Tabell 4. Våtorganisk avfall fordelt på opprinnelse og behandling. Rapporter 98/3

Solid waste according to fractions and NACE categories. 1991 Tons.

Solid waste according to fractions and NACE			Plastic (1)	Glass (2)	Wood (3)	Paper (4)	Textiles (5)	Metal (6)					Wet Organic (7)						
1991								Total	Used auto parts	Recycling (a)	Landfilled, deposited	Exported	Total*	Recycling	Compost	Incineration	Landfill	Ocean dumping	Other / not specified
TOTAL			**293 845**	**..**	**1 213 051**	**1 058 000**	**80 900**	**..**	**..**	**..**	**..**	**..**	**864 171**	**..**	**..**	**..**	**..**	**..**	**..**
Other industries (A, B, C, E)			9 079	..	472	30 000		..	..	..	..	..	369 313	..	..	..	..	..	..
	A	Agriculture, hunting and forestry	..	..			Incl in 'service'	..	..	..	..	..		..	..	..	..	..	..
	B	Fishing	..	..			9 300	..	..	..	..	..	344 451	..	..	..	..	..	..
	05.01	Fishing	..	..			..	..	..	..	..	..	314 341	..	..	..	..	..	..
	05.02	Operation of fish hatcheries and fish farms	..	..			..	..	..	..	..	..	30 110	..	..	..	..	..	..
	C	Mining and quarrying	..	..			Incl in 'service'	..	..	..	..	..	..	..	..	..	..	..	..
	E	Electricity, gas and water supply	..	..			Incl in 'service'	..	..	..	..	..	..	..	..	..	..	..	..
Manufacturing (NACE D)			33 146	..	907 732	189 000	4 300	..	4 200	..	..	..	182 129	..	..	..	..	..	..
	DA (15, 16)	Food products; beverages and tobacco	..	..			..	..	..	..	..	..	..	..	..	..	..	..	..
	DB (17, 18)	Textiles and textile products	..	..			..	..	..	..	..	..	..	..	..	..	..	..	..
	DC (19, 20)	Leather and leather products	..	..			..	..	..	..	..	..	..	..	..	..	..	..	..
	DD (20)	Wood and wood products	..	..			..	..	..	..	..	..	..	..	..	..	..	..	..
	DE (21, 22)	Pulp, paper & paper products; publishing & printing	..	..			..	..	..	..	..	..	..	..	..	..	..	..	..
	DF (23)	Coke, refined petroleum products & nuclear fuel	..	..			..	..	..	..	..	..	..	..	..	..	..	..	..
	DG (24)	Chemicals and chemical products	..	..			..	..	..	..	..	..	..	..	..	..	..	..	..
	DH (25)	Rubber and plastic products	..	..			..	..	..	..	..	..	..	..	..	..	..	..	..
	DI (26)	Other non-metallic mineral products	..	..			..	..	..	..	..	..	..	..	..	..	..	..	..
	DJ (27, 28)	Basic metals and fabricated metal products	..	..			..	..	..	..	..	..	..	..	..	..	..	..	..
	DK (29)	Machinery and equipment n.e.c.	..	..			..	..	..	..	..	..	..	..	..	..	..	..	..
	DL (30, 31, 32, 33)	Electrical and optical equipment	..	..			..	..	..	..	..	..	..	..	..	..	..	..	..
	DM (34,35)	Transport equipment	..	..			..	..	..	..	..	..	..	..	..	..	..	..	..
	DN (36, 37)	Manufacturing n.e.c.	..	..			..	..	..	..	..	..	..	..	..	..	..	..	..
Building and construction (NACE F)			8 356	..	195 843	incl in 'other industries'	200	..	200	..	..	..	Incl in 'other industries'	..	..	..	..	..	..
Service (NACE G to O)			84 746	..	30 865	480 000	6 900	..	6 800	..	..	..	40 271	..	..	..	..	..	..
Statistical error / Not able to distribute to NACE				..				..	..	..	..	..	..	..	..	..	..	..	..
Households (incl. NACE P)			158 519	..	78 139	359 000	60 200	..	59 200	..	..	..	272 458	..	..	..	..	..	..

(a) statistical error

*Numbers are rounded. Total does not always equal the sum of the detailed estimates

(1) Tabell 4.3, Rapport 2000/15 Plastavfall fordelt på opprinnelse 1990-1997
(2) ..
(3) Tabell 5.1, Rapport 2000/12 Treavfall fordelt på opprinnelse. 1990-1997. Tonn
(4) http://www.ssb.no/emner/01/05/avfall_tab_fig/t_pakits.html Papiravfall etter opphav. 1985-1999. 1000 tonn, updated 07/03/01
(5) http://www.ssb.no/emner/01/05/avfall_tab_fig/t_txkits.html Tekstilavfall etter opprinnelse. 1990-1998. Tonn
(6) ..
(7) Tabell 4. Våtorganisk avfall fordelt på opprinnelse og behandling. Rapporter 98/3

Solid waste according to fractions and NACE categories. 1992. Tons.

Solid waste according to fractions and NACE			Plastic (1)	Glass (2)	Wood (3)	Paper (4)	Textile (5)	Metal (6)					Wet Organic (7)						
1992								Total	Used auto parts	Recycling (a)	Landfilled, deposited	Exported	Total*	Recycling	Compost	Incineration	Landfill	Ocean dumping	Other / not specified
TOTAL			**307 463**	**..**	**1 177 640**	**1 053 000**	**81 900**	**524 335**	**3 208**	**508 584**	**131 486**	**84 259**	**1 001 231**		**..**	**..**	**..**	**..**	**..**
Other industries (A, B, C, E)			10 207	..	513	31 000		13 995		8 528	5 467	-	444 231	..	..	..	..	..	..
	A	Agriculture, hunting and forestry	..	..	..	..	Incl in 'service'	..	..	..	..	..		..	..	..	..	..	..
	B	Fishing	..	..	..	..	8 900	..	..	..	..	..	422 466	..	..	..	..	..	..
	05.01	Fishing	..	..	..	..	..	..	..	..	..	..	392 950	..	..	..	..	..	..
	05.02	Operation of fish hatcheries and fish farms	..	..	..	..	..	..	..	..	..	..	29 516	..	..	..	..	..	..
	C	Mining and quarrying	..	..	..	..	Incl in 'service'	..	..	..	..	..	..	..	..	..	..	..	..
	E	Electricity, gas and water supply	..	..	..	..	Incl in 'service'	..	..	..	..	..	..	..	..	..	..	..	..
Manufacturing (NACE D)			33 365	..	866 456	192 000	4 500	201 525	4 300	173 885	27 640	-	224 664	..	..	..	..	..	..
	DA (15, 16)	Food products; beverages and tobacco	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DB (17, 18)	Textiles and textile products	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DC (19, 20)	Leather and leather products	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DD (20)	Wood and wood products	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DE (21, 22)	Pulp, paper & paper products; publishing & printing	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DF (23)	Coke, refined petroleum products & nuclear fuel	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DG (24)	Chemicals and chemical products	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DH (25)	Rubber and plastic products	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DI (26)	Other non-metallic mineral products	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DJ (27, 28)	Basic metals and fabricated metal products	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DK (29)	Machinery and equipment n.e.c.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DL (30, 31, 32, 33)	Electrical and optical equipment	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DM (34, 35)	Transport equipment	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DN (36, 37)	Manufacturing n.e.c.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Building and construction (NACE F)			8 627	..	196 472	incl in 'other industries'	200	41 547	200	27 790	13 757	-	Incl in 'other industries'	..	..	..	..	..	..
Service (NACE G to O)			94 797	..	34 646	465 000	7 100	156 171	6 900	44 374	27 018	84 259	43 571	..	..	..	..	..	..
Statistical error / Not able to distribute to NACE				..						101601			..	..	..	..	..	..	..
Households (incl. NACE P)			160 467	..	79 553	365 000	61 200	111 097	60 200	50 805	57 603	-	288 765	..	..	..	..	..	..

(a) statistical error

*Numbers are rounded. Total does not always equal the sum of the detailed estimates

(1) Tabell 4.3, Rapport 2000/15 Plastavfall fordelt på opprinnelse 1990-1997
(2) ..
(3) Tabell 5.1, Rapport 2000/12 Treavfall fordelt på opprinnelse. 1990-1997. Tonn
(4) http://www.ssb.no/emner/01/05/avfall_tab_fig/t_pakits.html Papiravfall etter opphav. 1985-1999. 1000 tonn, updated 07/03/01
(5) http://www.ssb.no/emner/01/05/avfall_tab_fig/t_txkits.html Tekstilavfall etter opprinnelse. 1990-1998. Tonn
(6) Tabell 2. Registrert metallavfall fordelt på opprinnelse og behandling. 1992-1996. Tonn (http://www.ssb.no/ukens_statistikk/utg/9845/2-2t.txt)
(7) Tabell 4. Våtorganisk avfall fordelt på opprinnelse og behandling. Rapporter 98/3

Solid waste according to fractions and NACE categories. 1993. Tons.

Solid waste according to fractions and NACE			Plastic (1)	Glass (2)	Wood (3)	Paper (4)	Textiles (5)	Metal (6)					Wet Organic (7)						
1993								Total	Used auto parts	Recycling (a)	Landfilled, deposited	Exported	Total*	Recycling	Compost	Incineration	Landfill	Ocean dumping	Other / not specified
TOTAL			**323 536**	**116 775**	**1 184 588**	**1 065 000**	**84 400**	**458 849**	**3 271**	**464 670**	**122 048**	**32 632**	**1 156 000**	**398 000**	**12 000**	**112 000**	**371 000**	**252 000**	**17 000**
Other industries (A, B, C, E)			10 897	incl in Service	528	30 000		16 247		9 423	6 824	-	290 000	15 000	-	6 000	2 000	252 000	15 000
	A	Agriculture, hunting and forestry	..	..	..	..	Incl in 'service'	..	..	..	..	..	..	..	..	..	..	..	..
	B	Fishing	..	..	..	..	7 900	..	..	..	..	..	267 000	15 000	-	-	2 000	252 000	-
	05.01	Fishing	..	..	..	..	..	..	..	..	..	..	262 000	10 000	-	-	-	252 000	-
	05.02	Operation of fish hatcheries and fish farms	..	..	..	..	..	..	..	..	..	..	7 000	5 000	-	-	2 000	-	-
	C	Mining and quarrying	..	..	..	..	Incl in 'service'	..	..	..	..	..	..	..	..	..	..	..	..
	E	Electricity, gas and water supply	..	..	..	..	Incl in 'service'	..	..	..	..	..	..	..	..	..	..	..	..
Manufacturing (NACE D)			34 130	13 087	878 676	210 000	4 600	181 633	4 500	159 716	21 917	-	461 000	362 000	1 000	-	96 000	-	2 000
	DA (15, 16)	Food products; beverages and tobacco	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DB (17, 18)	Textiles and textile products	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DC (19, 20)	Leather and leather products	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DD (20)	Wood and wood products	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DE (21, 22)	Pulp, paper & paper products; publishing & printing	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DF (23)	Coke, refined petroleum products & nuclear fuel	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DG (24)	Chemicals and chemical products	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DH (25)	Rubber and plastic products	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DI (26)	Other non-metallic mineral products	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DJ (27, 28)	Basic metals and fabricated metal products	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DK (29)	Machinery and equipment n.e.c.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DL (30, 31, 32, 33)	Electrical and optical equipment	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DM (34, 35)	Transport equipment	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DN (36, 37)	Manufacturing n.e.c.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Building and construction (NACE F)			7 897	42 183	182 358	incl in 'other industries'	200	38 573	200	25 801	12 772	-	700	..	200	200	300	-	-
Service (NACE G to O)			102 483	17 921	34 815	444 000	7 200	107 071	7 100	45 552	28 369	32 632	71 000	13 000	1 000	17 000	41 000	-	-
Statistical error / Not able to distribute to NACE										81 886			..	..	..	..	..	..	..
Households (incl. NACE P)			168 130	43 584	88 211	381 000	64 500	115 325	61 200	60 406	52 166	-	334 000	8 000	9 000	88 000	232 000	-	-

(a) statistical error

*Numbers are rounded. Total does not always equal the sum of the detailed estimates

(1) Tabell 4.3, Rapport 2000/15 Plastavfall fordelt på opprinnelse 1990-1997

(2) SSB internet table, Beregnet mengde glassavfall, etter opprinnelse. Tonn og prosent. Last update 29.June.2000 (http://www.ssb.no/emner/01/05/40/avfregnglass/tab-2000-05-29-03.html

(3) Tabell 5.1, Rapport 2000/12 Treavfall fordelt på opprinnelse. 1990-1997. Tonn

(4) http://www.ssb.no/emner/01/05/avfall_tab_fig/t_pakits.html Papiravfall etter opphav. 1985-1999. 1000 tonn, updated 07/03/01

(5) http://www.ssb.no/emner/01/05/avfall_tab_fig/t_txkits.html Tekstilavfall etter opprinnelse. 1990-1998. Tonn

(6) Tabell 2. Registrert metallavfall fordelt på opprinnelse og behandling. 1992-1996. Tonn (http://www.ssb.no/ukens_statistikk/utg/9845/2-2t.txt)

(7) http://www.ssb.no/emner/01/05/avfall_tab_fig/t_vabmts.html Våtorganisk avfall etter opprinnelse og behandling/disponering. 1993-1998. Tonn. Last update 27.10.2000 (Tallene er avrundet, og totalene stemmer derfor ikke alltid overens med summen av deltallene)

Solid waste according to fractions and NACE categories. 1994. Tons.

Solid waste according to fractions and NACE			Plastic (1)	Glass (2)	Wood (3)	Paper (4)	Textiles (5)	Metal (6)					Wet Organic (7)						
1994								Total	Used auto parts	Recycling (a)	Landfilled, deposited	Exported	Total*	Recycling	Compost	Incineration	Landfill	Ocean dumping	Other / not specified
TOTAL			**337 410**	**122 688**	**1 168 983**	**1 048 000**	**88 100**	**658 112**	**3 182**	**400 018**	**126 732**	**186 325**	**1 197 000**	**393 000**	**23 000**	**127 000**	**350 000**	**291 000**	**18 000**
Other industries (A, B, C, E)			10 598	incl in Service	557	31 000	..	19 790		11 904	7 886		333 000	17 000	1 000	6 000	1 000	292 000	16 000
	A	Agriculture, hunting and forestry	..	..	..	..	Incl in 'service'	..	..	..	..	..	..	..	..	..	..	..	..
	B	Fishing	..	..	..	..	7 900	..	..	..	..	..	310 000	17 000	-	-	1 000	292 000	-
	05.01	Fishing	..	..	..	..	..	..	..	..	..	..	302 000	10 000	-	-	-	292 000	-
	05.02	Operation of fish hatcheries and fish farms	..	..	..	..	..	..	..	..	..	..	8 000	7 000	-	-	1 000	-	-
	C	Mining and quarrying	..	..	..	..	Incl in 'service'	..	..	..	..	..	..	..	..	..	..	..	..
	E	Electricity, gas and water supply	..	..	..	..	Incl in 'service'	..	..	..	..	..	..	..	..	..	..	..	..
Manufacturing (NACE D)			40 686	14 667	849 383	199 000	4 900	214 972	4 600	192 610	22 362	-	439 000	354 000	2 000	6 000	75 000	-	2 000
	DA (15, 16)	Food products; beverages and tobacco	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DB (17, 18)	Textiles and textile products	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DC (19, 20)	Leather and leather products	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DD (20)	Wood and wood products	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DE (21, 22)	Pulp, paper & paper products; publishing & printing	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DF (23)	Coke, refined petroleum products & nuclear fuel	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DG (24)	Chemicals and chemical products	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DH (25)	Rubber and plastic products	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DI (26)	Other non-metallic mineral products	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DJ (27, 28)	Basic metals and fabricated metal products	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DK (29)	Machinery and equipment n.e.c.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DL (30, 31, 32, 33)	Electrical and optical equipment	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DM (34, 35)	Transport equipment	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DN (36, 37)	Manufacturing n.e.c.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Building and construction (NACE F)			7 793	42 298	190 645	incl in 'other industries'	200	40 300	200	26 956	13 344	-	700	..	200	200	300	-	-
Service (NACE G to O)			106 819	20 083	36 351	423 000	7 300	266 141	7 200	49 111	30 193	186 325	76 000	15 000	2 000	19 000	42 000	-	-
Statistical error / Not able to distribute to NACE			..	..	..	..				58 145			..	..	..	..	..	..	..
Households (incl. NACE P)			171 514	45 640	92 047	396 000	67 700	116 909	64 500	61 292	52 947	-	350 000	8 000	18 000	96 000	232 000	-	-

(a) statistical error

*Numbers are rounded. Total does not always equal the sum of the detailed estimates

(1) Tabell 4.3, Rapport 2000/15 Plastavfall fordelt på opprinnelse 1990-1997

(2) SSB internet table, Beregnet mengde glassavfall, etter opprinnelse. Tonn og prosent. Last update 29.June.2000 (http://www.ssb.no/emner/01/05/40/avfregnglass/tab-2000-05-29-03.html

(3) Tabell 5.1, Rapport 2000/12 Treavfall fordelt på opprinnelse. 1990-1997. Tonn

(4) http://www.ssb.no/emner/01/05/avfall_tab_fig/t_pakits.html Papiravfall etter opphav. 1985-1999. 1000 tonn, updated 07/03/01

(5) http://www.ssb.no/emner/01/05/avfall_tab_fig/t_txkits.html Tekstilavfall etter opprinnelse. 1990-1998. Tonn

(6) Tabell 2. Registrert metallavfall fordelt på opprinnelse og behandling. 1992-1996. Tonn (http://www.ssb.no/ukens_statistikk/utg/9845/2-2t.txt)

(7) http://www.ssb.no/emner/01/05/avfall_tab_fig/t_vabmts.html Våtorganisk avfall etter opprinnelse og behandling/disponering. 1993-1998. Tonn. Last update 27.10.2000 (Tallene er avrundet, og totalene stemmer derfor ikke alltid overens med summen av deltallene)

Solid waste according to fractions and NACE categories. 1995. Tons.

Solid waste according to fractions and NACE			Plastic (1)	Glass (2)	Wood (3)	Paper (4)	Textiles (5)	Metal (6)					Wet Organic (7)						
1995								Total	Used auto parts	Recycling (a)	Landfilled, deposited	Exported	Total*	Recycling	Compost	Incineration	Landfill	Ocean dumping	Other / not specified
TOTAL			**352 689**	**136 304**	**1 157 840**	**1 027 000**	**91 900**	**506 759**	**3 553**	**514 113**	**132 560**	**3 434**	**1 243 000**	**403 000**	**52 000**	**145 000**	**310 000**	**320 000**	**18 000**
Other industries (A, B, C, E)			10 521	incl in Service	608	32 000	..	18 070	..	10 396	7 674	-	378 000	32 000	1 000	7 000	2 000	320 000	16 000
	A	Agriculture, hunting and forestry	..	..	..	..	Incl in 'service'	..	..	..	..	..	..	..	..	..	..	..	..
	B	Fishing	..	..	..	..	7 500	..	..	..	..	..	354 000	32 000	-	-	2 000	320 000	-
	05.01	Fishing	..	..	..	..	..	..	..	..	..	..	346 000	26 000	-	-	-	320 000	-
	05.02	Operation of fish hatcheries and fish farms	..	..	..	..	..	..	..	..	..	..	8 000	6 000	-	-	2 000	-	-
	C	Mining and quarrying	..	..	..	..	Incl in 'service'	..	..	..	..	..	..	..	..	..	..	..	..
	E	Electricity, gas and water supply	..	..	..	..	Incl in 'service'	..	..	..	..	..	..	..	..	..	..	..	..
Manufacturing (NACE D)			47 242	19 453	820 090	187 000	5 100	221 380	4 900	202 010	19 369	-	416 000	346 000	5 000	12 000	52 000	-	2 000
	DA (15, 16)	Food products; beverages and tobacco	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DB (17, 18)	Textiles and textile products	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DC (19, 20)	Leather and leather products	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DD (20)	Wood and wood products	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DE (21, 22)	Pulp, paper & paper products; publishing & printing	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DF (23)	Coke, refined petroleum products & nuclear fuel	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DG (24)	Chemicals and chemical products	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DH (25)	Rubber and plastic products	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DI (26)	Other non-metallic mineral products	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DJ (27, 28)	Basic metals and fabricated metal products	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DK (29)	Machinery and equipment n.e.c.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DL (30, 31, 32, 33)	Electrical and optical equipment	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DM (34, 35)	Transport equipment	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DN (36, 37)	Manufacturing n.e.c.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Building and construction (NACE F)			7 838	42 482	197 632	incl in 'other industries'	200	43 192	200	28 890	14 302	-	700	..	200	200	300	-	-
Service (NACE G to O)			111 341	26 637	45 254	396 000	8 000	97 921	7 300	59 664	34 279	3 434	82 000	16 000	4 000	21 000	41 000	-	-
Statistical error / Not able to distribute to NACE			..	..	..	..		..		146 902	..	..	..	..	..	..	..	..	..
Households (incl. NACE P)			175 747	47 732	94 256	411 000	71 000	126 196	67 700	66 251	56 936	-	366 000	9 000	41 000	105 000	215 000	-	-

(a) statistical error

*Numbers are rounded. Total does not always equal the sum of the detailed estimates

(1) Tabell 4.3, Rapport 2000/15 Plastavfall fordelt på opprinnelse 1990-1997
(2) SSB internet table, Beregnet mengde glassavfall, etter opprinnelse. Tonn og prosent. Last update 29.June.2000 (http://www.ssb.no/emner/01/05/40/avfregnglass/tab-2000-05-29-03.html
(3) Tabell 5.1, Rapport 2000/12 Treavfall fordelt på opprinnelse. 1990-1997. Tonn
(4) http://www.ssb.no/emner/01/05/avfall_tab_fig/t_pakits.html Papiravfall etter opphav. 1985-1999. 1000 tonn, updated 07/03/01
(5) http://www.ssb.no/emner/01/05/avfall_tab_fig/t_txkits.html Tekstilavfall etter opprinnelse. 1990-1998. Tonn
(6) Tabell 2. Registrert metallavfall fordelt på opprinnelse og behandling. 1992-1996. Tonn (http://www.ssb.no/ukens_statistikk/utg/9845/2-2t.txt)
(7) http://www.ssb.no/emner/01/05/avfall_tab_fig/t_vabmts.html Våtorganisk avfall etter opprinnelse og behandling/disponering. 1993-1998. Tonn. Last update 27.10.2000 (Numbers are rounded. Total does not always equal the sum of the detailed estimates)

Solid waste according to fractions and NACE categories. 1996. Tons.

Solid waste according to fractions and NACE			Plastic (1)	Glass (2)	Wood (3)	Paper (4)	Testiles (5)	Metal (6)					Wet Organic (7)						
1996								Total	Used auto parts	Recycling (a)	Landfilled, deposited	Exported	Total*	Recycling	Compost	Incineration	Landfill	Ocean dumping	Other / not specified
TOTAL			**363 673**	**141 537**	**1 144 200**	**1 007 000**	**96 700**	**717 015**	**10 875**	**547 646**	**210 337**	**16 918**	**1 268 000**	**419 000**	**126 000**	**157 000**	**233 000**	**323 000**	**16 000**
Other industries (A, B, C, E)			9 917	incl in Service	620	33 000	..	20 217	..	11 820	8 398	-	384 000	36 000	3 000	7 000	2 000	323 000	14 000
	A	Agriculture, hunting and forestry	6 123	..	..	..	Incl in 'service'	..	..	..	..	..	..	..	..	..	..	..	..
	B	Fishing	3 403	..	..	..	7 500	..	..	..	..	..	361 000	36 000	-	-	2 000	323 000	-
	05.01	Fishing	..	..	..	..	..	..	..	..	..	..	347 000	24 000	-	-	-	323 000	-
	05.02	Operation of fish hatcheries and fish farms	..	..	..	..	..	..	..	..	..	..	14 000	12 000	-	-	2 000	-	-
	C	Mining and quarrying	253	..	..	..	Incl in 'service'	..	..	..	..	..	..	..	..	..	..	..	..
	E	Electricity, gas and water supply	138	..	..	..	Incl in 'service'	..	..	..	..	..	..	..	..	..	..	..	..
Manufacturing (NACE D)			53 798	19 223	790 797	176 000	5 400	256 863	5 100	238 458	18 406	-	403 000	347 000	9 000	18 000	28 000	-	2 000
	DA (15, 16)	Food products; beverages and tobacco	15 875	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DB (17, 18)	Textiles and textile products	775	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DC (19, 20)	Leather and leather products	164	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DD (20)	Wood and wood products	6 606	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DE (21, 22)	Pulp, paper & paper products; publishing & printing	10 277	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DF (23)	Coke, refined petroleum products & nuclear fuel	174	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DG (24)	Chemicals and chemical products	2 145	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DH (25)	Rubber and plastic products	9 239	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DI (26)	Other non-metallic mineral products	487	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DJ (27, 28)	Basic metals and fabricated metal products	1 151	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DK (29)	Machinery and equipment n.e.c.	877	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DL (30, 31, 32, 33)	Electrical and optical equipment	2 470	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DM (34, 35)	Transport equipment	1 257	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DN (36, 37)	Manufacturing n.e.c.	2 300	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Building and construction (NACE F)			7 634	42 875	208 748	incl in 'other industries'	200	44 873	200	30 015	14 859	-	800	..	200	200	400	-	-
Service (NACE G to O)			105 262	26 322	46 490	380 000	8 700	131 917	8 000	71375	42 528	16 918	93 000	37 000	8 000	20 000	29 000	-	-
Statistical error / Not able to distribute to NACE										68 758			..	..	..	..	..	..	..
Households (incl. NACE P)			187 062	53 117	97 545	418 000	74 800	263 145	71 000	127 220	126 146	-	387 000	-	106 000	113 000	173 000	-	-

(a) statistical error

*Numbers are rounded. Total does not always equal the sum of the detailed estimates

(1) Tabell 4.3, Rapport 2000/15 Plastavfall fordelt på opprinnelse 1990-1997, Industry details
Ukens Statistikk nr 7/98

(2) http://www.ssb.no/emner/01/05/40/avfregnglass/tab-2000-05-29-03.html Beregnet mengde glassavfall, etter opprinnelse. Tonn og prosent. Last update 29.June.2000

(3) Tabell 5.1 Treavfall fordelt på opprinnelse. 1990-1997. Tonn. Rapporter 2000/12 korrigert utgave

(4) http://www.ssb.no/emner/01/05/avfall_tab_fig/t_pakits.html Papiravfall etter opphav. 1985-1999. 1000 tonn, updated 07/03/01

(5) http://www.ssb.no/emner/01/05/avfall_tab_fig/t_txkits.html Tekstilavfall etter opprinnelse. 1990-1998. Tonn

(6) Tabell 2. Registrert metallavfall fordelt på opprinnelse og behandling. 1992-1996. Tonn (http://www.ssb.no/ukens_statistikk/utg/9845/2-2t.txt)

(7) http://www.ssb.no/emner/01/05/avfall_tab_fig/t_vabmts.html Våtorganisk avfall etter opprinnelse og behandling/disponering. 1993-1998. Tonn. Last update 27.10.2000 (Tallene er avrundet, og totalene stemmer derfor ikke alltid overens med summen av deltallene)

Solid waste according to fractions and NACE categories. 1997. Tons.

