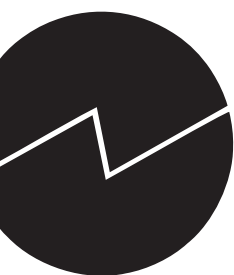


Statistics Norway



Statistisk sentralbyrå

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Documents

Environmentally related taxes in Norway

Totals and divided by industry

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1. Introduction and background

Statistics Norway has done work on environmentally related taxes for several years by reporting data to Eurostat/OECD. However, definitions and classifications of environmentally related taxes are not straight forward. In this report we present calculations following the Eurostat definitions (2001). We also present some additional calculations of environmental taxes following the principles in a White paper to the Norwegian Government (NOU, 2007:8). This clearly illustrates the importance of the definitions (see chapter 2). In international statistics it is important to be able to compare figures between countries, however, one should be aware of the disputes over definitions.

An environmentally related tax should address environmental harmful actions by industries and households (see also chapter 2.1 below). If effective, it leads to reductions in pressure on the environment, although there may be a time lag between the actual taxation and its effect. In practice, demarcation of what is an environmental tax and what is not, may be difficult. This is discussed in chapter 2.3. Nevertheless, it should be a long-term goal to establish statistics in such a way that analyses and environmental accounts should show the links between taxation and the results for the environment in a country and in the European society.

Amongst different economic instruments for pollution control and natural resource management, Eurostat has focused on developing statistics on environmentally *related* taxes. This is an area where basic data generally is readily available and comparable between countries. Environmentally related taxes is part of the larger framework of integrated environment-economic accounting, which Statistics Norway has been working to establish since 1999 as part of the project NORwegian Environmental and Economic Accounts (NOREEA).

The first Norwegian attempts to calculate statistics on environmentally related taxes divided by industry were undertaken in 2001, as part of an Eurostat funded Nordic project including participants from Sweden, Denmark, Finland and Norway (See “Energy taxes in the Nordic countries - does the polluter pay?”, Grant Agreement no. 200141200022). The “Eurostat manual on Environmental taxes” (2001) was used as the starting point for the work within the project. Smith (2005) presented energy taxes paid by industry together with pollution figures from those same industries. Also the 2001 NOREEA Report to Eurostat (Contract N°. 200041200016) and the 2003 NOREEA Report to Eurostat (Contract N°. 200241200013) included such statistics.

Total tax figures for Norway have been reported to Eurostat for several years by Statistics Norway’s Division for Public Finances (as part of ESA-reporting). These data diverge from the figures in this report, as a few more are included in these data. This will be better coordinated in the future. Total tax figures for Norway have been reported to Eurostat for several years by Statistics Norway’s Division for Public Finances (as part of ESA-reporting). These data diverge from the figures in this report, as a few more are included in these data. This will be better coordinated in the future.

Statistics Norway has also compiled data based on a more precise definition of environmental taxes, see for instance Bye and Bruvoll (2008). Statistics Norway’s Research Department also headed a public inventory on environmental taxes in 2007 and some results from that study are presented in annex 3 in this report (NOU, 2007:8).

Different methods are used to extract environmentally related taxes by the Eurostat definition from the national accounts system. The relevant taxes are split between taxes on products and other taxes on production¹ in the national accounts. In 1999, Sørensen and Sjølie outlined the changes necessary to be able to deduct statistics on environmentally related taxes on products by industry directly from the national accounts. In 2006-2008 the necessary resources were made available to implement these

¹ Annual vehicle tax paid by consumers is neither defined as tax on products or other taxes on production. This tax is therefore added when presenting overall figures to be able to show all environmentally related taxes.

recommendations, using 2005 as the first available reference year. However, to get the full picture, also the environmentally related taxes on production are needed, although these are proportionally much less important than the product taxes. The last piece of having the environmentally related taxes on production included has been done with financial support from Eurostat, and was carried out in 2008 through this project.² Presenting both environmental data and environmentally related economic information broken down by industry, provides valuable information for different kinds of policy analysis.

This report presents overall figures for environmentally related taxes by the Eurostat definition for the years 1990-2007 broken down by categories of taxes, as well as figures for 2005 broken down by industry. The industry breakdown is published for the first time. Environmentally related taxes have not yet been established as official statistics in Norway. For relevant comparison, alternative figures following the Pigouvian definition of taxes are also presented in this report. It is important that such definitions are studied and more detailed figures developed.

2. Definitions and categorisation

Definitions and categorisations of the statistics presented in this report follow guidelines given by the EU, the IEA and the OECD (Eurostat, 2001). An alternative definition following the discussions in an official committee (NOU, 2007:8) is also presented in chapter 2.3 and annex 3.

2.1 The Eurostat definition of environmentally related taxes

The definition of environmentally related taxes provided in Eurostat (2001) is the following:

"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."

According to these guidelines, *"all taxes on energy and transport are per definition environmentally related taxes. Value added type taxes are excluded from the definition."*

The general definition of a tax used in this framework follows from the National Accounts, where the main point is that taxes are compulsory payments to the government, where the benefits provided to the taxpayer are not directly linked to the payment.

Since motivation is not a part of the definition, one can argue that "environmental taxes" is not a good name for the statistics, and that "environmentally related taxes" is more correct. While Eurostat uses "environmental taxes" for simplicity, we use the full wordings in Norway so far.

According to Eurostat (2001), the environmental effect of a tax comes primarily through the impact a tax has on the relative prices of environmentally related products and activities, in combination with the relevant price elasticities. The potential effect of a given tax will in such a perspective depend on the costs and prices.

The definition simply focuses on defining the tax bases with particular environmental relevance, and considers all taxes levied on these tax bases as environmental. The reason behind this choice was that the tax base was considered the only objective basis for identifying environmentally related taxes for the purpose of international comparisons. Criterias like the name of the tax, the rationale behind or earmarking were stated to have a proven difficulty when used in practise. Defining a tax out of

² Tuva Grytli, Kristine Kolshus, Ole Magnus Jakobsen and Annegrete Bruvoll have also participated in this project and contributed to the figures presented in this report.

purpose can also be difficult, as goal-conflicts often exist. E.g., a tax can have both a fiscal and an environmental motivation.

Another issue to have in mind when analyzing taxes is that a tax is not defined as price and volume as other products in the national accountings. The taxes have to be calculated in fixed prices as the system of the National Accounts requires it⁴.

In the Norwegian case, using the Eurostat definition of environmentally related taxes does result in a high ratio of fiscally motivated taxes being defined as environmentally related. Some taxes might even have only a vague link to the environment from an environmental motivation point of view. This can clearly be seen to have weaknesses when it comes to making use of the figures for policy purposes. A presentation of an alternative definition is therefore also given (chapter 2.3).

When identifying environmentally related taxes in Norway, the taxes (excise duties) received by the general government and defined as a tax in the Norwegian national accounts were used as the starting point. In order to get the total picture of environmentally related taxes, taxes received by the local government as well as through extra budgetary accounts also had to be examined. However, we found that there were no environmentally related taxes received by local governments.

2.2 The Eurostat categorisation of environmentally related taxes

Since different countries have different taxes, 4 main categories of environmentally related taxes have been defined. This has been done for reporting purposes and with the aim of making international comparisons possible. The four main categories are:

- Energy taxes
- Transport taxes
- Pollution taxes
- Resource taxes

Eurostat has further suggested that, when possible, countries should show CO₂ and SO₂ taxes separately, and not only within their respective classes. However, it has not yet been possible to report these taxes separately to Eurostat.

