

Requirements to Energy Statistics as Basis for Environmental Statistics

- With focus on the Norwegian Emission Inventory

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1. Introduction

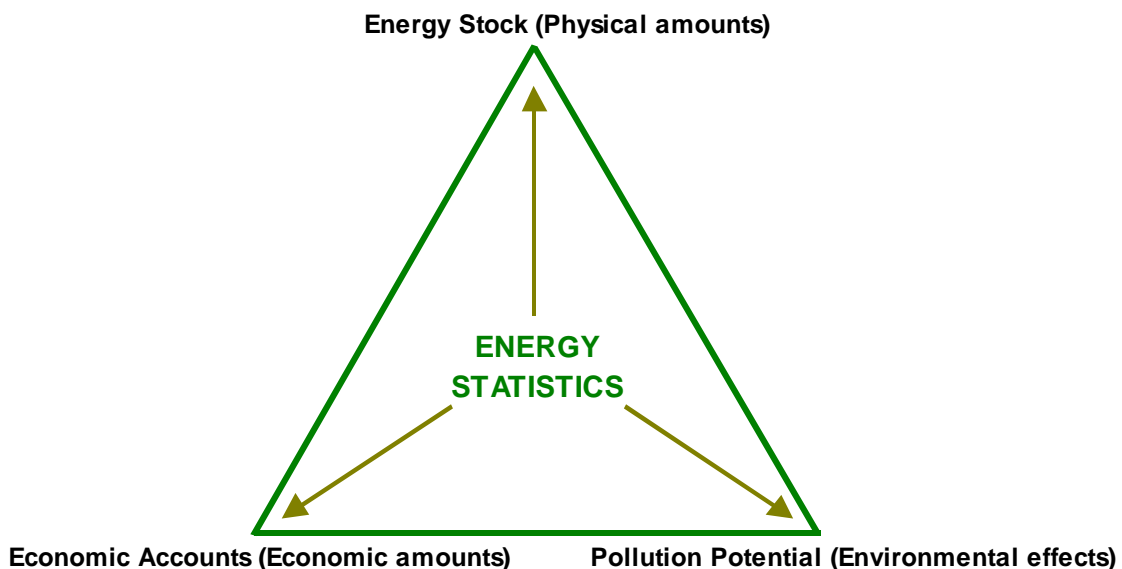
Energy statistics serve different purposes and needs, of which one is to provide basic data for other types of statistics. The structure and priorities of energy statistics are generally governed by three main perspectives: 1) The energy stock perspective, 2) The economic accounts perspective and 3) The pollution potential perspective (Figure 1).

The energy stock perspective refers to the needs of mapping the total availability of energy sources in order to secure the present and future demands for energy in society. Energy statistics based on this perspective is primarily concerned with total stocks and tend to prioritize the largest quantities.

The economic accounts perspective refers to the needs of mapping the value of energy sources in the economy. Energy statistics based on this perspective is primarily concerned with the economic importance of the energy sources in different sectors of the economy and normally follows the structure of national accounts. Compared to the energy stock perspective, an economic accounts perspective might lead to a prioritization of energy sources of high economic importance, but which not necessarily have to be large quantities.

Energy statistics based on the pollution potential perspective is primarily concerned with energy sources that have the largest environmental effects, and to attribute these sources to their respective social and economic sectors of origin in order to provide a basis for dealing with the growing environmental challenges, such as global heating. Compared to the two former perspectives, energy sources with a high pollution potential do normally have, but do not necessarily have to be the largest quantities or to be of high economic importance (e.g. the non-market energy sources might play an important role in emissions to air statistics). In addition, the origins of emission can also cross common categories of industries and other standard divisions.

Figure 1. Different perspectives governing the structure and production of energy statistics



Although energy statistics, balances and accounts may be produced with different perspectives, there is not necessarily any conflict between the perspectives, and most energy statistics serve the different needs in an acceptable way. However, in the real world with limited resources there are always questions of priority, and covering all needs of all users might lead to over-extensive and confusing tables of energy statistics.

The purpose of this paper is to outline the importance and use of energy statistics for production of environmental statistics, with focus on emissions to air statistics, and in particular to outline the requirements for energy statistics as seen from the pollution potential perspective. The paper is almost entirely based on the experiences from Statistics Norway's work on the Norwegian Emission Inventory, and does not intend to cover the full range of requirements for energy data related to the production of environmental statistics. The different environmental effects related to production and use of energy is, however, presented in the next section of this introduction.