Solid waste according to fractions and NACE			Plastic (1)	Glass (2)	Wood (3)	Paper (4)	Textiles (5)	Metal (6)					Wet Organic (7)						
1997								Total	Used auto parts	Recycling (a)	Landfilled, deposited	Exported	Total*	Recycling	Compost	Incineration	Landfill	Ocean dumping	Other / not specified
TOTAL			**368 318**	**134 006**	**1 152 951**	**1 092 000**	**102 100**	**..**	**..**	**..**	**..**	**..**	**1 268 000**	**419 000**	**126 000**	**157 000**	**233 000**	**323 000**	**16 000**
Other industries (A, B, C, E)			10 850	incl in Service	639	35 000	..	..	..	..	..	..	384 000	36 000	3 000	7 000	2 000	323 000	14 000
	A	Agriculture, hunting and forestry	..	..	..	..	Incl in 'service'	..	..	..	..	..	..	..	..	..	..	..	..
	B	Fishing	..	..	..	..	8 100	..	..	..	..	..	361 000	36 000	-	-	2 000	323 000	-
	05.01	Fishing	..	..	..	..	..	..	..	..	..	..	347 000	24 000	-	-	-	323 000	-
	05.02	Operation of fish hatcheries and fish farms	..	..	..	..	..	..	..	..	..	..	14 000	12 000	-	-	2 000	-	-
	C	Mining and quarrying	..	..	..	..	Incl in 'service'	..	..	..	..	..	..	..	..	..	..	..	..
	E	Electricity, gas and water supply	..	..	..	..	Incl in 'service'	..	..	..	..	..	..	..	..	..	..	..	..
Manufacturing (NACE D)			56 401	16 420	768 279	175 000	5 700	..	5 400	..	..	..	403 000	347 000	9 000	18 000	28 000	-	2 000
	DA (15, 16)	Food products; beverages and tobacco	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DB (17, 18)	Textiles and textile products	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DC (19, 20)	Leather and leather products	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DD (20)	Wood and wood products	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DE (21, 22)	Pulp, paper & paper products; publishing & printing	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DF (23)	Coke, refined petroleum products & nuclear fuel	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DG (24)	Chemicals and chemical products	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DH (25)	Rubber and plastic products	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DI (26)	Other non-metallic mineral products	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DJ (27, 28)	Basic metals and fabricated metal products	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DK (29)	Machinery and equipment n.e.c.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DL (30, 31, 32, 33)	Electrical and optical equipment	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DM (34, 35)	Transport equipment	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DN (36, 37)	Manufacturing n.e.c.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Building and construction (NACE F)			8 852	43 170	226 481	Incl in 'other industries'	300	..	200	..	..	..	800	..	200	200	400	-	-
Service (NACE G to O)			104 186	22 484	46 713	447 000	9 300	..	8 700	..	..	..	93 000	37 000	8 000	20 000	29 000	-	-
Statistical error / Not able to distribute to NACE					..	..		..		..	..	..	..	..	..	..	..	..	..
Households (incl. NACE P)			188 029	51 933	110 839	435 000	78 700	..	74 800	..	..	..	387 000	-	106 000	113 000	173 000	-	-

(a) statistical error

*Numbers are rounded. Total does not always equal the sum of the detailed estimates

(1) Tabell 4.3, Rapport 2000/15 Plastavfall fordelt på opprinnelse 1990-1997
(2) SSB internet table, Beregnet mengde glassavfall, etter opprinnelse. Tonn og prosent. Last update 29.June.2000 (http://www.ssb.no/emner/01/05/40/avfregnglass/tab-2000-05-29-03.html
(3) Tabell 5.1, Rapport 2000/12 Treavfall fordelt på opprinnelse. 1990-1997. Tonn
(4) http://www.ssb.no/emner/01/05/avfall_tab_fig/t_pakits.html Papiravfall etter opphav. 1985-1999. 1000 tonn, updated 07/03/01
(5) http://www.ssb.no/emner/01/05/avfall_tab_fig/t_txkits.html Tekstilavfall etter opprinnelse. 1990-1998. Tonn
(6) ..
(7) http://www.ssb.no/emner/01/05/avfall_tab_fig/t_vabmts.html Våtorganisk avfall etter opprinnelse og behandling/disponering. 1993-1998. Tonn. Last update 27.10.2000 (Tallene er avrundet, og totalene stemmer derfor ikke alltid overens med summen av deltallene)

Solid waste according to fractions and NACE categories. 1998. Tons.

Solid waste according to fractions and NACE			Plastic (1)	Glass (2)	Glass (3)	Wood (4)	Paper (5)	Textile (6)	Metal (7)					Wet Organic (8)						
1998									Total	Used auto parts	Recycling (a)	Landfilled, deposited	Exported	Total*	Recycling	Compost	Incineration	Landfill	Ocean dumping	Other / not specified
TOTAL			**..**	**131 145**	**131 145**	**..**	**1 096 000**	**106 000**	**..**	**..**	**..**	**..**	**..**	**1 295 000**	**417 000**	**140 000**	**170 000**	**242 000**	**317 000**	**16 000**
Other industries (A, B, C, E)			..	incl in Service	1 633	..	..	..	..	..	..	..	..	374 000	31 000	2 000	7 000	2 000	317 000	14 000
	A	Agriculture, hunting and forestry	..	..	1 203	..	..	Incl in 'service'	..	..	..	..	..	..	..	..	..	..	..	..
	B	Fishing	..	..	incl in NACE A	..	..	7 900	..	..	..	..	..	350 000	31 000	-	-	2 000	317 000	-
	05.01	Fishing	..	..	..	..	..	..	..	..	..	..	..	335 000	18 000	-	-	-	317 000	-
	05.02	Operation of fish hatcheries and fish farms	..	..	..	..	..	..	..	..	..	..	..	15 000	13 000	-	-	2 000	-	-
	C	Mining and quarrying	..	..	245	..	..	Incl in 'service'	..	..	..	..	..	..	..	..	..	..	..	..
	E	Electricity, gas and water supply	..	..	185	..	..	Incl in 'service'	..	..	..	..	..	..	..	..	..	..	..	..
Manufacturing (NACE D)			..	13 672	13 672	5 900	..	5 700	..	..	..	..	..	398 000	343 000	9 000	18 000	28 000	0	2 000
	DA (15, 16)	Food products; beverages and tobacco	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DB (17, 18)	Textiles and textile products	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DC (19, 20)	Leather and leather products	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DD (20)	Wood and wood products	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DE (21, 22)	Pulp, paper & paper products; publishing & printing	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DF (23)	Coke, refined petroleum products & nuclear fuel	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DG (24)	Chemicals and chemical products	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DH (25)	Rubber and plastic products	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DI (26)	Other non-metallic mineral products	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DJ (27, 28)	Basic metals and fabricated metal products	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DK (29)	Machinery and equipment n.e.c.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DL (30, 31, 32, 33)	Electrical and optical equipment	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DM (34, 35)	Transport equipment	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	DN (36, 37)	Manufacturing n.e.c.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Building and construction (NACE F)			..	43 620	44 791	300	..	300	..	..	..	..	..	900	..	200	300	400	0	0
Service (NACE G to O)			..	18 722	15 918	9 400	..	9 300	..	..	..	..	..	103 000	43 000	7 000	21 000	33 000	0	0
Statistical error / Not able to distribute to NACE			..				..		..	..	..	..	..	..	..	..	..	..	..	..
Households (incl. NACE P)			..	55 131	55 131	82 500	..	78 700	..	..	..	..	..	420 000	0	121 000	124 000	179 000	0	0

(a) statistical error

*Numbers are rounded. Total does not always equal the sum of the detailed estimates

(1) ..

(2) SSB internet table, Beregnet mengde glassavfall, etter opprinnelse. Tonn og prosent. Last update 29.June.2000 (http://www.ssb.no/emner/01/05/40/avfregnglass/tab-2000-05-29-03.html

(3) SSB internet table, Beregnet mengde glassavfall, etter produkttype og opprinnelse. 1998. Last update 29.June.2000

(4) ..

(5) http://www.ssb.no/emner/01/05/avfall_tab_fig/t_pakits.html Papiravfall etter opphav. 1985-1999. 1000 tonn, updated 07/03/01

(6) http://www.ssb.no/emner/01/05/avfall_tab_fig/t_txkits.html Tekstilavfall etter opprinnelse. 1990-1998. Tonn

(7) ..

(8) http://www.ssb.no/emner/01/05/avfall_tab_fig/t_vabmts.html Våtorganisk avfall etter opprinnelse og behandling/disponering. 1993-1998. Tonn. Last update 27.10.2000 (Tallene er avrundet, og totalene stemmer derfor ikke alltid overens med summen av deltallene)

Solid waste according to fractions and NACE categories. 1999. Tons.

Solid waste according to fractions and NACE			Plastic (1)	Glass (2)	Wood (3)	Paper (4)	Textile (5)	Metal (6)					Wet Organic (7)						
1999								Total	Used auto parts	Recycling (a)	Landfilled, deposited	Exported	Total*	Recycling	Compost	Incineration	Landfill	Ocean dumping	Other / not specified
TOTAL			..	..	..	**1 039 000**		..	..	..	..	..	..	..	..	..	..	..	..
Other industries (A, B, C, E)			..	..	..	35 000		..	..	..	..	..	..	..	..	..	..	..	..
	A	Agriculture, hunting and forestry	..	..	..	..		..	..	..	..	..	..	..	..	..	..	..	..
	B	Fishing	..	..	..	..		..	..	..	..	..	..	..	..	..	..	..	..
	05.01	Fishing	..	..	..	..		..	..	..	..	..	..	..	..	..	..	..	..
	05.02	Operation of fish hatcheries and fish farms	..	..	..	..		..	..	..	..	..	..	..	..	..	..	..	..
	C	Mining and quarrying	..	..	..	..		..	..	..	..	..	..	..	..	..	..	..	..
	E	Electricity, gas and water supply	..	..	..	..		..	..	..	..	..	..	..	..	..	..	..	..
Manufacturing (NACE D)			45 345	14 552	671 480	172 864	6 155	..	..	..	..	..	..	..	..	..	..	..	..
	15, 16	Food products; beverages and tobacco	12 317	4 529	6 282	31 246	52	..	..	..	..	..	..	..	..	..	..	..	..
	17	Textiles	669	3	189	819	1 281	..	..	..	..	..	..	..	..	..	..	..	..
	18	Wearing apparel; dressing and dyeing of fur	24	2	11	396	802	..	..	..	..	..	..	..	..	..	..	..	..
	19	Tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness & footwear	67	-	142	227	214	..	..	..	..	..	..	..	..	..	..	..	..
	20	Wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	784	713	428 456	2 361	-	..	..	..	..	..	..	..	..	..	..	..	..
	21	Pulp, paper and paper products	4 681	11	195 298	44 091	27	..	..	..	..	..	..	..	..	..	..	..	..
	22	Publishing, printing and reproduction of recorded media	338	1	347	65 339	5	..	..	..	..	..	..	..	..	..	..	..	..
	23	Coke, refined petroleum products and nuclear fuel	10	31	306	153	-	..	..	..	..	..	..	..	..	..	..	..	..
	24	Chemicals and chemical products	2 606	245	3 782	3 163	29	..	..	..	..	..	..	..	..	..	..	..	..
	25	Rubber and plastic products	10 042	34	1 091	2 370	41	..	..	..	..	..	..	..	..	..	..	..	..
	26	Other non-metallic mineral products	549	8 574	3 150	2 451	16	..	..	..	..	..	..	..	..	..	..	..	..
	27	Basic metals	331	4	3 145	1 752	57	..	..	..	..	..	..	..	..	..	..	..	..
	28	Fabricated metal products, except machinery and equipment	5 249	102	1 817	3 401	721	..	..	..	..	..	..	..	..	..	..	..	..
	29	Machinery and equipment n.e.c.	610	12	2 239	3 435	11	..	..	..	..	..	..	..	..	..	..	..	..
	30	Office machinery and computers	24	-	23	160	-	..	..	..	..	..	..	..	..	..	..	..	..
	31	Electrical machinery and apparatus n.e.c.	956	4	1 334	2 530	81	..	..	..	..	..	..	..	..	..	..	..	..
	32	Radio, television and communication equipment and apparatus	52	4	80	798	5	..	..	..	..	..	..	..	..	..	..	..	..
	33	Medical, precision and optical instruments, watches and clocks	280	1	121	1 159	13	..	..	..	..	..	..	..	..	..	..	..	..
	34	Motor vehicles, trailers and semi-trailers	495	14	495	417	11	..	..	..	..	..	..	..	..	..	..	..	..
	35	Other transport equipment	2 018	30	4 753	3 027	246	..	..	..	..	..	..	..	..	..	..	..	..
	36	Furniture; manufacturing n.e.c.	1 314	238	17 536	3 473	1 042	..	..	..	..	..	..	..	..	..	..	..	..
	37	Recycling	1 927	-	884	98	1 500	..	..	..	..	..	..	..	..	..	..	..	..
Building and construction (NACE F)			..	..	..	incl in 'other industries'		..	..	..	..	..	..	..	..	..	..	..	..
Service (NACE G to O)			..	..	..	350 000		..	..	..	..	..	..	..	..	..	..	..	..
Statistical error / Not able to distribute to NACE			..	..	..			..	..	..	..	..	..	..	..	..	..	..	..
Households (incl. NACE P)			..	..	..	480 000		..	..	..	..	..	..	..	..	..	..	..	..

(1) Manufacturing data: http://www.ssb.no/emner/01/05/avfall_tab_fig/t_iamang.html
(2) Manufacturing data: http://www.ssb.no/emner/01/05/avfall_tab_fig/t_iamang.html
(3) Manufacturing data: http://www.ssb.no/emner/01/05/avfall_tab_fig/t_iamang.html
(4) http://www.ssb.no/emner/01/05/avfall_tab_fig/t_pakits.html Papiravfall etter opphav. 1985-1999. 1000 tonn, updated 07/03/01; Manufacturing data: http://www.ssb.no/emner/01/05/avfall_tab_fig/t_iamang.html
(5) Manufacturing data: http://www.ssb.no/emner/01/05/avfall_tab_fig/t_iamang.html
(6) ..
(7) ..

NACE rev. 1 section, subsection, division and class descriptions used in the waste statistics NAMEA tables

A	Agriculture, hunting and forestry
B	Fishing
05.01	Fishing
05.02	Operation of fish hatcheries and fish farms
C	Mining and quarrying
D	Manufacturing
DA	Food products; beverages and tobacco (Divisions 15, 16)
DB	Textiles and textile products (Divisions 17, 18)
DC	Leather and leather products (Divisions 19, 20)
DD	Wood and wood products (Division 20)
DE	Pulp, paper & paper products; publishing & printing (Divisions 21, 22)
DF	Coke, refined petroleum products & nuclear fuel (Division 23)
DG	Chemicals and chemical products (Division 24)
DH	Rubber and plastic products (Division 25)
DI	Other non-metallic mineral products (Division 26)
DJ	Basic metals and fabricated metal products (Divisions 27, 28)
DK	Machinery and equipment n.e.c. (Division 29)
DL	Electrical and opitcal equipment (Divisions 30, 31, 32, 33)
DM	Transport equipment (Divisions 34, 35)
DN	Manufacturing n.e.c. (Divisions 36, 37)
E	Electricity, gas and water supply
F	Construction (NACE F)
G	Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods
H	Hotels and restaurants
I	Transport, storage and communication
J	Financial intermediation
K	Real estate, renting and business activities
L	Public administration and defense; compulsory social security
M	Education
N	Health and social work
O	Other community, social and personal service activities
P	Private households with employed persons
Q	Extra-territorial organizations and bodies
	Households (would include NACE P)

For 1999 NACE D has detail at the division (2-digit) level which correspond to the following categories:

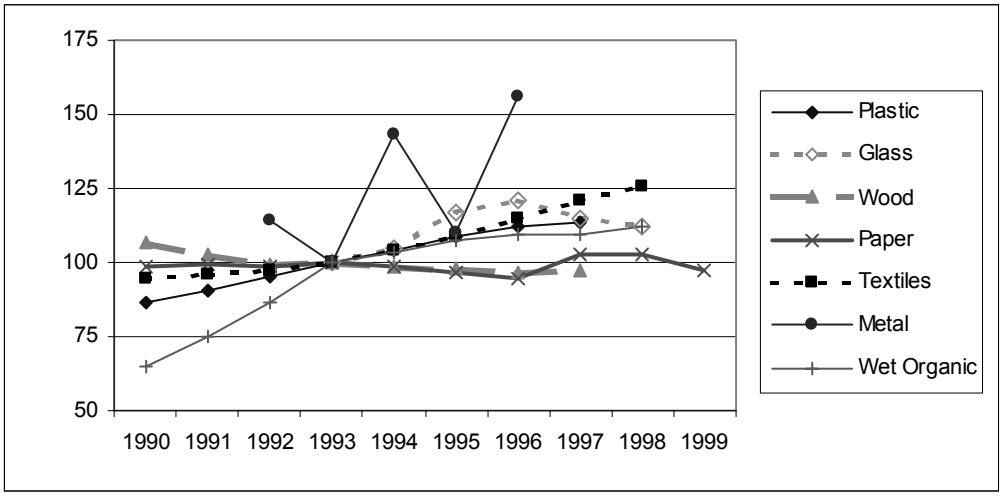
17	Textiles
18	Wearing apparel; dressing and dyeing of fur
19	Tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness & footwear
20	Wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials
21	Pulp, paper and paper products
22	Publishing, printing and reproduction of recorded media
23	Coke, refined petroleum products and nuclear fuel
24	Chemicals and chemical products
25	Rubber and plastic products
26	Other non-metallic mineral products
27	Basic metals
28	Fabricated metal products, except machinery and equipment
29	Machinery and equipment n.e.c.
30	Office machinery and computers
31	Electrical machinery and apparatus n.e.c.
32	Radio, television and communication equipment and apparatus
33	Medical, precision and optical instruments, watches and clocks
34	Motor vehicles, trailers and semi-trailers
35	Other transport equipment
36	Furniture; manufacturing n.e.c.
37	Recycling

2.3 Waste by NACE categories

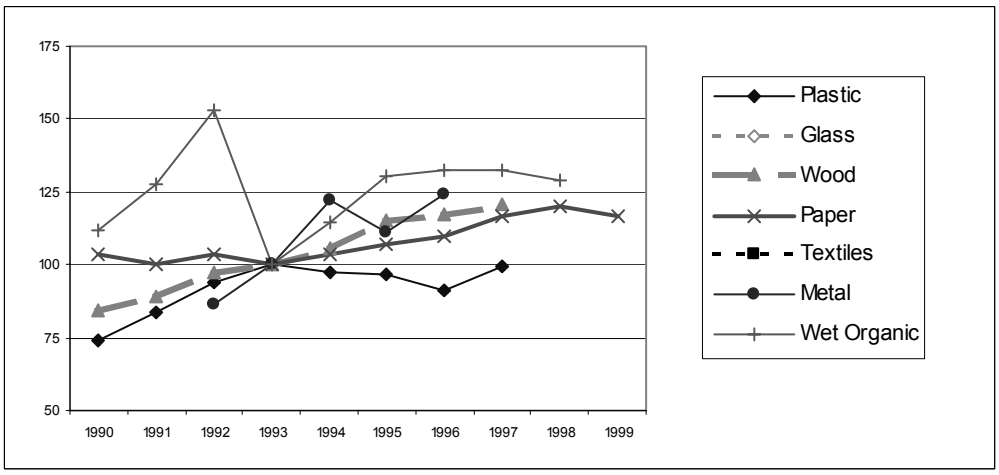
Based on the data in the previous waste tables, figures showing a time series of the seven different solid waste fractions were developed for each of the different aggregated NACE categories. All of the graphs show the trends for the different waste fractions in each category. 1993 is used as the reference year (1993 = 100 percent) since this is the first year there is data available for all of the fractions.

Waste by NACE Categories. 1990 – 1999. Percent (1993 = 100 percent)

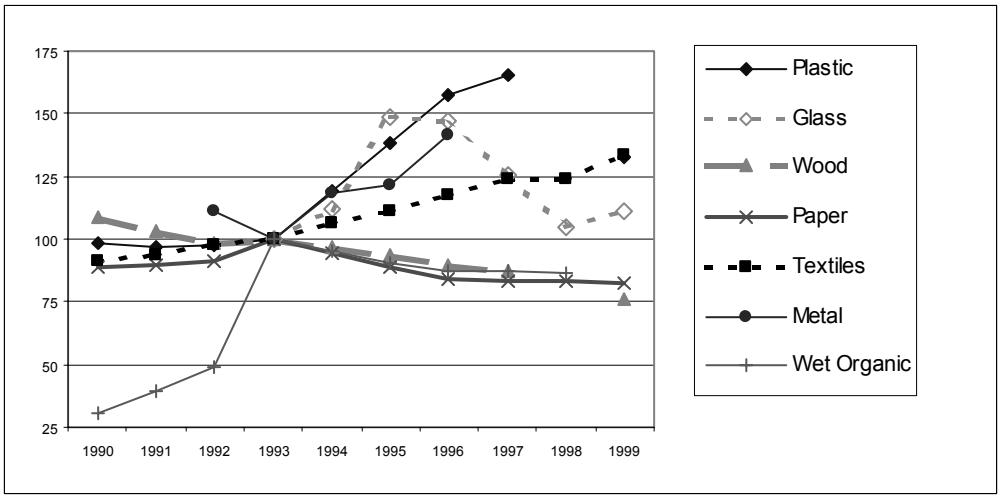
A. Totals for Norway (includes all sectors). 1990-1999. Percent (1993 = 100 percent)



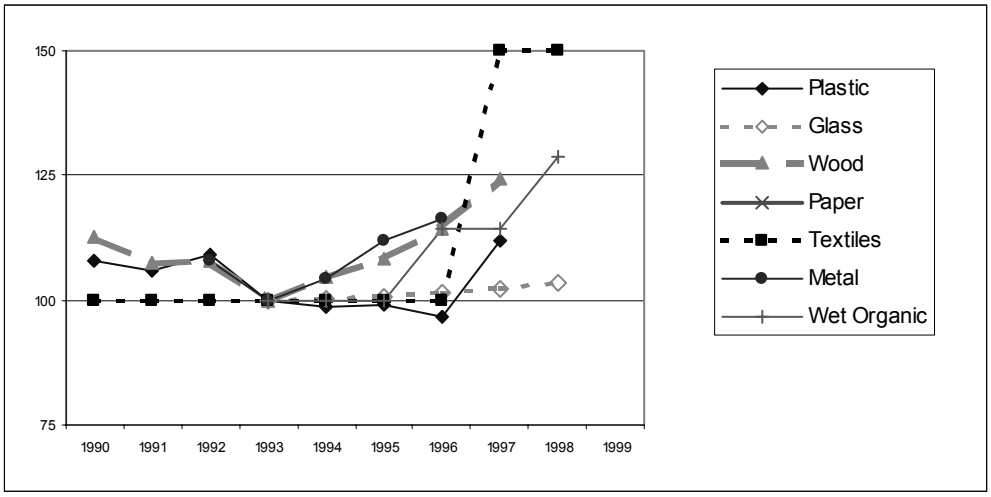
B. Other industries, NACE A, B, C, E. 1990-1999. Percent (1993 = 100 percent)



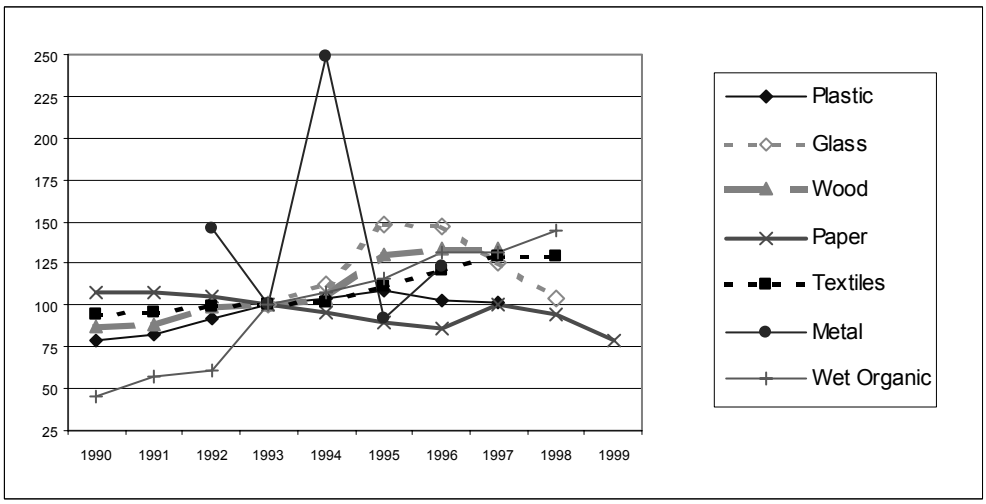
C. Manufacturing, NACE D. 1990-1999. Percent (1993 = 100 percent)



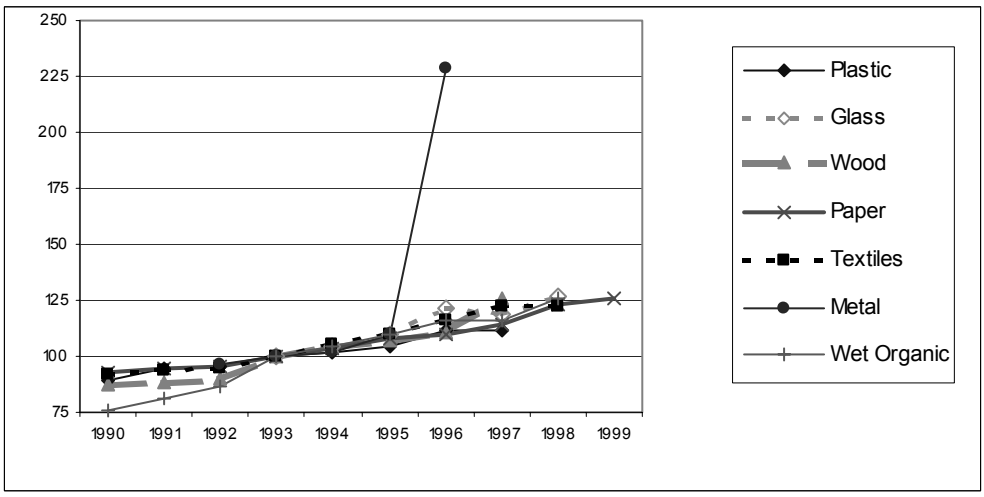
D. Building and Construction. NACE F. 1990-1999. Percent (1993 = 100 percent)



E. Service, NACE G to O. 1990-1999. Percent (1993 = 100 percent)



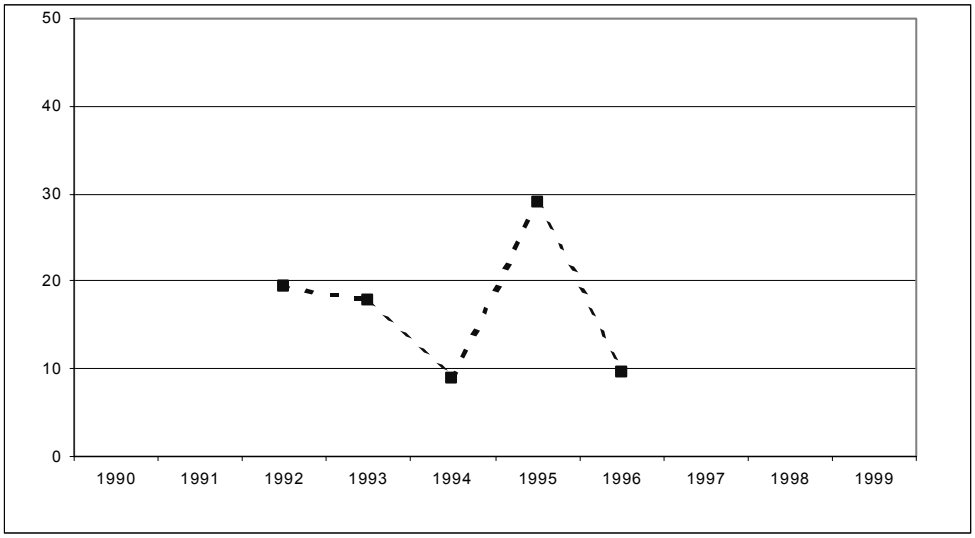
F. Households. 1990-1999. Percent (1993 = 100 percent)



The trends at the national and most aggregated level (Figure A) appear fairly consistent. The fraction that shows the greatest variation at the national level is metal waste. There can be a number of reasons for this including the fact that the calculated estimates for metal waste are some of the oldest and have not been revised since 1998. Some of the erratic behavior of the data can be partially explained by examining the amounts of recycled metal that are listed in the category "Statistical error / Not able to

distribute to NACE." Since a substantial amount of recycled metal is not distributed according to NACE groups, this results in lower estimates for all industries. One consequence of these non-distributed amounts are erratic time series. The following figure shows the percent of total metal waste belonging to this "Statistical error / Not able to distribute to NACE" category.

Recycled metal not able to distribute to NACE / statistical error.
Percent of total metal waste.



The wet organic and metal waste fractions also bring up the question about when does waste become waste? In the SEEA the definition of "waste" (also called "residuals" in the latest draft of the SEEA manual) excludes all waste that has an economic value greater than "zero." If a type of waste has a positive economic value then it is considered a bi-product and is not strictly considered "waste." Since portions of these two waste fractions could have economic value, given that large amounts are recycled, it is unclear exactly whether these fractions should be included as "waste." In the Norwegian waste accounts the amounts that are recycled are considered "waste" so these amounts are also included in the NAMEA-waste tables.

For the wet organic and metal waste fractions estimates for recycling and reuse have been included in the total amounts of waste. Perhaps it would be more appropriate to not graph the totals for these fractions but rather exclude the amounts that are recycled (and also the metal waste category "used auto parts") since these amounts are taken out of the waste stream that needs to be deposited or incinerated for that year. These recycled amounts do eventually end up deposited or incinerated but in later years. Materials sent for recycling can create double counting challenges when trying to account for total amounts of waste.

If the metal wastes are excluded, the two graphs with the least variation are for "households" (figure F) and for "Totals for Norway (all sectors)" (figure A). The graphs showing different NACE categories have much more variation. This can be due to the methods used for estimating waste amounts. Turnover and number of employees are often used as calculation factors. If these factors vary greatly from year to year it can influence the estimates. Also estimates of the "stock" of waste can vary over the time period thus adding additional variation into the time series data. Much more detail is desirable with regard to industry. The NAMEA for air has approximately 65 different categories but with the waste statistics only 6 aggregate NACE groupings are possible. There is better coverage for the manufacturing industry (NACE D) for 1993, 1996 and 1999 since there have been specific waste surveys for these years. The waste statistics from the 1999 manufacturing industry survey are the most detailed now available. The 1999 survey was conducted in such a way that, for the first time, estimates at the division level (2-digit NACE) are now made. Only NACE 15 and 16 are still reported together.

This is due primarily to confidentiality problems related to these categories. Results from earlier surveys only allowed for reporting at the subsection (2-letter) level.

From assembling these tables and examining the results, the data appears to be fairly stable at high levels of aggregation but at more detailed levels the methods for estimation can be a source for large variations in the data. Spitting the data into just six NACE categories appears to result in fairly high levels of variation in the data for some waste fractions. Although it is desirable to increase the number of NACE categories to correspond to the same number of NACE categories as in the quarterly national accounts, increasing the level of detail could make the data too dependent on the methods of estimation to make it worth the extra work required to obtain this detail. It appears that breaking the amounts down even further to give more detailed NACE estimates would not necessarily provide meaningful data.

