ANNUAL DANISH INFORMATIVE INVENTORY REPORT TO UNECE

Emission inventories from the base year of the protocols to year 2011

Scientific Report from DCE – Danish Centre for Environment and Energy No. 53 2013

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Data sheet

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Abstract: This report is a documentation report on the emission inventories for Denmark as reported to the UNECE Secretariat under the Convention on Long Range Transboundary Air Pollution due by 15 February 2013. The report contains information on Denmark's emission inventories regarding emissions of (1) SO_X for the years 1980-2011, (2) NO_X, CO, NMVOC and NH_3 for the years 1985-2011, (3) Particulate matter: TSP, PM_{10}, $PM_{2.5}$ for the years 2000-2011, (4) Heavy Metals: Pb, Cd, Hg, As, Cr, Cu, Ni, Se and Zn for the years 1990-2011, (5) Polyaromatic hydrocarbons (PAH): Benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene and indeno(1,2,3-cd)pyrene, PCDD/F and HCB for the years 1990-2011. Further, the report contains information on background data for emissions inventory.

Keywords: Emission Inventory; Emissions; Projections; UNECE; EMEP; LRTAP; NO_X; CO; NMVOC; SO_x; NH_3; TSP; PM_{10}; $PM_{2.5}$; Pb; Cd; Hg; As; Cr; Cu; Ni; Se; Zn; Polyaromatic hydrocarbons; Dioxin; Benzo(a)pyrene, Benzo(b)fluoranthene

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Contents

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Summary

I Background information on emission inventories

Annual report

This report is Denmark's Annual Informative Inventory Report (IIR) due March 15, 2013 to the UNECE-Convention on Long-Range Transboundary Air Pollution (LRTAP). The report contains information on Denmark's inventories for all years from the base years of the protocols to 2011.

The air pollutants reported under the LRTAP Convention are SO_2, NO_X, NMVOC, CO, NH_3, As, Cd, Cr, Cu, Hg, Ni, Pb, Se, Zn, dioxins/furans, HCB, PAHs, TSP, PM_{10} and $PM_{2.5}$.

The annual emission inventory for Denmark is reported in the Nomenclature for Reporting (NFR 2009) format. In December 2008 new reporting guidelines were decided by the EMEP Executive Body. Many of the new elements and demands in the reporting guidelines have not been implemented yet. The reason for this is that they require significantly more resources, which are not currently available.

The issues addressed in this report are: trends in emissions, description of each NFR category, uncertainty estimates, recalculations, planned improvements and procedures for quality assurance and control. The structure of the report follows to the extent possible the proposed outline.

Information contained in this report is available to the public on the Danish Centre for Environment and Energy (DCE), Aarhus University's homepage:

http://www.dmu.dk/Luft/Emissioner/Home+of+Inventory/

and this report and the NFR tables are available on the Eionet central data repository:

http://cdr.eionet.europa.eu/dk/Air_Emission_Inventories/Submission_EMEP_UNECE

Responsible institute

DCE-Danish Centre for Environment and Energy, Aarhus University, is on behalf of the Danish Ministry of the Environment responsible for the annual preparation and submission to the UNECE-LRTAP Convention of the Annual Danish Emissions Report and the inventories in the NFR format. DCE participates in meetings under the UNECE Task Force on Emission Inventories and Projections and the related expert panels, where parties to the convention prepare the guidelines and methodologies on inventories.

II Trends in emissions

Acidifying gases

In 1990, the relative contribution in acid equivalents was almost equal for the three gases SO_2, NO_x and NH_3. In 2011, the most important acidification factor in Denmark is ammonia nitrogen and the relative contributions for SO_2, NO_X and NH_3 were 6 %, 36 % and 58 %, respectively. However, with regard to long-range transport of air pollution, SO_2 and NO_X are still the most important pollutants.

Sulphur dioxide (SO_2)

The main part of the SO_2 emission originates from combustion of fossil fuels, i.e. mainly coal and oil, in public power and district heating plants. From 1980 to 2011, the total emission decreased by 97 %. The large reduction is mainly due to installation of desulphurisation plants and use of fuels with lower content of sulphur in public power and district heating plants. Despite the large reduction of the SO_2 emissions, these plants make up 23 % of the total emission. Also emissions from industrial combustion plants, non-industrial combustion plants and other mobile sources are important. National sea traffic (navigation and fishing) contributes with about 13 % of the total SO_2 emission in 2011. This is due to the use of residual oil with high sulphur content.