1.2. Environmental effects of energy production and use

(This part will be included in the paper and submitted at the meeting in Delhi)

2. Use of energy statistics in the Norwegian Emission Inventory

2.1. "Terms of reference" for the Emission Inventory

Output tables from the Norwegian Emission Inventory of Greenhouse Gases (GHG), Acidifying Pollutants, Heavy Metals (HM) and Persistent Organic Pollutants (POPs) is used for the following main purposes:

- Cover the national reporting obligations related to the United Nations Framework Convention on Climate Change (UNFCCC) and the Convention on Long-Range Transboundary Air Pollution (CLRTAP)
- Cover reporting agreements with the European Environmental Agency (EEA), Eurostat, OECD and other international institutions via the UNFCCC and CLRTAP databases
- Monitoring national environmental policy targets stated in Government White Papers, and monitoring Sustainable Development Indicators (SDIs)
- Input data in economic analyses, and in integrated environmental-economic accounting such as National Accounts Matrices including Environmental Accounts (NAMEA)
- Information to public and private institutions dealing with emission technology, pollution, health and economy
- Information to NGOs, newspapers and other news media

In addition, regional level statistics generated from the Emission Inventory is used by regional authorities and media.

The structure and statistical boundaries of the Emission Inventory is mainly governed by the reporting obligations according to international conventions. The primary source of reference related this reporting is the IPCC (Intergovernmental Panel on Climate Change) Guidelines for National Greenhouse Gas Inventories (Garg et al. 2006). The IPCC guidelines are developed to cover greenhouse gases only, but harmonization with the EMEP/CORINAIR guidelines for other emissions, make it possible to use the IPCC guidelines as the primary reference in the Norwegian Emission Inventory.

Thus, both the structure (see next paragraph) and the statistical boundaries of the Emission Inventory are developed according to IPCCs guidelines, which bases its methodological approach on fuel sales and its statistical boundary on the *territorial approach*. This means that the Inventory covers Norwegian territory only, and which includes domestic air and ship traffic (between domestic destinations) and total fuel sales to road traffic and fishing vessels (regardless if the fuel is combusted within Norwegian territory).

Due to the fact that *fuel sales* are used as data sources, it is necessary to be able to separate *fuel used for combustion* from fuel used as *raw material* in the underlying energy statistics. The IPCC guidelines also recommend to include *waste* used for generation of heat and power in the energy statistics, and to report the emissions from this source under the energy sector.

When comparing the Emission Inventory with the Energy Balance and Accounts, it can be generally stated that the structure of the Inventory follows the Energy Accounts (see next paragraph) while the boundary follows the Energy Balance (see figure 2). No reporting obligations are yet based on the residential approach, but the interest for such overviews is increasingly in demand by different users.

Lastly, the production of the Emission Inventory follows general Statistics Code of Practices, which are incorporated in the basis of the IPCC guidelines. The principle of *coherence and comparability* is particularly in focus, mainly due to the statement of 1990 as the basis year in the Kyoto protocol and the need to ensure consistency of the time series back to this basis year.

2.2. The structure of the Inventory

The Norwegian Emission Inventory contains Emission figures for 21 different pollutants (see Appendix 1) divided by:

1. Industries (including households)
2. Sources
3. Fuels
4. Geographical regions

The industrial classification is common with the Norwegian Energy Accounts and is almost identical to that used in the National Accounts. To make the standard sectors more appropriate for emission calculation a few changes have been made, e.g. "Private households" is defined as a sector. The classification is aggregated from the Norwegian *Standard Industrial Classification, SIC2002* (Statistics Norway 2003). The SIC is identical to the European NACE (*Nomenclature statistique des activités économiques dans la Communauté européenne*) (rev. 1.1) classification up to the four-digit level, which again is based on the *International Standard Industrial Classification of All Economic Activities (ISIC)*. A national level has been introduced at the five-digit level (see appendix 2).

The source categories used in the Inventory refer to activities that produce emissions sub-divided by sub-activities, type of industrial production, energy commodities and/or combustion technologies. The source categories are based on the UNFCCC/CRF and EMEP/NFR source sector categories (see appendix 3).

The Norwegian Emission Model is structured according to the UNFCCC guidelines for National Inventories Structure. This implies that the Inventory is divided between all activities that involve combustion of energy (the Energy Sector) and non-combustion sources (Industrial Processes, Solvent and Other Product Use, Agriculture and Waste). The calculation of emissions from the Energy Sector is the main part of the Emission Inventory Model that requires data from energy statistics. Some of the Non-combustion sources are calculated in side-models.

The fuel categories (energy commodities) used in the Inventory are shown in table 1, where they are combined with the source categories.

The Inventory Model also provides emission figures at the regional and local level. These output data are only used for national purposes.