One major use of the NAMEA-based data is to track the environmental consequences of a specific NACE category over time. Using the current methods of estimation it does not appear that further breakdown of NACE categories are warranted. At the same time the level of aggregation is almost too high to provide very helpful information to policy makers. There is a demand for information that can help track changes over time for certain sectors that are of more interest than others.

For example, there is specific interest in the manufacturing industry (NACE D). The enterprises in the manufacturing industry have been surveyed every three years beginning in 1993. For the years between the survey years there are currently only totals for the manufacturing industry as a whole (NACE D) that are made. It may be possible to begin making annual estimates for certain waste fractions at a more detailed level, such as NACE divisions (2-digit) since this is the level of detail for the survey years.

2.4 Additional work

A major need identified is to have a more consistent use of aggregate NACE categories for the different waste fractions. For some fractions, for example glass and textiles, the waste from "other industries" (NACE A, B, D, E) are included with the "service" sector (NACE G to O). This makes it very difficult to make consistent tables and figures comparing the different NACE categories. The supply of goods method also uses calculation estimates to assign waste amounts to the different NACE categories. To help with this assigning of amounts, sector specific surveys are needed.

It may also be possible to estimate different waste fractions for NACE D at the division level for the years when the waste survey is not conducted. There is also a wider variety of waste fractions, including some types of special waste, that are included in the industrial waste survey than is currently available from the supply of goods method of estimation. For some fractions, information obtained from the surveys may be the best and most economical approach to estimating these fractions. If that type of waste is only produced by a certain industry then obtaining waste estimates through the use of surveys makes the most sense. But for other types of waste fractions that arise from a variety of producers, the supply of goods method is most likely the best approach to estimation.

In the coming years, the focus for the solid waste NAMEA will be to expand the number of fractions included in the tables so that more and more of the total waste in Norway is included. There will also need to be a focus on improving the NACE level detail since many fractions have only been split into six NACE categories and these categories are not always consistent.

It will also be necessary to examine the waste accounts definition of Norway in light of the national accounts economic definition of Norway. As is often the case with environment statistics, a geographic definition of Norway is used whereas the national accounts uses an economic definition. This may be of importance with respect to the export or import of certain types of waste that is sent to other countries for treatment and disposal purposes. Some hazardous waste types may fit under this

category as well as glass sent for recycling. Some types of special waste may be exported or imported for treatment. There is also the issue of waste arising from national units operating abroad. Although these waste fractions are sent to areas that are outside the control of Norwegian authorities these waste amounts arising from the economic activity in Norway should be included in the waste NAMEA. In terms of tourism, the assumption is made that Norwegians produce as much waste as tourists in other countries as the foreign tourists produce here in Norway. This assumption may be appropriate. There is one major area that may need special focus and that involves Norway's international shipping (including ferries between countries) which are classified in the national accounts as "national units operating outside the territory." The air emissions from this sector have considerable meaning for Norway's total emissions. There may be some parallels in terms of solid waste especially with respect to the ferries that run between Norway and Denmark. This area requires some special focus before it is decided that it is of little importance in the overall picture.

The current plans of the solid waste statistics groups are to update calculations for all fractions to 1999 and make estimates for 2000. This work should be done by summer 2002. The NACE-category tables will also need to be revised when the revision is completed.

2.5 References for Solid Waste NAMEA

Sørensen, K.Ø., J.L. Hass, H. Sjølie, P. Tønjum and K. Erlandsen. (2001): *Norwegian Economic and Environment Accounts (NOREEA) Phase 2.* Documents 2001/2. Statistics Norway.

Data sources for the waste statistics can be located on the Statistics Norway website (http://www.ssb.no) and in various reports:

1. Plastic: Rapport 2000/15, Tabell 4.3 Plastavfall fordelt på opprinnelse 1990-1997
2. Glass: SSB internet table, Beregnet mengde glassavfall, etter opprinnelse. Tonn og prosent. (http://www.ssb.no/emner/01/05/40/avfregnglass/tab-2000-05-29-03.html) Last update 29/06/2000.
3. Wood: Rapport 2000/12, Tabell 5.1 Treavfall fordelt på opprinnelse. 1990-1997. Tonn
4. Paper: SSB internet table, Papiravfall etter opphav. 1985-1999. 1000 tonn, (http://www.ssb.no/emner/01/05/avfall_tab_fig/t_pakits.html) last update 07/03/01
5. Textiles: Tekstilavfall etter opprinnelse. 1990-1998. Tonn (http://www.ssb.no/emner/01/05/avfall_tab_fig/t_txkits.html)
6. Metal: Tabell 2. Registrert metallavfall fordelt på opprinnelse og behandling. 1992-1996. Tonn (http://www.ssb.no/ukens_statistikk/utg/9845/2-2t.txt)
7. Wet organic: SSB Internet table, Våtorganisk avfall etter opprinnelse og behandling/disponering. 1993-1998. Tonn. (http://www.ssb.no/emner/01/05/avfall_tab_fig/t_vabmts.html) Last update 27.10.2000 (Values are rounded and the totals do not always equal the sum of the detailed figures.)
8. 1999 manufacturing industry data: http://www.ssb.no/emner/01/05/avfall_tab_fig/t_iamang.html

3 Environmental taxes

3.1 Introduction

The work with statistics covering environmental taxes is one of the fields being established through the NOREEA-project. Green taxes continue to be an important method for influencing and reducing the use of products that have environmentally negative effects.

The Eurostat manual *Environmental taxes - A statistical guide* (Eurostat, 2001) presents guidelines for compiling statistics on environmental taxes, forming a basis for a harmonization of the definitions and concepts, data sources and estimation methods of the statistical work with environmental taxes. The guidelines are based on a harmonized statistical framework developed in 1997, jointly by Eurostat, the European Commission, OECD and the International Energy Agency (IEA).

The framework for statistics on environmental taxes defined in *Environmental taxes - A statistical guide* (Eurostat, 2001) has been used to help systemise the work with the Norwegian environmental taxes. The framework outlined in the guide will, as far as it is possible, be used as the basis for statistical presentation of Norwegian environmental taxes.

Previous work on environmental taxes in Statistics Norway identified some obstacles that had to be resolved before further development could be done in this area. Both the problems and the efforts on these issues will be described in sections 2 and 3.

Section 4 first gives an overview of definitions and the overall framework that is used. Then the Norwegian environmental taxes for the eleven-year period 1990-2000 are presented. At the end of the section, some specific Norwegian environmental tax issues are discussed.

In section 5 some results are presented. In addition to presenting statistics on environmental taxes and time series of data, another objective for the present work with environmental taxes is to develop a system for distributing the environmental taxes by industries and by products. The improvements needed for this system to function are part of the major National Accounts revision for the years 1991 to 1999 that will be completed in June 2002.

3.2 Previous work

The first effort made to illustrate Norwegian environmental taxes by the National Accounts was made in 1999. Based on a joint project for analysis of environmental taxes by the European commission, OECD and the International Energy Agency (Steurer, 1998), Norwegian National Accounts were used to illustrate environmental taxes. The main focus was on the distribution of environmental taxes by sectors and by products. Total values for the environmental taxes for the years 1994-97 were given, and the 1995 environmental taxes were distributed by sector and product (Sjølie and Sørensen, 1999).

The work in 1999 identified two major obstacles to overcome:

1. The classification of products, especially refined oil products, was too broad for proper distribution among the environmental taxes.
2. When a product is charged with more than one tax, the sum of the different taxes charged on the product was distributed among its users, regardless of the legislative structure of each of the taxes and the total sum of each of the taxes.

These two areas have been included as important elements in the current revision of the National Accounts.

3.3 Change for the better

Improving the basis for a more accurate distribution of environmental taxes by industries and products will affect numerous parts of the National Accounts. The occasional revision of the National Accounts for the years 1991 - 1999 offered an opportunity to improve this part of the accounts. The revised National Accounts for these years will be published in June 2002, and the methodological changes and improvements are now being implemented. Chapter 3.1 and 3.2 summarise the revisions made to improve the compilation of environmental taxes.

3.3.1 Improving the classification of refined oil products

In the National Accounts prior to the revision, most of the refined oil products were included in only two products, *Gas oils (232011) (incl. auto fuel, marine gas oils and fuel oil no. 1)* and *Other light petroleum oils; medium preparations (232013) (incl. marine diesel and fuel oil no. 2)*. These two products were charged with most of the taxes levied on mineral oils, i.e. the tax on mineral oils, the CO_2-tax on mineral products, the sulphur tax, the basic tax on fuel oil and the tax on auto fuel. These different taxes are, with the exception of the tax on auto fuel, levied on both *Gas oils* and *Diesel oils*. Due to the lack of detailed statistics on the use of the various sub-products, difficulties arose when calculating the share of the mentioned environmental taxes levied on marine gas oils vs. marine diesel and fuel oil no. 1 vs. fuel oil no. 2.

This problem was resolved by dividing the 2 "old" products into three "new" products: *Fuel oil no. 1 and no. 2 (232015), Autodiesel (232017)* and *Marine gas oil (incl. marine diesel oils)(232018).* The problem is then transformed into a problem of estimating the amount of tax levied on each of the new products. This is solved with the use of the Energy Accounts annually published by Statistics Norway.

3.2 Improving the distribution of taxes among users

In the National Accounts, taxes on products are allocated to the different products charged with tax. The industries exempted from tax when using a charged product, are defined. The National Account System (SNA-NT) then proportionally distributes the tax levied on a product among the users of that product that are not exempted. Prior to the revision of the National Accounts the system assumed that all these users were facing the same level of tax rates, and that different taxes levied on the same product had the same rules of exemptions.

In 1999 the structure of the tax on mineral oils was changed and new separate taxes on CO_2, sulphur and fuel oil were introduced. It became clear that the original system for allocating revenues in the National Accounts was not capable of dealing with the different aspects of these new taxes. The three new taxes are all basically levied on the same products, introducing the problem that these taxes have different rules regarding exceptions for taxpayers and they have differentiated tax rates depending on the industry using the charged products.

As part of the revision of the National Accounts, a new system for taking these different issues into consideration has been developed. At this time the changes has been implemented into the National Accounts system, but it is not possible to develop a full set of statistics until the revised National Accounts is published in summer 2002. After the revised National Accounts are published, it will be possible to create an environmental tax system from where detailed tables of types of taxes according to products and industries (NACE categories) can be produced.

3.4 Expansion of previous work

In addition to the work dealing with the technical/methodological obstacles connected to the use of Norwegian National Accounts to develop detailed environmental taxes statistics, the Eurostat manual *Environmental taxes - A statistical guide* (Eurostat, 2001) also provides a framework for systemising the statistical work with environmental taxes.

3.4.1 Definition of environmental taxes

The Eurostat manual uses the following definition of *environmental taxes* (Eurostat 2001 p.9):

> *A tax whose tax base is a physical unit (or a proxy of it) of something that has a proven, specific negative impact on the environment.*

A list of environmentally relevant tax bases is presented in the manual, with the main categories summarized to:

- Measured or estimated emission to air
- Ozone depleting substances
- Measured or estimated effluents to water
- Certain non-point sources of water pollution
- Waste management
- Noise
- Energy products
- Transport
- Resources

As seen in Table 4.1, the environmental taxes are systemised into four main categories:

- Energy taxes that include taxes on energy products used for both transport and stationary purposes.
- Transport taxes that include taxes related to the ownership and use of motor vehicles.
- Pollution taxes that include taxes on measured or estimated emissions to air and water, management of solid waste and noise.
- Resource taxes include taxes related to extraction of natural resources. These taxes pose some particular problems, as there are discussions to whether this resource extraction in itself is environmentally harmful, although there is a broad agreement that it can lead to environmental problems.

According to the Eurostat manual, resource taxes do not include taxes on oil and gas extraction. Taxes on extraction of minerals and petroleum are often designed to capture the resource rent, and do not influence prices in the way that other taxes do. However, in Norway there is a CO_2 tax on the petroleum extraction activity on the continental shelf that is included as an energy tax, because this tax is designed to reduce the emissions of CO_2 and not to capture the resource rent.

3.4.2 Norwegian environmental taxes

Based on the definition of environmental taxes and the list of tax bases, the environmental taxes present in Norway from 1990-2000 are listed in Table 3.4.1. The table shows times series of revenue from each environmental tax and for the four main categories of environmental taxes: energy, transport, pollution and resource taxes.

In Table 3.4.1, the non-existing of a tax is marked with " - ", and "NA" is the abbreviation for data not available.

Table 3.4.1: Norwegian environmental taxes, 1990 - 2000, mill NOK

All values in mill NOK	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Sum environmental taxes	**20 020**	**22 642**	**26 918**	**27 681**	**32 123**	**34 094**	**36 957**	**40 034**	**40 379**	**41 688**	**41 623**
Energy taxes:	**11 535**	**14 198**	**16 692**	**17 093**	**19 383**	**21 024**	**21 955**	**23 779**	**22 905**	**24 648**	**25 942**
CO_2-tax in the petroleum activity on the continental shelf	-	810	1 916	2 271	2 557	2 559	2 787	3 034	3 229	3 261	3 047
Tax on mineral products, total	1 064	2 030	1 969	1 626	1 925	1 400	1 671	1 665	1 698	-	-
CO_2-tax on mineral products		-	-	-	-	-	-	-	-	3 643	3 520
Sulphur tax	-	-	-	-	-	-	-	-	-	344	117
Basic tax on fuel oil	-	-	-	-	-	-	-	-	-	-	489
Excise on petrol	7 057	7 978	9 351	9 338	9 298	9 941	10 154	10 903	11 312	9 666	9 762
Auto fuel tax	-	-	-	107	1 659	2 706	2 912	3 406	3 763	4 465	4 802
Tax on coal and coke	-	-	-	4	7	9	11	6	2	-	-
Tax on production of electricity	3 414	3 380	3 456	1 132	1 286	1 519	1 533	1 471	2	2	-
Tax on consumption of electricity	-	-	-	2 615	2 651	2 890	2 887	3 294	2 899	3 267	4 205
Pollution taxes:	**70**	**214**	**357**	**364**	**538**	**454**	**491**	**548**	**529**	**1 060**	**1 144**
Basic tax on non-refillable beverage containers	-	-	-	-	56	100	129	166	162	261	324
Tax on beer containers	21	13	19	11	91	14	13	13	11	31	3
Tax on wine/spirit containers	49	41	44	48	43	51	51	66	59	63	8
Tax on non-alcoholic lemonade containers		60	35	24	30	15	10	11	9	22	1
Tax on non-alcoholic non-fizzy lemonade containers		60	49	65	70	28	32	37	32	29	1
Tax on plastic beverage containers	-	-	-	-	-	-	-	-	-	-	15
Tax on metal beverage containers	-	-	-	-	-	-	-	-	-	-	100
Tax on glass beverage containers	-	-	-	-	-	-	-	-	-	-	48
Tax on paper beverage containers	-	-	-	-	-	-	-	-	-	-	13
Tax on final treatment of waste	-	-	-	-	-	-	-	-	-	442	483
Tax on artificial fertiliser	-	-	156	166	171	167	172	171	165	108	2
Tax on pesticides	-	-	23	22	21	19	22	21	24	35	53
Tax on lubricating oil	-	28	30	28	56	60	62	63	67	69	88
Tax on batteries	-	12	1	-	-	-	-	-	-	-	-
Tax on trichloroethane	-	-	-	-	-	-	-	-	-	-	4
Tax on tetrachloroethane	-	-	-	-	-	-	-	-	-	-	1
Transport taxes:	**8 415**	**8 230**	**9 869**	**10 224**	**12 202**	**12 616**	**14 511**	**15 707**	**16 945**	**15 980**	**14 537**
Import tax on vehicles	3 615	3 245	4 143	4 174	7 022	7 575	8 945	9 771	10 078	8 705	6 929
Tax on heavy vehicles	-	-	-	-	293	293	315	271	214	226	273
Car re-registration tax	939	887	892	981	1 049	1 100	1 229	1 307	1 348	1 402	1 410
Annual vehicle tax	2 166	2 240	2 731	2 978	3 134	3 225	3 403	3 688	4 247	4 442	4 626
Tax per driven km by diesel vehicles	1 695	1 745	1 968	1 966	560	2	14	4	2	8	1
Tax on aircraft, charter		113	135	125	21	-	-	-	-	-	-
Tax on aircraft, airliner	-	-	-	-	123	-	-	-	-	-	-
Tax on aircraft	-	-	-	-	-	421	605	666	1 056	1 197	1 298
Resource taxes:	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Licenses for fish, hunt and shoot	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Source: General Government fiscal accounts 1990-2000

3.4.2.1 Energy taxes

The CO_2-tax and the sulphur tax are basis for discussions as whether they should be included as parts of the pollution taxes or the energy taxes. The reasons for including the CO_2-taxes under energy taxes are, first of all, problems due to identifying CO_2-taxes separately in tax-statistics. They are often integrated with energy taxes. This has been the case for Norway until 1999, when the tax on mineral oils for instance was split into a CO_2-tax and a sulphur tax, with no statistics showing these two parts separately. The excise on petrol and the tax on coal and coke also included parts that indirectly were connected to reducing the CO_2 emissions. From 1999 all the CO_2-fractions from the various taxes were put into one CO_2-tax. The same course of events is seen with the sulphur tax. These changes connected to the taxation of refined oil products, result in some major changes in the structure of energy taxes in 1999 and 2000. The tax on coal and coke disappears from 1999 and the tax on mineral oil from 1990 to 1998 is converted into a tax only on fuel oils after 1999.

The decline in total excise on petrol charged in 1999 and 2000 compared to the years 1990 to 1998 is due to the CO_2-part previous charged on petrol now included in the CO_2-tax on mineral products. Table 3.4.2 gives an overview of the development of the CO_2-tax on petrol, which is a part of the excise on petrol.

Table 3.4.2: CO_2-tax on petrol, 1991 - 2001, NOK/ litre petrol

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
NOK / litre petrol	-	0.60	0.80	0.80	0.82	0.83	0.85	0.89	0.87	0.92*	0.94*	0.72*

* The CO_2-part of the tax on the use of petrol, now as a part of the CO_2-tax on mineral oils.

There was a change in the taxation of electricity in 1993 with the introduction of a tax on production of electricity in addition to the existing tax on consumption of electricity. Table 3.4.3 gives an overview of the development of the electricity tax in *øre* (100 øre = 1 NOK) per kWh. It is worth mentioning that the consumers of electricity in the northern part of Norway, as well as some parts of Norwegian industry, are paying a strongly reduced tax on electricity.

Table 3.4.3: Tax on electricity, 1990 - 2001, øre/kWt

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Tax on production of electricity øre/KWt	-	-	-	1.2	1.50	1.52	1.55	1.88	-	-	-	-
Tax on consumption of electricity øre/kWt	3.85	4.00	4.15	4.15	5.10	5.20	5.30	5.62	5.75	5.94	8.56	10.30

In Table 3.4.3 taxes on the use and production of electricity are presented. To include the tax on production of electricity as an environmental tax is, however, a controversial issue in Norway. It can be argued that the tax on production of electricity has an element of capturing the resource rent and from 1998 on, the tax on production of electricity was converted into a new tax on resource rent which is why this is no longer considered an environment tax and there are no values reported in Table 4.3 from 1998 onwards. Another argument for not including the tax on electricity production as part of the Norwegian environmental taxes is the fact that Norwegian electricity supply almost entirely comes from hydropower that has negligible emissions to air. Though domestic production of electricity is clean, Norway has in recent years been a net importer of electricity based on Danish coal-fire plants. In terms of gross supply of electricity for the years 1993-1997, an average of 93.5 percent originated from domestic hydropower production, 6.0 percent was imported and only 0.5 percent was supplied from heat power plants. For the peak year 1996, 11.2 percent of gross electricity supply was imported. There could be a case for including only the taxes paid on the imported part of the electricity use among the green taxes. A practical difficulty would, however, be that the tax rates are differentiated among users. The imports, as well as the production of electricity based on other production than hydropower, might as a practical approximation, be assigned the highest tax rates. For foreign users, there is a danger that modest figures for these taxes may be misinterpreted to the effect that taxes on electricity use are insignificant in Norway. Apart from the emissions to air, there are environmental impacts of hydroelectric power plants such as loss of biodiversity, impacts on fishing areas, impacting cultural landscapes and loss of pristine nature areas.

3.4.2.2 Pollution taxes

The taxes on beverage containers compose the largest group of taxes within Pollution taxes, both in terms of different types of taxes and the revenues raised. The structure of the taxes on beverage containers changed in 2000. Through the 1990s the taxation of beverage containers was linked to the content of the containers, i.e. tax on beer containers, soft drink containers etc. Now the taxation is linked to the type of material from which the container is made. The total amount of tax revenues from beverage containers in 2000 was 30 percent higher than the previous year (189 mill NOK in 2000 compared to 145 mill NOK in 1999). Due to lack of comparable statistics for these two years, it is hard to state the exact reasons for this increase in revenues from taxes charged on beverage containers. However, what can be seen in the data material is that the revenue from the basic tax on non-refillable beverage containers has increased by 24 percent and the revenue from the new tax on metal beverage containers is very high compared to the other taxes introduced on beverage containers.

The high level of revenue from the tax on metal beverage containers might be connected with the increase in soft drinks and beer sold in metal beverage containers. In 1997 0.9 percent of the total sale of beer was beer in metal beverage containers. In 1999 the share had increased to 16.6 percent, and in 2000 the share was 30.5 percent (BROM, 2001). In addition to increased sale of metal beverage containers, the tax rate for these kinds of beverage containers have also increased. As seen in Table 4.4 and 4.5, the tax rate for beer containers in 1999 was 3.37 NOK per beverage container, while the tax rate in 2000 had increased to 4.00 NOK.

The tax on non-refillable beverage containers is a tax levied on beverage containers that can only be used in its original form ones. This tax is difficult to implement in the National Accounts, because beverage products that are covered by this tax are soon withdrawn from the market and replaced with other refillable beverage containers, which of course is one of the purposes of this tax. However, there are some exceptions. In May 2001 the State liquor store stopped using refillable containers when tapping wine on bottles.

The 24 percent increase in revenue from the tax on non-refillable beverage containers from 1999-2000 can also be connected to the increase in sale of beverages in metal containers, as well as the increase in the sale of wine in the late 1990s. From 1997 - 2000, the total increase in wine sold (in litre) from the State liquor shop increased with 27 percent. While all imported wine bottles have been levied with the tax on non-refillable beverage containers, wine tapped in Norway until May 2001 has not.

Table 3.4.4: Tax rates for beverage containers, 1990 - 1999, NOK/beverage container

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Tax on beer containers	3.50	3.50	3.50	3.50	3.00	3.00	3.0	3.19	3.26	3.37
Tax on wine/spirit containers	2.50	2.50	2.50	2.50	3.00	3.0	3.0	3.19	3.26	3.37
Tax on non-alcoholic lemonade containers	3.50	3.50	3.50	3.50	3.00	3.0	3.0	3.19	3.26	3.37
Tax on non-alcoholic non-fizzy lemonade containers	0.50	0.50	0.50	0.50	0.70	0.30	0.30	0.32	0.33	0.34

Table 3.4.5: Tax rates for beverage containers, 2000 - 2001, NOK/beverage container

	2000	2001
Tax on glass beverage containers	4.00	4.11
Tax on metal and plastic beverage containers	2.40	2.47
Tax on paper beverage containers	1.00	1.03

Table 3.4.6: Tax rates for non-refillable beverage containers, 2000 - 2001, NOK/beverage container

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Basic tax on non-refillable beverage containers	-	-	-	-	0.70	0.70	0.70	0.74	0.76	0.79	0.81	0.83

In 1999 there was a new tax on delivering waste to landfills. This type of tax did not exist before 1999. The tax on batteries was phased out during 1992 and there are new taxes on tricholorethane and tetracholorethane from 2000. Although these taxes do not raise a great deal of revenues it is expected that these new taxes will decrease the use of the chemicals over time.

The reason for the extreme decrease in tax levied from the tax on artificial fertiliser from 1999 to 2000 is due to the change in the charge rate that is set to zero in 2000. This tax still exists, but the revenues from this tax are not expected to be at the same levels as in the previous years.

3.4.2.3 Transport taxes:

The Transport taxes are dominated by the taxes on ownership of motor vehicles. These taxes are primarily fiscal taxes.

The structure of the import tax on motor vehicles was changed from 1996. The tax was previously calculated on the basis of weight and value, but changed to a system where the weight, the effect of the motor and the cylinder displacement form the basis of the calculations. As seen in Table 4.1, there was a 13.6 percent decrease in the charges from the import tax on motor vehicles from 1998 to 1999. This reduction can be seen in connection to the decrease of 12.2 percent in the registration of cars imported to Norway from 1998 to 1999. The noticeably decrease can probably be related to the modernisation of the stock of vehicles in 1996 and 1997, which followed after the special 1996 increase in the amount of subsidy received when cars were wrecked.

The tax per driven km for diesel vehicles officially was brought to an end in 1995, but in the General Government fiscal accounts there have been registered some minor income from this tax in the years 1995 - 2000.

The tax on aircraft has been changed various times through the 1990s. With an exception of a one-year period in 1998 and 1999, the tax on aircraft has always been linked to the amount of passengers transported. The tax on aircrafts was only levied on charter traffic from 1991 to 1993, and in 1994 a special tax was included on some chosen inland airliner distances. From 1995 to 2000 the tax is changed to a tax levied on both international flights and most of the inland flights. There are now ongoing discussions to whether this tax is legal due to the EØS treatment, and the future of this tax is uncertain.

3.4.2.4 Resource taxes

Resource taxes, as defined in the Eurostat manual, compose a very small part of the total environmental taxes in Norway. Licenses for fishing, hunting and shooting are the only identified taxes that are included in this group. The reason for including these licenses as environmental taxes is the definition of such licenses in SNA93 (8.54c): "Payments by persons or households for licenses to […] shoot or fish are treated as current taxes".

We have so far not been able to find or calculate publishable numbers for these taxes in the National Accounts data.

3.4.3 National Accounts vs. Government Fiscal Accounts

There is one issue that requires some extended information related to this presentation of environmental taxes. The National Accounts do not specify taxes by type or by purpose, which makes it difficult to obtain information solely concerning environmental taxes from the real accounts. Table

3.4.1 is therefore derived from the Governments Fiscal Accounts. When calculating the distribution of environmental taxes by industry and by product, calculations will be made on the basis of the pre-systems of the National Accounts, where the taxes are identifiable. The National Accounts data for the product data generally differ from those of the fiscal accounts due to accruals adjustment. The National Accounts in principle record taxes on products accrued during the accounting period, while the fiscal accounts show the cash flow.

In addition to the differences of the values of the taxes presented, Table 4.1 may differ from lists of environmental taxes published by the Norwegian Government. The difference mainly arises from the strict tax definition used in the National Accounts. The environmental tax statistics framework uses the tax definition of the National Accounts, which states that:

> "A tax is a compulsory, unrequited payment to general government. Taxes are unrequited in the sense that benefits provided by the government to taxpayers are not normally in proportion to their payments (OECD, 1999; Eurostat, 2001)."

Some of the "environmental taxes" absent in Table 3.4.1 are due to the fact that they are classified as government fees and charges in the National Accounts. As opposed to taxes, fees and charges are seen as payments for a service, i.e. requited payments. As stated in the Eurostat manual, the main focus of the statistical framework is on taxes, rather than charges and fees. But, there are some borderline cases where it can be difficult to decide if an environmentally related payment to the government should be classified as a tax or a fee.

For instance, the charges on the municipal sewage treatment and waste management might be included as environmental taxes in some countries. Another example is the environmental fee on household appliances and electronically goods. This payment is the result of an agreement between the Government and the relevant association of retail traders. Under a law that came into effect in July 1999, importers, retailers and manufactures are responsible for taking back and recycling household appliances and electronically goods. To finance this activity, the traders collect an amount from their customers for this purpose. The retailers introduced this payment as a tax and in most cases they quote their prices net of this payment. From the National Accounts point of view, this payment is neither a fee nor a tax, as it is not received by the government sector. For the National Accounts purpose, this payment is considered to be part of the price of the relevant products.

It is important to be aware of the various definitions of environmental taxes when analysing different statistics covering this area, especially when the single environmental taxes that compose the total are not identified. When further comparing the Norwegian results with the total results for the European Union presented in the Eurostat manual in Chapter 5, assumptions are made that the European results are calculated using the same definitions as done in the Norwegian case.

3.5 Results

Based on Table 3.5.1, it is possible to illustrate tax statistics in various ways and some examples are shown below. Tax statistics from the EU are presented in the Eurostat manual (Eurostat 2001, Ch. 5) and some of these results are compared with the Norwegian situation. Table 3.5.1 in the Eurostat manual is referred to as the basic tax revenue table.

The row 'total taxes and social contributions' in Table 3.5.1 includes the General Governments receipts of taxes on production and imports, current taxes on income and wealth and social contributions. The GDP for the years 1998-2000 is based on the quarterly National Accounts estimates.