Energy taxes (including CO₂ taxes)

This group includes taxes on energy products used for both transport and stationary purposes. The most important energy products for transport purposes are petrol and diesel. Energy products for stationary use include fuel oils, natural gas, coal and electricity. The CO₂ taxes are included in energy taxes rather than in pollution taxes due to several reasons. Often they are integrated with other energy taxes and cannot be separated in the national accounts. Another reason is that they may have been introduced as a substitute for other energy taxes. However, in Norway we are able to separate CO₂ taxes from other taxes.

Also use-dependent motor-vehicle taxes are included in this category.

In our calculations also SO₂ taxes have been grouped under energy taxes. There has been a “tradition” among Nordic countries to do it this way since a common project finished in 2003 (National Statistical Offices in ..., 2003). However, as categorising the sulphur tax among energy taxes not seems to get support in the London group, we will necessarily change this.

⁴ Price and volume figures for taxes on production i.e. VAT, taxes on products and industry tax is calculated as recommended in ESA 1995 section 10.50 – 10.52. This method reflects the change in price, i.e. tax rate and volume. However, since the tax figures are based on production from the National Accounts, volume figures cannot be linked to a quantum, i.e. kilos or litres, which is desired when describing environmentally related taxes.

Transport taxes

This group mainly includes taxes related to the ownership and use of motor vehicles. Taxes on other transport equipment (e.g. planes), and related transport services (e.g. duty on charter or scheduled flights) are also included here, when they conform to the general definition of environmentally related taxes. The transport taxes may be ‘one-off’ taxes related to imports or sales of the equipment or recurrent taxes such as an annual road tax. Taxes on petrol, diesel and other transport fuels are included under energy taxes. Marine engine tax should have been included in this study, placed in this category. This will be done from next year’s reporting.

Pollution taxes

This group includes taxes on measured or estimated emissions to air and water, management of solid waste and noise. An exception is the CO₂ taxes, which are included under energy taxes as mentioned above.

Resource taxes (excluding resource taxes on oil and gas)

Resource taxes are taxes on extraction of natural resources, except taxes on oil and gas that are meant to capture the resource rent. Taxes on resources pose some particular problems. There are differences in opinion on whether resource extraction is environmentally harmful in itself, although there is broad agreement that it can lead to environmental problems, such as pollution and soil erosion. Anyhow, in the Norwegian case there exist no taxes that can be defined in this category. Therefore, the resource taxes category will not be found in figures and tables.

2.3 From environmentally related taxes to environmental taxes in Norway

The guidelines stated in Eurostat (2001) aim to include all taxes *related* to environmental aspects. This opens for a broader set of taxes than the pure environmental taxes derived from economics literature.

An *environmental tax* or a Pigouvian tax (Pigou, 1920) in this literature is a tax levied on a market activity to internalize the cost of negative externalities associated with this activity. In the presence of negative externalities, the social cost of a market activity exceeds the private cost. Then the market outcome is not efficient, i.e. the market tends to over-supply. An optimal environmental tax is equal to the marginal negative externality. When an optimal tax is imposed, the market outcome would return to efficiency.

The environmentally related taxes as defined by Eurostat include more than the Pigouvian elements. Some examples may clarify this: The total revenue from the Norwegian petrol tax is included in the Eurostat concept of environmental tax. However, the main purpose of this tax is to price road use and accident costs. Pollution costs amount to only 6 percent of the tax. Road construction is relatively expensive in Norway and hence constitutes a large part of the total revenue. In other countries the road and environment share of the tax may be inverted, i.e. larger parts of such taxes may cover environmental externalities in other countries. Another example is the electricity consumption tax in Norway. Electricity consumption has no direct environmental costs in Norway, and almost 100 per cent of the power production is based on renewable hydro power. This is in contrast to many European countries, where power production is mainly based on fossil fuels. A third example is the motor vehicle registration tax that is exceptionally high in Norway. This tax is defined as a fiscal tax, and may have reverse environmental effects by delaying the replacement of the ageing car park.

According to the Eurostat guidelines, environmentally related taxes are classified in three subgroups, “energy taxes”, “pollution taxes” and “transport taxes”. One may expect that the subgroup “pollution taxes” correspond to the environmental taxes defined above. Rather, some of the taxes defined as “energy taxes”, e.g. the CO₂ taxes, are clearly Pigouvian taxes, and some of the “pollution taxes”, such as the base tax on beverage packaging, are fiscal and not environmental.

This illustrates that following the Pigouvian definition may result in very different calculations of the amount of environment taxes than following the Eurostat definition, both with respect to the total amount of taxes for a country and with respect to the relative amount of taxes among different countries. The economics literature advocates the Pigouvian definition, which implies that cross country comparisons following the Eurostat definition may be arbitrary, due to country specific conditions.

An official commission (NOU 2007:8) recently evaluated all Norwegian taxes and to what degree the taxes correspond to their initial purpose. This report forms a solid basis for defining the Norwegian environmental taxes. Bruvoll, Næss and Smith (2009) calculate the total Norwegian environmental taxes following the Pigouvian definition to about 11 bill NOK, or about 1/6 of the environmentally related taxes as defined by the Eurostat definition, see Annex 3.

3. Methods

The environmentally related taxes presented for 1990-2007* have been produced by extracting the relevant taxes (following the definition and listing of tax bases included in the Eurostat manual (2001)) from the state accounts. A total of 35 environmentally related taxes have been listed in table 2 for all the years. The total number of taxes each year differs, as taxes are phased out, added or have changed name or purpose,. In 2005, 22 taxes were listed as environmentally related.

To be able to report environmentally related taxes by industry, a more complex system was needed to be set up. An extensive work has been done to be able to extract the taxes from the national accounts. Statistics Norway's Division for National Accounts, IT Resources, Economics and Financial Statistics and Division for Environmental Statistics have collaborated to enable to systemise, publish and report these on a regular basis.

The relevant taxes are in the national accounts split into taxes on products and other taxes on production.⁵ Both types of taxes are transfers from domestic producers to general government of taxes or excises. Taxes on products are payable per unit of some good or service produced or transacted – and therefore varies in line with production or are related to products in other ways. Typical taxes on products are registration tax on vehicles and petrol tax. Other taxes on production are a result of engaging in production, and are not payable per unit of goods and services. Typical other taxes on production are tax on emissions of CO₂ on the continental shelf and annual vehicle tax.

For a more detailed description of the methods and techniques used when establishing taxes distributed by industry, see Annex 1.

4. Results

4.1 Total environmentally related taxes 1990-2007

The revenues from environmentally related taxes in Norway increased from NOK 23 billion in 1991 to about NOK 66 billion in 2007 (measured in current prices). In 2007 these taxes amounted to 6.7 per cent of total tax revenues – a slight decline from 7.2 per cent since 1991 (see table 1).

⁵ Annual taxes on vehicles paid by households must be added manually. This tax is a bit special, since it is neither tax on products nor other tax on production (since only industries can pay taxes on production).

After an increase in the period 1991-1994, the environmentally related taxes' proportion of total tax payments has fallen gradually. The proportion of environmentally related taxes in Norway almost draws near to the average level in the EU (15). During the 1990s, the Norwegian level was 1-2 per cent points above the EU (15) average, while in 2006 the difference was only 0.3 per cent (Figure 1).