Table 2. Energy commodities and sources of energy combustion used in the Norwegian Emission Inventory

	Stationary combustion					Mobile combustion														
	Direct fired furnaces	Gas turbines	Boilers	Small stoves	Flaring	Passenger car	Light duty vehicles	Heavy duty vehicles	Motorcycle	Moped	Snowscooter	Railway	Aviation jet/turboprop	Aviation helicopter	Aviation small craft	Ships	Small boats 2 stroke	Small boats 4 stroke	Equipment 2 stroke	Equipment 4 stroke, tractor
Coal	x	..	x	x	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Coke	x	..	x	x	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Petrol coke	x	..	x	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Fuel wood	..	..	..	x	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Wood waste	..	..	x	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Black liquor	..	..	x	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Wood pellets	..	..	x	x	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Wood briquettes	..	..	x	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Charcoal	..	..	..	x	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Natural gas	x	x	x	..	x	x	..	x	..	..	..	..	..	..	..	x	..	..	..	..
Refinery gas	x	..	x	..	x	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Blast furnace gas	x	..	x	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Landfill gas	..	..	x	..	x	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Fuel gas	x	..	x	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
LPG	..	..	x	x	..	x	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Motor gasoline	..	..	..	..	..	x	x	x	x	x	x	..	..	..	..	..	x	x	x	x
Aviation gasoline	..	..	..	..	..	..	..	..	..	..	..	..	..	..	x	..	..	..	..	..
Kerosene (heating)	..	..	x	x	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Jet kerosene	..	..	..	..	..	..	..	..	..	..	..	x	x	..	..	..	..	..	..	..
Auto diesel	..	..	x	..	..	x	x	x	..	..	x	..	..	..	..	..	..	x	..	x
Marine gas oil/diesel	x	x	x	..	..	..	..	..	..	..	..	..	..	..	x	..	..	..	..	..
Light fuel oils	..	..	x	x	..	..	..	..	..	..	..	..	..	..	x	..	..	..	..	x
Heavy distillate	x	..	x	..	..	..	..	..	..	..	..	..	..	..	x	..	..	..	..	..
Heavy fuel oil	x	..	x	..	..	..	..	..	..	..	..	..	..	..	x	..	..	..	..	..
Municipal waste	..	..	x	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Special waste	x	..	x	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..

2.3. Use of energy data in the Inventory

As already mentioned above, energy statistics are used as input data in the Emission Model to calculate emissions from the Energy Sector (combustion of energy) only. However, the Energy sector accounts for over 90 per cent of the total CO₂ emissions and about 75 per cent of the total greenhouse gas emissions in industrialized countries (IPCC 2006), and is the far most important source of emissions to air. Beside data from energy statistics, only sales statistics for different petroleum products is used to calculate emission from the Energy Sector in the Model (to attribute petroleum combustion to different combustion technologies).