Table 3.5.1: Norwegian tax revenue, 1990-2000, in mill NOK

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Energy taxes	11 535	14 198	16 692	17 093	19 383	21 024	21 955	23 779	22 905	24 648	25 942
Transport taxes	8 415	8 230	9 869	10 224	12 202	12 616	14 511	15 707	16 945	15 980	14 537
Pollution taxes	70	214	357	364	538	454	491	548	529	1 060	1 144
Resource taxes	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total environmental taxes	20 020	22 642	26 918	27 681	32 123	34 094	36 957	40 034	40 379	41 688	41 623
Total taxes and social contributions	307 064	317 902	327 119	338 880	366 165	395 232	437 629	470 135	477 858	521 450	618 034
GDP	722 705	763 414	784 934	823 704	867 563	928 745	1016 589	1096 170	1109 348	1197 457	1423 864

Table 3.5.2 shows the share that the four tax categories have of the total environmental taxes and gives a picture of the relative importance of energy, transport, pollution and resource taxes. The structure of the Norwegian taxes has changed little through the 1990s, with energy taxes accounting for 57.6 percent to 62.3 percent of the total revenues from environmental taxes through the whole period. It is also worth noticing that the share of total environmental taxes from energy taxes and pollution taxes has increased, while the share by transport taxes has decreased through the 1990s.

Table 3.5.2: Environmental taxes in Norway by tax category, 1990-2000, as a percentage of total revenue from environmental taxes

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Energy taxes	57.6	62.7	62.0	61.7	60.3	61.7	59.4	59.4	56.7	59.1	62.3
Transport taxes	42.0	36.3	36.7	36.9	38.0	37.0	39.3	39.2	42.0	38.3	34.9
Pollution taxes	0.3	0.9	1.3	1.3	1.7	1.3	1.3	1.4	1.3	2.5	2.7
Resource taxes	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 3.5.3 shows the EU countries' structure of the four tax categories of the total revenue from environmental taxes in the Member States. As in Norway, the energy taxes are dominating the environmental taxes in the EU countries. But, the share of energy taxes compared to the other tax categories is higher in the EU countries than in Norway (see figure 3.5.1). This can be seen in connection to the use of hydroelectricity in Norway, compared to the use of other more polluting energy sources in the EU countries. The high share of transport taxes in Norway compared to the EU countries is also noticeable. Due to the definition of transport taxes that states they include "taxes related to ownership and use of motor vehicles", the Norwegian numbers on transport taxes include both the tax on heavy vehicles and the tax on car re-registration (see Table 3.4.1 and Figure 3.5.2) (Eurostat, 2001p. 12).

Table 3.5.3: Environmental taxes in EU by tax category, 1990-1997, as a percentage of total revenue from environmental taxes

	1990	1991	1992	1993	1994	1995	1996	1997
Energy taxes	76.3	77.5	78.2	77.7	77.9	77.8	77.6	77.3
Transport taxes	20.9	19.6	18.9	19.1	18.8	18.8	18.8	18.9
Pollution taxes	2.6	2.7	2.8	3.1	3.1	3.2	3.4	3.7
Resource taxes	0.2	0.2	0.1	0.1	0.1	0.1	0.2	0.2

Figure 3.5.1: Energy taxes as per cent of total revenue from environmental taxes, 1990-2000, Norway and the EU countries

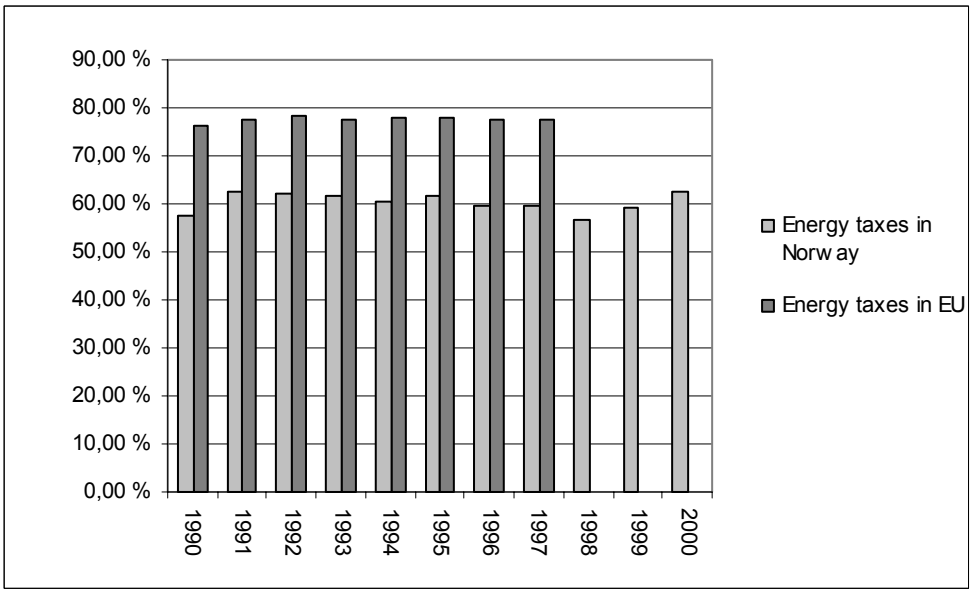


Figure 3.5.2: Transport taxes as percent of total revenue from environmental taxes, 1990 - 2000, Norway and the EU countries

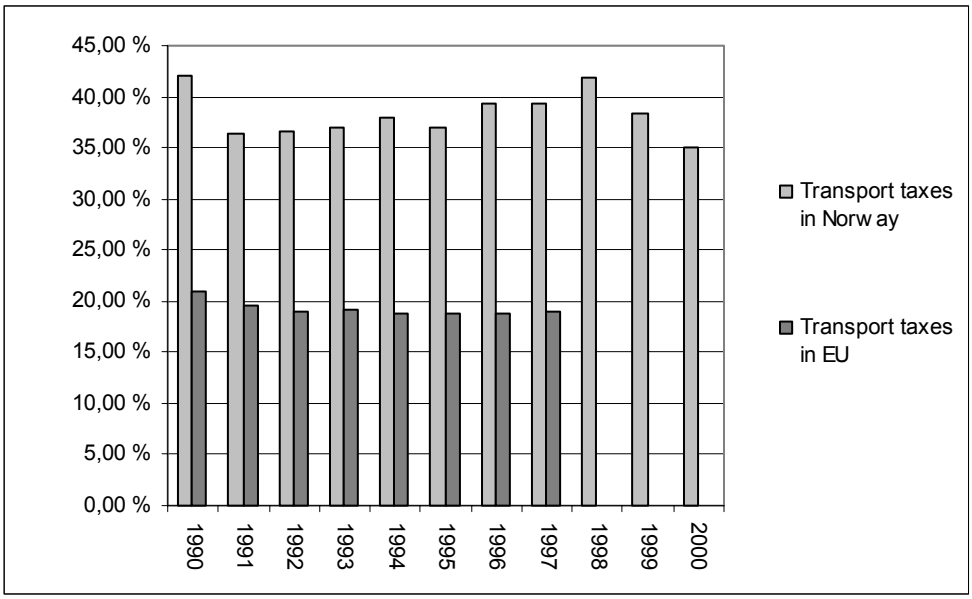


Table 3.5.4 shows the shares that total environmental taxes and the four tax categories have of the total revenues from all taxes and social contributions. These shares can be seen as indicators for the tax burden on the use of the environment and of the tax shift that is part of a green tax reform. A green tax reform implies increasing environmental taxes and using the increased revenues to reduce distortionary taxes on other tax bases, in particular labour. The Eurostat manual emphasizes that high or increased revenue from environmental taxes should not be interpreted as an indicator for the environmental "friendliness" of the fiscal policies. An increase from environmental taxes may be caused by the introduction of new taxes or an increase in the tax rates, but also as an increase in the tax base, i.e. higher emissions etc.

Table 3.5.4: Environmental taxes by tax category, 1990-2000, in percent of total revenues from taxes and social contributions. Norway.

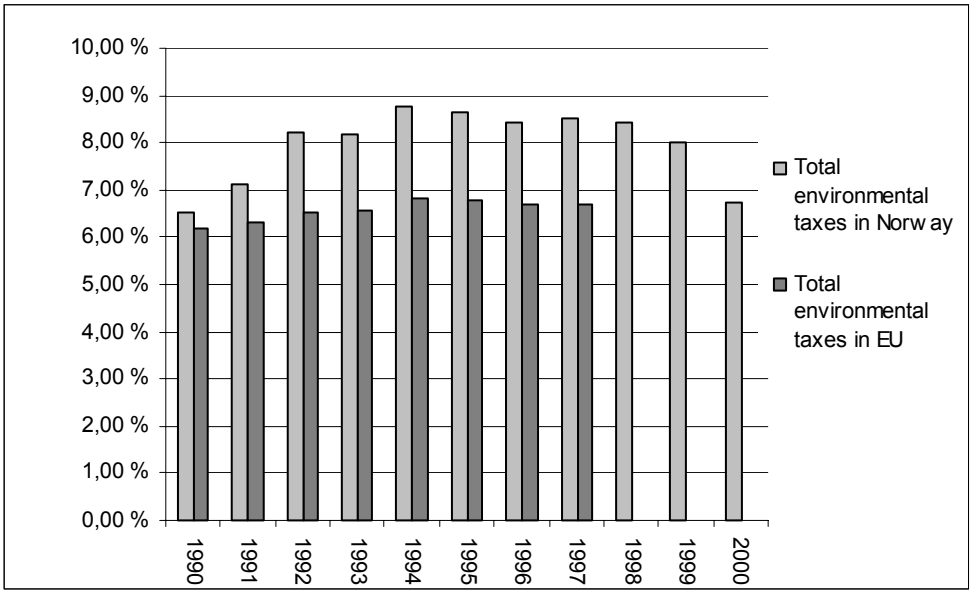
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Energy taxes	3.76	4.47	5.10	5.04	5.29	5.32	5.02	5.06	4.79	4.73	4.20
Transport taxes	2.74	2.59	3.02	3.02	3.33	3.19	3.32	3.34	3.55	3.06	2.35
Pollution taxes	0.02	0.07	0.11	0.11	0.15	0.11	0.11	0.12	0.11	0.20	0.19
Resource taxes	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total environmental taxes	6.52	7.12	8.23	8.17	8.77	8.63	8.44	8.52	8.45	7.99	6.73

Table 3.5.5 shows the European environmental taxes in percent of total revenues from taxes and social contributions. As seen in the period from 1990 to 1997 where there are comparable data, the importance of Norwegian taxes are slightly higher in Norway than in the EU countries. But, as mentioned in the Eurostat manual (p. 14) the importance of environmental taxes differs significantly across the Member states. Figure 3.5.4 illustrates the differences between tables 3.5.4 and 3.5.5.

Table 3.5.5: Environmental taxes in EU by tax category, 1990-1997, in percent of total revenues from taxes and social contributions

	1990	1991	1992	1993	1994	1995	1996	1997
Energy taxes	4.71	4.91	5.10	5.11	5.32	5.27	5.21	5.18
Transport taxes	1.29	1.24	1.23	1.25	1.29	1.27	1.26	1.26
Pollution taxes	0.16	0.17	0.18	0.20	0.21	0.22	0.23	0.25
Resource taxes	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Total environmental taxes	6.17	6.33	6.53	6.57	6.82	6.77	6.71	6.71

Figure 3.5.3: Total environmental taxes in percent of total revenues from taxes and social contributions, 1990 - 2000, Norway and the EU countries



3.6 Future work

The overall objective with the statistics covering environmental taxes is the establishment of statistics identifying revenues from environmental taxes by industry and by product. The forthcoming publication of the revised National Accounts in June 2002 is a foundation for accomplishing this objective.

It will still not be possible to directly find the different environmental taxes by industry and product from the National Accounts. However, the basic material makes it now possible to develop a system for distributing the environmental taxes by industries (NACE rev.1) and by products. The main elements in this system is the use-table from the National Account showing the use of products by industry, and two "tax-tables" showing the products and industries that are taxed.

The system cannot be put into effect before the revision of the National Accounts is completed in June 2002.

The work so far accomplished on environmental taxes will also be coupled with a National Account project on taxes in autumn 2002. The objective of this project is to develop a structure within the National Accounts system to systematise all taxes by purpose.

3.7 References

BROM, 2001: Norwegian Brewers and Soft Drink Producers, Annual Statistics 2001, www.brom.no

Eurostat, 2001: *Environmental taxes - A statistical guide*

General National Fiscal Accounts, 1990 - 2000: St meld nr 3, Statsregnskapen medrekna folketrygda, Ministry of Finance.

Steurer A., 1998: Environmental taxes in the European Union - Draft version. Doc. Eco-taxes/98/1. Paper to the joint meeting of the working party "Economic Accounts for the Environment" and the sub-group "Environmental Expenditure Statistics" of the working group "Statistics of the Environment".

Sjølie H. and Sørensen Ø. K., 1999: Grønne skatter belyst ved nasjonalregnskapet, Økonomiske Analyser 9/99, 25 - 30.

4 Indirect emissions allocated to households

4.1 Introduction

In Statistics Norway's statistical system, emissions to air are related to those who directly are responsible for the activities that give rise to emissions. The direct emissions related to households as consumers, are those coming from consumption activities such as use of motor vehicles and heating dwellings. There are for example no direct emissions related to households consumption of books and newspapers, because these emissions are reported as generated by the companies producing these products.

When analysing emissions to air related to household consumption, we also want to include emissions related to the production processes of the goods and services consumed. Estimating the "hidden" indirect emissions to air will illustrate that some products and services that by first sight seems environmental friendly, nevertheless are generating emissions to air due to their past.

4.1.1 Background

The analysis presented in this article is part of the NOREEA-project (NORwegian Economic and Environmental Accounts project), a joint project between the division for environmental statistics and the division for national accounts in Statistics Norway. The project is co-financed by Eurostat. The overall objective for the project is to integrate environmental and national accounts data in a joint system, from which connections between economic activity and environmental issues can be described and analysed (Hass and Sørensen, 1998, 1999, 2000)

One of the issues emphasised in the NOREEA-project is the harmonisation of national accounts data and emissions to air data, i.e. the NAMEA-framework. The harmonisation processes between monetary and physical data, as well as data material between countries, are almost finalised. Norway has reported NAMEA-air data for air emissions for the years 1991-1997 to Eurostat. The next step is now to establish methods to analyse this data. In the first year of the NOREEA-project (1998) the national accounts data and the emission to air data were used in input-output analysis to provide information regarding the indirect emissions from the different economic industries of the Norwegian economy for the year 1993. Since this initial exploration of the data and technique, there have been no additional attempts to analyse the Norwegian NAMEA-air data in this manner.

4.1.2 The scope of this chapter

To see how the NAMEA-air data can be utilized to a larger extent, an analysis of indirect emissions to air allocated to final demand in households has been made using input-output analysis data from 1993 and from 1997.

The focus of this chapter is on the use of the NAMEA-air data to calculate "hidden" indirect air emissions related to household consumption of goods and services. The main objective of the calculations is to track all emissions to air related to household consumption of goods and services, not only the emissions from the direct use of these products, but also the indirect emissions resulting from the production process of these products. In view of the data requirements, we focus on emissions from domestic producers. This directs the attention to the producers which could most readily be influenced by the Government. In this connection, we identify the products that generate the most indirect emissions to air when consumed by households. An interesting question related to these analyses, is the possibility to analyse whether household consumption in Norway has developed in a more environmentally friendly way regarding emissions to air.

This analysis is similar to, but not as extensive as, the one made in Sweden (Wadeskog 2000) and the publication by Denmark (Statistics Denmark 2000).

4.2 Concepts, definitions and classifications

In this Chapter some important concepts, as well as input-data used in the analysis is defined.

4.2.1 Direct and indirect emissions to air

The emissions to air that directly can be attributed to households are readily observable from the Norwegian NAMEA-air data. Private household contributes directly to air emissions mainly through heating and driving. However, household consumption is responsible for other emissions as well. These emissions are referred to as indirect emissions, and are attributed to the producers of the products that are consumed. In order to reallocate the emissions to end users, the products that are consumed and the inputs used to produce them needs to be traced through the production chains, summing up emissions at each stage. This can been done by input-output analyses.

The generalised input-output framework used in this analysis has been extended to account for environmental pollution generation associated with inter-industry activity. This type of analysis uses the NAMEA-air direct emissions tables and the National Accounts as starting points. The methodology of the input-output analysis will be explained in Chapter 4.3. In Chapter 4.2.2 and Chapter 4.2.3, the different data used in the input-output analysis will be accounted for.

4.2.2 National Accounts

The input-output model used in this analysis is an *industry-by-industry* format of the input-output table. This is the traditional approach in Norway. This approach differs, however, from the homogenous branches-approach that is described in the ESA Chapter 9 (paragraphs 9.53 - 9.62). The starting point for the construction of the input-output table is the same, that is a set of supply and use tables.

In order to clarify the differences between the Norwegian approach as opposed to that of homogenous branches, the combined supply and use table from the ESA Table IX.3 is reproduced.

Figure 4.2.1: A Simplified combined supply and use table

Use / Supply		Products	Industries	Rest of the world	Final consumption and gross capital formation
		(1)	(2)	(3)	(4)
Products	(1)		Intermediate consumption (1,2)	Exports (1,3)	Final consumption and gross capital formation (1,4)
Industries	(2)	Output (2,1)	(2,2)	(2,3)	(2,4)
Components of value added			Value added		
Rest of the world	(3)	Imports (3,1)	(3,2)		(3,4)

The homogenous branches approach modifies the output matrix (the submatrix (2.1)) from the rectangular form in the basic supply and use table (SUT) to a quadratic matrix with entries along the

main diagonal only. Corresponding modifications are done to the matrix of intermediate input (1.2) and other inputs (labour, energy) that are reported by industry.

In Norway, a SUT table specifying approximately 180 industries and more than 1200 products form the basis. The further approach is then to distribute the imports and production figures by users, that is to estimate the matrices (2.2), (2.3), (2.4), (3.2) and (3.4).

We have chosen the industry-by-industry format mainly because this is the format demanded by the Norwegian data users. It allows the input-output table to be based on the same statistical units (Local Kind of Activity Units) that are used in other Norwegian statistics and in the Norwegian Supply and Use tables underlying the National Accounts. Also, we think that the assumptions used to compile the tables are much weaker than the ones that are necessary to produce a product-by-product table based on homogenous units.

The transformations used to construct the *industry-by-industry* input-output tables are done as a standard part of the yearly national accounts procedures. The input-output tables used in the applications are aggregated from these basic tables to the industry detail needed. The aggregate industries are not consolidated at the table level, so that the results to some extent correspond to those that would be produced if based on the detailed tables.

The starting point of the input-output transformations is to assume that exports are supplied by domestic industries. Thus, the matrix (2.3) is estimated, assuming that the distributions of exports of each product by supplying industries are proportional with the different industries production of the product. Imported goods and the remaining part of domestic produced products are then subsequently distributed proportional with the different domestic use of the product. This is done at the detailed level of industries and products in the national accounts. This means that the same import share applies to all domestic use categories of a product, and that all industries that supply a product, have the same market share in all types of use of that product.

The rows of the input-output table illustrate how the output of the industry is used partly for intermediate consumption in other industries and partly for final use (capital formation, exports, consumption). A column for an industry shows deliveries of inputs for intermediate consumption (at basic prices) from other industries, and the columns then express the structure of intermediate consumption.

For this analysis, the *industry-by-industry* table is aggregated to NACE rev.1 level to classify the industries. The data used on household final consumption expenditure are classified by the COICOP (Classification Of Individual COnsumption by Purpose). This classification is based on the one presented in SNA 1993 and ESA 1995. COICOP are however now revised.

4.2.3 Emissions to air data

The emissions data used is the Norwegian NAMEA-air data, which is based on Statistics Norway's emission model and covers emission to air in physical units. Some differences between these two presentations of air emission data are worth noticing. The air emissions in the Norwegian NAMEA-air are compiled according to the classifications and definitions of the national accounts, i.e. air emissions due to national economic activities. Air emissions from ocean transport, international air traffic and Norwegian residents abroad are included. The Statistics Norway's emission model only includes air emission from the national territory, including water transport between national harbours and air traffic at altitudes below 100 meter. These data therefore, contrary to the NAMEA-air data, follow the definitions according the Kyoto-protocol.

The NAMEA-air data only includes the emissions to air that are a result of Norwegian production. The emissions associated with the imported production of goods and services are not included.

It is worth noticing that the emissions to air data, both in the Norwegian NAMEA-air data and in Statistics Norway's emission model does not account for emissions to air from biomass used as fuel.

The greenhouse gases included in the calculations on which this article is based are carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). By integrating the radiative effect of a unit of a greenhouse gas over a certain time horizon, it is possible to get a rough measure of the warming potential of that gas. This method is called Global Warming Potential (GWP). It is common to use a 100-year time horizon (GWP-100), which is used in this analysis. It is also the convention to normalize the warming potential such that the warming potential of CO_2 is equal to one (i.e. all gases are compared to CO_2 when assessing their warming potentials). The gases are hence measured in CO_2-equivalents.

The acid rain gases included in the calculations on which this article is based are sulphur dioxides (SO_2), nitrogen oxides (NO_X) and ammonia (NH_3). It is possible to express these acid rain precursors in number of H+ moles per unit of gas emitted. The coefficients used for the calculation of acid rain precursors differ according to circumstances. The NAMEA-air pilot study suggest the use of a simple Potential Acid Equivalent index (PAE) that does not take into account the location of the emissions or their transport through the atmosphere. PAE will be used as an acidification index in this analysis.

4.3 Method used

The generalised input-output framework used in this analysis has been extended to account for environmental pollution generation associated with inter-industry activity.

4.3.1 Definition of the method

Definitions of the input-output framework:

x_i is the production in industry i, measured in basic value.
s_i is the production in industry i delivered to household final consumption, measured in basic value
h_{ij} is the production in industry i delivered to intermediate consumption in industry j, measured in basic value.
a_{ij} is the input-output giving the intermediate consumption in industry j delivered from industry i per unit of production in industry j.
ae_{jk} is the direct emission of component k from industry j per unit of production of industry j.

We find the following relations:
1) $x_i = h_{i1} + h_{i2} + \ldots + h_{in} + s_i \;,\; i = 1, \ldots, n$

The input-output coefficient is defined as:
$a_{ij} = h_{ij} / x_j \;,\; i, j = 1, \ldots, n$

Putting the input-output coefficient into equation 1), we receive:
1') $x_i = a_{i1} * x_1 + a_{i2} * x_2 + \ldots + a_{in} * x_n + s_i \;,\; i = 1, \ldots, n$

The emissions data are found directly in the Norwegian NAMEA matrix, defining
e_{jk} as the emission from industry j for emission component k, in physical units.

The direct emission coefficient for emission type k is defined as:
$ae_{jk} = e_{jk} / x_j \;,\; j = 1, \ldots, n$
which gives the amount of pollution type, k, generated per NOK's worth of industry j's output.

The assumptions for the input-output model are:

- Changes in final uses are exogenously given.
- The input-output coefficients a_{ij} are constant and independent of the changes in production level.
- The direct emissions coefficients ae_{jk} are constant and independent of the changes in production level.

Based on these assumptions, the set of equations form n equations as a function of final demand in each industry. Defining the equations as matrices can solve these equations:
X is a column vector with x_i as elements (the production in industry i).
S is a column vector with s_i as elements (final deliveries from industry i).
A is a matrix with a_{ij} as elements (input-output coefficients).
AE_K is a row vector with ae_{jk} as elements (direct emission coefficients).

Equation 1') can then be written as:
$X = AX + S \Rightarrow (I - A) * X = S$,
where I is an identity matrix. The inverse of the matrix (I - A) shows the total inter-industry production as a function of the final deliveries:

2) $X = (I - A)^{-1} * S$

The elements in equation 2) are called impact coefficients, v_{ij}, expressing the change in production in industry j when final deliveries from industry i increase with one unit. Equation 2 is a linear model. Changes in production as a function of changes in final demand can therefore be calculated by adding the change into the S-vector of equation 2. Total change in production caused by a change in final deliveries from industry i, assuming all other final deliveries as constant, can be calculated by summing all impact coefficients from column i, ie: $v_{i1} + v_{i2} + \ldots + v_{in}$. The sum is referred to as the input - output multiplier.

By adding the matrix of direct emission coefficients, AE_K, to the traditional Leontief model, $X = (I - A)^{-1} * S$, we can compute e_k as a function of final demand, that is the total pollution of each type k generated by the economy directly and indirectly in supporting that final demand:

3) $e_k = [AE_K (I - A)^{-1}] * S$

The bracketed quantity can be viewed as a matrix of total impact coefficients, that is, an element of this matrix is the total pollution impact generated per NOK's worth of final demand from the industries.

Most specific changes in final use would incorporate deliveries from several industries. Considering for instance a change in final use of households for own account transport (buying and using cars), this would normally involve deliveries from several industries, as petroleum refineries, repair shops, etc.. Out of a specific change in final demand of this consumption, a substantial part would be directed to imports. Further, this consumption is subject to product taxes, a fact that needs to be taken into account, assessing expected exogenous changes in deliveries from domestic industries measured in basic values.

4.3.2 Calculations

The national accounts and the Norwegian NAMEA-air data for 1993 and 1997 were used as basis to calculate the indirect emissions to air from final deliveries to households and to assign emissions to air to various product groups.

The Norwegian NAMEA-air data were combined with the industries' gross value of production to calculate the direct emission coefficients. In this analysis the direct emission coefficients show the number of kilo of each type of emissions to air that are connected to each million NOK produced in an industry (see appendix 4.C.1 and 4.C.2). These coefficients can indicate the emission intensity of one industry in comparison to another. However, a limitation is the impossibility to differentiate between different productions processes within one industry, assuming all products produced in one industry as homogenous in regard to pollution intensity.

On the basis of the national accounts *industry-by-industry* matrix, the A-matrix with input-output coefficients is calculated. Next, the inverted matrix of input-output coefficients was multiplied by the final deliveries to households. This produces a matrix that tracks all the economic activity that follows from the final deliveries to households.

The matrix tracking the economic activity attributed to final deliveries to households then multiplies the direct emission coefficients. The results of these calculations are the emissions to air from the industries that are attributed to final deliveries to Norwegian households. These emissions are referred to as the indirect emissions arising from household consumption.

The total final deliveries were also divided in different product groups according to COICOP, to identify what products that generated the most indirect emissions to air (see appendix 4.A.1, 4.A.2, 4.B.1, 4.B.2). In this article, the different product groups are aggregated to 10 different groups (Table 4.4.4).

4.4 Results

The main results from the calculations will be presented in this Chapter. Although the calculations were done for each of the emission components, main emphasis will be put on the results in terms of CO_2-equivalents and acid rain precursors.

4.4.1 Direct emissions to air

As basis for later comparison, we first present direct emissions to air data for industries and households. Due to annual revisions of the emissions to air data, the numbers that are presented here might differ from the Norwegian NAMEA-air data that have already been reported to Eurostat.

Total direct greenhouse gas emissions from Norwegian industries increased from 1993 to 1997 by 17.67 percent, from 51 533 to 61 178 thousand tonnes CO_2-equivalents. Total direct greenhouse gas emissions from households increased in the same period by 1.50 percent, from 5601 to 5685 thousand tonnes CO_2-equivalents (see Table 4.4.1). It is worth noticing that 7 industries bear approximately 75 percent of the total emissions of greenhouse gases, and these industries have increased their emissions the most in the period 1993 to 1997 (see Table 4.4.2). Direct household emissions to air of greenhouse gases from heating have in the same period increased by 7.9 percent, while emissions to air from transport have decreased by 0.3 percent.

Total direct acid rain precursors emissions from Norwegian industries increased from 1993 to 1997 by 17.46 percent, from 13.15 to 15.48 thousand tonnes acid-equivalents. Total direct acid rain precursors emissions from households decreased in the same period by 24.31 percent, from 0.831 to 0.629 (see Table 4.4.1). It is worth noticing that Ocean transport abroad (NACE 619) in 1993 alone accounted for 56.5 percent of the total acid rain precursors, and in 1997 this share has increased to 56.5 percent. Ocean transport abroad is the industry that increases its emissions the most in the period 1993 to 1997 (see Table 4.4.2). Emission related to Ocean transport do not fall down on Norwegian territory. Direct household emissions to air of acid rain precursors from heating have in the same period increased by 4.6 percent, while emissions to air from transport have decreased by 27.7 percent.

Table 4.4.1: Direct emissions to air from national producers and households, 1993 and 1997.

1000 tonnes		CH_4	CO_2	N_2O	CO2-equivalents	NO_x	NH_3	SO_x	Acid rain equivalents
1993	Total direct emissions from national producers	318.9	40178.9	15.0	51532.6	379.1	24.5	111.1	13.2
	Total direct emissions from households	9.19	5 290	0.379	5601	34.52	0.356	1.906	0.831
1997	Total direct emissions from national producers	333.9	49483.1	15.1	61177.7	475.8	25.5	116.3	15.5
	Total direct emissions from households	10.15	5222	0.803	5685	24.89	0.853	1.237	0.629

Table 4.4.2: Changes in direct emissions to air for some selected industries, 1993 and 1997.