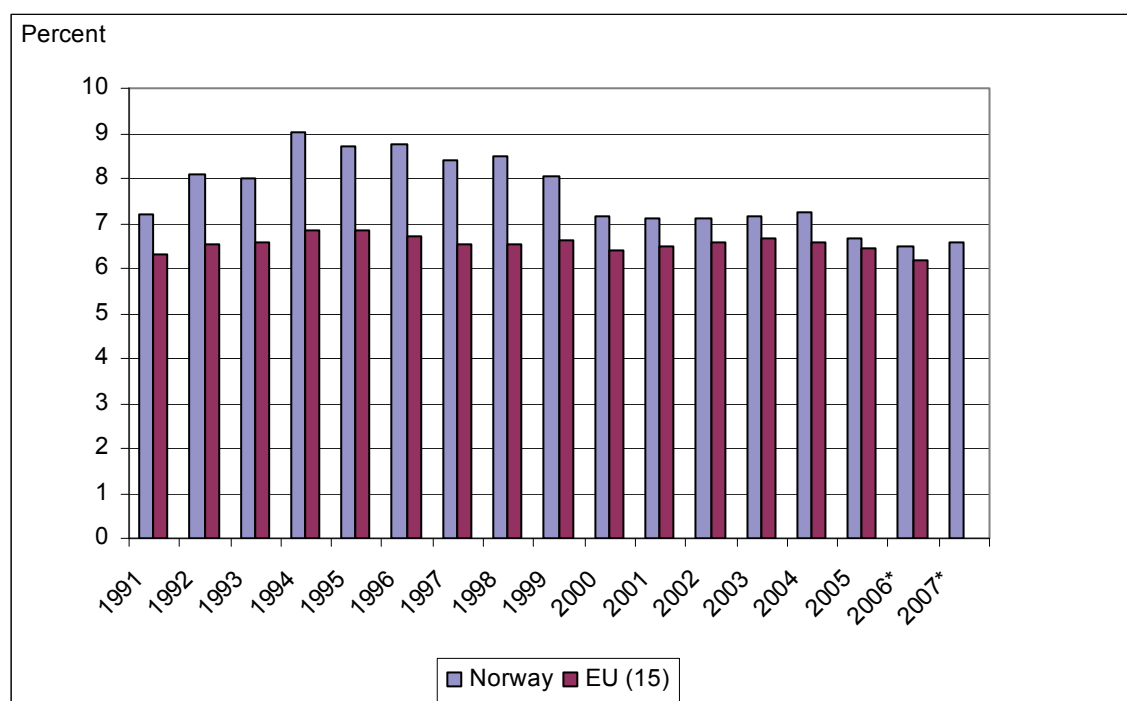
The relationship between environmentally related taxes and gross domestic product (GDP) shows a similar trend. After an increase from 3.0 to 3.7 per cent in the period 1991-1996, environmentally related taxes' proportion of GDP fell to 2.8 per cent in 2007. Norway lies approximately on the average level of the EU (15) countries (2.7 per cent in 2006). In 2006, Denmark had the highest burden of environmentally related taxes in the EU; 6.0 per cent of GDP (Eurostat, 2008).

Table 1. Total taxes¹ and environmentally related taxes. 1991-2007*. Million NOK and per cent.

	1991	2000	2001	2002	2003	2004	2005	2006*	2007*
Total taxes (mill. NOK)	320 785	630 748	658 040	659 839	672 907	753 580	845 680	948 265	991 406
Total environmentally related taxes (mill. NOK)	23 167	45 268	46 857	46 829	48 348	54 533	56 300	61 708	65 950
Total env. taxes in per cent of total taxes	7,2	7,2	7,1	7,1	7,2	7,2	6,7	6,5	6,7

¹ Total tax includes taxes on production, social contributions, and taxes on income and wealth (incl. taxes on oil/gas).

Figure 1. Environmentally related taxes as a proportion of total tax revenues. Norway and the EU (15). 1991-2007*. Per cent.



4.2 Environmentally related taxes by category

For the purpose of Eurostat reporting, all Norwegian environmentally related taxes have been categorised by the four sub-groups of taxes following the guidelines from Eurostat (2001). Table 2 shows all the Norwegian taxes that have been defined as being environmentally related in this project. The table also shows how they are categorised into the four sub-groups. As mentioned earlier, there are no resource taxes in Norway.

Table 2. Environmentally related taxes by tax category and type, 1990-2007*. Current prices.

NOK million (current prices)	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007*
Environmentally related taxes, total	23167	26597	27319	33211	34413	38182	39555	40675	42185	45268	46857	46829	48348	54533	56300	61708	65950
Energy taxes	14665	16424	16904	20133	21410	22199	23741	23303	24888	26935	27212	25321	26178	26840	27590	28851	30429
Tax on CO ₂ emissions from petroleum activity on the continental shelf	810	1916	2271	2557	2559	2787	3034	3229	3261	3047	2861	3012	3056	3309	3306	3405	3385
Petrol tax	8345	9122	9126	9581	9935	10042	10883	11367	9623	9756	8821	8548	8651	8754	8623	8412	8132
Tax on mineral products, total	2172	1851	1623	2001	1330	1798	1514	1631									
Tax on production of electricity	3338	3535	1132	1286	1519	1533	1471	2	2								
Electricity consumption tax			2606	2955	3254	3100	3344	3393	3482	4993	7015	5631	5502.6	5492	5884	6111	5996
Diesel tax			142	1746	2804	2928	3489	3679	4533	4814	4067	3977	4305	4731	5217	5746	6425
Tax on coal and coke			4	7	9	11	6	2									
CO ₂ tax (on mineral products)									3644	3815	3575	3587	3853	3819	3899	4366	4469
Sulphur tax (on mineral products)									343	138	119	84	94	84	76	121	129
Tax on mineral oils										372	754	482	716	651	585	690	685
Tax on NOX emissions in the petroleum sector																	491
Tax on NOX emissions																	716
Pollution taxes	216	357	365	533	458	491	548	529	1058	1145	1150	1260	1407	1491	1463	2009	2222
Tax on lubricating oil	28	30	28	56	60	62	63	67	69	88	86	80	81	84	85	94	92
Tax on beer packaging	13	19	11	91	14	13	13	11	31	3							
Tax on wine- and liquor packaging	45	45	49	41	55	51	66	59	63	8							
Tax on packaging on carbonated beverages	59	35	23	30	15	10	11	9	22	1							
Taxes on still soft beverages	59	48	66	71	28	32	37	32	29	1							
Tax on batteries	12	1															
Tax on fertilizers		156	166	171	167	172	171	165	108	2							
Tax on pesticides		23	22	21	19	22	21	24	35	53	35	56	65	85	49	63	70
Base tax on disposable beverage packaging				52	100	129	166	162	259	325	363	433	483	462	484	593	669
Tax on final treatment of waste									442	483	473	498	501	554	488	596	684
Tax on plastic beverage containers										15	22	39	58	57	64	89	86
Tax on metal beverage containers										100	102	86	77	63	71	107	103
Tax on glass beverage containers										48	45	45	58	39	41	44	50
Tax on paper beverage containers										13	15	17	17	18	14	241	243
Tax on trichloroethane										4	7	4	4	4	3	3	2
Tax on tetrachloroethane										1	2	2	2	2	2	3	2
Tax on greenhouse gases HFC and PFC													61	123	162	176	222
Transport taxes	8286	9816	10050	12545	12545	15492	15266	16843	16239	17188	18495	20248	20763	26202	27247	30848	33299
Motor vehicle registration tax	3300	4092	4005	7365	7484	9900	9345	9976	8889	9557	9821	12319	12888	17125	17737	20721	22663
Re-registration tax on motor vehicles	887	892	981	1049	1100	1229	1307	1348	1402	1410	1595	1598	1796	1820	1882	2049	2172
Annual motor vehicle tax	2240	2731	2978	3134	3225	3403	3688	4247	4442	4626	5348	5583	5780	6964	7281	7722	8110
Mileage tax for diesel vehicles	1745	1968	1966	560	2	14	4	2	8	1							
Tax on air traffic passengers	114	133	120	144	441	631	651	1056	1272	1321	1389	434					
Annual weight based tax on motor vehicles				293	293	315	271	214	226	273	342	314	299	293	347	356	353
Resource taxes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Taxes on energy and transportation dominates

In Norway, the revenues from environmentally related taxes come mainly from use and purchase of vehicles and use of energy products. In 2007, the revenues from these taxes amounted to 96 per cent of total environmentally related taxes.