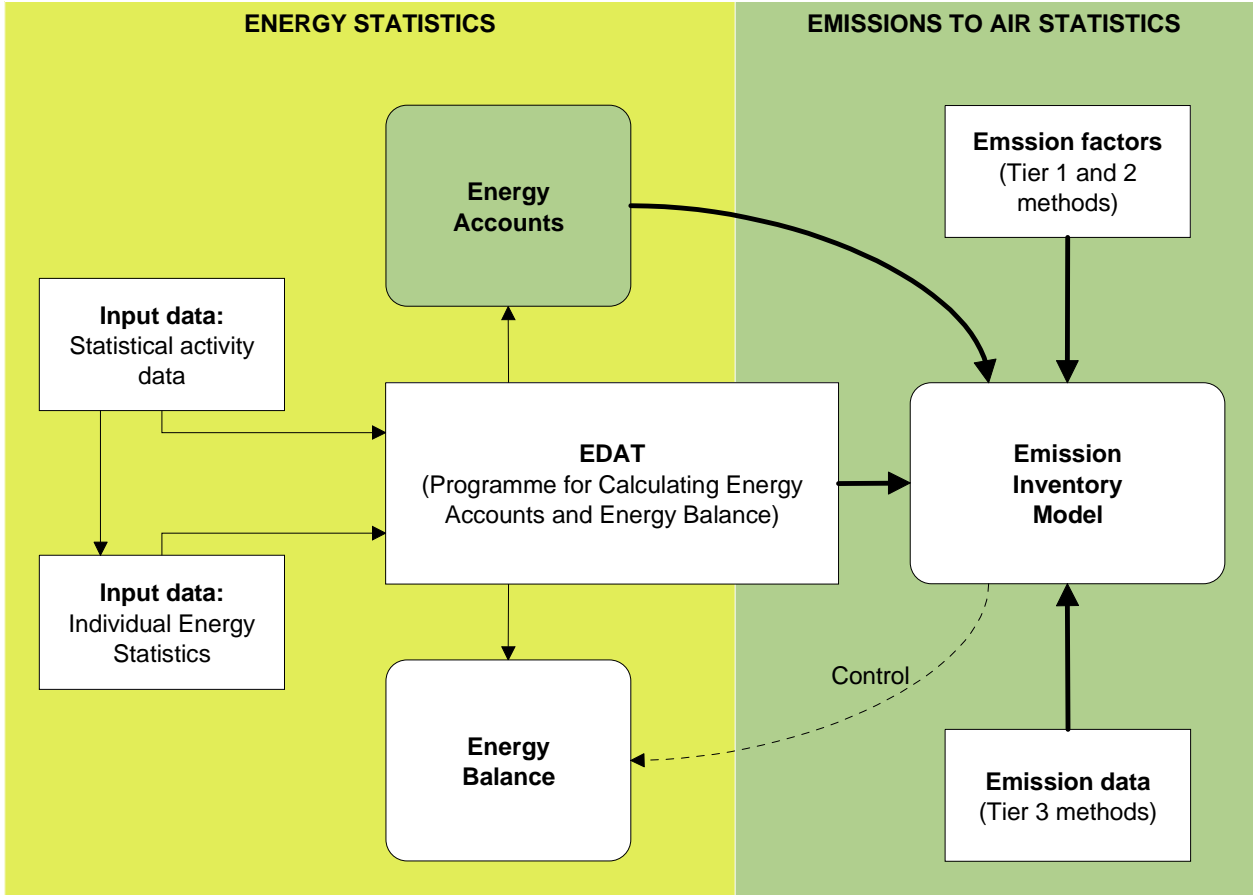
Figure 3 shows the main flow and use of energy statistical data to the Norwegian Emission Model. The core database of energy data used in the Emission Model is the EDAT (Programme for Calculating Energy Accounts and Balance), which was developed in 1991 to, among other things, ensure consistence in the energy data used for different purposes within Statistics Norway, and between the Energy Balance and the Energy Accounts and the Energy Accounts and the National Accounts.

EDAT contains 15 calculation sheets organized in 5 main categories: 1) Basic input activity data, 2) Energy Accounts activity data and calculations, 3) Energy Balance activity data and calculations, 4) Consistency test calculations and 5) Extracts of basic energy data, and factor sheets for use in the Emission Inventory Model. Thus, EDAT serves as a common database not only for the Energy Balance and Accounts, but also for the Emission Inventory and the National Accounts. A more specific content of the EDAT calculation sheets are given in appendix 4.

Since the Emission Inventory follows the structure of the Energy Accounts (and the National Accounts), data from the Energy Accounts are the main input to the Emission Model¹ (bold arrows in figure 3). In practice, the data comes from the Energy Accounts calculation sheets in EDAT. The activity data from EDAT are combined with standard international emission factors (referred to as Tier 1 method in the IPCC guidelines) or with nationally developed emission factors (referred to as Tier 2 method). The Norwegian Emission Inventory is primarily based on Tier 2 methods. Some emission sources are, however, covered by measured emission figures reported to the Norwegian Pollution Control Authority. This is primarily the case of major manufacturing plants (i.e. offshore activities, refineries, gas terminals, cement industries, production of plastics and ammonia production). In these cases, the energy consumption of the plants in question is subtracted from the total energy use before the general method is used to calculate the remaining emissions of the compound in question, in order to prevent double counting (referred to as Tier 3 method).

Since the statistical boundary of the Emission Inventory is based on the territorial principle, the total output figures from the Inventory can be compared with the total output in the Energy Balance. This test is based on the fact that both statistics reflect the total flow of Carbon within the national boundaries.

Figure 3: The flow and use of energy data in the Norwegian Emission Inventory



¹ The production of the Energy Accounts is institutionally allocated to the Division for Environmental Statistics in Statistics Norway (indicated by the green colour of the box in figure 3), while all other energy statistics, including the Energy Balance are produced by the Division for Energy and Industrial Production Statistics.