		CO2-equivalents			Acid-equivalents		
		% of total emission		% change in emissions from 93 -97	% of total emission		% change in emissions from 93 -97
NACE rev. 1	Industry	1993	1997		1993	1997	
1	Agriculture	10.7 %	9.0 %	-0.2	11.9 %	10.3 %	1.2 %
11	Oil and gas extraction sector	17.7 %	17.9 %	20.0	7.6 %	7.4 %	15.0 %
24	Manufacture of chemicals and chemicals products	8.1 %	7.4 %	8.1	2.7 %	2.2 %	-3.0 %
279	Other manufacture of basic metals	6.4 %	7.4 %	37.0	3.4 %	2.8 %	-2.6 %
602	Other land transport	5.1 %	4.8 %	11.3	4.9 %	3.6 %	-12.8 %
619	Ocean transport abroad	18.9 %	22.3 %	40.1	51.2 %	56.5 %	30.0 %
90	Sewage and refuse disposal, sanitation etc	6.7 %	5.8 %	3.1	0.0 %	0.0 %	-74.9 %

4.4.2 Indirect emissions to air

As defined in Chapter 4.2.1, some of the direct emissions to air from Norwegian industries can be seen as emissions related to final deliveries to households, i.e. household's indirect emissions to air.

Emphasis will mainly be put on the indirect emissions to air related to final deliveries to households. The results presented in Table 4.4.3a and Table 4.4.3b show that the indirect emissions to air from households are higher than the direct emissions from the households. The indirect household green gas emissions increased from 1993 to 1997 by 8.40 percent, from 10127 to 10978 thousand tonnes CO_2-equivalents. The indirect household acid rain precursors emissions increased from 1993 to 1997 by 9.10 percent, from 2.0 to 2.2 thousand tonnes acid-equivalents.

The total indirect emissions allocated to final demand categories should ideally add up to total direct emissions from national producers. The discrepancy between these two factors is in Table 4.4.3 a and b entitled 'Other'. The reason is that FISIM (Financial intermediate services indirectly measured) and trade margins have not been included in the calculations. In the Norwegian National Accounts, FISIM is not distributed to the different industries. In the input-output tables, FISIM is regarded as a negative final demand category, but not included in the calculation of total indirect emissions. The trade margins are not included because this analysis is based on final deliveries at basic values only. However, there are possibilities to include the trade margins in this kind of analyses.

Table 4.4.3a: Indirect emissions allocated to final demand categories (1000 tonnes) (1993)

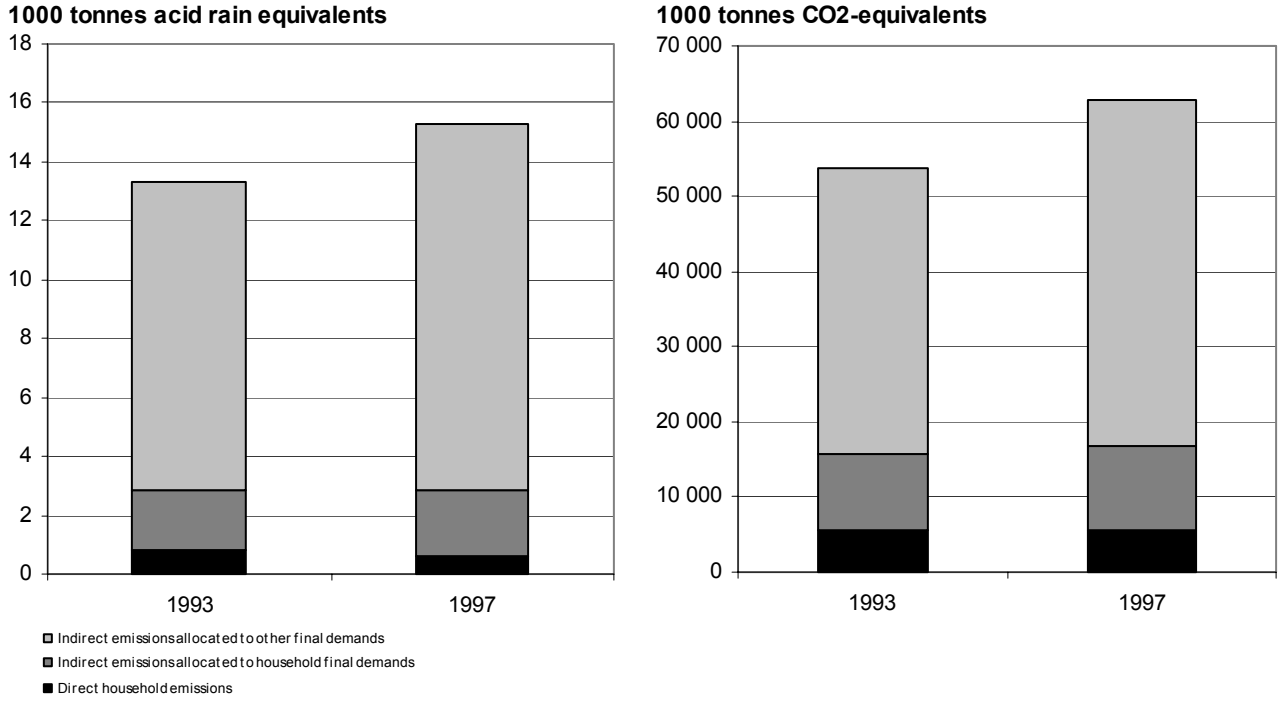
	CH_4	CO_2	N_2O	CO2-equivalents	NO_x	NH_3	SO_2	Acid-equivalents
Household consumption	151.2	5 038.5	6.2	10 126.7	44.6	14.5	6.3	2.0
Public -sector consumption	25.0	2 045.1	0.8	2 815.4	13.6	0.9	2.2	0.4
Investments	38.9	3 727.4	1.9	5 139.8	24.5	3.7	4.0	0.9
Export	80.9	26 637.3	5.8	30 132.0	270.8	5.0	95.5	9.2
Total	296.0	37 448.2	14.7	48 214.0	353.5	24.1	108.0	12.5
Other	22.90	2 730.7	0.3	3 318.6	25.6	0.4	3.10	0.7
Total direct emission from national producers	318.9	40 178.9	15.0	51 532.6	379.1	24.5	111.1	13.2

Table 4.4.3b: Indirect emissions allocated to final demand categories (1000 tonnes) (1997)

	CH_4	CO_2	N_2O	CO2-equivalents	NO_x	NH_3	SO_2	Acid-equivalents
Household consumption	159.3	5 651.0	6.4	10 977.9	49.9	16.0	5.7	2.2
Public -sector consumption	23.9	2 064.5	0.7	2 783.4	11.9	0.8	1.8	0.4
Investments	31.7	4 731.1	1.0	5 720.6	29.6	1.1	4.6	0.9
Export	94.7	33 591.7	6.4	37 566.2	354.3	6.9	100.1	11.2
Total	309.7	46 038.3	14.5	57 048.1	445.7	24.8	112.2	14.7
Other	24.20	3 444.8	0.60	4 129.6	30.10	0.70	4.1	0.8
Total direct emission from national producers	333.9	49 483.1	15.1	61 177.7	475.6	25.5	116.3	15.5

Figure 4.4.1 shows the direct emissions related to household consumption, as well as the indirect emissions allocated to final demand in household.

Figure 4.4.1: Direct and indirect emissions to air related to household final demand



4.4.3 Households' total emissions to air

Combining the indirect and the direct emissions to air related to household consumption, total household greenhouse gas emissions increased by 5.94 percent, from 15 728 to 16 633 thousands tonnes CO_2-equivalents, while acid rain precursors emission actually decreased by 12.54 percent, from 3.03 to 2.65 thousand tonnes acid-equivalents.

This result is surprising at first, until private consumption and industry emissions are examined in more detail.

4.4.4 Indirect emissions to air split by products

When analysing the indirect emissions to air related to final deliveries to household consumption, an interesting approach is to identify the products that through their production processes generate the most emissions to air.

As seen in Table 4.4.4, the deliveries of food, beverages and tobacco to household consumption bear approximately 40 percent of the total household indirect green house gas emissions. 35 percent of these emissions to air are related to deliveries of food, while almost 5 percent are related to deliveries of beverages.

The deliveries of food, beverages and tobacco to household consumption bear more than 50 percent of the total household indirect acid rain precursors gas emissions. 49 percent of these emissions to air are related to deliveries of food, while almost 5 percent are related to deliveries of beverages.

Table 4.4.4 Indirect household emission to air divided into product groups, 1993 and 1997

	CO_2-equivalents				**Acid-equivalents**			
	1993		**1997**		**1993**		**1997**	
	1000 tonnes	Share of total (%)	1000 tonnes	Share of total (%)	1000 tonnes	Share of total (%)	1000 tonnes	Share of total (%)
Total private consumption	**10 127**		**10 978**		**2,02**		**2,21**	
Food, beverages and tobacco	4 089	40.4	4 322	39.4	1.10	54.58	1.18	53.7
Clothing and footwear	26	0.3	19	0.2	0.00	0.20	0.00	0.1
Housing, water, electricity and other fuels	2 190	21.6	2 256	20.6	0.10	5.10	0.11	4.9
Furnishings, household equipment etc	233	2.3	237	2.2	0.03	1.29	0.03	1.2
Health (private)	113	1.1	94	0.9	0.01	0.69	0.01	0.5
Transport	2 155	21.3	2 387	21.7	0.53	25.98	0.57	25.9
Leisure, entertainment and culture	453	4.5	587	5.3	0.09	4.60	0.12	5.5
Education	19	0.2	21	0.2	0.00	0.15	0.00	0.1
Hotels, cafes and restaurants	525	5.2	625	5.7	0.11	5.29	0.13	5.9
Other goods and services	324	3.2	429	3.9	0.04	2.18	0.05	2.2

4.5 Household consumption versus emissions to air

It is often assumed that increased household consumption would automatically result in an associated increase in emissions to air. In our analysis this result was not found.

In Norway, the economy was weak in 1993 whereas in 1997 the economy was very strong. Between these two years, private consumption in monetary terms increased from 403 789 million NOK to 476 462 million NOK (in constant 1995 prices). This is an 18.00 percent increase in real terms.

Table 4.5.1: Change in percent in emission to air from 1993 to 1997

	Change in percent in emission to air from 1993 to 1997	
	CO_2-equivalents	**Acid-equivalents**
Total direct emissions to air	17.03	15.18
Direct household emissions	1.50	-24.31
Direct industries emissions	17.67	17.46
Of which indirect household emission	8.40	9.10

Table 4.5.1 summarises some of the results presented in Chapter 4.4. Although there was an increase in household's direct and indirect emissions to air measured in CO_2-equivalents, the increase was not as large as the volume increase in household consumption.

From this information one conclusion could be that household consumption is de-coupled from the associated air emissions indicating an improvement in environmental efficiency. A more likely explanation can be found by analysing the indirect household emission to air and the amount of imports that are associated with household consumption, as well as the amount of exports that are part of the emissions intensive industries.

4.5.1 Import

A limitation of this analysis is that the data material only includes emissions to air data that are a result of Norwegian production. The emissions associated with the production of imported goods and services are not included, because we only analyse emissions from resident producers. This might be one reason to the lack of correlation between the emission to air data and the household consumption data. The major part of air emissions that could be attributed to household consumption is embedded in the Norwegian imports.

Norwegian households use a fairly large amount of imported goods. The production of the imported goods does not cause emissions that are included in Norwegian emissions figures. In current prices, household consumption from imported products were 52 897 million NOK in 1993 and 71 961 million NOK in 1997 (these values were not immediately available in constant prices so the real change is less than 36 percent but is still very substantial). This is a 36 percent increase.

Examining the import statistics in more detail for the product groups of *Clothing and footwear and Furnishing,* household *equipment etc.* and *health services* shows some interesting results when compared to table 4.5.2. Table 4.5.2 shows that the indirect emissions to air from final deliveries to households of these products have either declined or slightly increased between 1993 and 1997. The import statistics shows that the import of *Clothing and footwear* has increased by 24.13 percent, *Furnishing,* household *equipment etc* has increased by 36.50 percent and *health services* have increased by 11.06 percent.

Table 4.5.2: Change in percent in sources to indirect household emission to air

	CO_2-equivalents (1000 tons)			Acid-equivalents (1000 tons)		
	1993	**1997**	**% change**	**1993**	**1 997**	**% change**
Total private consumption	**10 127**	**10 978**	**8.4**	**2.02**	**2.21**	**9.1**
Food, beverages and tobacco	4 089	4 322	5.7	1.10	1.18	7.3
Clothing and footwear	26	19	-24.9	0.00	0.00	-25.0
Housing, water, electricity, gas and other fuels.	2 190	2 256	3.0	0.10	0.11	5.8
Furnishings, household equipment etc.	233	237	1.6	0.03	0.03	3.8
Health (private)	113	94	-16.6	0.01	0.01	-14.3
Transport	2 155	2 387	10.8	0.53	0.57	8.6
Leisure, entertainment and culture	453	587	29.6	0.09	0.12	30.1
Education	19	21	9.1	0.00	0.00	0.0
Hotels, cafes and restaurants	525	625	19.0	0.11	0.13	20.6
Other goods and services	324	429	32.5	0.04	0.05	9.1

Household consumption of imported products as a percentage of total household consumption increased from 13.25 percent in 1993 to 14.50 percent in 1997. An increase in energy use by households also does not contribute too radically to increased emissions since most of the electricity production in Norway is from hydroelectric power plants.

4.5.2 Export

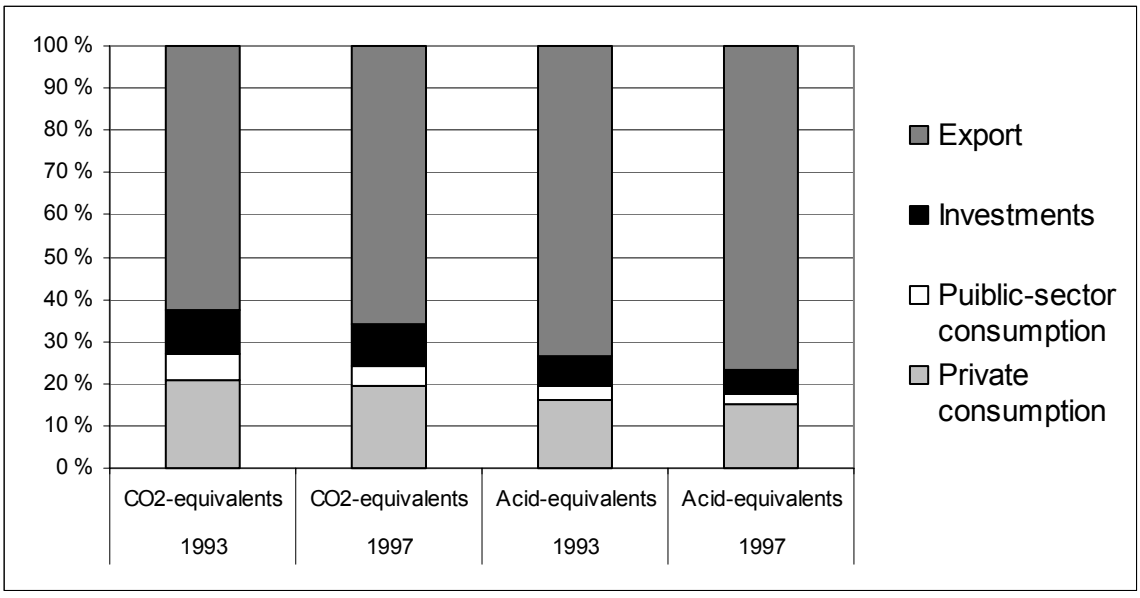
In addition to the fact that Norwegian households use a fairly large amount of imported goods, many of the emission intensive products produced by Norwegian industries are exported.

In Norway much of the production from the industries that account for the majority of the emissions of greenhouse gases and the acid rain precursors is exported and is not a direct part of Norwegian household consumption. Examining the direct emission coefficients, the industries that are the most emission intensive are identified as *Inland water transport* (NACE 611), *Ocean transport abroad* (NACE 619), *Other land transport* (NACE 602), *Manufacture of non-metallic mineral products* (NACE 269), *Other manufacture of basic metals* (NACE 279), *Manufacture of coke, refined petroleum products and nuclear fuel* (NACE 23), *Manufacture of chemicals and chemicals products* (NACE 24), as well as *Agriculture* (NACE 01) and *Fishing* (NACE 05). In addition the *Oil and gas extraction sector* (NACE 11) is one of the major sources of greenhouse gas emission and acid rain precursors emissions in Norway.

Most of these sectors have in common that their products are primarily exported and not purchased by households.

Figure 4.5.1 illustrates that export allocates most of the indirect emissions due final demand categories.

Figure 4.5.1: Indirect emissions allocated to final demand categories, as percent of total indirect emissions. CO_2-eqivalents and Acid-equivalents. 1993 and 1997.



4.5.3 Have households developed in a more environmental friendly way?

Using the traditional Leontief input-output method as in this analysis, it is hard to conclude whether households have become more environmental friendly due to air emissions.

In general, Norwegian household consumption patterns do not greatly influence the total air emissions from Norwegian resident producers due to a relatively high level of imported consumer goods. The expenditures of Norwegian households accordingly has some indirect impact on the air emissions of the other countries producing the imported products. Production related to Norwegian export activities accounts for the majority of the Norwegian emissions. Changes in industries' production influence the

Norwegian emissions pattern much more than what can be explained from household consumption patterns.

4.6 Future work

One of the problems with the present analysis is the absence of emissions to air related to import of goods and services. The simplest method is to use domestic direct emission coefficients for imports. This method does not produce the actual emissions associated to imports, but the emissions due to 'displaced production' assuming domestic and foreign industries generate the same amount of emissions to air. In addition to the emission related to the production abroad of the imported products, we have emissions from the related transport activities. Only activities of non-resident transporters should be added, as emissions of resident transport firms are included in the along with other resident producers in our analyses. This method will nonetheless be difficult to use on imported goods and services that are not produced domestically, but could give a first approximation and an idea of the size of the emissions involved.

The ideal solution for estimating the actual emissions associated to imports would be the use of environmental accounts for the trading partners. As many of our trading partners now have environmental accounts, we shall look into the feasibility of such analyses. However, our trading partners also have imports with related emissions in other countries. So, such an approach demands large data requirements. A simplified solution may still be preferable.

With the objective of improving the quality of analyses that allocate emissions to final demand categories, we will concentrate future work in this area on developing methods to account for emissions associated with import of goods and services. A possible extension could be to analyse total emissions (direct and indirect) related to the generation of waste in the households.

4.7 References

Hass and Sørensen (1998): Norwegian Economic and Environment Accounts (NOREEA Phase 2) Project, 1998 Final Report to Eurostat. Project No. 72950002

Hass and Sørensen (1999): Norwegian Economic and Environment Accounts (NOREEA) Project, 1999 Final Report to Eurostat. Project No. 8412002

Hass and Sørensen (2000): Norwegian Economic and Environment Accounts (NOREEA Phase 2) Project, 2000 Final Report to Eurostat. Project No. 79412002

Statistiscs Norway (2001): *Direct and indirect household emissions of greenhouse gases in Norway*. in: Natural resources and the Environment 2001, ch 11.7 pp 210-212.

Statistics Denmark (2000): Miljøøkonomisk regnskab for Danmark 1998. Statistiske efter retninger: Miljø og energi, nr. 12.

Wadeskog, A. (2000): Hushållen og miljön, VälfärdsBulletinen. Nr. 1. 14-15. http://www.scb.se/publkat/allman/valfard/valfard1_00.asp

Appendix 4.A.1

Direct emission coefficients, acid equivalents. 1993.

	Direct emissions from Norwegian industries				Production	Direct emission (kilo) per produced mill nok			
NACE rev.1	NOx	NH_3	SO_2	Acid equiv.	Mill NOK 1993-basic prices	NOx	NH_3	SO_2	Acid quiv.
1	6 544.7	24 051.0	395.5	1 569.4	26 033	251.4	923.8675	15.2	60.3
2	831.4	0.1	35.8	19.2	3 230	257.4	0.0247	11.1	5.9
5	27 766.4	0.2	935.4	632.9	12 459	2 228.6	0.0152	75.1	50.8
10	32.6	0.0	5.0	0.9	134	243.2	0.1610	37.3	6.5
11	44 754.6	0.0	910.6	1 001.4	128 303	348.8	0.0000	7.1	7.8
13	419.9	0.1	481.9	24.2	982	427.6	0.0646	490.7	24.6
14	637.2	0.1	89.5	16.7	2 853	223.4	0.0322	31.4	5.8
15	1 358.5	0.9	929.2	58.6	78 848	17.2	0.0113	11.8	0.7
16	14.8	0.1	2.6	0.4	893	16.6	0.1432	2.9	0.5
17	32.2	0.0	47.0	2.2	3 734	8.6	0.0088	12.6	0.6
18	3.0	0.0	0.9	0.1	1 189	2.5	0.0055	0.8	0.1
19	2.6	0.0	1.8	0.1	589	4.4	0.0001	3.0	0.2
20	542.3	0.1	173.8	17.2	11 577	46.8	0.0075	15.0	1.5
21	1 870.2	0.0	1 513.8	88.0	15 796	118.4	0.0014	95.8	5.6
22	63.7	0.3	5.1	1.6	24 291	2.6	0.0138	0.2	0.1
23	3 821.4	0.0	2 313.7	155.4	16 788	227.6	0.0029	137.8	9.3
24	4 373.1	316.1	7 847.7	358.9	24 973	175.1	12.6569	314.2	14.4
25	28.3	0.0	33.7	1.7	5 330	5.3	0.0031	6.3	0.3
261	100.9	0.0	171.8	7.6	1 266	79.7	0.0075	135.7	6.0
269	4 263.4	0.0	1 348.9	134.8	6 818	625.3	0.0041	197.8	19.8
271	336.4	0.0	287.4	16.3	6 921	48.6	0.0006	41.5	2.4
279	6 207.4	0.0	10 087.2	450.2	19 182	323.6	0.0009	525.9	23.5
28	128.5	0.2	33.7	3.9	11 141	11.5	0.0142	3.0	0.3
29	78.8	0.3	30.4	2.7	18 825	4.2	0.0134	1.6	0.1
30	2.0	0.0	0.4	0.1	964	2.0	0.0171	0.4	0.1
31	120.9	0.0	62.5	4.6	9 419	12.8	0.0037	6.6	0.5
32	3.4	0.0	0.9	0.1	3 846	0.9	0.0058	0.2	0.0
33	2.1	0.0	0.3	0.1	4 441	0.5	0.0010	0.1	0.0
34	14.9	0.0	8.7	0.6	2 516	5.9	0.0017	3.5	0.2
35	219.8	0.2	70.5	7.0	34 167	6.4	0.0048	2.1	0.2
36	37.6	0.1	14.2	1.3	7 620	4.9	0.0100	1.9	0.2
37	0.0	0.0	0.0	0.0	432	0.0	0.0000	0.0	0.0
401	1 316.3	1.1	714.6	51.0	28 081	46.9	0.0394	25.4	1.8
403	0.0	0.0	0.0	0.0	294	0.0	0.0000	0.0	0.0
41	245.5	0.0	24.6	6.1	2 046	120.0	0.0195	12.0	3.0
45	5 093.2	3.9	295.2	120.2	87 210	58.4	0.0444	3.4	1.4
50	9 152.3	60.2	497.9	218.1	136 228	67.2	0.4419	3.7	1.6
55	107.6	0.8	37.4	3.6	23 125	4.7	0.0334	1.6	0.2
601	1 523.9	0.0	74.5	35.5	6 890	221.2	0.0000	10.8	5.1
602	27 056.4	10.7	1 769.8	644.1	25 880	1 045.5	0.4122	68.4	24.9
603	35.9	0.0	0.0	0.8	12 710	2.8	0.0000	0.0	0.1
611	23 708.0	0.0	1 407.3	559.4	4 503	5 264.9	0.0000	312.5	124.2
619	197 626.4	0.0	77 815.2	6 728.0	55 307	3 573.3	0.0000	1 407.0	121.6
62	1 105.4	0.0	43.6	25.4	14 327	77.2	0.0000	3.0	1.8
63	1 496.0	1.1	68.4	34.7	26 937	55.5	0.0406	2.5	1.3
64	1 023.9	10.2	30.8	23.8	27 814	36.8	0.3649	1.1	0.9
650	355.0	3.8	26.5	8.8	53 314	6.7	0.0712	0.5	0.2
70	461.6	3.2	25.6	11.0	153 545	3.0	0.0210	0.2	0.1
75	2 914.8	0.9	140.6	67.8	78 166	37.3	0.0113	1.8	0.9
80	194.8	1.8	41.0	5.6	45 586	4.3	0.0387	0.9	0.1
85	510.9	3.9	157.4	16.3	83 474	6.1	0.0471	1.9	0.2
90	121.6	0.4	32.7	3.7	5 746	21.2	0.0758	5.7	0.6
91	30.1	0.0	26.8	1.5	7 398	4.1	0.0000	3.6	0.2
92	15.4	0.0	5.7	0.5	19 864	0.8	0.0000	0.3	0.0
93	354.4	2.8	26.4	8.7	5 856	60.5	0.4823	4.5	1.5
Total	**379 062.4**	**24 474.7**	**111 102.1**	**13 152.1**	**1 389 861**				

Appendix 4.A.2

Direct emission coefficients, acid equivalents. 1997.

	Direct emissions from Norwegian industries				Production Mill NOK 1997-basic prices	Direct emission (kilo) per produced mill nok			
NACE rev.1	NOx	NH_3	SO_2	Acid equiv.		NOx	NH_3	SO_2	Acid quiv.
1	5 433.7	24 875.9	218.1	1 588.2	24 589	221.0	1011.6691	8.9	64.6
2	749.1	0.1	17.4	16.8	4 277	175.2	0.0168	4.1	3.9
5	34 694.3	0.7	659.0	774.9	18 587	1 866.6	0.0402	35.5	41.7
10	30.7	0.0	3.5	0.8	152	202.1	0.2333	23.2	5.1
11	52 235.8	0.0	504.5	1 151.3	201 818	258.8	0.0000	2.5	5.7
13	158.2	0.1	46.8	4.9	744	212.6	0.1824	62.9	6.6
14	835.3	0.1	60.8	20.1	4 647	179.7	0.0266	13.1	4.3
15	1 262.4	1.8	719.4	50.0	91 670	13.8	0.0200	7.8	0.5
16	10.8	0.2	1.0	0.3	861	12.5	0.2279	1.1	0.3
17	82.1	0.1	41.1	3.1	4 194	19.6	0.0134	9.8	0.7
18	10.4	0.0	1.1	0.3	1 480	7.0	0.0291	0.8	0.2
19	10.1	0.0	1.2	0.3	532	19.1	0.0130	2.3	0.5
20	489.5	0.2	220.0	17.5	16 971	28.8	0.0116	13.0	1.0
21	2 638.7	0.1	2 447.4	133.8	18 272	144.4	0.0045	133.9	7.3
22	54.1	1.0	3.9	1.4	31 081	1.7	0.0315	0.1	0.0
23	3 358.4	0.0	2 010.7	135.8	19 279	174.2	0.0009	104.3	7.0
24	5 222.9	318.3	6 902.7	348.0	32 289	161.8	9.8594	213.8	10.8
25	66.3	0.1	25.8	2.3	7 530	8.8	0.0084	3.4	0.3
261	190.1	0.0	133.4	8.3	2 173	87.5	0.0113	61.4	3.8
269	4 770.1	0.1	1 923.0	163.8	12 012	397.1	0.0103	160.1	13.6
271	302.6	0.0	69.3	8.7	8 826	34.3	0.0009	7.8	1.0
279	7 435.6	0.1	8 853.3	438.3	29 022	256.2	0.0031	305.1	15.1
28	149.8	0.5	16.3	3.8	17 204	8.7	0.0319	0.9	0.2
29	166.5	0.5	31.7	4.6	28 118	5.9	0.0161	1.1	0.2
30	0.0	0.0	0.0	0.0	1 521	0.0	0.0000	0.0	0.0
31	140.9	0.1	67.9	5.2	12 351	11.4	0.0055	5.5	0.4
32	3.0	0.1	0.2	0.1	7 236	0.4	0.0078	0.0	0.0
33	3.5	0.1	0.2	0.1	7 856	0.4	0.0101	0.0	0.0
34	65.7	0.0	9.9	1.7	5 091	12.9	0.0047	1.9	0.3
35	159.7	0.3	35.4	4.6	53 424	3.0	0.0054	0.7	0.1
36	80.0	0.2	11.8	2.1	11 743	6.8	0.0158	1.0	0.2
37	33.3	0.0	6.9	0.9	910	36.6	0.0061	7.6	1.0
401	1 369.3	1.5	676.5	51.0	32 506	42.1	0.0466	20.8	1.6
403	0.0	0.0	0.0	0.0	372	0.0	0.0000	0.0	0.0
41	114.3	0.0	9.6	2.8	2 907	39.3	0.0082	3.3	1.0
45	6 223.5	10.3	210.3	142.5	126 590	49.2	0.0814	1.7	1.1
50	6 728.3	170.2	256.5	164.3	173 372	38.8	0.9817	1.5	0.9
55	99.2	2.1	25.6	3.1	30 889	3.2	0.0695	0.8	0.1
601	1 106.4	0.0	31.0	25.0	9 214	120.1	0.0000	3.4	2.7
602	24 220.8	38.6	1 044.6	561.5	37 598	644.2	1.0275	27.8	14.9
603	44.2	0.0	0.0	1.0	14 207	3.1	0.0000	0.0	0.1
611	30 987.7	0.0	1 276.0	713.5	4 954	6 255.1	0.0000	257.6	144.0
619	276 898.6	0.0	87 293.4	8 747.5	63 762	4 342.7	0.0000	1 369.1	137.2
62	1 312.2	0.0	61.8	30.5	17 531	74.9	0.0000	3.5	1.7
63	1 165.4	3.6	33.9	26.6	37 200	31.3	0.0958	0.9	0.7
64	738.6	25.4	12.5	17.9	36 096	20.5	0.7031	0.3	0.5
650	238.3	8.9	12.4	6.1	57 329	4.2	0.1550	0.2	0.1
70	561.7	11.7	21.4	13.6	206 810	2.7	0.0563	0.1	0.1
75	2 134.5	1.1	86.8	49.2	87 317	24.4	0.0122	1.0	0.6
80	165.6	3.1	48.7	5.3	56 709	2.9	0.0548	0.9	0.1
85	428.0	11.8	78.2	12.4	106 984	4.0	0.1101	0.7	0.1
90	39.4	0.2	1.8	0.9	8 337	4.7	0.0298	0.2	0.1
91	19.2	0.0	11.0	0.8	8 890	2.2	0.0000	1.2	0.1
92	39.1	0.0	8.9	1.1	24 473	1.6	0.0001	0.4	0.0
93	272.2	6.5	38.2	7.5	8 011	34.0	0.8161	4.8	0.9
Total	**475 750.1**	**25 495.9**	**116 282.9**	**15 476.0**	**1 828 518**				

Appendix 4.B.1

Direct emission coefficients, acid equivalents. 1993.