Pollution taxes' proportion of total environmentally related taxes has more than tripled since 1991, mainly due to the introduction of the tax on final treatment of waste in 1999. However, these taxes only amount to a minimal proportion of the total (3.4 per cent). In figure 3, all taxes are shown by the three relevant categories of environmentally related taxes.

A slight but continuous change in the relationship between revenue from the different types of environmentally related taxes has been observed since 1991 (see figure 2 and 3). In the period 1991-2007 the proportion of energy taxes has been reduced from 63 to 46 per cent and the transportation taxes proportion has increased from 36 to 51 per cent. Both payments from energy and transportation taxes have increased in the period, but for transportation taxes the increase is sharper for the latter years. As from 2006, the payment from transportation taxes has been higher than for energy taxes.

Figure 2. Revenue from environmentally related taxes. 1991-2007*. Million NOK (current prices)

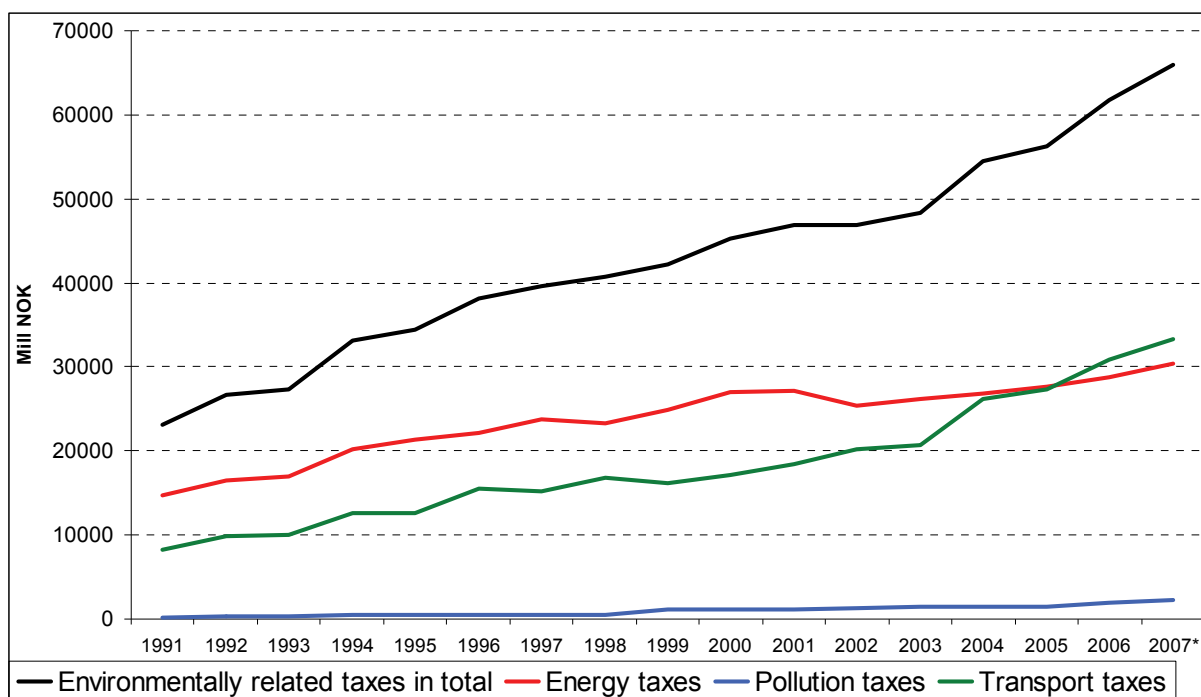
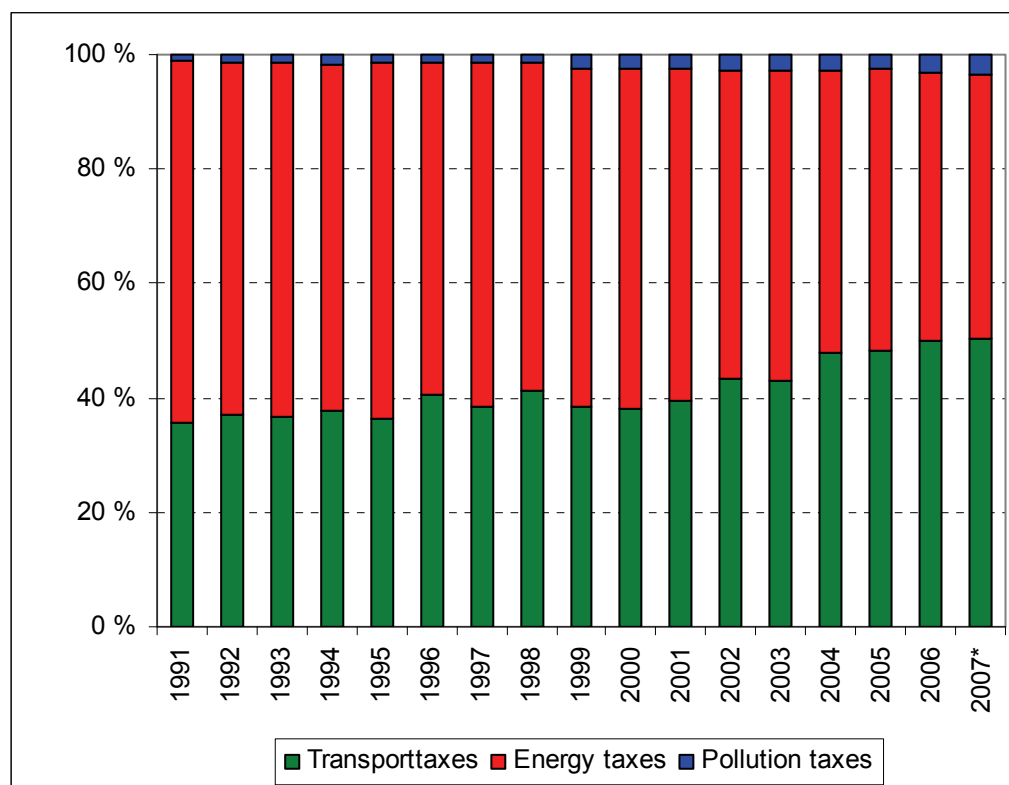


Figure 3. Proportion of tax payments, by type of tax. 1991-2007*. Per cent.



Energy taxes

This group of taxes includes taxes on energy products for both transport and stationary purposes. Included here are user-dependent vehicle taxes such as petrol tax and diesel tax, whilst the non-use-dependent vehicle taxes are included in the transport category.

At the end of the 1990s, a change was made for taxes on consumption of energy products. In 1999, a tax on use of heating oil and energy-products that lead to CO₂- and SO₂-emissions, was introduced. These taxes replaced the earlier taxes on consumption of mineral products and tax on coal and coke. The petrol tax was also changed. As the new CO₂-tax also included consumption of petrol for transport purposes, the CO₂-component in the petrol tax was pulled out. This explains the (moderate) decline of payments in petrol tax from 1998 to 1999.