3. Requirements to energy statistics for serving the needs of emissions to air statistics

3.1. Present potentials for improvements of the emissions to air statistics related to the use of energy statistics

Considerable improvements have been made in Statistics Norway during the last years to produce energy statistics according to the needs of environmental statistics, and emissions to air statistics in particular. However, there are still needs for improvements in some areas in order for the Emission Inventory to serve all its purposes and to comply with the requirements of international conventions and statistical codes of practice. The following areas are of particular concern:

1. The reliability of emission figures divided by industries

Emission figures are allocated to different industrial divisions in the Emission Inventory by the same procedures as for the Energy Accounts. The general allocation methodology is based on sales statistics, which is relatively incomplete with respect to industrial divisions. Taking total fuel sales as a starting point, statistical surveys and different estimation methods are used to allocate the consumption of the different fuels to the industrial divisions, including households. This methodology implies in general that the figures that are considered most reliable are included in total (in practice, consumption in manufacturing industries only), while the allocation to the other industrial divisions and the household to a smaller or larger degree are based on residuals from the total combined with more uncertain estimation methods.

The most reliable survey conducted on the consumption of energy, is a survey on the consumption of energy in the manufacturing industries. In addition, there are some data on energy consumption in households collected in Statistics Norway's household consumption survey (a sample of 1200 households only), and there is one individual survey on the consumption of firewood in the households. Extrapolations of old surveys, e.g. for energy use in the service industry sector, are also used as basis for allocating energy consumption on the different industrial divisions.

To improve the possibilities for a more reliable allocation of energy use on different industrial divisions, two approaches have been discussed: 1) A register approach and 2) a survey approach. The register approach will make use of business registers that include organizational id numbers, which make it possible to identify the ISIC/NACE code of single establishments. This approach is already used for sale from oil companies today. Statistics Norway has also produced statistics on waste and water consumption based on this approach with promising results (Skullerud and Stave 2002, Stave 2006). A challenge is, however, that much of the oil products and other fuels are sold through dealers, who are not included in this system today. To make the register approach work, it is therefore necessary to pose claims towards dealers of fuels to participate in such a system. An electronically based reporting system would, however, minimize this burden.

The alternative approach is to conduct more "classical" statistical surveys on energy use in the different industrial divisions. This would imply a heavier reporting burden on more people, but are probably impossible to avoid to some extent even if a register reporting system is established. The Emission Inventory calculations does also require information on combustion technologies used, which in many cases have to be collected through surveys.

2. The reliability of emission figures related to the use of non-market fuels

The only data source per date on the use of non-market fuels in Norway is Statistics Norway's survey on consumption of firewood in the households. Other types of fuels, such as waste and non-wood biomass, are also used for heating in households, and non-market firewood can be used to some extent by industrial enterprises. Although the use of non-market fuels in Norway, with exception from

firewood, is relatively limited compared to e.g. developing countries, these sources have high pollution potentials and is therefore of importance for estimation of emissions to air.

3. The quality of re-calculations/consistency of time series

International environmental agreements normally state targets according to a baseline year, such as the Kyoto protocol, which uses the 1990-emission as the baseline and the upper limit for future emissions. Since the emission calculations depend heavily on energy statistics, it is thus of strong importance that these statistics are consistent, in general and particularly back to the conventions' baseline years.

3.2. Facing the future

In addition to the areas of present concern outlined in the previous paragraph, there are some areas of adaptations of the emissions to air statistics and its underlying energy statistics that should be considered in order to meet future needs of information, of which some already are in strong demand:

1. Renewable energy identification and certification

Different user groups increasingly demand a division between renewable and non-renewable energy sources; Energy production from renewable versus non-renewable sources is selected as one indicator in the official Norwegian set of sustainable development indicators, and the EU directive on electricity requires that all electricity should contain a declaration on how the electricity has been produced, including what energy sources that has been used. As per date, a source identification of some of the electricity imported to Norway is impossible (However, more than 99 per cent of the electricity used in Norway originates from renewable sources).

In an emission to air perspective, there is a need to distinguish between renewable energy with emissions (bio fuels, waste, etc.) and without emission (water, wind, solar, etc.).

2. Provision of data for conducting "ecological footprint" analyses (according to the residential principle)

Similar to the renewable/non-renewable focus, there is an increasing demand for energy and emission figures on Norwegian activities abroad. Researchers, and NGO' in particular, use the ecological footprint approach to put focus on international and social inequalities with respect to who uses the world's resources and who impact our common environment. Such approaches are undoubtedly important as a supplement to approach taken as basis in international conventions, as it emphasis more on the individual obligations towards the environment than the national/state obligations alone.

To provide data for footprint analyses, it is necessary to produce energy and emission statistics according to the residential principle, basically following the structure of national accounts.

3. Inclusion of new, and presently minor energy sources

The energy market is in transition, driven to a large degree by the need to reduce emissions to air, and new energy sources are and will be introduced in the future. To be able to make consistent statistics on these sources, it is important that they are included in statistical systems as soon as possible. The same should be the case for new energy saving technologies, such as heating pumps.