Nitrogen oxide (NO_x)

The largest sources of emissions of NO_X are road transport followed by other mobile sources and combustion in energy industries (mainly public power and district heating plants). The transport sector is the sector contributing the most to the emission of NO_X and, in 2011, 47 % of the Danish emissions of NO_X stems from road transport, national navigation, railways and civil aviation. Also emissions from national fishing and off-road vehicles contribute significantly to the NO_X emission. For non-industrial combustion plants, the main sources are combustion of gas oil, natural gas and wood in residential plants. The emissions from energy industries have decreased by 75 % from 1985 to 2011. In the same period, the total emission decreased by 55 %. The reduction is due to the increasing use of catalyst cars and installation of low-NO_X burners and denitrifying units in power plants and district heating plants.

Ammonia (NH_3)

Almost all atmospheric emissions of NH_3 result from agricultural activities. Only a minor fraction originates from road transport (2.2 %) and stationary combustion (0.3 %) in 2011. This share for road transport increased during the 1990'ties and early 2000's due to growing use of catalyst cars. In more recent years the share is again decreasing due to more advanced catalysts being implemented. The major part of the emission from agriculture stems from livestock manure (84 %) and the largest losses of ammonia occur during the handling of the manure in stables and in field application. Other contributions come from use of mineral fertilisers (6 %), N-excretion on pasture range and paddock (3 %), sewage sludge used as fertiliser, crops and ammonia used for straw treatment (8 %) and field burning (less than 1 %). The total ammonia emission decreased by 37 % from 1985 to 2011. This is due to the active national environmental policy efforts over the past twenty years.

Other air pollutants

Non-methane volatile organic compounds (NMVOC)

The emissions of NMVOC originate from many different sources and can be divided into two main groups: incomplete combustion and evaporation. Road vehicles and other mobile sources such as national navigation vessels and off-road machinery are the main sources of NMVOC emissions from incomplete combustion processes. Road transportation vehicles are still the main contributors, even though the emissions have declined since the introduction of catalyst cars in 1990. The evaporative emissions mainly originate from the use of solvents and the extraction, handling and storage of oil and natural gas. The emissions from the energy industries have increased during the nineties due to the increasing use of stationary gas engines, which have much higher emissions of NMVOC than conventional boilers. The total anthropogenic emissions have decreased by 58 % from 1985 to 2011, largely due to the increased use of catalyst cars and reduced emissions from use of solvents.

Carbon monoxide (CO)

Mobile sources and non-industrial combustion plants contribute significantly to the total emission of this pollutant. Transport is the second largest contributor to the total CO emission. In 1990 a law forbidding the burning of agricultural crop residues in the fields was implemented, which caused a significant reduction in CO emission. The emission decreased further by 48 % from 1990 to 2011, largely because of decreasing emissions from road transportation.

Particulate Matter (PM)

The particulate matter (PM) emission inventory has been reported for the years 2000 onwards. The inventory includes the total emission of particles Total Suspended Particles (TSP), emission of particles smaller than 10 µm (PM_{10}) and emission of particles smaller than 2.5 µm ($PM_{2.5}$).

The largest $PM_{2.5}$ emission sources are residential plants (67 %), road traffic (10 %) and other mobile sources (9 %). For the latter, the most important sources are off-road vehicles and machinery in the industrial sector and in the agricultural/forestry sector (32 % and 37 %, respectively). For the road transport sector, exhaust emissions account for the major part (63 %) of the emissions. The $PM_{2.5}$ emission increased by 2 % from 2000 to 2011, due to an increasing wood consumption in the residential sector counteracted by a decrease in emission from the transport sector and to a less degree from manufacturing industries and construction.

The largest TSP emission sources are the residential sector and the agricultural sector. The TSP emissions from transport are also important and include both exhaust emissions and the non-exhaust emissions from brake and tyre wear and road abrasion. The non-exhaust emissions account for 63 % of the TSP emission from road transport.

Heavy metals

In general, the most important sources of heavy metal emissions are combustion of fossil fuels and waste. The heavy metal emissions have decreased substantially in recent years, except for Cu. The reductions span from 28 % to 92 % for Zn and Pb, respectively. The reason for the reduced emissions is mainly increased use of gas cleaning devices at power and district heating plants (including waste incineration plants). The large reduction in the Pb emission is due to a gradual shift towards unleaded gasoline, the latter being essential for catalyst cars. The major source of Cu is automobile tyre and break wear (93 % in 2011) and the 35 % increase from 1990 to 2011 owe to increasing mileage.