The total revenue from energy taxes mainly comes from petrol and diesel tax (48 per cent in 2007), tax on CO₂-emission⁶ (26 per cent in 2007) and electricity consumption tax (20 per cent in 2007).

Until 2001, payments from energy taxes increased gradually, but from 2001 to 2002 revenue from energy taxes fell by 6.9 per cent. All taxes showed a decline this year, except taxes on CO₂-emission. A particular drop of 19.7 per cent of the electricity consumption tax made the total revenues from energy taxes go down. From 2002 the revenue from energy taxes has again increased, mainly because of annual increases in payments from the diesel tax. The growth in revenue of CO₂-taxes strongly contributed in 2006, while the revenue from the new tax on emission of NO_x made a considerably contribution in 2007.

⁶ This consists of a tax on CO₂-emission from petroleum activity on the continental shelf and a CO₂-tax on mineral products.

Transportation taxes

This category mainly includes use-independent motor vehicle taxes (registration tax, re-registration tax, annual tax and annual weight based tax)⁷. In Norway these taxes have primarily a fiscal purpose. Anyhow, they are included in the environmentally related taxes due to the international definitions. The latest years, the tax base for the registration tax and annual weight tax have been differentiated based on environmental purposes. The annual weight tax consists of a weight graded and an environmentally differentiated annual tax. The environmentally differentiated tax is graded based on the emission requirement the vehicle fulfil. In January 2007, the registration tax was reorganized so that CO₂-emission replaced engine volume as one of the tax components in the registration tax. The main purpose of the change was further to motivate to the purchase of vehicles miserly on use of fuel with low CO₂-emission.

The revenue of transport taxes mainly comes from the registration tax on motor vehicles (68.1 per cent in 2007). Increases in the registration tax and annual tax on vehicle in 2004 and in 2006, combined with increased purchase of vehicles, have lead to transport taxes now contributing more than 50 per cent of total revenues from environmentally related taxes.

Pollution taxes

Pollution taxes include taxes on measured or estimated emission to air or water, noise and treatment of waste. As mentioned earlier, we have included SO₂ in the energy taxes in this report, due to a Nordic “tradition” dating back to a common energy tax project in 2003 (National statistical offices (...), 2003), although according to Eurostat this tax should be part of the pollution taxes.

Principally, taxes on emissions of CO₂ could also have been included in pollution taxes, since they are often not easily identified or divided from other energy taxes in the national accounts. Another argument for including them in the energy taxes is that they partly have been introduced as substitutes of other energy taxes.

The revenue from pollution taxes comes mainly through the base tax on the disposable beverage packaging (30.1 per cent in 2007) and tax on final treatment of waste (30.8 per cent in 2007). Pollution taxes includes a list of taxes that in terms of income are relatively low, but which might still play an important role when reducing different environmental pressures (for instance disposable beverage packaging).

The revenues from pollution taxes have been relatively low compared to the revenues from energy and transport taxes. Both in 2006 and 2007 the revenues from pollution taxes increased considerably with respectively 37 per cent and 10 per cent from the year before. Primarily increased revenues from tax on disposable beverage packaging and tax on final treatment of waste raised the total revenues from pollution taxes these years. However, the strong increase in 2006 was also caused by a strong increase in the tax on containers as a consequence of the exemption of tax on paper beverage containers was phased out this year.

4.3 Environmentally related taxes broken down by industry

Below, we first present figures on other taxes on production which have been compiled for the first time. The technical description of this work can be found in the Annex 1. Thereafter, total environmentally related taxes by Nace A17-industry are presented, as well as a table by Nace A60-industry in annex 2. So far, figures for environmentally related taxes broken down by industry have been compiled only for 2005.

⁷ The mileage tax on diesel vehicles existed until 1994, and was then included in the transportation taxes. The tax on air traffic passengers, which existed until 2002, was also included here.

Other taxes on production by industry

In 2005, the total amount of other taxes on production⁸ amounted to mill NOK 16 212. Out of this, million NOK 7 344 were environmentally related, constituting a proportion of about 45,3 per cent of total other taxes on production. The total environmentally related taxes in 2005 amounted to mill NOK 56 299. Hence, environmentally related other taxes on production accounted for 13 per cent of totally environmentally related taxes in 2005.

Of the other taxes on production, 45 per cent comes from energy taxes (NOK 3 305 600 000), 48 per cent from transportation taxes (NOK 3 496 700 000) and 7 per cent from pollution taxes (NOK 541 900 000).

Mining and Quarrying (Extraction of crude petroleum and natural gas; service activities incidental to oil and gas extraction excluding surveying) stands out as the main payer, responsible for 45 per cent of the payments. The second largest payer is Wholesale and Retail Trade; Repair of Motor Vehicles, Motorcycles and Personal and Household Goods, paying 32 per cent of these taxes, while Transport, Storage and Communication contributes 9 per cent of the payments. Taxes from these three largest payers amount to 86 per cent of the total environmentally related other taxes on production. Other taxes on production have a different distribution than the total environmentally related taxes. The most evident difference is that households pay almost half of the total environmentally related taxes, but none of the taxes on production (due to the nature of other taxes on production).

The three largest environmental other taxes on production constitutes to 85 per cent of the total. The CO₂ tax on the petroleum activity on the continental shelf is the largest and represents 45 per cent. The re-registration tax on motor vehicles makes up for 26 per cent of the total, while the annual motor vehicle tax come to 17 per cent of the environmental other taxes on production.

Totals by industry

Environmentally related taxes are dominated by taxes on use and purchase of vehicles and tax on use of energy products. Newly compiled figures show that the households carry the largest tax burden. They also contribute to the largest tax payments in all three categories of environmentally related taxes.

In 2005, households paid 52.9 per cent of all environmentally related taxes, which is then slightly more than Norwegian industries all together. Of the industries, Transport, Storage and Communication (12.2 per cent), Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods (11.1 per cent) and Mining and Quarrying are the industries paid the most (see figure 4 and table 3).

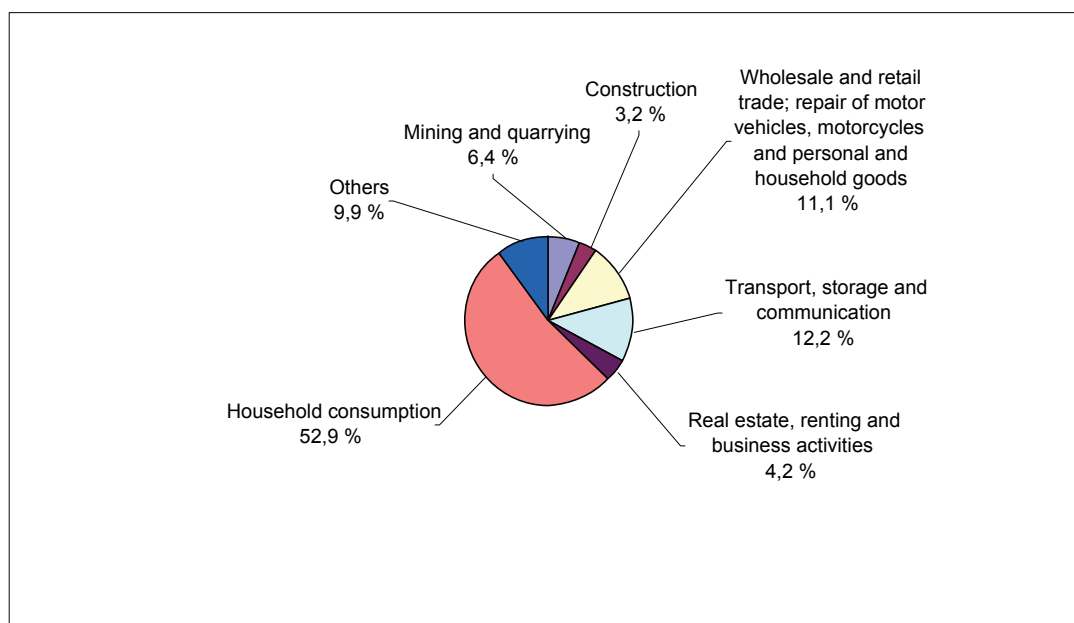
The households paid 65.7 per cent of total transport taxes. This group of taxes also made up the main part of households' expenditures on environmentally related taxes. The motor vehicle registration tax and annual motor vehicle tax amounted to 60 per cent of the households' total expenditures of environmentally related taxes. The largest industries paying transport taxes are Wholesale and retail trade (incl. repairs), Hotels and restaurants (14.4 per cent) and the Service industry (9.9 per cent).