3.3. Summary of requirements to energy statistics as basis for environmental statistics

On basis of the above discussion, the following requirements to energy statistics can be stated to comply with the needs of emissions to air statistics:

1. Energy statistics according to the territorial boundary principle is the basis for emission statistics reported to international conventions. However, there is an increasing demand for emission statistics that follows the residential principle
2. Reporting of emission statistics to international conventions generally follow standard industrial classifications (ISIC, NACE), in common with national accounts. Attributing correct use of different energy sources (fuels) to the different industrial division (including households) is perhaps the most important basis for production of emission statistics, and should be emphasized in production of energy statistics
3. The total energy use within the different industrial divisions should be divided by:
 - a. Renewable and non-renewable energy sources
 - b. Combusted and used as raw material (and other non-combustion purposes)
 - c. Used for transportation and used for non-transportation purposes
4. Energy statistics should include the use of all energy commodities/sources, including non-market sources, which from an environmental point of view, should be given special attention. In addition, it is important to include small and new energy sources to, among other things, state baselines for statistical time-series
5. Special attention should be given to time-series consistency, including re-calculations, of primary energy statistics. There are strong requirements attached to emission statistics with respect to time-series consistency, e.g. in relation to the Kyoto protocol with its 1990 baseline year
6. Focus should be given to include energy saving technologies, such as heating pumps, in energy statistics. This is not directly required to estimate emissions, but an important basis for monitoring and analyzing environmental policy measures

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Appendix 1: Definition of pollutants in the Norwegian Emission Inventory

Class	Pollutant	Symbol	Definition
Greenhouse gases	Carbon dioxide	CO ₂	
	Methane	CH ₄	
	Nitrous oxide	N ₂ O	
	Perfluorocarbons	PFCs	CF ₄ + C ₂ F ₆
	Hydrofluorocarbons	HFCs	
	Sulphur hexafluoride	SF ₆	
Acidifying gases	Sulphur dioxide	SO ₂	
	Nitrogen oxides	NO _x	NO + NO ₂
	Ammonia	NH ₃	
Heavy metals (HM)	Lead	Pb	
	Cadmium	Cd	
	Mercury	Hg	
	Arsenic	As	
	Chromium	Cr	
	Copper	Cu	
Persistent organic pollutants (POPs)	Polycyclic Aromatic Hydrocarbons	PAH	Emissions are calculated for PAH-total, PAH-6 and PAH-4. PAH-total includes 16 components according to Norwegian Standard (NS9815). PAH-6 is OSPARs Borneff-6 and include 6 components. PAH-4 is consisting of four components used as an indicator for PAH emissions required for reporting to CLRTAP.
	Dioxins	-	Dioxin emissions are given in the unit I-TEQ, which is required for reporting to CLRTAP. I-TEQ is based on the international model ("Nato-modell") and is the sum of PCDD/PCDF multiplied by the components toxicity equivalency factor (I-TEF). TEQ = sum (PCDD _i * TEF _i) + sum (PCDD _j * TEF _j).
Particulates	Total suspended particulates	TSP	
	-	PM ₁₀	Particulate matter with diameter less than 10µm
	-	PM _{2,5}	Particulate matter with diameter less than 2.5µm
Other pollutants	Carbon monoxide	CO	
	Non-methane volatile organic compounds	NMVOC	

Appendix 2: Economic sectors in the Norwegian emission model

Sector number	SIC code	Sector name
Agriculture and forestry		
230100	01.1-3	Agriculture
0140	01.4-5	Services related to agriculture and forestry
0200	02	Forestry and logging
Fishing		
0510	05.01	Fishing
0520	05.02	Operation of fish farms
Energy sectors		
1000	10.1-2	Coal mining
1110	11.1	Extraction of crude petroleum and natural gas
1200	12	Mining of uranium and thorium ores
2320	23.2 part	Manufacture of refined petroleum products
2330	23.3	Processing of nuclear fuel
2340	11.1	Gas terminal
4010	40.110	Production of electricity
4020	40.120	Distribution of electricity
4030	40.2	Manufacture and distribution of gas
4040	40.3	Steam and hot water supply
Mining/manufacturing		
1120	11.2	Oil drilling
1300	13	Mining of metal ores
1400	14, 10.3	Other mining and quarrying
1510	15.1	Production, processing and preserving of meat and meat products
1520	15.2	Processing and preserving of fish and fish products
1530	15.3	Processing and preserving of fruit and vegetables
1540	15.4	Manufacture of vegetable and animal oils and fats
1550	15.5	Manufacture of dairy products
1560	15.6	Manufacture of grain mill products, starches and starch products
1570	15.7	Manufacture of prepared animal feeds
1580	15.8	Manufacture of other food products
1590	15.9	Manufacture of beverages
1600	16	Manufacture of tobacco products
1700	17	Manufacture of textiles and textile products
Mining/manufacturing (cont.)		
1810	18.1	Manufacture of leather clothes
1820	18.2	Manufacture of other wearing apparel and accessories
1830	18.3	Dressing and dyeing of fur, manufacture of articles of fur
1910	19.1-2	Tanning and dressing of leather, manufacture of luggage, handbags, saddlery and harness
1930	19.3	Manufacture of footwear
2010	20.1	Sawmilling and planing of wood, impregnation of wood
2020	20.2	Manufacture of particle board, fibre board and other panels and boards
2030	20.3	Manufacture of builders' carpentry and joinery
2040	20.4-5	Manufacture of other products of wood
2110	21.11	Manufacture of pulp
2120	21.12	Manufacture of paper and paperboard
2130	21.2	Manufacture of articles of paper and paperboard
2210	22.1	Publishing