	Direct emissions from Norwegian industries				Production Mill NOK 1997-basic prices	Direct emission (kilo) per produced mill nok			
NACE rev.1	CH_4	CO_2	N_2O	CO_2- equiv		CH_4	CO_2	N_2O	CO_2-equiv
1	102 599.8	693 604.1	8 669.9	5 535 876.2	26 033	3 941.1	26 643.3	333.0	212 648.4
2	11.6	54 224.0	20.8	60 907.6	3 230	3.6	16 787.6	6.4	18 856.8
5	96.0	1 261 525.5	31.6	1 273 336.9	12 459	7.7	101 254.2	2.5	102 202.2
10	143.8	7 729.3	0.1	10 782.4	134	1 073.4	57 681.1	0.8	80 465.8
11	24 946.3	8 557 392.5	76.2	9 104 871.2	128 303	194.4	66 696.7	0.6	70 963.8
13	2.2	80 266.9	9.5	83 266.3	982	2.2	81 738.1	9.7	84 792.5
14	4.1	97 326.4	14.5	101 923.1	2 853	1.4	34 113.7	5.1	35 724.9
15	22.4	509 419.5	6.1	511 772.9	78 848	0.3	6 460.8	0.1	6 490.6
16	1.0	4 398.1	0.2	4 473.8	893	1.1	4 925.1	0.2	5 009.8
17	0.9	23 140.1	0.2	23 234.6	3 734	0.2	6 197.1	0.1	6 222.5
18	0.1	1 411.1	0.0	1 418.6	1 189	0.1	1 186.8	0.0	1 193.1
19	0.1	2 913.3	0.0	2 922.5	589	0.1	4 946.2	0.0	4 961.7
20	17 730.5	58 427.0	20.8	437 214.6	11 577	1 531.5	5 046.8	1.8	37 765.8
21	13 189.3	262 856.7	113.7	575 083.4	15 796	835.0	16 640.7	7.2	36 406.9
22	3.3	45 438.4	0.6	45 682.9	24 291	0.1	1 870.6	0.0	1 880.7
23	737.5	2 497 446.2	19.2	2 518 895.9	16 788	43.9	148 763.8	1.1	150 041.5
24	967.5	2 615 541.2	5 037.5	4 197 476.1	24 973	38.7	104 734.8	201.7	168 080.6
25	0.8	25 767.4	0.2	25 856.1	5 330	0.2	4 834.4	0.0	4 851.1
261	2.6	64 461.0	0.6	64 712.6	1 266	2.0	50 917.0	0.5	51 115.8
269	12.7	1 533 590.6	4.1	1 535 119.1	6 818	1.9	224 932.6	0.6	225 156.8
271	0.9	651 134.9	0.5	651 293.0	6 921	0.1	94 081.0	0.1	94 103.9
279	6.3	3 318 076.3	2.4	3 318 962.6	19 182	0.3	172 978.6	0.1	173 024.8
28	3.1	59 869.8	0.7	60 156.0	11 141	0.3	5 373.8	0.1	5 399.5
29	2.9	49 142.3	0.6	49 402.6	18 825	0.2	2 610.5	0.0	2 624.3
30	0.1	714.1	0.0	721.8	964	0.1	740.8	0.0	748.8
31	1.5	104 180.4	0.4	104 344.7	9 419	0.2	11 060.7	0.0	11 078.1
32	0.2	1 599.5	0.0	1 612.3	3 846	0.0	415.9	0.0	419.2
33	0.0	575.4	0.0	579.3	4 441	0.0	129.6	0.0	130.4
34	0.5	12 822.6	0.1	12 873.1	2 516	0.2	5 096.4	0.1	5 116.5
35	3.1	60 990.7	0.8	61 305.6	34 167	0.1	1 785.1	0.0	1 794.3
36	1.6	22 944.4	0.4	23 101.4	7 620	0.2	3 011.1	0.1	3 031.7
37	0.0	0.0	0.0	0.0	432	0.0	0.0	0.0	0.0
401	108.7	215 030.3	5.9	219 150.7	28 081	3.9	7 657.5	0.2	7 804.2
403	0.0	0.0	0.0	0.0	294	0.0	0.0	0.0	0.0
41	2.8	35 459.6	0.6	35 690.5	2 046	1.4	17 331.2	0.3	17 444.1
45	45.3	482 882.3	84.4	510 012.2	87 210	0.5	5 537.0	1.0	5 848.1
50	363.7	1 195 037.7	54.3	1 219 498.4	136 228	2.7	8 772.3	0.4	8 951.9
55	10.4	58 433.4	1.1	58 983.1	23 125	0.5	2 526.8	0.0	2 550.6
601	6.4	107 320.4	38.9	119 501.3	6 890	0.9	15 576.2	5.6	17 344.2
602	171.0	2 601 311.9	50.4	2 620 515.6	25 880	6.6	100 514.4	1.9	101 256.4
603	5.2	13 389.5	0.1	13 532.5	12 710	0.4	1 053.5	0.0	1 064.7
611	83.6	1 154 830.3	29.1	1 165 604.3	4 503	18.6	256 458.0	6.5	258 850.6
619	697.1	9 659 685.1	242.5	9 749 496.0	55 307	12.6	174 655.7	4.4	176 279.6
62	29.5	717 387.4	22.7	725 045.9	14 327	2.1	50 072.4	1.6	50 607.0
63	13.6	130 652.0	2.9	131 839.2	26 937	0.5	4 850.3	0.1	4 894.4
64	54.4	123 583.1	8.0	127 219.9	27 814	2.0	4 443.2	0.3	4 574.0
650	23.4	67 481.1	3.2	68 955.2	53 314	0.4	1 265.7	0.1	1 293.4
70	19.1	64 615.5	2.9	65 907.0	153 545	0.1	420.8	0.0	429.2
75	23.0	379 964.6	10.6	383 723.0	78 166	0.3	4 861.0	0.1	4 909.1
80	15.6	69 191.9	1.8	70 087.2	45 586	0.3	1 517.8	0.0	1 537.5
85	47.0	254 320.3	119.6	292 370.1	83 474	0.6	3 046.7	1.4	3 502.5
90	156 710.7	73 662.6	304.8	3 459 087.3	5 746	27 273.0	12 819.8	53.1	601 999.2
91	4.8	38 172.8	0.4	38 386.0	7 398	0.7	5 159.9	0.0	5 188.7
92	1.4	14 481.4	0.5	14 666.4	19 864	0.1	729.0	0.0	738.3
93	16.0	43 105.1	2.4	44 174.7	5 856	2.7	7 360.8	0.4	7 543.5
Total	**318 945.5**	**40 178 928.0**	**15 018.8**	**51532625.9**	**1389 861**				

Appendix 4.B.2

Direct emission coefficients, acid equivalents. 1997.

	Direct emissions from Norwegian industries				Production Mill NOK 1997-basic prices	Direct emission (kilo) per produced mill nok			
NACE rev.1	CH_4	CO_2	N_2O	CO_2- equiv		CH_4	CO_2	N_2O	CO_2-equiv
1	108 152.6	607 600.6	8 542.6	5 526 998.1	24 589	4 398.4	24 710.3	347.4	224 775.2
2	13.0	49 787.2	18.7	55 852.9	4 277	3.0	11 640.7	4.4	13 058.9
5	118.8	1 585 899.8	39.8	1 600 739.3	18 587	6.4	85 323.1	2.1	86 121.4
10	207.5	9 984.9	0.2	14 390.4	152	1 365.2	65 690.2	1.0	94 673.8
11	29 600.3	10 279 333.9	86.3	10 927 691.3	201 818	146.7	50 933.7	0.4	54 146.3
13	1.1	26 126.2	3.9	27 348.6	744	1.4	35 115.8	5.2	36 758.9
14	4.4	99 344.8	20.1	105 675.0	4 647	0.9	21 378.3	4.3	22 740.5
15	23.5	563 509.3	7.6	566 371.7	91 670	0.3	6 147.2	0.1	6 178.4
16	0.6	2 915.2	0.2	2 992.4	861	0.6	3 385.8	0.2	3 475.4
17	1.2	31 063.9	0.4	31 218.6	4 194	0.3	7 406.8	0.1	7 443.6
18	0.2	3 178.4	0.1	3 205.2	1 480	0.1	2 147.5	0.1	2 165.7
19	0.1	3 663.6	0.0	3 681.0	532	0.2	6 886.4	0.1	6 919.2
20	17 236.1	65 368.2	26.0	435 384.0	16 971	1 015.6	3 851.8	1.5	25 654.6
21	12 880.1	587 489.0	131.6	898 774.4	18 272	704.9	32 152.4	7.2	49 188.6
22	2.4	35 538.6	0.9	35 877.4	31 081	0.1	1 143.4	0.0	1 154.3
23	1 344.4	2 705 275.4	20.7	2 739 925.1	19 279	69.7	140 322.4	1.1	142 119.7
24	1 051.8	3 032 970.5	4 785.0	4 538 411.1	32 289	32.6	93 932.0	148.2	140 555.9
25	0.9	27 274.9	0.3	27 401.9	7 530	0.1	3 622.2	0.0	3 639.0
261	3.8	98 226.5	1.1	98 648.6	2 173	1.8	45 203.2	0.5	45 397.4
269	20.0	1 841 343.2	26.5	1 849 983.5	12 012	1.7	153 292.0	2.2	154 011.3
271	0.6	183 585.3	0.3	183 687.7	8 826	0.1	20 800.5	0.0	20 812.1
279	9.3	4 545 856.4	3.3	4 547 060.8	29 022	0.3	156 634.8	0.1	156 676.3
28	2.7	51 126.7	1.0	51 507.2	17 204	0.2	2 971.8	0.1	2 993.9
29	2.9	59 133.5	1.1	59 524.3	28 118	0.1	2 103.0	0.0	2 116.9
30	0.0	0.0	0.0	0.0	1 521	0.0	0.0	0.0	0.0
31	1.8	107 892.2	0.6	108 107.5	12 351	0.1	8 735.5	0.0	8 752.9
32	0.1	764.1	0.1	782.6	7 236	0.0	105.6	0.0	108.2
33	0.2	857.0	0.1	882.1	7 856	0.0	109.1	0.0	112.3
34	2.2	27 681.1	0.6	27 923.2	5 091	0.4	5 437.3	0.1	5 484.8
35	2.4	49 604.2	0.8	49 916.9	53 424	0.0	928.5	0.0	934.4
36	3.5	25 675.0	1.1	26 089.1	11 743	0.3	2 186.4	0.1	2 221.7
37	0.4	11 999.5	0.2	12 057.3	910	0.5	13 186.2	0.2	13 249.8
401	116.7	286 705.9	6.3	291 110.3	32 506	3.6	8 820.1	0.2	8 955.6
403	0.0	0.0	0.0	0.0	372	0.0	0.0	0.0	0.0
41	2.2	25 404.4	0.4	25 581.7	2 907	0.7	8 739.0	0.1	8 800.0
45	53.7	661 340.8	129.7	702 686.5	126 590	0.4	5 224.3	1.0	5 550.9
50	367.7	1 277 500.1	143.3	1 329 641.3	173 372	2.1	7 368.5	0.8	7 669.3
55	11.1	64 663.7	2.2	65 585.9	30 889	0.4	2 093.4	0.1	2 123.3
601	5.2	81 938.2	28.2	90 778.3	9 214	0.6	8 892.8	3.1	9 852.2
602	181.1	2 885 884.5	90.0	2 917 599.8	37 598	4.8	76 756.3	2.4	77 599.9
603	5.8	15 652.3	0.1	15 814.1	14 207	0.4	1 101.7	0.0	1 113.1
611	109.3	1 508 895.3	38.0	1 522 977.6	4 954	22.1	304 581.2	7.7	307 423.8
619	976.8	13 529 141.2	339.8	13 654 977.2	63 762	15.3	212 181.9	5.3	214 155.4
62	40.3	984 734.6	31.2	995 241.3	17 531	2.3	56 171.0	1.8	56 770.4
63	13.4	119 201.2	4.6	120 894.5	37 200	0.4	3 204.3	0.1	3 249.9
64	49.6	127 701.1	20.4	135 069.8	36 096	1.4	3 537.8	0.6	3 742.0
650	19.9	61 540.5	7.2	64 203.9	57 329	0.3	1 073.5	0.1	1 119.9
70	25.3	98 610.7	10.1	102 261.1	206 810	0.1	476.8	0.0	494.5
75	24.6	457 281.2	12.7	461 721.4	87 317	0.3	5 237.0	0.1	5 287.9
80	19.9	124 634.4	3.5	126 141.5	56 709	0.4	2 197.8	0.1	2 224.4
85	43.7	222 217.0	128.7	263 025.5	106 984	0.4	2 077.1	1.2	2 458.5
90	161 078.7	65 934.4	383.5	3 567 469.4	8 337	19 320.9	7 908.7	46.0	427 908.1
91	3.1	24 292.6	0.2	24 428.2	8 890	0.3	2 732.6	0.0	2 747.8
92	2.8	29 238.5	0.7	29 527.7	24 473	0.1	1 194.7	0.0	1 206.5
93	22.3	110 529.2	6.0	112 866.2	8 011	2.8	13 797.2	0.8	14 088.9
Total	**333 861.8**	**49 483 110.5**	**15 108.1**	**61 177 712.3**	**1 828 518**				

Appendix 4.C.1
Indirect emissions (tonnes) allocated to final demand in households
Divided on COICOP products - 1993

COICOP	NOx	NH_3	SO_2	Acid eqv	CH_4	CO_2	N_2O	CO_2-eqv
61011	406.37	304.55	49.64	28.30	1 450.84	40 191.90	115.71	106 528.72
61012	1 154.28	865.02	141.00	80.38	4 120.94	114 165.49	328.65	302 587.32
61013	3 511.69	2 933.81	427.91	262.29	13 796.87	350 458.15	1 110.34	984 398.29
61014	1 365.36	31.45	55.59	33.27	188.20	67 986.76	14.95	76 572.94
61015	454.11	340.17	55.50	31.62	1 620.91	44 937.48	129.26	119 047.93
61016	1 824.11	1 404.91	224.18	129.30	6 670.54	181 271.76	534.22	486 961.24
61017	1 024.63	767.88	125.16	71.36	3 658.13	101 339.41	291.74	268 600.34
61018	234.89	612.51	27.20	41.99	2 658.42	27 768.13	226.49	153 805.93
61019	289.87	215.76	37.97	20.18	1 029.01	29 449.51	83.68	76 999.20
61021	375.09	900.57	43.70	62.49	3 921.88	43 535.71	333.32	229 223.92
61022	295.16	769.66	34.18	52.76	3 340.49	34 892.63	284.60	193 268.06
61023	132.86	99.57	16.23	9.25	474.34	13 140.30	37.83	34 828.40
61024	137.42	358.35	15.91	24.56	1 555.30	16 245.64	132.51	89 983.56
61025	218.40	163.67	26.68	15.21	779.72	21 600.08	62.18	57 251.06
61026	0.13	0.10	0.02	0.01	0.47	12.91	0.04	34.23
61027	999.66	748.72	122.88	69.61	3 567.19	99 106.32	284.98	262 360.94
61028	527.41	436.73	64.77	39.18	2 055.92	52 745.77	165.66	147 273.29
61031	339.48	254.41	41.47	23.64	1 212.00	33 575.46	96.66	88 991.83
61032	1 192.13	892.38	147.33	83.01	4 252.12	118 431.80	340.18	313 181.31
61033	312.39	234.11	38.16	21.75	1 115.29	30 896.23	88.95	81 890.54
61034	1.64	1.23	0.20	0.11	5.86	162.43	0.47	430.51
61035	24.37	18.26	2.98	1.70	87.00	2 410.00	6.94	6 387.72
61041	33.75	1.69	7.53	1.07	64.08	6 105.48	1.77	8 000.20
61111	19.55	3.10	8.02	0.86	46.83	4 409.88	2.31	6 109.40
61112	38.16	3.08	9.67	1.31	81.19	6 846.83	2.93	9 459.37
61113	11.29	1.79	4.65	0.50	27.10	2 558.01	1.34	3 543.50
61114	4.47	0.37	1.18	0.16	10.78	933.91	0.35	1 269.35
61115	3.92	0.68	1.75	0.18	9.60	924.65	0.50	1 281.64
61116	9.26	0.22	1.13	0.25	20.41	1 279.61	0.22	1 776.01
61121	2.78	0.25	0.84	0.10	7.55	687.06	0.25	923.36
61122	7.69	0.18	0.94	0.21	16.85	1 062.08	0.18	1 472.13
61211	398.26	25.32	83.50	12.76	2 569.13	65 008.25	26.75	127 252.27
61212	1 805.74	109.36	386.77	57.77	12 743.67	295 873.98	118.35	600 179.48
61213	113.79	6.89	24.37	3.64	803.07	18 645.10	7.46	37 821.53
61221	13.06	0.84	13.37	0.75	40.30	4 754.39	7.84	8 032.21
61231	119.90	5.01	30.08	3.84	55 519.86	39 887.53	112.87	1 240 795.58
61232	0.45	0.02	0.07	0.01	1.25	70.10	0.02	101.66
61233	258.55	3.57	33.00	6.86	218.08	39 363.68	4.19	45 243.42
61241	246.12	5.20	113.94	9.22	234.04	40 808.53	4.93	47 250.33
61242	165.40	1.42	57.64	5.48	93.38	65 611.34	6.77	69 672.45
61243	86.67	9.08	4.91	2.57	61.97	6 489.88	5.45	9 479.63
61244	9.11	0.53	6.61	0.44	19.18	2 588.90	3.34	4 027.87
61311	137.97	7.17	49.79	4.98	482.67	29 367.51	10.30	42 696.47
61312	0.68	0.12	0.31	0.03	1.68	161.50	0.09	223.84
61313	9.33	0.52	4.15	0.36	15.11	3 116.16	0.65	3 635.87
61314	47.50	1.94	19.17	1.75	102.77	11 851.37	2.04	14 642.96
61315	6.28	0.15	0.77	0.17	13.77	867.62	0.15	1 202.59
61321	24.33	3.18	11.56	1.08	56.02	6 062.11	3.54	8 337.35
61331	19.31	1.39	6.51	0.71	42.63	4 573.74	1.43	5 912.13
61332	13.19	0.87	5.71	0.52	26.00	3 525.52	0.92	4 355.93
61333	20.58	0.48	2.51	0.55	45.10	2 842.20	0.48	3 939.51
61341	79.73	1.55	29.66	2.75	82.75	25 279.21	2.42	27 767.48
61351	3.74	0.26	1.43	0.14	7.96	929.48	0.27	1 179.38
61352	14.78	0.53	12.74	0.75	16.53	5 629.75	0.75	6 209.79
61361	103.78	7.21	133.98	6.87	91.49	47 315.47	83.18	75 022.78
61362	89.56	2.80	46.08	3.55	363.14	14 051.62	7.19	23 906.16
61363	10.67	0.25	1.42	0.29	16.25	1 452.20	0.33	1 897.08
61364	72.39	1.57	9.44	1.96	92.36	9 769.34	2.21	12 394.79
61411	6.68	0.52	1.74	0.23	16.44	1 156.71	0.53	1 665.50
61412	66.91	9.60	78.00	4.46	77.83	27 934.38	50.08	45 092.55

COICOP	NOx	NH_3	SO_2	Acid eqv	CH_4	CO_2	N_2O	CO_2-eqv
61421	139.43	21.62	32.15	5.31	298.30	27 045.83	19.50	39 354.47
61422	66.69	10.41	15.42	2.54	143.38	12 967.73	9.39	18 889.41
61423	23.88	3.74	5.53	0.91	51.34	4 646.82	3.37	6 769.19
61431	4.66	0.73	1.08	0.18	10.01	906.32	0.66	1 320.27
61511	114.93	2.82	19.09	3.26	246.56	17 571.64	2.96	23 667.71
61512	17.79	1.64	5.79	0.66	36.19	3 962.07	1.75	5 263.78
61521	28.71	1.43	17.82	1.27	44.49	9 448.74	2.74	11 233.89
61522	1 069.56	6.82	335.43	34.13	592.64	421 823.29	13.68	438 508.74
61523	23.28	1.05	3.63	0.68	65.49	3 665.24	0.89	5 315.20
61524	310.39	7.38	41.48	8.48	676.46	44 075.40	7.50	60 606.76
61525	482.94	7.55	56.44	12.71	352.24	52 445.90	7.16	62 062.83
61531	11 473.83	16.24	776.11	274.64	576.10	838 139.08	32.71	860 376.88
61532	4 819.41	13.06	903.43	133.77	471.79	437 728.31	27.57	456 182.73
61533	30.40	0.07	2.27	0.74	4.00	2 908.52	0.19	3 052.36
61534	2 143.06	15.63	217.36	54.30	552.07	211 454.55	17.19	228 376.69
61611	13.11	0.66	7.64	0.56	27.18	3 405.86	0.59	4 159.52
61612	0.78	0.06	0.26	0.03	1.74	183.17	0.06	237.49
61613	0.00	0.00	0.00	0.00	0.01	0.50	0.00	0.74
61614	45.66	7.55	20.35	2.07	102.92	11 238.60	5.65	15 150.14
61615	26.15	2.58	11.07	1.07	73.25	6 040.33	2.70	8 414.83
61616	8.91	0.50	3.51	0.33	19.58	1 917.52	1.53	2 803.36
61617	15.41	0.80	5.31	0.55	54.59	2 857.16	1.08	4 338.33
61618	450.43	929.94	60.78	66.39	4 108.01	57 061.59	349.78	251 762.62
61619	33.09	1.01	4.55	0.92	72.93	4 724.23	0.94	6 548.12
61621	121.45	6.81	25.58	3.84	343.74	19 779.52	6.28	28 945.28
61622	114.90	5.24	20.10	3.43	271.74	17 643.82	4.91	24 871.21
61623	56.64	3.20	12.31	1.80	163.77	9 341.94	3.00	13 712.38
61624	104.96	4.17	16.53	3.04	351.26	15 539.65	4.23	24 227.84
61631	57.63	2.68	18.83	2.00	242.65	9 564.19	4.16	15 949.06
61632	170.25	7.93	55.49	5.90	715.51	28 237.28	12.26	47 064.92
61633	17.87	0.60	8.32	0.68	75.27	2 657.47	1.23	4 620.24
61711	6.02	0.15	0.85	0.17	7.13	828.01	0.15	1 024.99
61712	6.16	0.16	0.87	0.17	7.39	847.85	0.16	1 051.79
61713	44.21	1.13	6.23	1.22	52.37	6 081.35	1.12	7 528.08
61714	27.82	0.71	3.92	0.77	32.96	3 826.94	0.70	4 737.35
61721	17.50	0.84	5.71	0.61	70.54	2 969.94	1.31	4 857.79
61811	1 653.77	582.99	258.29	78.32	4 506.85	209 396.33	263.45	385 709.82
61821	609.11	211.27	91.06	28.51	1 665.83	75 932.78	92.89	139 712.29
61911	317.47	6.91	41.41	8.60	405.05	42 845.06	9.70	54 359.39
61912	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
61913	79.04	4.97	81.81	4.57	145.91	28 654.18	45.10	45 700.31
61921	22.92	0.62	9.34	0.83	48.38	4 952.79	0.75	6 202.46
61922	2.90	0.25	0.98	0.11	8.03	663.37	0.28	918.15
61923	48.27	1.08	15.41	1.59	42.08	14 755.35	1.38	16 066.24
61931	30.68	0.85	3.23	0.82	46.05	4 138.58	0.79	5 350.39
61932	352.36	9.81	37.12	9.40	528.93	47 533.48	9.07	61 451.70
61941	122.96	19.24	28.47	4.69	264.32	23 925.38	17.34	34 852.96
61942	183.35	28.68	42.45	7.00	394.15	35 676.85	25.86	51 971.75
61951	113.61	5.16	17.81	3.33	325.92	17 899.32	4.36	26 096.28
61961	100.96	4.08	16.06	2.94	251.64	14 431.24	4.11	20 988.32
61992	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	**44 622.11**	**14 535.36**	**6 268.21**	**2 020.95**	**151 248.98**	**5 038 460.04**	**6 167.93**	**10 126 747.91**

Appendix 4.C.2

Indirect emissions (tonnes) allocated to final demand in households Divided on COICOP products - 1997

COICOP	NOx	NH_3	SO_2	Acid eqv	CH_4	CO_2	N_2O	CO_2-eqv
61011	463.35	327.69	42.70	30.68	1 577.07	44 202.28	117.55	113 761.99
61012	1 304.87	922.81	120.27	86.41	4 441.24	124 483.53	331.04	320 373.32
61013	4 176.28	3 436.15	383.62	304.90	16 283.73	403 070.61	1 226.81	1 125 341.43
61014	1 559.07	44.74	41.27	37.81	264.26	78 214.19	18.93	89 633.51
61015	419.21	296.35	38.66	27.75	1 426.53	40 012.63	106.33	102 931.23
61016	1 606.56	1 161.25	149.63	107.91	5 575.82	154 165.47	417.42	400 657.90
61017	1 105.76	782.01	101.91	73.22	3 763.59	105 486.62	280.53	271 487.54
61018	157.76	491.95	13.53	32.79	2 167.86	18 726.15	171.87	117 531.27
61019	318.12	224.07	30.52	21.05	1 079.02	30 825.42	81.23	78 667.56
61021	344.56	919.87	29.95	62.54	4 072.02	39 405.41	321.80	224 675.77
61022	302.35	942.83	25.92	62.84	4 154.75	35 889.05	329.39	225 251.05
61023	123.93	87.64	11.42	8.21	421.80	11 822.40	31.44	30 426.92
61024	80.59	251.31	6.91	16.75	1 107.43	9 566.05	87.80	60 039.57
61025	249.55	176.48	23.00	16.53	849.36	23 806.10	63.31	61 268.99
61026	0.24	0.17	0.02	0.02	0.80	22.56	0.06	58.06
61027	1 120.20	791.83	103.77	74.17	3 811.10	107 073.52	284.43	275 279.33
61028	758.81	586.67	70.41	53.21	2 797.30	73 119.40	210.28	197 049.95
61031	409.17	289.37	37.71	27.10	1 392.65	39 033.54	103.81	100 459.37
61032	1 693.90	1 197.33	156.96	112.16	5 762.82	161 927.66	430.12	416 282.73
61033	360.10	254.67	33.19	23.85	1 225.66	34 353.05	91.36	88 413.34
61034	0.68	0.48	0.06	0.05	2.32	64.98	0.17	167.23
61035	44.10	31.19	4.06	2.92	150.09	4 206.77	11.19	10 826.84
61041	44.42	5.02	9.44	1.56	101.28	7 897.98	3.50	11 110.56
61111	24.40	8.66	6.37	1.24	65.44	4 772.42	3.72	7 300.80
61112	15.38	1.76	3.11	0.53	28.23	2 595.06	1.17	3 550.74
61113	14.15	5.33	3.80	0.74	38.98	2 811.72	2.27	4 335.46
61114	1.27	0.13	0.23	0.04	2.32	210.14	0.08	283.44
61115	3.77	1.57	1.06	0.21	10.92	770.62	0.66	1 205.05
61116	6.54	0.28	0.86	0.19	15.59	1 153.97	0.26	1 561.21
61121	0.06	0.01	0.01	0.00	0.30	11.10	0.01	19.50
61122	5.26	0.22	0.69	0.15	12.54	928.31	0.21	1 255.91
61211	412.93	22.36	84.02	12.92	2 675.96	69 947.46	27.85	134 776.00
61212	2 035.69	100.77	421.87	63.36	14 101.86	342 185.08	133.57	679 730.49
61213	118.41	5.86	24.54	3.69	820.30	19 904.68	7.77	39 539.47
61221	17.22	1.08	13.57	0.86	45.31	6 317.19	8.65	9 948.82
61231	92.35	4.44	17.76	2.82	52 601.08	36 092.67	129.82	1 180 960.53
61232	4.16	0.21	0.71	0.13	14.83	755.28	0.21	1 132.58
61233	170.21	3.74	23.35	4.65	253.25	35 122.63	5.15	42 036.02
61241	364.34	12.69	150.26	13.36	618.66	72 685.62	9.73	88 693.58
61242	143.70	0.70	42.74	4.50	85.45	66 361.74	1.35	68 575.89
61243	65.83	7.02	2.79	1.93	48.79	5 245.61	4.07	7 533.33
61244	8.59	0.54	4.33	0.35	20.88	2 355.87	1.46	3 245.98
61311	187.34	13.34	48.47	6.37	496.27	34 139.62	14.76	49 136.81
61312	0.93	0.39	0.26	0.05	2.71	190.85	0.16	298.46
61313	7.37	0.35	2.72	0.27	9.29	2 308.45	0.45	2 641.99
61314	48.34	2.56	15.34	1.68	113.17	11 545.48	2.45	14 681.50
61315	5.19	0.22	0.68	0.15	12.37	915.05	0.20	1 237.97
61321	32.10	8.09	10.60	1.50	71.83	7 066.28	5.31	10 222.16
61331	18.37	1.28	4.40	0.61	33.71	3 582.76	1.16	4 649.55
61332	15.02	0.99	4.30	0.52	25.66	3 308.84	0.92	4 134.30
61333	22.33	0.95	2.94	0.63	53.22	3 938.68	0.88	5 328.66
61341	92.49	2.06	32.99	3.16	70.77	28 537.42	2.66	30 847.85
61351	7.99	0.55	2.02	0.27	14.47	1 606.48	0.50	2 064.53
61352	18.02	0.71	10.51	0.76	18.36	6 515.52	0.91	7 182.01
61361	83.32	5.41	77.79	4.56	65.61	35 867.78	51.42	53 185.09
61362	99.52	2.70	59.70	4.19	306.62	20 053.34	8.57	29 148.49
61363	7.50	0.27	1.31	0.22	11.93	2 270.19	0.32	2 619.15
61364	55.32	1.94	9.79	1.62	88.02	17 092.54	2.36	19 673.81
61411	12.00	0.83	2.68	0.39	25.77	2 017.59	0.73	2 784.95