Households pay 40.6 per cent of total energy taxes. Energy tax expenditures made up 38 per cent of the households' total expenditures on environmentally related taxes. The main expenditure comes from tax on petrol (57 per cent of households' energy taxes) and consumption of electricity (28 per cent of households' energy taxes). Transportation, storage and communication paid 19.2 per cent of the energy taxes, which to a large extent came from diesel tax (64 per cent of the transport industry's transportation taxes). The Mining and quarrying industry paid 12.7 per cent of the energy taxes, of

⁸ Other taxes on production excluding annual vehicle tax paid by households. Source: http://www.ssb.no/english/subjects/09/01/nr_en/tabe-04.html

which almost everything was related to the tax on CO₂-emissions on the continental shelf. The households paid 45.6 per cent of total pollution taxes. These payments were mainly related to tax on beverage containers. Annex 2 shows the environmentally related taxes distributed by Nace A60 industry.

Figure 4. Revenue from environmentally related taxes in per cent broken down by industries and households. 2005.



• Others include: Agriculture, hunting and forestry, Fishing, Manufacturing, Electricity, gas and water supply, Hotels and restaurants, Financial intermediation, Public administration and defence, compulsory social security, Education, Health and social work and Other community, social, personal service activities.

Table 3. Revenue from environmentally related taxes in mill. NOK and per cent, by Nace A17 industry and households. 2005.

	Total	Energy taxes	Transport taxes	Pollution taxes	Total	Energy taxes	Transport taxes	Pollution taxes
	Mill NOK				Per cent			
Total	56 299	27 590	27 247	1 463	100,0	100,0	100,0	100,0
Agriculture, hunting and forestry	409	348	49	12	0,7	1,3	0,2	0,8
Fishing	195	188	6	1	0,3	0,7	0,0	0,1
Mining and quarrying	3 606	3 512	93	1	6,4	12,7	0,3	0,1
Manufacturing	926	608	265	52	1,6	2,2	1,0	3,6
Electricity, gas and water supply	290	230	60	0	0,5	0,8	0,2	0,0
Construction	1 815	1 213	577	25	3,2	4,4	2,1	1,7
Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods	6 238	2 361	3 806	71	11,1	8,6	14,0	4,8
Hotels and restaurants	387	195	108	85	0,7	0,7	0,4	5,8
Transport, storage and communication	6 895	5 308	1 555	32	12,2	19,2	5,7	2,2
Financial intermediation	781	94	684	3	1,4	0,3	2,5	0,2
Real estate, renting and business activities	2 384	550	1 824	10	4,2	2,0	6,7	0,7
Public administration and defence; compulsory social security	501	437	57	7	0,9	1,6	0,2	0,5
Education	346	306	39	1	0,6	1,1	0,1	0,1
Health and social work	496	488	4	4	0,9	1,8	0,0	0,3
Other community, social, personal service activities	1 258	552	216	490	2,2	2,0	0,8	33,5
Activities of households as employers of domestic staff	0	0	0	0	0,0	0,0	0,0	0,0
Extra-territorial organizations and bodies	0	0	0	0	0,0	0,0	0,0	0,0
Household consumption	29 771	11 200	17 904	667	52,9	40,6	65,7	45,6

5. Some considerations

The polluter-pays-principle is an important principle in the environmental- and climate politics. New statistics showing environmentally related taxes broken down by industry, gives new opportunities to link environmentally related economic information to statistics on for example emissions to air and energy consumption on an industry-to-industry level. This can be used for instance to analyse relations between those using energy that causes emissions to air, and those paying for such emissions.

However, policy instruments can not be evaluated exclusively without information on emissions and environmentally related taxes, as there are exemptions and reimbursement schemes for some industries. Environmentally related taxes are only one of several alternative policy instruments to make use of in preventive environmental policy. Therefore, an overview of exemptions from the general environmentally related taxes, volunteer agreements, environmental subsidies, the quota system and environmentally related fees must be assessed together to see the whole picture.

There are as mentioned also different definitionwise approaches on environmentally related taxes. By practising a more precise definition, Norwegian environmental taxes have been showed to constitute to only 1/6 of the numbers presented by the Eurostat definition, see Annex 3 (Bruvoll et al., 2009).

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Annex 1: Classification and compilation of taxes broken down by industry

Compilation of environmentally related taxes by industry is made possible through extraction of data from the national accounts. Different methods are used to extract environmentally related taxes on products and on other taxes on production from the national account system. Until 2008, only environmentally related taxes on products (by industry) had been identified and classified. How this was done and put up is shortly presented in the first part of this annex. The second part gives a thorough description of how environmentally related taxes on production are extracted and put up from the national accounts system. This project has been done as part of the larger Eurostat funded project on environmentally related transactions carried out in 2008.

Taxes on products

The following taxes on products have been identified as environmentally related:

Energy tax:

- Electricity consumption tax
- Diesel tax
- Petrol tax
- CO₂ tax on mineral products
- Sulphur tax on mineral products

Pollution taxes:

- Tax on greenhouse gases HFC and PFC
- Tax on mineral oils
- Tax on Plastic Beverage Containers
- Tax on Metal Beverage Containers
- Tax on Glass Beverage Containers
- Tax on Paper Beverage Containers

Transport taxes:

- Motor vehicle registration tax

The system consists of:

- Overview spreadsheet of the environmentally related taxes on products (as given over)
- Basics spreadsheet (by NR-industry and 'yart')
- Spreadsheet presented by Nace-industry and tax category
- Spreadsheet presented by Knr-industry and tax category

The spreadsheets in the book are related, so that unless there are new taxes, only the basic spreadsheet needs to be filled out.

Overview spreadsheet of the environmentally related taxes on products

The different environmentally related taxes on products are listed by:

- Chapter and post in the National budget/National accounts
- ‘Ytart’ (which is what the taxes on products are defined by in the national accounts)
- Text description from the National budget /National accounts
- Total expenditure for each tax
- Type of tax (energy-, transport-, pollution or resource tax), following the Eurostat definition (2001), using class codes 1-4 (see definition further down).
- Source of information (e.g. White paper nr. 3)
- Whether the tax is an environmentally related tax or whether it is a case of doubt
- Remarks (E.g. why it is a case of doubt, or other information about the tax)

“Ytart” and total tax is related in the basics spreadsheet, so this information will relate in the overview spreadsheet when the basics spreadsheet is filled out. This is an easier way to keep track of the basics sheet as the basis of figures shall be sorted (and appears listed) on “ytart” and industry code (NR). Second you fill out the correct information after “ytart” and the sum that appears in the basics spreadsheet. Type of tax (energy, pollution etc) is related contrary, this appears in the basics spreadsheet as you put it into the overview spreadsheet. The tax is described with text in the overview sheet, as to make it easier to find type of tax by text than by “ytart”-number.