Sector number	SIC code	Sector name
2220	22.2	Printing and service activities related to printing
2230	22.3	Reproduction of recorded media
2310	23.1	Manufacture of coke oven products
2322	23.2 part	Manufacture of asphalt
2411	24.11	Manufacture of industrial gases
2412	24.12-13	Manufacture of dyes and pigments and other inorganic basic chemicals
2415	24.15, 24.2	Manufacture of fertilisers, nitrogen compounds and pesticides
2416	24.14, 24.16-17	Manufacture of plastics and synthetic rubber in primary forms, manufacture of other organic basic chemicals
2430	24.3	Manufacture of paints and varnishes, printing ink and mastics
2440	24.4	Manufacture of basic pharmaceutical products and pharmaceutical preparations
2450	24.5	Manufacture of soap and detergents and toilet preparations
2460	24.6	Manufacture of other chemical products
2470	24.7	Manufacture of man-made fibres
2500	25	Manufacture of rubber and plastic products
2610	26.1	Manufacture of glass and glass products
2620	26.2-3	Manufacture of ceramic goods
2640	26.4,6-8	Manufacture of other mineral products
2650	26.5	Manufacture of cement, lime and plaster
2710	27.1-3 except 27.35	Manufacture of basic iron and steel
2720	27.35	Manufacture of ferro-alloys
2730	27.42	Aluminium production
2740	27.4 except 27.42	Other non-ferrous metal production
2750	27.5	Casting of metals
2810	28.1-5	Manufacture of fabricated metal products, except machinery and equipment
2860	28.6	Manufacture of cutlery, tools and general hardware
2870	28.7	Manufacture of other metal products
2910	29.1-2	Manufacture of general purpose machinery
2930	29.3-5	Manufacture of special purpose machinery
2960	29.6	Manufacture of weapons and ammunition
2970	29.7	Manufacture of domestic appliances
3000	30	Manufacture of office machinery and computers
3110	31.1-2	Manufacture of electric motors, generators and transformers, manufacture of electricity distribution and control apparatus
3130	31.3	Manufacture of insulated wire and cable
3140	31.4-6	Manufacture of other electrical apparatus and equipment
3210	32.1-2	Manufacture of electronic components and television and radio transmitters
3230	32.3	Manufacture of television and radio receivers, sound or video recording apparatus
3310	33.1-3	Manufacture of medical and precision instruments
3340	33.4-5	Manufacture of optical instruments, photographic equipment, watches and clocks
3400	34	Manufacture of motor vehicles and parts and accessories for motor vehicles
3510	35.1 except 35.114	Building and repair of ships and boats
3520	35.114	Building and repair of oil platforms
Mining/manufacturing (cont.)		
3530	35.2	Manufacture and repair of railway and tramway locomotives and rolling stock
3540	35.3	Manufacture and repair of aircraft and spacecraft
3550	35.4-5	Manufacture of other transport equipment
3610	36.1	Manufacture of furniture
3620	36.2	Manufacture of jewellery and related articles
3630	36.3-6	Other manufacturing
3710	37.1	Recycling of metal waste and scrap
3720	37.2	Recycling of non-metal waste and scrap