COICOP	NOx	NH_3	SO_2	Acid eqv	CH_4	CO_2	N_2O	CO_2-eqv
61412	41.28	5.74	34.50	2.31	44.98	16 145.33	23.79	24 465.83
61421	133.53	21.10	24.36	4.91	276.76	25 552.72	17.41	36 762.76
61422	78.99	12.58	14.43	2.91	164.18	15 111.61	10.38	21 777.69
61423	26.20	4.18	4.79	0.97	54.45	5 013.74	3.45	7 226.00
61431	5.51	0.88	1.01	0.20	11.45	1 054.59	0.73	1 519.92
61511	115.05	4.80	18.18	3.35	263.33	21 577.54	4.60	28 533.06
61512	10.06	0.90	2.60	0.35	18.59	2 051.28	0.84	2 703.14
61521	34.18	1.31	17.00	1.35	39.28	10 732.01	3.05	12 502.10
61522	861.71	4.30	257.40	27.03	512.66	397 887.42	9.17	411 495.08
61523	26.55	1.35	4.55	0.80	94.72	4 824.30	1.36	7 234.28
61524	368.62	15.73	49.54	10.49	874.83	65 448.73	14.54	88 326.71
61525	457.09	6.77	55.79	12.08	269.51	53 368.73	6.57	61 063.71
61531	12 424.14	22.71	594.75	290.01	712.73	916 194.28	41.81	944 121.32
61532	6 195.86	12.20	828.96	161.32	439.72	533 008.67	27.92	550 897.19
61533	25.00	0.10	1.47	0.60	4.34	2 789.37	0.21	2 946.40
61534	2 438.63	20.28	261.73	62.39	643.97	256 807.99	22.79	277 396.57
61611	42.22	0.98	34.72	2.06	27.98	18 923.68	1.01	19 825.12
61612	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
61613	1.22	0.10	0.26	0.04	2.46	202.47	0.08	278.41
61614	47.01	12.58	15.63	2.25	111.74	10 921.43	6.55	15 299.58
61615	34.17	6.55	9.77	1.43	86.91	6 800.59	4.06	9 885.22
61616	2.88	0.16	1.54	0.12	5.07	839.52	0.89	1 221.43
61617	0.20	0.01	0.08	0.01	0.29	58.25	0.01	67.89
61618	513.56	1 291.29	57.91	88.93	5 766.30	66 607.07	458.43	329 813.55
61619	23.06	2.08	3.47	0.73	56.47	4 149.44	1.30	5 739.39
61621	126.87	8.37	26.95	4.09	366.21	23 150.39	7.26	33 092.33
61622	130.40	7.81	23.95	4.04	370.79	22 883.19	6.87	32 799.38
61623	59.05	3.90	12.55	1.91	170.61	10 772.96	3.38	15 404.58
61624	67.55	3.50	10.10	1.99	153.85	12 238.31	3.10	16 429.89
61631	120.76	7.28	36.04	4.18	616.71	21 145.83	8.88	36 849.67
61632	228.82	15.92	86.30	8.61	804.60	41 456.38	18.37	64 049.21
61633	20.73	0.90	10.42	0.83	68.19	3 913.32	1.45	5 794.92
61711	5.72	0.23	0.92	0.17	9.47	1 102.62	0.19	1 361.60
61712	4.25	0.17	0.68	0.12	7.13	815.39	0.14	1 009.91
61713	37.03	1.47	5.96	1.08	61.30	7 135.36	1.25	8 811.25
61714	20.22	0.80	3.26	0.59	33.48	3 897.20	0.68	4 812.54
61721	16.73	1.16	6.20	0.63	57.26	3 053.54	1.34	4 671.94
61811	2 130.44	747.20	260.41	98.40	5 551.35	263 804.27	309.67	476 380.54
61821	677.25	235.25	79.05	31.03	1 768.43	82 134.94	94.98	148 716.48
61911	275.34	9.63	48.64	8.07	425.01	85 417.14	11.71	97 972.97
61912	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
61913	106.82	5.54	80.68	5.17	234.82	31 843.73	33.57	47 181.65
61921	12.50	0.55	3.14	0.40	27.32	2 702.38	0.54	3 444.06
61922	1.48	0.14	0.42	0.05	3.05	309.45	0.12	410.76
61923	54.91	1.64	17.75	1.84	47.95	15 544.16	1.97	17 160.63
61931	37.09	1.81	4.87	1.06	102.30	6 042.29	1.64	8 699.60
61932	460.60	22.45	60.34	13.22	1 271.19	74 981.07	20.39	107 995.84
61941	107.77	17.19	19.69	3.97	223.92	20 620.54	14.18	29 719.17
61922	1.48	0.14	0.42	0.05	3.05	309.45	0.12	410.76
61923	54.91	1.64	17.75	1.84	47.95	15 544.16	1.97	17 160.63
61931	37.09	1.81	4.87	1.06	102.30	6 042.29	1.64	8 699.60
61932	460.60	22.45	60.34	13.22	1 271.19	74 981.07	20.39	107 995.84
61941	107.77	17.19	19.69	3.97	223.92	20 620.54	14.18	29 719.17
61942	195.03	31.11	35.63	7.18	405.24	37 317.28	25.66	53 783.21
61951	122.53	6.22	20.99	3.69	437.21	22 266.78	6.26	33 390.15
61961	82.13	3.66	15.58	2.49	186.67	19 092.99	3.79	24 187.26
61992	16.39	0.81	3.40	0.51	113.51	2 754.47	1.08	5 471.59
Total	**49 886.13**	**16 025.29**	**5 691.84**	**2 205.02**	**159 309.30**	**5 651 026.04**	**6 391.61**	**10 977 920.99**

5 Household emissions and constant prices

5.1 Input/output analyses in constant chained prices.

5.1.1 Background: an analysis of emissions from households

One question that we have tried to analyse is whether household consumption in Norway has developed in a more environmentally friendly way. So far, we have only taken up one aspect of the development, that is emissions to air.

The emissions that can be directly attributed to households are readily observable from the NOREEA matrix. However, household consumption is responsible for other emissions as well. In the NOREEA matrices, these emissions are attributed to the producers of the products that are consumed. In order to reallocate the emissions to end users, the products that are consumed and the inputs used to produce them need to be traced through the production chains, summing up emissions at each stage. This has been done by way of input-output analyses.

For convenience, we have compared results for 1993 with 1997. The year 1997 still is the latest year for which we have a full supply and use matrix from the National Accounts. This is due an ongoing revision of the National Accounts. Please note that the results may be different if re-analysed on the revised data. The year 1993 was chosen because we already had prepared an input-output analysis for that year. We could have chosen a starting point back to 1991. Preliminary results were published in an article in our yearbook Statistics Norway (2001). Some further reflections on the methods for the analyses were included in our report to Eurostat (Hass and Sorensen, 2000).

5.1.2 Price movements - what is the problem?

Suppose we observe a particular production process for two different years. Suppose further that all volumes and emissions are the same for the two years, but prices increased by 10 percent. As emissions per volume of output are equal, it seems reasonable to say that emission efficiency of this production process is unchanged. To reach this conclusion from statistics on the process, we must look at production valued at constant prices. Looking at production valued at current prices would give the wrong impression that emission efficiency increased, as the production increased by 10 per cent in value, while emissions did not change.

The general conclusion is that whenever we compare physical measures with economic values, we must take care to correct for price changes. The development of economic values between two periods should be split into two components, a price increase and a volume growth. This splitting of the change in values into a price and volume component is a classic issue in National Accounting.

In the Norwegian National accounts all transactions are estimated in current value terms and then in the prices of the previous year. So, for 1997, we have figures in current prices and in 1996-prices. The value of a product for 1997 expressed in 1996 prices, divided by the current value for 1996, gives the growth expressed in fixed prices, or the volume growth. The growth in prices are expressed as the current value in 1997 divided by the value in 1996 prices. If we multiply the growth in prices by the volume growth, we get exactly the growth in the current value.

5.1.3 Price movements in input- output analysis - is there a problem?

In many cases the results from the input output (IO) analyses are stated in terms of physical measures of emissions, energy uses etc, which do not directly involve economic values or prices. So, given IO tables for two different years, some results could be compared directly even though the IO tables are

established at current prices. This is the case with the analyses referred to above (Statistics Norway, 2001).

A typical IO-analyses would involve some standard components. So, you have a matrix of IO-coefficients, a matrix of final demands (or exogenous changes in final demands) and finally a vector of unit coefficients to provide the link to emissions (or labour etc). The IO-coefficients are ratios of value figures, and so they are independent of changes in the general price level. The final demands are in current values, and so are the unit coefficients. Provided that you are careful with the price level of the final demand and the unit coefficients, a lot could be said in terms of analysing changes between two points in time using the current price IO matrix of each period.

As Norway is one of few countries that prepare IO-tables every year in constant (t-1) prices as well as current prices, our ambition is to establish an IO matrix in fixed (chained) prices to further illustrate structural changes and their implication for our household emission example. To establish these matrixes using yearly chaining is rather data demanding, as you have to observe IO-matrices in current and constant (t-1) prices for every intervening year. Using our chained-price IO analyses, some simplified solutions based only on current prices IO matrices are evaluated.

The simplest approach is to use the value figures as they were at each point in time. If the question is how the emission indirectly attributable to household consumption has changed, the analyses can be done separately in the two years, and then the emissions in physical units are compared. This comparison of the emission figures can then be related to the growth in fixed (chained) prices of the total household consumption. This would enable us to compare the growth in emissions to volume growth in consumption without the need for the chained input-output matrices

The next approach would be to use the current price matrices of the years involved unchanged to illustrate the structure of the economy, but supplement this by volume figures for the inputs and (if necessary) the outputs of the analyses. This could enable a comparison between the results of changes that are of same volume.

5.2 Compiling the 1993 input-output matrices in 1997-prices

The Norwegian National Accounts contain a full supply and use table every year in current prices and in the prices of the previous year. These supply and use tables are the starting points for our input/output matrices, as described in chapter 4. The procedures used to transform the supply and use table into the input-output table are routinely applied to the supply and use table in fixed (previous year) prices as well. For our use, the industry by industry table is aggregated to our level of analyses (55 industries). On this level, each element of the 1993 table is transformed to the 1997 set of prices by chaining year to year implicit price indexes. When the chained input output table has been established, then the input-output coefficients are calculated and the input-output analyses can proceed.

The main computational problem encountered is when the time series for intermediate consumption of a product has gaps or starts/stops in the middle of the period. With a relatively detailed industry aggregation level we see some instances of changes in the product composition of the inputs. A few case on negative constant price figures where current price estimates are positive also occur. These problems are a result of a simplified, automatic balancing of the figures of the input- output tables, and occur when domestic deliveries are small in relation to imports and exports and the price changes relating to domestic deliveries are different from the changes in prices of imports and exports. In these cases, we generally have regarded the price index relating to this specific element of the input- output table as unknown. Those specific prices that are considered unknown are assumed to be equal to the average price index relating to total deliveries from the same industry used for intermediate consumption. This would be the expected implication of our double-deflation procedure, at the

greatest level of detail, provided that the market shares assumption used to construct the input output table are fulfilled.

The usual chaining methods imply that the sum of the chained components no longer adds up to the (independently) chained total. This is because the chaining considers growth rates, and the growth rates of the totals are calculated from changing relative weights of the components. If the totals were defined simply as the sum of the chained components, the totals would differ depending on the aggregation level of the tables. So we always chain totals independently of their components, and define the difference as 'chaining discrepancies'.

The simplest way to handle the chaining discrepancies is to define the difference between the total supply and the sum of the deliveries to each user as an exogenous final demand component. The chaining discrepancies are then entered into a column among the final deliveries. Also a row is added, containing the differences between total uses and the sum of deliveries to each category of users. This row is regarded as a row of correction items. The deliveries from domestic producers to intermediate consumption are not affected in this method, so the usual routines for input-output analyses can be used without any explicit treatment of the chaining discrepancies.

We have also made experiments with alternative treatments of the chaining discrepancies. We have split the chaining discrepancies in two parts, those related to the sum of intermediate consumption from domestic producers (incl. trade margins) and other. This split enables us to re-establish the consistency requirement that the sum of (chained-priced) deliveries from domestic suppliers for intermediate consumption (IC) equals total uses for IC delivered from domestic suppliers. The chaining discrepancies relating to IC were then included in our analyses technically as an additional industry. The consequence of an exogenous increase in a final demand component would in this model imply increased deliveries for IC but also larger chaining discrepancies. This could be seen as a built-in correction for chaining discrepancies.

There are, however, some problems that made us choose the simplest solution. In the first place, the economic interpretation of the 'chaining discrepancies industry' is not obvious. Most of the discrepancies in our detailed analysis are negative, and the mixture of negative and positive values combined with relatively small totals could cause problems. There is no longer a guarantee that the elements of the inverted input-output matrix (those relating to regular industries) are all positive. The size of the endogenous chaining discrepancies produced by the model has no immediate use in the analyses of residuals generated.

In the simplest model that we choose, the chaining discrepancies influences the results in that the individually chained total production figures (including chaining discrepancies) are used to define input-output coefficients and unit coefficients for emissions.

5.3 Some selected results.

Some results are given in table 5.1. The table only shows indirectly generated emissions, as a result of induced production from domestic producers in order to deliver goods and services for final household consumption. The direct emissions from households are not included. Please also note that the table includes emissions from production of trade and transport margins. These margins are included in the production at basic value in the industries producing them. The input output models in current prices for 1993 and 1997, as well as the unit coefficients linking production at basic values to emissions, are otherwise the same as reported elsewhere in this report. Only results for CO2 are given in the table, but this should be sufficient to illustrate our points.

Table 5.1. Analysis of changes of CO_2 emissions from households 1993 and 1997.

Industry NACE code	Indirect emissions from actual household consumption 1993 (1) Tons CO_2	Indirect emissions from actual household consumption 1997 (2) Tons CO_2	Indirect emissions using IO structure from 1993 HC for 1997 (3) Tons CO_2	Indirect emissions using IO structure from 1997 HC for 1993 (4) Tons CO_2	Growth rates of indirect emissions from actual HC 1993-97 (5) Percent	Volume growth rates of induced domestic production from HC 1993-97 (6) Percent
Total	**6 701 160**	**7 643 957**	**6 814 097**	**7 548 750**	**114.1**	**115.7**
01	422 728	396 349	367 908	457 086	93.8	106.0
02	17 485	14 695	12 905	20 168	84.0	106.5
05	448 229	561 512	493 358	511 853	125.3	130.4
10	1 858	1 459	1 351	1 996	78.5	64.7
11	235 362	209 537	202 239	245 315	89.0	104.0
13	2 414	1 593	1 381	2 752	66.0	147.9
14	12 903	11 244	9 826	14 583	87.1	127.2
15	306 279	348 207	312 593	340 903	113.7	115.7
16	2 272	1 558	1 723	2 051	68.6	90.9
17	9 331	11 087	11 735	8 804	118.8	96.6
18	854	1 353	2 015	475	158.4	83.4
19	952	636	1 273	443	66.8	49.9
20	9 613	9 821	8 711	10 864	102.2	113.9
21	53 434	115 363	101 092	61 234	215.9	95.7
22	22 013	16 743	14 928	24 748	76.1	106.0
23	556 676	531 242	541 896	556 943	95.4	87.1
24	361 758	382 729	364 222	376 299	105.8	107.0
25	6 410	6 144	5 196	7 566	95.9	118.1
261	12 517	21 325	17 692	15 461	170.4	172.3
269	235 506	234 160	203 248	271 720	99.4	129.0
271	27 273	7 317	6 454	31 072	26.8	110.3
279	127 744	145 567	115 815	159 696	114.0	121.3
28	8 753	7 915	6 861	10 188	90.4	143.6
29	5 669	6 402	5 540	6 551	112.9	127.0
30	11	0	0	13	0.0	120.7
31	15 981	12 944	12 129	17 444	81.0	87.6
32	270	71	78	258	26.3	96.2
33	44	70	55	60	159.1	185.2
34	2 511	4 467	3 657	3 087	177.9	155.7
35	6 250	4 296	3 952	6 786	68.7	116.9
36	9 193	8 872	7 246	11 290	96.5	126.1
37	0	759	661	0	-	97.6
401	104 145	141 332	127 812	117 466	135.7	95.6
403	0	0	0	0	-	146.5
41	30 254	22 268	18 590	36 231	73.6	118.8
45	44 272	60 248	53 908	49 499	136.1	123.9
50	636 866	652 653	551 410	753 998	102.5	116.0
55	47 867	54 371	42 844	60 759	113.6	127.0
601	40 546	29 615	26 469	45 514	73.0	116.0
602	1 444 239	1 541 142	1 323 338	1 682 986	106.7	125.4
603	5 937	5 733	4 878	6 980	96.6	141.5
611	597 171	814 465	707 835	690 010	136.4	104.5
619*	214 327	454 868	412 169	228 231	212.2	162.1
62	283 396	384 535	355 879	307 116	135.7	111.3
63	65 993	59 990	48 078	82 813	90.9	124.0
64	53 696	59 901	41 926	79 653	111.6	154.4
65	12 253	13 802	12 807	13 195	112.6	107.7

Industry NACE code	Indirect emissions from actual household consumption 1993 (1) Tons CO_2	1997 (2) Tons CO_2	Indirect emissions using IO structure from 1993 HC for 1997 (3) Tons CO_2	from 1997 HC for 1993 (4) Tons CO_2	Growth rates of indirect emissions from actual HC 1993-97 (5) Percent	Volume growth rates of induced domestic production from HC 1993-97 (6) Percent
70	40 241	56 912	52 252	43 704	141.4	115.3
75	13 327	14 775	14 976	13 281	110.9	89.7
80	6 093	11 100	10 468	6 457	182.2	108.5
85	46 608	41 132	36 726	52 212	88.3	111.7
90	44 547	38 927	36 663	47 344	87.4	110.4
91	1 597	1 017	881	1 846	63.7	102.2
92	6 450	12 891	11 644	7 145	199.9	111.3
93	39 042	96 847	84 804	44 601	248.1	116.6

Note: trade margins are included as production in the relevant industries

* Code 619 is here Ocean shipping (in international waters)

The first column of the table gives the induced indirect emission from the household consumption in 1993, evaluated using the 1993 input-output model at current prices. The corresponding figures for 1997 are given in column (2), and the growth rates in column (5). To calculate these figures, IO models in current prices are sufficient. The growth rates result partly from the changes in consumption, partly from changes in emission coefficients, partly also from a changing economic structure. It would not be sufficient to relate the growth of indirect emissions for the industries to the growth of consumption, even if we could calculate volume growth rates of household consumption expenditures delivered from each industry. This is because the indirect emissions are related to the production activities that are generated by the household consumption, and not by the household consumption as such. The growth in indirect emissions can be related to the volume growth of household consumption. We find a growth in consumption, defined as deliveries from domestic industries to consumption in (chained) constant prices, of 13.8 percent for this period, slightly less than the growth in related indirect emissions.

Having access to current price input- output models of the two years, one can calculate the columns (3) and (4) in the table. For column (3) we have expressed the deliveries from domestic producers for household consumption for the year 1993 in the prices of 1997 using yearly chaining. We calculate the indirect emission by means of the current price IO model and unit emission coefficients for 1997. So we find 1997 emissions related to a consumption volume and composition that are comparable to 1993 actual indirect emission. The table shows a small increase in total indirect emissions and considerable changes for the individual industries. This suggests an overall change in structure giving slightly increased emission efficiency. On the other hand, the household consumption of 1997 can be expressed in 1993 prices, so that indirect emission using the 1993 structure for the corresponding volumes of consumption can be calculated. Comparing to the indirect emissions of 1997, we find that this volume of consumption produced larger indirect emissions according to the 1997 than to the 1993 structure. Contrary to our first comparison, this suggests a slight decrease in emission efficiency. These two comparisons can be done without yearly chaining of the elements of the input-output tables, if the task of calculating the relevant volume measures of deliveries for household consumption can be handled. For Norway, the relevant price indexes should in principle be available from the internal computations done in the course of our double deflation procedures related to our supply and use tables.

The last column is calculated from our chained price input-output model. The model expresses all elements of the matrix of deliveries of 1993 in 1997 prices, so that changes in relation to the 1997 current price IO analysis can be interpreted as volume changes. We find that the volume growth of induced production was slightly larger than the growth of emissions, so that emission efficiency has

improved somewhat. In the period there were also an increase in the average unit coefficients of emissions. Comparing unit coefficients for in chained 1997 values with the ones for 1997, we find an average growth of 3.9 per cent. This strengthens the impression that emission efficiency increased in the period. We should not forget, however, the difficulties in handling the chaining discrepancies inherent in our chained price input-output model. In particular, the chaining discrepancy for this total is negative, so calculations based on the components tend to overvalue the sum. Thus, applying unit coefficients of emission as emission of 1993 in chained 97 prices to the indirect emission generated by the household consumption for 1993 (also in chained 97-prices), we find total emissions to be somewhat higher than the emissions for 1993 from column (1). The difference corresponds to 1,5 percent of the 1993 result.

We find that a lot can be done, analyzing changes in emissions resulting from household consumption without having access to yearly input-output matrices in constant and current price sets. With such data, more detailed analyses of changes are possible. The chaining method applied here opens the possibilities to trace changes back to changes in the input-output coefficients. However, problems in handling chaining discrepancies remain.

6 Changes in the National accounts to improve the consistency with the Energy accounts.

6.1 The National accounts versus the Energy accounts

At Statistics Norway, three different divisions produce statistics concerning the use of energy products. The division for National accounts produces the National accounts, which give data about Norwegian industries' supply and use of energy products in value terms. The division for Environmental statistics and the division for Energy and industry statistics produce the Energy balance and the Energy account. These two accounts give data about the supply and use of energy products in physical terms.

In the Energy balance, the focus is on the supply and use of energy products by kind of activity, i.e. transport by lorries. In the Energy account, the use of energy products is defined according to the industry in which the energy products are used, i.e. the autodiesel used in the lorry is classified under the industry in which the lorry is used. The Energy account is the one most consistent with the National accounts.

6.2 Why is better consistency needed?

There are requests from the users of the Energy- and National accounts to improve the consistency between these two accounts. The request is embedded in the fact that the Energy- and the National accounts do not use the same definitions due to the nomenclature of the energy products that are included in the two accounts. The Energy account contains more energy products than the National accounts, but it is not necessarily more detailed. The National accounts give more detailed data about different petrol products than the Energy account, while the Energy account gives more detailed data on gas oils and other light petroleum products.

When the energy taxes are implemented into the National accounts, the Energy account is used as a source to estimate the amount of tax levied on the different energy products. To improve the quality of the energy tax data in the National accounts, a more detailed classification of gas oils and other light petroleum products also has been a preferred adjustment by the national accountants. But, a more

detailed energy product classification also means more work concerning data collection on supply, use and prices of the new energy products. However, with the total change in the energy tax system in 2000, a more detailed classification of energy products became a necessity for the implementation of the new energy taxes into the National accounts.

6.3 Changes carried out in the National accounts

In the National accounts prior to the revision, most of the refined oil products were included in only two energy products:
1. Gas oils (232011), which included auto fuel, marine gas oils and fuel oil no. 1.
2. Other light petroleum products (232013), which included marine diesel and fuel oil no. 2

In line with the definitions in the energy accounts, these two products have now been divided into three new energy products:
1. Fuel oil no. 1 and no. 2 (232015)
2. Auto diesel (232017)
3. Marine gas oils (incl. marine diesel) (232018)

The problem of consistency is now transferred into a problem of estimating the supply and use of these products in the National accounts and to estimate the amount of tax levied on each of the new energy products.

The industries' supplies of these new energy products are given by the "Production statistics for manufacturing, mining and quarrying"(NACE rev 1. 10, 12-37). There are however some challenges due to this statistics not having the same nomenclature for the new energy products as the Energy- and National accounts.

The industries' uses of the new energy products are given by the industries' own accounts. When these statistics do not provide suitable data, the Energy account and appropriate price statistics are used to estimate the use of the energy products in value terms.

The Energy account is now also used as the main source to estimate the amount of CO_2-tax and sulphur tax levied on the energy products, as well as to calculate the table that in the national accounts gives information about which industries that are to pay a reduced fee on the energy taxes.

As part of the revision of the National accounts, the new energy products will be implemented in the National accounts from 1991 on.

7 Regular routines for publishing NAMEA-air emission accounts

Developing and publishing the NAMEA air tables requires that the national accounts data, energy accounts data and the air emissions data be coordinated. The air emissions data use the energy data and the publication of the air emissions data are already coordinated with the energy accounts. For the NAMEA-air tables, the air emissions and national accounts data need to be coordinated. These two data sets are published at different times during the year and the work to put together the two sets of data needs to be coordinated with the normal preparation and publishing times of these other statistics.

When developing the NAMEA tables we had initially proposed to wait until the final figures for both the national accounts and the air emissions were available before we made the NAMEA tables available. This would mean that the figures could be published in May of year t-3. In other words the figures would be 3 years and 5 months old. After discussions with the Norwegian Ministry of the

Environment more current figures were desired. To try to meet this need the normal publishing cycles for the national accounts and the air emissions data were identified, both for final figures and for preliminary estimates.

Another difference between the air emissions data and the national accounts data is the cycle for revisions. The national accounts data are only revised periodically whereas the air emissions data are revised annually. This difference in revision cycles also needs to be included in the publication plans for the NAMEA-air tables. The following table shows the normal publishing cycles for the national accounts, the emissions by NACE rev.1 classification and the proposed NAMEA publishing time.

	The National accounts	**The Emission data by NACE rev 1 classification**	**Proposed for NAMEA matrix**
January year t		- Final for t-3 (published) - Preliminary for t-2 (not published by NACE only national totals) - Revision of time series to 1991	
February year t	- Preliminary: Quarterly t-1		
April year t	- Preliminary Revised quarterly t-1 - Preliminary Revised quarterly t-2		
May year t	- Final for Annual t-3		- Final for t-3 - Preliminary for t-2 - Revision of time series to 1991

In order to provide the most current data, the preliminary quarterly national accounts data would need to be used for year t-2. In addition the preliminary air emissions data broken down by NACE categories would also need to be published. These preliminary air emissions figures are normally only published as totals for the country and are not published by NACE categories until the final figures are available in t-3. In recent years the air emissions data are improving and it appears that we will be allowed to publish these preliminary air emissions data broken down according to NACE.

Due to the revision of the national accounts that will be completed in June 2002, the proposed publishing time schedule will be delayed for some months. Completely new tables for all economic, employment, energy use and air emissions will need to be developed in 2002 and this needs to be done after the national accounts revision is completed. Publication in early autumn 2002 is anticipated.

In addition to publishing the data tables, it is also necessary to develop a good format for presenting the data in an interesting and more understandable format. Figures and profiles showing changes over time will need to be developed.

8 Table 3 of NAMEA-2000 air emissions Eurostat reporting tables

Table 3 of Eurostat's NAMEA-2000 air emissions reporting tables was not completely filled out by Statistics Norway in the autumn 2000 because the emissions values reported to Eurostat were calculated directly from the air emissions data base and were not adjustments made to other types of reporting. Most countries start with their reporting to another international convention (such as CLRTAP [Convention of Long-Range Transboundary Air Pollution] with reporting to UNECE/EMEP and UNFCCC [UN Framework Convention of Climate Change] with reporting to the secretariat in Bonn) and adjust the values according to the national accounts definition of the country (i.e. the economic activity resident in the national territory).