Basics sheet

Numbers from the overview sheet are plotted with “ytart” at the top, then the results from each industry downwards. The sum below each column is the total tax that appears in the overview sheet. Type of tax is put into the overview sheet where the description of the tax is written and thereby easier can be found – (so not in the basics sheet alone).

NACE-industries

By using the conditional sum function (SUM IF(range; criteria; sum_range)) it was possible to aggregate the different types of taxes in a spreadsheet listing the different industries according to the NACE-codes. This was done by setting the condition to correspond with the code for type of tax where area is the row where the tax type is coded. The criteria is that the value in this row shall be 1 for energy tax, 2 for transport tax, 3 for pollution tax and 4 for resource tax. The sum-range is the rows where industries included in the NACE-industry are. Each rows included in the industry-code have to be added with a SUM IF-function, as the SUM IF-function can only handle one row at a time. This sheet does not need to be changed when used for other years unless the industry according to NACE-codes have changed. That is a time-consuming process.

The NACE-codes are placed in the first column, thereafter the name of the NACE-industry, sum for each tax type on each industry, and at the end a total sum for each industry. Total sum for each type of tax is at the bottom, as well as total sum for all the environmentally related taxes on products.

Industry breakdown by Norwegian national account classification (KNR)

We use the same set-up here as in the NACE-industry sheet, only sorted by KNR-industries. KNR is the industry breakdown used in quarterly national accounts statistics, and is used in the Norwegian NAMEA-statistics as it is the industry breakdown/classification providing the timeliest national accounts data. This sheet does not need change unless the KNR-codes change.

In the first column the KNR-code is found, thereafter the name of the KNR-industry, sum for each industry, and a total sum per industry. At the bottom a total sum per tax and total sum for all environmentally related taxes on products are found.

Other taxes on production

From this project, we have for the first time compiled other taxes on production by industry. By achieving this, we are able to present total environmentally related taxes by industry for the year 2005. We have also set up a system making it an easy task to compile these figures in the future.

The work of defining the environmental other taxes on production started with a list of other taxes on production from the national accounts. Using the Eurostat guidelines (2001), we were able to define 8 environmentally related taxes out of all other taxes on production. These taxes were:

Energy tax:

- CO₂ Tax on the Petroleum Activity on the Continental Shelf

Transport taxes:

- Annual Vehicle Tax⁹
- Annual weight based tax on motor vehicles
- Re-registration tax on motor vehicles

Pollution taxes:

- Tax on Final Treatment of Waste
- Tax on Pesticides
- Tax on Trichloroethene
- Tax on Tetrachloroethene

Using Excel the taxes were then organized as an overview in a spreadsheet as following:

- Chapter and post in the national budget and the national accounts
- Name of the tax
- Total sum collected in 2005 (most of the sums are book values, not time adjusted values),
- Type of tax (coded 1, 2, 3 and 4 for energy, transport, pollution or resource taxes respectively), source and a field for comments.

This spreadsheet was related – through the chapter, post and total sum to another spreadsheet (referred to as ‘Basics’) where the different taxes were listed as the sum each industry had paid. The chapter and post defined which tax was being treated in the column, and the industries were listed downwards, making it possible to sum up each column, so the total sum of the tax could be related to the overview spreadsheet. As many links as possible were made in the spreadsheets to decrease the effort needed to produce the same data for prior and latter years.

Using the conditional sum function (SUMIF()) it was possible to aggregate the different types of taxes in a spreadsheet listing the different industries according to the NACE-codes. This was done by setting the condition to correspond with the code for type of tax. (E.g. =SUMIF(Basics!C1:Z1;”=1”;Basics!C25:Z25) would add line 25 to the sum if the tax is an energy tax, given that the tax type code is in line 1 in the Basics spreadsheet.) In this way we got an overview

⁹ Only annual vehicle taxes paid by industries are included here. Annual vehicle tax paid by households are defined neither as tax on products or other tax on production, but considered an environmental related tax, and therefore added to the data when total results are presented. This is done by adding the difference between the book value of the annual tax (in the national accounts) and the value received from the basis numbers.

of both the size of the taxes paid by each industry, as well as a total sum for each tax type. This was also done both for a table using NACE classification and for a table using the Norwegian national accounts industry classification (KNR).

The taxes on production and taxes on products were systematised in the same way, making it possible to add up the total environmentally related taxes, so the proportion of other taxes on production could be compared to the total.

Given the definitions from Eurostat (2001) and the list of all the other taxes on production in the national accounts, the identification of the environmentally related taxes was an easy task. The amount of other taxes on production was moderate, making any criteria of selection unnecessary. The systematisation and creation of the spreadsheet was done thoroughly and with as many links as possible to facilitate regular production of these statistics in the future.

Annex 2. Table of environmentally related taxes by Nace A60-industry

	Total Energy taxes	Total Transport taxes	Total Pollution taxes	Total Taxes per Industry
Nace A60-industry. Thousand NOK.				
Total industries	27 589 600	27 246 697	1 462 825	56 299 122
Agriculture, hunting and forestry	348 000	48 528	12 357	408 885
Agriculture, hunting and related service activities	292 000	45 479	9 814	347 293
Forestry, logging and related service activities	56 000	3 049	2 543	61 592
Fishing	188 000	6 098	1 288	195 386
Mining and quarrying	3 511 600	92 964	1 418	3 605 982
<i>Mining and quarrying of energy producing materials</i>				
Mining of coal and lignite; extraction of peat	11 000	53 270	240	64 510
Extraction of crude petroleum and natural gas; service activities incidental to oil and gas extraction excluding surveying	3 363 600	2 710	21	3 366 331
Mining of uranium and thorium ores				
<i>Mining and quarrying except energy producing materials</i>				
Mining of metal ores	11 000	23 266	106	34 372
Other mining and quarrying	126 000	13 718	1 051	140 769
Manufacturing	608 000	265 339	52 214	925 553
<i>Manufacture of food products; beverages and tobacco</i>				
Manufacture of food products and beverages	133 000	88 038	3 328	224 366
Manufacture of tobacco products	1 000	1 996	9	3 005
<i>Manufacture of textiles and textile products</i>				
Manufacture of textiles	4 000	1 646	11	5 657
Manufacture of wearing apparel; dressing; dyeing of fur	0	508	4	512
<i>Manufacture of leather and leather products</i>	0	0	0	0
<i>Manufacture of wood and wood products</i>	31 000	13 624	83	44 707
<i>Manufacture of pulp, paper and paper products; publishing and printing</i>				
Manufacture of pulp, paper and paper products	60 000	1 367	7	61 374
Publishing, printing, reproduction of recorded media	17 000	17 335	34	34 369
<i>Manufacture of coke, refined petroleum products and nuclear fuel</i>	40 000	508	4	40 512
<i>Manufacture of chemicals, chemical products and man-made fibres</i>	71 000	12 157	32 049	115 206
<i>Manufacture of rubber and plastic products</i>	10 000	2 384	14	12 398
<i>Manufacture of other non-metallic mineral products</i>	111 000	28 792	2 132	141 924
<i>Manufacture of basic metals and fabricated metal products</i>				
Manufacture of basic metals	26 000	23 243	1 134	50 377
Manufacture of fabricated metal products, except machinery and equipment	36 000	12 921	1 085	50 006
<i>Manufacture of machinery and equipment n.e.c.</i>	23 000	17 929	2 091	43 020
<i>Manufacture of electrical and optical equipment</i>				
Manufacture of office machinery and computers	0	0	0	0
Manufacture of electrical machinery and apparatus n.e.c.	3 000	2 215	1 013	6 228
Manufacture of radio, television and communication equipment and apparatus	0	169	1	170
Manufacture of medical, precision and optical instruments, watches and clocks	0	1 367	6	1 373