Water supply

Sector number	SIC code	Sector name
4100	41	Collection, purification and distribution of water
Construction		
4500	45	Construction
Wholesale and retail trade/hotels and restaurants		
5000	50-52	Wholesale and retail trade, repair of motor vehicles and personal and household goods
5500	55	Hotels and restaurants
Transport etc.		
6010	60.1	Transport via railways
6020	60.21	Tramway and suburban transport, other scheduled passenger land transport
6030	60.22	Taxi operation
6040	60.23-24	Other land passenger transport, freight transport by road
6080	60.3	Transport via pipelines
6110	61.101	Ocean transport
6130	61.103-109, 61.2	Inland and coastal water transport
6202	62 part	Domestic air transport
6203	62 part	International air transport
6300	63	Supporting and auxiliary transport activities
6400	64	Post, telecommunications
Financing, insurance, real estate and business services		
6500	65-67	Financial intermediation, insurance
7000	70	Real estate activities
7100	71	Renting of machinery and equipment
7200	72	Computer and related activities
7300	73	Research and development
7400	74	Other business activities
8000	80	Education
8500	85	Health and social work
9000	90	Sewage and refuse disposal, sanitation and similar activities
9100	91	Activities of membership organisations
9200	92	Recreational, cultural and sporting activities
9300	93	Other service activities
9500	95	Private households with employed persons
Central government		
246300	63	Supporting and auxiliary transport activities
7300	73	Research and development
7400	74	Other business activities
7510	75.1, 75.21, 23, 24, 75.3	Public administration
7520	75.22	Defence
8000	80	Education
8500	85	Health and social work
9200	92	Other service activities
Local government		
257510	75.1, 75.25	Public administration
8000	80	Education
8500	85	Health and social work
9000	90	Sewage and refuse disposal, sanitation and similar activities
9200	92, 93.03	Other service activities

Sector number	SIC code	Sector name
Private households		
330000	n.a.	Private household
Foreign activities in Norway		
660000	n.a.	Foreign activities in Norway

Appendix 3: Source classifications used in the Norwegian Emission Inventory

Stationary combustion		
Oil and gas extraction	Natural gas Flaring Diesel combustion Gas terminals	
Manufacturing and mining	Refining Manufacture of pulp and paper Manufacture of mineral products Manufacture of chemicals Manufacture of metals Other manufacturing	
Other industries Dwellings Incineration of waste and landfill gas		
Process emissions		
Oil and gas extraction	Venting, leaks, etc. Oil loading at sea Oil loading, on shore Gas terminals	
Manufacturing and mining	Refining Manufacture of pulp and paper Manufacture of chemicals Manufacture of mineral products Manufacture of metals	Iron, steel and ferroalloys Aluminium Other metals
Petrol distribution Agriculture Landfill gas Solvents Road dust Other process emissions	Other manufacturing	
Mobile combustion		
Road traffic	Petrol engines	Passenger cars Other light vehicles Heavy vehicles
	Diesel engines	Passenger cars Other light vehicles Heavy vehicles
	Motorcycles, mopeds	Motorcycles Mopeds
Snow scooters		

Small boats
Motorized equipment
Railways
Air traffic

Domestic < 1000 m
Domestic > 1000 m

Shipping

Coastal traffic, etc.
Fishing vessels
Mobile oil rigs, etc.

Appendix 4: Content of the calculation sheets in EDAT

Calculation sheet	Content
INN_NN	Fuel consumption: Norwegian purchases of energy goods/sources in Norway, outside the energy sectors.
INN_NU	Fuel consumption: Norwegian purchases of energy goods/sources abroad.
INN_UN	Fuel consumption: Foreign purchases of energy goods/sources in Norway.
INN_RÅ	Energy goods/sources used as feedstock/raw material.
INN_ESEK	Energy sectors: Production, fuel and feedstock/raw material use, import, export, stock changes etc.
RES_EREGRN_FYS	Energy account: Consumption (outside the energy sectors) in each sector. Physical units.
RES_EREGRN_PJ	Energy account: Consumption (outside the energy sectors) in each sector. Energy units (PJ).
RES_EREGRN_ESEK	Energy account: Production and consumption in the energy sectors, import, export, stock changes, other supplies etc.
RES_EREGRN_MSG	Energy account: RES_EREGRN_FYS aggregated to MSG-model sectors.
RES_EREGRN_TAB	Energy account: Tables published in the Weekly Bulletin of Statistics, Natural resources and the environment etc.
RES_EBAL_FYS	Energy source balance: Supply and consumption, all sectors and all energy goods/sources.
RES_EBAL_PJ	Energy source balance: Energy units (PJ). The sheet is generated by multiplying the figures in RES_EBAL_FYS by the theoretical energy content of the energy goods/sources.
RES_EBAL_TAB	Energy source balance (physical units) and energy balance (PJ), aggregated figures, published in the Weekly Bulletin of Statistics.
RES_UTSLIPP	Energy data generated from the definitions that are used in emission calculations.
FAKTORER	Factors for energy content and fuel efficiency.
TEST	Checks the consistency with the petroleum statistics and that statistical errors in the Energy account and Energy source balance are identical.