The NAMEA-air Table 3 was developed by Eurostat to help account for and explain the differences between the various air emissions data being reported to the various international agencies and organizations. We feel it is important to evaluate the differences between the different sets of air emissions data so that we can explain these differences precisely to the different users of our data. We have only done this in a very general manner before and are now wanting to look at this issue in more detail since publishing more than one set of air emissions data can be very confusing to non-experts.

There are very specific definitions determining how different aspects are included for reporting to the various international organizations. With respect to the international agreements to which Norway has ratified, the official air emissions for Norway will be based on these definitions and the NAMEA-air emissions tables will be supplementary information. The international reporting definitions specifying which emissions to include and exclude result in estimates that are close to the concept of "emissions on the national territory." Whereas the national accounts focus is on actual emissions from the national economy or economic units that are resident in the national territory.

The difference between emissions on the national territory and emissions of the national economy is mainly determined by emissions from mobile sources, and in particular air, water and land transport (NACE 60-62). The major adjustments needed are additions of emissions by units resident in the rest of the world and deductions of emissions by non-resident units on the national territory. For Norway the emissions from ocean transport arising from the international bunkering of ships accounts for the majority of the adjustments.

Due to the structure of the Norwegian air emissions data base and model it is possible to specify directly which parts of the data included in the data base will be included. The values are then obtained from the database directly and not "adjusted" afterwards as is the case for most other countries. There are five dimensions specified for each entry in the database. The five dimensions are:

- pollutant type
- technical source (34 sources including direct-fired furnaces, passenger cars, extraction processes, etc.)
- emission carrier (32 carriers including coal, natural gas, gasoline, waste, etc.)
- economic sectors (131 sectors based on NACE Rev. 1)
- territorial units (435 municipalities in mainland Norway, Svalbard, sea north of 62^{o}N, sea south of 62^{o}N and air space 100-1000 meters and more than 1000 meters).

It was difficult to obtain a matched set of NAMEA-data and Eurostat/OECD data that corresponded to the exact same database time period. When the NAMEA-data had been taken out for reporting to the NAMEA-2000 tables, the values in the database had been updated from those air emissions values that were reported to the OECD/Eurostat 2000 joint questionnaire. This made calculating values for Table 3 not possible. Instead we have examined the different definitions that are used and have identified the groups that are included and excluded for the different types of reporting in preparation for doing the calculations on the 2002 Joint Questionnaire data.

Since we are in the process of establishing routines for publishing the NAMEA-air emissions tables on a more regular basis, the values for Table 3 should be able to be calculated for the new set of air emissions tables that will be reported to Eurostat in the Joint Questionnaire reporting in spring 2002 since we also have plans to publish new NAMEA-air emissions tables in the spring. Since the publication of these related tables will be so close in time and this should enable us to calculate in the values in Table 3. The NAMEA-air emissions tables that will be regularly published will not be as detailed as the Eurostat NAMEA-air tables because the categories will be according to the same categories as the Quarterly National Accounts which differs slightly in the detail of the NACE categories from the Eurostat NAMEA-air tables.

Documenting the exact relationships between the different air emissions model codes, national accounts codes and double checking that the programming for the NAMEA-air emissions tables were correct led to the development of the coding table at the end of this section. This is an important key relevant to our refining of our NAMEA-air emissions work.

There are a few categories that account for most of the important differences. It is worth examining the structure of the transport sector in more detail. In the air emissions model there are two different codes that separate domestic and international air transport (6202 and 6203) these are not separate in the national accounts (2362) or NACE codes (62). This allows for the inclusion/exclusion of these emissions as required. With respect to water transport there are separate codes for ocean transport and for inland and coastal water transport in the air emissions model (6110/6130), the national accounts model (2365/2366) and the NACE divisions (61.101-102/61.103-109, 61.2). So in this case, no additional detail was required to separate out these different activities.

To adjust for the economic activity that is resident in Norway but not occurring on the national territory, the emissions for ocean transport, sea and coastal transport in Europe (air emissions code 6110, national accounts code 2365) and the emissions for International air transport (air emissions code 6203) need to be included in the NAMEA-air emissions whereas they are excluded for other types of international reporting. Also the emissions from air transport over 1000 m are included in the NAMEA-air emissions. The emissions in category "660000 Foreign activities in Norway" are from air transport of foreign companies in Norway. These emissions are excluded from the NAMEA-air emissions.

Road transportation for trucking abroad and tourism abroad can also be a difficult area. Since Norway is not a country that is on the way to anywhere else, the through traffic complications relevant for mid-European countries (such as the Netherlands, Switzerland, Luxembourg, etc.) are not applicable in the case of Norway. It is assumed that the emissions from road transportation from foreigners in Norway are basically equal to the emissions from Norwegians outside of Norway.

The following calculations should resolve the discrepancies between the official air emissions values for Norway and the NAMEA-air emissions:

Official air emissions	**Air emission model codes for adjusting emission amounts**
+ Residents in the rest of the world	+ 6203 International air transport + 6110 Ocean transport, sea and coastal transport in Europe
- Non-residents in Norway	- 660000 Foreign activities in Norway (covers only air transport)
Total emissions by residents, NAMEA	(assumption that emissions from road transport from foreigners in Norway are equal to the emissions from Norwegian units outside of Norway)

These calculations will be attempted in the spring of 2002 when a newly developed, matched set of NAMEA-data and air emissions data are available and the corresponding emissions from the specific categories that need to be added or subtracted are also available.

The following shows a portion of the NAMEA-air Table 3. This table can be confusing and lead to double counting if not filled out and interpreted correctly.

The values reported on row no. 2, Total emissions from national producers, already includes the values for rows 3, 4, 5, and excludes rows 6 and 7 because that is the way our database and NAMEA programming against that database is developed. What this table requires from Norway is to go into the database and retrieve individual information that we otherwise do not develop separately.

Emissions from waste dumping sites in the NAMEA data are usually found associated with NACE 90 but if landfills are owned by enterprises in other sectors then the emissions are associated with that NACE group. Our air emissions database has heterogeneous production units and the NACE category of the enterprise is determined by the official NACE category in the business register. There are air emissions for landfills available from the air emissions calculations under the category "process emissions, landfill gas." It must be noted that these emissions are already included in the values reported in row 2. Reporting them again in row 3 can lead to misunderstanding the values reported in row 2. The directions of what should be include in row 2 need to be improved.

Values for rows 4 and 5 should be available from the air emissions model codes 6110 and 6203. Values for rows 6 and 7 are not currently estimated. Values for rows 8, 9 and 10 cannot be reported separately. These emissions would correspond to the air emissions model code 660000 Foreign activities in Norway. These emissions are not included when the NAMEA-air emissions values are estimated. So again the values reported in row 2 are already excluding these emissions. Row 11 is not currently estimated or calculated. The transborder emissions are currently only estimated for acidification precursor gases by the EMEP model. The EMEP work is expanding to include other air emissions such as heavy metals but the reporting areas for the greenhouse gases should be excluded from the reporting areas in table 3. This same principal holds for the themes. Only the gases included in the theme calculation should be able to be reported in the table. Because the methodology for determining and reporting carbon sequestration has not yet become standardized this is not yet reported officially for Norway.

Row no.		Greenhouse Gases	Acid precursor gases
	ORIGINS OF EMISSIONS		
1	**Emissions by households**	reported	reported
2	**Total emissions from national producers**	reported	reported
	Emissions to include		
3	Emissions from waste dumping sites	Data available from air emission statistics "Process emissions, landfill gas"	Data available from air emission statistics "Process emissions, landfill gas"
	Emissions from bunkering abroad		
4	- shipping abroad	Air Emissions Model code 6110 Ocean transport, sea and coastal transport in Europe	Air Emissions Model code 6110 Ocean transport, sea and coastal transport in Europe
5	- flying abroad	Air Emissions Model code 6203 International air transport	Air Emissions Model code 6203 International air transport
	Emissions from road transport abroad		
6	- trucking abroad	not currently estimated in air emissions model	not currently estimated in air emissions model
7	- tourism abroad	not currently estimated in air emissions model	not currently estimated in air emissions model
	Emissions to exclude		
	Emissions from foreigners inside		
8	- international flying inside	Air Emissions Model code 660000 Foreign activities in Norway	Air Emissions Model code 660000 Foreign activities in Norway
9	- international trucking inside	not currently estimated in air emissions model	not currently estimated in air emissions model
10	- foreign tourists	not currently estimated in air emissions model	not currently estimated in air emissions model

Row no.		Greenhouse Gases	Acid precursor gases
11	National territory producers' emissions excluding waste dumping sites	not estimated or calculated for Norway - considered not needed or necessary	not estimated or calculated for Norway - considered not needed or necessary
12	National territory producers' emissions including waste dumping sites	reported	reported
13	**Transborder emissions from the rest of the world**	not applicable - category should not be possible to be reported in table	From EMEP Model
14	**Total origin of emissions**	reported	reported
	DESTINATION OF SUBSTANCES		
15	**Carbon sequestration**	not estimated at this point	not applicable - category should not be possible to be reported in table
16	**Transborder emissions to the rest of the world**	not applicable - category should not be possible to be reported in table	From EMEP Model
	Contribution to environmental themes		
16	Greenhouse effect	reported	not applicable - category should not be possible to be reported in table
17	Acidification	not applicable - category should not be possible to be reported in table	reported
18	Photochemical pollution	not estimated	not estimated
	Total destination emissions		
	Environmental themes		
19	GWP_{100} (CO_2, N_2O, $_{CH4}$)	reported	not applicable - category should not be possible to be reported in table
20	GWP_{100} (CO_2, N_2O, CH_4, HFCs, PFCs, SF_6)	reported	not applicable - category should not be possible to be reported in table
21	PAE (SO_2, NO_x, NH_3)	not applicable - category should not be possible to be reported in table	reported

We are currently aware of two factors in relation to the way the air emissions model is developed and the resident units (or economic) definition of Norway that may differ from the approach used in other countries. One problem is related to the CO_2 emissions from the combustion of biofuels and the second problem is related to emissions from road transport abroad.

The problem relates to how the CO_2 emissions from the combustion of biofuels are calculated in the air emissions model and included in the air emissions database. The emissions factor used in the air emissions calculation model for the CO_2 emissions from biofuels is zero. This choice of emission factor means that there are no CO_2 emissions estimated from the combustion of this fuel type (emission source). This approach produces results that are according to the CLRTAP and UNFCCC conventions. The assumption behind this approach is the CO_2 emissions with non-fossil origin are supposed to be taken up by the biomass to the same extent as it is emitted. However, it could be argued that these emissions should be estimated and included as emissions from the units resident in Norway in the NAMEA-air tables. By not including them the CO_2 emissions are under estimated.

The second problem is related to emissions from road transport abroad, specifically trucking abroad and tourism abroad. At this time no estimates for these types of emissions are made. The general assumption is that the emissions from road traffic due to trucking and tourism from foreigners in Norway is the same as the amount produced by Norwegians abroad. This assumption may need to be considered more carefully.

The following tables provide the connection between the codes for the air emissions model, NACE and the national accounts (both quarterly and detailed). This provides the key for how these different categories are combined in the NAMEA-tables.

Air emissions sector no.	SIC (NACE) code	NACE Division	Detailed National Accounts code	Quarterly National Accounts code	Sector (industry) name
Agriculture and forestry					
230100	01.1-3	1	23010, 22010,22015	2301	Agriculture
0140	01.4-5	1	23014	2301	Services related to agriculture and forestry
0200	02	2	23020, 23024	2302	Forestry and logging
Fishing					
0510	05.01	5	23051, 22051	2305	Fishing
0520	05.02	5	23052	2306	Operation of fish farms
Energy sectors					
1000	10.1-2	10	23100	2310	Coal mining
1110	11.1	11	23111	2311	Extraction of crude petroleum and natural gas
1200	12	n.a	n.a	n.a	Mining of uranium and thorium ores (no activity)
2320	23.2 part	23	23231,23232	2323	Manufacture of refined petroleum products
2330	23.3	n.a	n.a	n.a	Processing of nuclear fuel (no activity)
2340	11.1	11	23111	2311	Gas terminal
4010	40.101	401	23401	2341	Production of electricity
4020	40.102	401	23402,23403	2342,2343	Distribution of electricity
4030	40.2	401	23404	2344	Manufacture and distribution of gas
4040	40.3	403	23405	2344	Steam and hot water supply
Mining/manufacturing					
1120	11.2	11	23112	2312	Oil drilling
1300	13	13	23130	2310	Mining of metal ores
1400	14, 10.3	14	23140	2310	Other mining and quarrying
1510	15.1	15	23151	2315	Production, processing and preserving of meat and meat products
1520	15.2	15	23152	2314	Processing and preserving of fish and fish products
1530	15.3	15	23153	2316	Processing and preserving of fruit and vegetables
1540	15.4	15	23154	2316	Manufacture of vegetable and animal oils and fats
1550	15.5	15	23155	2315	Manufacture of dairy products
1560	15.6	15	23156	2316	Manufacture of grain mill products, starches and starch products
1570	15.7	15	23157	2316	Manufacture of prepared animal feeds
1580	15.8	15	23158	2316	Manufacture of other food products
1590	15.9	15	23159	2317	Manufacture of beverages

Air emissions sector no.	SIC (NACE) code	NACE Division	Detailed National Accounts code	Quarterly National Accounts code	Sector (industry) name
Mining/manufacturing cont.					
1600	16	16	23160	2317	Manufacture of tobacco products
1700	17	17	23170	2318	Manufacture of textiles and textile products
1810	18.1	18	23180	2318	Manufacture of leather clothes
1820	18.2	18	23180	2318	Manufacture of other wearing apparel and accessories
1830	18.3	18	23180	2318	Dressing and dyeing of fur, manufacture of articles of fur
1910	19.1-2	19	23190	2318	Tanning and dressing of leather, manufacture of luggage, handbags, saddlery and harness
1930	19.3	19	23190	2318	Manufacture of footwear
2010	20.1	20	23201	2320	Sawmilling and planing of wood, impregnation of wood
2020	20.2	20	23202	2320	Manufacture of particle board, fibre board and other panels and boards
2030	20.3	20	23203	2320	Manufacture of builders' carpentry and joinery
2040	20.4-5	20	23204	2320	Manufacture of other products of wood
2110	21.11	21	23211	2321	Manufacture of pulp
2120	21.12	21	23212	2321	Manufacture of paper and paperboard
2130	21.2	21	23213	2321	Manufacture of articles of paper and paperboard
2210	22.1	22	23221	2322	Publishing
2220	22.2	22	23222	2322	Printing and service activities related to printing
2230	22.3	22	23223	2322	Reproduction of recorded media
2310	23.1	23	23231	2323	Manufacture of coke oven products
2322	23.2 part	23	23232	2323	Manufacture of asphalt
2411	24.11	24	23241	2324	Manufacture of industrial gases
2412	24.12-13	24	23241	2324	Manufacture of dyes and pigments and other inorganic basic chemicals
2415	24.15, 24.2	24	23242	2324	Manufacture of fertilisers, nitrogen compounds and pesticides
2416	24.14, 24.16-17	24	23241 (Nace 24.14), 23247 (Nace 24.16-17)	2324	Manufacture of plastics and synthetic rubber in primary forms, manufacture of other organic basic chemicals
2430	24.3	24	23243	2325	Manufacture of paints and varnishes, printing ink and mastics
2440	24.4	24	23244	2325	Manufacture of basic pharmaceutical products and pharmaceutical preparations
2450	24.5	24	23245	2325	Manufacture of soap and detergents and toilet preparations
2460	24.6	24	23246	2325	Manufacture of other chemical products
2470	24.7	24	23247	2324	Manufacture of man-made fibres
2500	25	25	23250	2325	Manufacture of rubber and plastic products
2610	26.1	261	23261	2325	Manufacture of glass and glass products
2620	26.2-3	269	23262	2325	Manufacture of ceramic goods
2640	26.4,6-8	269	23262 (Nace 26.4),23266 (Nace 26.6-8)	2325	Manufacture of other mineral products

Air emissions sector no.	SIC (NACE) code	NACE Division	Detailed National Accounts code	Quarterly National Accounts code	Sector (industry) name
Mining/manufacturing cont.					
2650	26.5	269	23265	2325	Manufacture of cement, lime and plaster
2710	27.1-3 except 27.35	271	23271	2327	Manufacture of basic iron and steel
2720	27.35	271	23271	2327	Manufacture of ferro-alloys
2730	27.42	279	23273	2327	Aluminium production
2740	27.4 except 27.42	279	23274	2327	Other non-ferrous metal production
2750	27.5	279	23275	2327	Casting of metals
2810	28.1-5	28	23281	2330	Manufacture of fabricated metal products, except machinery and equipment
2860	28.6	28	23286	2330	Manufacture of cutlery, tools and general hardware
2870	28.7	28	23287	2330	Manufacture of other metal products
2910	29.1-2	29	23291	2330	Manufacture of general purpose machinery
2930	29.3-5	29	23293	2330	Manufacture of special purpose machinery
2960	29.6	29	23296	2330	Manufacture of weapons and ammunition
2970	29.7	29	23297	2330	Manufacture of domestic appliances
3000	30	30	23300	2330	Manufacture of office machinery and computers
3110	31.1-2	31	23311	2330	Manufacture of electric motors, generators and transformers, manufacture of electricity distribution and control apparatus
3130	31.3	31	23313	2330	Manufacture of insulated wire and cable
3140	31.4-6	31	23314	2330	Manufacture of other electrical apparatus and equipment
3210	32.1-2	32	23321	2330	Manufacture of electronic components and television and radio transmitters
3230	32.3	32	23323	2330	Manufacture of television and radio receivers, sound or video recording apparatus
3310	33.1-3	33	23331	2330	Manufacture of medical and precision instruments
3340	33.4-5	33	23334	2330	Manufacture of optical instruments, photographic equipment, watches and clocks
3400	34	34	23340	2330	Manufacture of motor vehicles and parts and accessories for motor vehicles
3510	35.1 except 35.114	35	23351	2335	Building and repair of ships and boats
3520	35.114	35	23352	2336	Building and repair of oil platforms
3530	35.2	35	23353	2330	Manufacture and repair of railway and tramway locomotives and rolling stock
3540	35.3	35	23354	2330	Manufacture and repair of aircraft and spacecraft
3550	35.4-5	35	23355	2330	Manufacture of other transport equipment
3610	36.1	36	23361	2337	Manufacture of furniture
3620	36.2	36	23362	2337	Manufacture of jewellery and related articles
3630	36.3-6	36	23363	2337	Other manufacturing
3710	37.1	37	23371	2337	Recycling of metal waste and scrap

Air emissions sector no.	SIC (NACE) code	NACE Division	Detailed National Accounts code	Quarterly National Accounts code	Sector (industry) name
3720	37.2	37	23372	2337	Recycling of non-metal waste and scrap
Water supply					
4100	41	41	25410	2542	Collection, purification and distribution of water
Construction					
4500	45	45	22452,23451,23452,23453,23454, 23455,25453	2345	Construction
Wholesale and retail trade/hotels and restaurants					
5000	50-52	50-52	23501,23502,23505,23510,23521,23527	2351,2352	Wholesale/retail trade, repair of motor vehicles etc
5500	55	55	23551,23553	2355	Hotels and restaurants
Transport etc.					
6010	60.1	601	23601	2361A	Transport via railways
6020	60.21	602	23602, 23605	p.o.2361A (N 60211), p.o.2361B (N60.212)	Other scheduled passenger land transport
6030	60.22	602	23603	2361B	Taxi operation
6040	60.23-24	602	23604,	2361B	Other land passenger transport, freight transport by road
6080	60.3	603	23608	2360	Transport via pipelines
6110	61.101-102	611	23610, 23611, 23612	2365	Ocean transport, sea and coastal transport in Europe
6130	61.103-109, 61.2	619	23613	2366	Inland and coastal water transport
6202	62 part	62	23620	2362	Domestic air transport
6203	62 part	62	23620	2362	International air transport
6300	63	63	23631,23632,23633,	2363	Supporting and auxiliary transport activities
6400	64	64	23641,23642	2364	Post, telecommunications

Air emissions sector no.	SIC (NACE) code	NACE Division	Detailed National Accounts code	Quarterly National Accounts code	Sector (industry) name
Financing, insurance, real estate and business services					
6500	65-67	65-67	23651, 23652, 23655,23661,23662, 23663,23670	2367	Financial intermediation, insurance
7000	70	70	23700,22704	2370,p.o.2371	Real estate activities
7100	71	71	23711, 23713	2371	Renting of machinery and equipment
7200	72	72	23720	2371	Computer and related activities
7300	73	73	23730	2371	Research and development
7400	74	74	23741, 23742, 23744, 23745, 23747, 23748	2371	Other business activities
8000	80	80	23800,26800	2380,2680	Education
8500	85	85	23851, 23852, 23853, 23859,26851, 26853,26854	2385,2685	Health and social work
9000	90	90-93	23900	2390	Sewage and refuse disposal, sanitation and similar activities
9100	91	90-93	23910,26910	2390, 2690	Activities of membership organisations
9200	92	90-93	23921, 23922, 23926, 23927,26921, 26926	2390, 2690	Recreational, cultural and sporting activities
9300	93	90-93	23930	2390	Other service activities
9500	95	95	22950	2390	Private households with employed persons
Central government					
		601	24601	2490	Transport via railways
246300	63	63	24631, 24632	2490	Supporting and auxiliary transport activities
		67	24670	2490	
7300	73	73	24730	2490	Research and development
7400	74	74	24742, 24745	2490	Other business activities
7510	75.1, 75.21, 23, 24, 75.3	75	24751	2490	Public administration
7520	75.22	75	24752	2475	Defence
8000	80	80	24800	2480	Education
8500	85	85	24851, 24852	2485	Health and social work
9200	92	90-93	24921	2490	Other service activities

Air emissions sector no.	SIC (NACE) code	NACE Division	Detailed National Accounts code	Quarterly National Accounts code	Sector (industry) name
Local government					
257510	75.1, 75.25	75	25751	2590	Public administration
8000	80	80	25800	2580	Education
8500	85	85	25851, 25853, 25854	2585	Health and social work
9000	90	90-93	25900	2542	Sewage and refuse disposal, sanitation and similar activities
9200	92, 93.03	90-93	25921	2590	Other service activities
Private households					
330000	n.a.	990	61_,68_	61_	Private households (consumption)
Other data elements:					
Foreign activities in Norway					
660000	n.a.				Foreign activities in Norway
Financial Intermediation Services Indirectly measured (FISIM)					
n.a	n.a	981	23654, 23659,	2358	FISIM
n.a	n.a	981	23669	2367	FISIM
Taxes on products					
n.a	n.a	982	29501	2951	Value Added Tax
n.a	n.a	983	29502	2952	Investment levy
n.a	n.a	984	29503	2953	Taxes on products
n.a	n.a	985	29504	2953	Subsidies on products
n.a	n.a	986	29505	2955	Import duties
n.a	n.a	987	29506	2956	Taxes on imports excluding VAT and import duties

9 NAMEA Technical report

The final draft version of the technical documentation that describes how the Norwegian NAMEA for air emissions is also part of this work. The documentation only briefly describes how the data may be used. The major focus for this work is on how the different data are included in the NAMEA. After several years of working and refining the system it was necessary to document the methodologies and programs used. The report is primarily documentation of what is included and excluded in the different calculations.

The report is in its final draft version but has not yet been printed. The document still needs to be approved through the Statistics Norway system and may require some editing and corrections. Since this report is combining systems from two different divisions the approval process needs to be followed through both divisions.

The content of the document includes:

1. Introduction

2. Norway's NAMEA for Air
   a) Industry profiles
   b) Time series and trends

3. What are hybrid accounts / NAMEA?
   a) Approaches to combining environment and economic information
   b) The development of NAMEA
   c) Parts to the NAMEA
   d) NAMEA data are not the same as national air emissions data
   e) Work in other European countries
   f) Shortcomings of NAMEA – need for different systems

4. Construction of Norwegian NAMEA-Air Data Matrices
   a) Data sources
      (1) Economic data
      (2) Method used for creating the input-output matrix
      (3) Air emissions data
      (4) Import and export of air emissions and the NAMEA tables
      (5) Changes in NACE categories and consistent time series data

   b) Important NAMEA issues
      (1) Energy accounts
      (2) Non-homogeneous NACE categories
      (3) CO_2 emissions from biofuels
      (4) Landfill emissions
      (5) Carbon sequestration
      (6) Household emissions
      (7) Electricity production
      (8) Fishing vessels
      (9) Ocean Transport, Sea and coastal transport Europe (NACE 61.101)
      (10) Coastal water transport
      (11) Air Transport (NACE 62)
      (12) Land Transport (NACE 60.1, 60.2)
      (13) Own Account Transport
      (14) Tourism and Household emissions from transport

5. Themes
   a) Greenhouse effect theme
   b) Acidification theme
6. Regular routines for publishing NAMEA-air emission accounts
7. Future work
8. NAMEA matrix
9. Eurostat reporting to Table 3 for NAMEA-air 2000
10. Aggregation of HFCs and PFCs into "-equivalents"
11. SAS program for extracting NAMEA air emissions data from air emissions database
12. SAS programs for extracting NAMEA national accounts data from national accounts database
13. List showing corresponding codes from air emissions model, NACE (SIC) codes, quarterly national accounts and detailed national accounts codes
14. Abbreviations
15. References

Recent publications in the series Documents

2000/14 H.C. Bjørnland: VAR Models in Macro-economic Research

2000/15 T.L. Andersen: Short-term Statistics in Mozambique: A short-term mission 19 June - 6 July 2000

2000/16 J. Thori Lind: The Use of Household Welfare Functions to Estimate Equivalence Scales

2001/1 T. Bye, R Choudhury, M. Harlarson and P. Hardarson: The ISM model: A CGE model for the Icelandic Economy

2001/2 K.Ø. Sørensen, J.L. Hass, H. Sjølie, P. Tønjum and K. Erlandsen: Norwegian Economic and Environment Accounts (NOREEA) Phase 2

2001/3 G. Haakonsen, K. Rypdal, P. Schøning and S.E. Stave: Towards a National Indicator for Noise Exposure and Annoyance: Part I: Building a Model for Traffic Noise Emissions and Exposure

2001/4 T. Åvitsland: User Costs of Real Capital

2001/5 H.V. Sæbø: Strategic planning and management in Institutio Nacional de Estatística, Mozambique: Short Term Mission Report, November 2 - 9, 2000

2001/6 H.V. Sæbø, J. Byfuglien and R. Johannessen: Quality issues in Statistics Norway

2001/7 J. Byfuglien: Comparability of income data: Project report

2001/8 A.S. Abrahamsen,.M.Q. Andersen and R.Ragnarsøn: Project: Quality of Manufacturing Statistics and Evaluation of Methods for Producing Preliminary and Final Figures. Final Report

2001/9 T. Skoglund: Employment in the Norwegian National Accounts

2001/10 O.C. Moen: Nordic Economic Growth in Light of New TheoryL: Overoptimism about R&D and Human Capital?

2001/11 H.V. Sæbø: Strategic Planning and Management in Instituto Nacional de Estatistica, Mozambique: Short Term Mission Report, August 27 - September 6, 2001

2001/12 B. Hoem: Environmental Pressure Information System (EPIS) for the household sector in Norway

2001/13 H. Brunborg, I. Bowler, A.Y. Choudhury and M. Nasreen: Appraisal of the Birth and Death Registration Project in Bangladesh

2001/14 K. Rypdal: CO_2 Emission Estimates for Norway. Methodological Difficulties

2001/15 E. Røed Larsen: Bridging the Gap between Micro and Macro: Interdependence, Contagious Beliefs and Consumer Confidence

2001/16 L. Rogstad: GIS-projects in Statistics Norway 2000/2001

2002/1 B. Hoem, K. Erlandsen og T. Smith: Comparisions between two Calculation Methods: LCA using EPIS-data and Input-Output Analysis using Norway' s NAMEA-Air Data

2002/2 R. Bjørnstad: The Major Debates in Macroeconomic Thought - a Historical Outline

2002/3 J. L. Hass and T. Smith: Methodology Work for Environmental Protection Investment and Current Expenditures in the Manufacturing Industry. Final Report to Eurostat.

2002/4 R. Bjørnstad, Å. Cappelen, I. Holm and T. Skjerpen: Past and Future Changes in the Structure of Wages and Skills

2002/5 P. Boug, Å. Cappelen and A. Rygh Swensen: Expectations and Regime Robustness in Price Formation: Evidence from VAR Models and Recursive Methods

2002/6 B.J. Eriksson, A.B. Dahle, R. Haugan, L. E. Legernes, J. Myklebust and E. Skauen: Price Indices for Capital Goods. Part 2 - A Status Report

2002/7 R. Kjeldstad and M. Rønsen: Welfare, Rules, Business Cycles and the Employment of Single Parents

2002/8 B.K. Wold, I.T. Olsen and S. Opdahl: Basic Social Policy Data. Basic Data to Monitor Status & Intended Policy Effects with Focus on Social Sectors incorporating Millennium Development Goals and Indicators

2002/9 T.A. Bye: Climate Change and Energy Consequenses.

2002/10 B. Halvorsen: Philosophical Issues Concerning Applied Cost-Benefit Analysis

2002/11 E. Røed Larsen: An Introductory Guide to the Economics of Sustainable Tourism

2002/12 B. Halvorsen and R. Nesbakken: Distributional Effects of Household Electricity Taxation

2002/13 H. Hungnes: Private Investments in Norway and the User Cost of Capital

2002/14 H. Hungnes: Causality of Macroeconomics: Identifying Causal Relationships from Policy Instruments to Target Variables