Manufacture of transport equipment				
Manufacture of motor vehicles, trailers and semi-trailers	3 000	1 646	11	4 657
Manufacture of other transport equipment	21 000	8 736	7 054	36 790
Manufacturing n.e.c.				
Manufacture of furniture; manufacturing n.e.c.	5 000	12 243	2 061	19 304
Recycling	13 000	16 515	83	29 598
Electricity, gas and water supply	230 000	59 581	289	289 870
Electricity, gas, steam and hot water supply	180 000	56 024	242	236 266
Collection, purification and distribution of water	50 000	3 557	47	53 604
Construction	1 213 000	577 403	24 613	1 815 016
Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods	2 361 000	3 806 405	70 874	6 238 279
Sale, maintenance and repair of motor vehicles	365 000	2 457 243	6 264	2 828 507
Wholesale trade and commission trade, except of motor and motorcycles	1 397 000	690 006	60 658	2 147 664
Retail trade, except of motor vehicles, motorcycles; repair of personal and household goods	599 000	659 156	3 952	1 262 108
Hotels and restaurants	195 000	107 533	84 934	387 467
Transport, storage and communication	5 308 000	1 554 804	32 236	6 895 040
Land transport; transport via pipelines	3 711 000	1 355 066	23 422	5 089 488
Water transport	218 000	0	5 821	223 821
Air transport	370 000	1 597	81	371 678
Supporting and auxiliary transport activities; activities of travel agencies	824 000	101 833	773	926 606
Post and telecommunications	185 000	96 308	2 139	283 447
Financial intermediation	94 000	684 257	2 953	781 210
Financial intermediation, except insurance and pension funding	83 000	660 095	2 862	745 957
Insurance and pension funding, except compulsory social security	9 000	21 766	80	30 846
Activities auxiliary to financial intermediation	2 000	2 396	11	4 407
Real estate, renting and business activities	550 000	1 823 616	10 213	2 383 829
Real estate activities	160 000	192 618	959	353 577
Renting of machinery and equipment without operator and of personal and household goods	60 000	1 125 484	5 784	1 191 268
Computer and related activities	27 000	26 545	265	53 810
Research and development	14 000	799	182	14 981
Other business activities	289 000	478 170	3 023	770 193
Public administration and defence; compulsory social security	437 000	56 618	7 127	500 745
Education	306 000	39 079	1 311	346 390
Health and social work	488 000	4 297	4 000	496 297
Other community, social, personal service activities	552 000	216 175	489 998	1 258 173
Sewage and refuse disposal, sanitation and similar activities	135 000	120 053	488 685	743 738
Activities of membership organization n.e.c.	149 000	10 333	113	159 446
Recreational, cultural and sporting activities	159 000	19 765	764	179 529
Other service activities	109 000	66 024	436	175 460
Activities of households as employers of domestic staff				
Extra-territorial organizations and bodies				
Household consumption	11 200 000	17 904 000	667 000	29 771 000
Norwegian households' consumption in Norway	8 846 000	17 814 000	630 000	27 290 000
Norwegian tourists consumption in Norway	1 472 000	90 000	4 000	1 566 000
Foreigners consumption in Norway	882 000	0	33 000	915 000

Annex 3: Environmental taxes, Norway

The Norwegian environmental taxes in 2007 following the Pigouvian definition and reported in table 4 are calculated to about 11 billion NOK. An elaboration of the arguments, discussions and the calculations will be presented in Bruvoll, Næss and Smith (2009, forthcoming). The main elements are the taxes on CO₂ and NO_x, as these taxes amount to 81 percent of the total environmental taxes.

Table 4, Environmental taxes, total, million NOK, 2007

	11168	
Tax on CO ₂ emissions from petroleum activity on the continental shelf	3385	
Petrol tax, environmental element	488	*
Diesel tax, environmental element	386	**
CO ₂ tax on mineral products	4469	
Sulphur tax (on mineral products)	129	
Tax on NO _x emissions in the petroleum sector	491	
Tax on NO _x emissions	716	
Tax on lubricating oil	92	
Tax on Pesticides	70	
Tax on final treatment of waste, environmental element	234	***
Tax on plastic beverage containers	86	
Tax on metal beverage containers	103	
Tax on glass beverage containers	50	
Tax on paper beverage containers	243	
Tax on trichloroethane	2	
Tax on tetrachloroethane	2	
Tax on greenhouse gases HFC and PFC	222	

*, ** and ***: see table 5 and the corresponding explanations

Compared to the Eurostat definition, 55 billion NOK are disregarded in the environmental tax calculation, see table 5.

Table 5. Other taxes included in the Eurostat definition, million NOK, 2007

	54781	
Petrol tax, non-environmental elements	7644	*
Electricity consumption tax	5996	
Diesel tax, non-environmental elements	6039	**
Tax on mineral oils	685	
Base tax on disposable beverage packaging	669	
Tax on final treatment of waste, non-environmental elements	450	***
Motor vehicle registration tax	22663	
Re-registration tax on motor vehicles	2172	
Annual motor vehicle tax	8110	
Annual weight based tax on motor vehicles	353	

*, ** and ***: cf table 4 and the explanations below.

Reasons why the taxes in table 5 are not included in the environmental tax calculations following the Pigouvian definition are:

Petrol and diesel taxes (* and **): 6 percent of this tax is estimated to relate to emissions, the rest covers road use and accident costs (NOU 2007: 8, Econ 2003). 6 percent of the revenue of this tax is accounted as environmental taxes.

Electricity consumption tax: Electricity consumption has no direct environmental costs in Norway. Also, almost 100 percent of the production is renewable energy, based on hydro power, and environmental costs related to electricity production (dams etc) are regulated directly.

Tax on mineral oils: This has the opposite effect of the electricity tax. Principally, it is a fiscal tax; cf. the VAT (NOU 2007:8).

Base tax on disposable beverage packaging: This tax is not related to any documented environmental effects (NOU 2007:8).

Tax on final treatment of waste (***): The entire incineration tax is an environmental tax. 14 percent of the revenue is the incineration tax. 86 percent of the revenue is from the landfill tax. Only a share of the landfill tax is environmentally related. The rest is to be considered a fiscal tax. The implicit tax per tonne of CO₂ at is estimated to 850 NOK/tonne CO₂. The landfill tax is corrected for the additional tax exceeding a permit price in the CO₂ emission market of 200 NOK/tonne CO₂ ($684 \cdot (0,14 + (0,86 \cdot 200 / 850)) = 234$).

Motor vehicle registration tax: This is a fiscal tax (NOU 2007:8). Also, it may delay the renewable of the car park and the transition to more energy efficient transport.

Re-registration tax on motor vehicles: This is a fiscal tax. (NOU 2007:8).

Annual motor vehicle tax: This is a fiscal tax (NOU 2007:8).

Annual weight based tax on motor vehicles: This tax is not use-dependent and is hence unsuited as an environmental instrument (NOU 2007:8). We have thus evaluated this tax to not be an environmentally related tax.