Cadmium (Cd)

The main sources of emissions of Cd to air are combustion in energy industries (mainly combustion of wood, wood waste and municipal waste) and manufacturing industries (mainly combustion of residual oil). In the transport sector emissions from passenger cars is the main source contributing with 55 % of the sectoral emission in 2011. The emission from non-industrial combustion is dominated by wood combustion in residential plants which accounts for 76 % of the sectoral emission in 2011. Emissions from combustion in residential plants have increased by 98 % since 1990. The decreasing emission from energy industries are related to the decreasing combustion of coal.

Mercury (Hg)

The largest sources of Hg emissions to air are waste incineration and coal combustion in energy industries. Due to improved flue gas cleaning and decreasing coal combustion the emissions from Energy industries decreased by 76 % from 1990-2000. The trend has continued in the following years and the corresponding decrease from 1990-2011 is 90 %. Non-industrial combustion is dominated by wood combustion in residential plants while emissions from the waste sector mainly owe to cremation. The variations in emissions from industrial processes owe to shut down in 2002 followed by re-opening and a second shut down in 2005 of the only Danish electro-steelwork.

Lead (Pb)

The main Pb emission sources are combustion in residential plants and energy industries and transport. In earlier years combustion of leaded gasoline was the major contributor to Pb emissions to air but the shift toward use of unleaded gasoline for transport have decreased the Pb emission from transport by 94 % from 1990-2011. In the non-industrial combustion sector the dominant source is wood combustion in residential plants. The trend in the Pb emission from non-industrial combustion from 1990 to 2011 is almost constant. This is due to a decrease in emission caused by the shift towards unleaded gasoline, as this sector includes other mobile sources in household, gardening, agriculture, forestry, fishing and military. This is counteracted by an increase in the emission from residential plants. The decreasing emission from Energy industries (96 % from 1990 to 2011) is caused by the deceasing coal combustion.

Polycyclic aromatic hydrocarbons (PAHs)

The present emission inventory for polycyclic aromatic hydrocarbons (PAH) includes four PAHs: benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene and indeno(1,2,3-cd)pyrene. Benzo(b)fluoranthene and Benzo(a)pyrene contribute the major PAH emission by 31 % and 30 %, respectively. The most important source of PAHs emissions is combustion of wood in the residential sector making up 85 % of the total emission in 2011. The increasing emission trend is due to increasing combustion of wood in the residential sector. The PAH emission from combustion in residential plants has increased by 118 % from 1990 to 2011.

Dioxins and furans

The major part of the dioxin emission owes to wood combustion in the residential sector, mainly in wood stoves and ovens without flue gas cleaning. Wood combustion in residential plants accounts for 60 % of the national dioxin emission in 2011. The contribution to the total dioxin emission from the waste sector (27 % in 2011) owes to accidental fires, especially building fires. The emissions of dioxins from energy industries mainly owe to the combustion of biomass as wood, wood waste and to a less extend agricultural waste

Hexachlorobenzene (HCB)

Stationary combustion accounts for 98 % of the estimated national hexachlorobenzene (HCB) emission in 2011. This owes mainly to combustion of municipal solid waste in heating and power plants. Wood combustion in households is an important source, too, and has increased by 260 % since 1990 due to increasing wood consumption. The HCB emission from stationary plants has decreased 82 % since 1990 mainly due to improved flue gas cleaning in MSW incineration plants. The emission from residential plants has increased due to increased wood consumption in this source category

III Recalculations and Improvements

In general, considerable work is being carried out to improve the inventories. Investigations and research carried out in Denmark and abroad produce new results and findings which are given consideration and, to the extent which is possible, are included as the basis for emission estimates and as data in the inventory databases. Furthermore, the updates of the EMEP/CORINAIR guidebook (Now the EMEP/EEA Guidebook), and the work of the Task Force on Emission Inventories and its expert panels are followed closely in order to be able to incorporate the best scientific information as the basis for the inventories.

The implementation of new results in inventories is made in a way so that improvements, as far as possible, better reflect Danish conditions and circumstances. This is in accordance with good practice. Furthermore, efforts are made to involve as many experts as possible in the reasoning, justification and feasibility of implementation of improvements.

In improving the inventories, care is taken to consider implementation of improvements for the whole time series of inventories to make it consistent. Such efforts lead to recalculation of previously submitted inventories. This submission includes recalculated inventories for the whole time series. The reasoning for the recalculations performed is to be found in the sectoral chapters of this report. The text below focuses on recalculations, in general, and further serves as an overview and summary of the relevant text in the sectoral chapters. For sector specific planned improvements please also refer to the relevant sectoral chapters.

Energy

Improvements and updates of the Danish energy statistics are made regularly by the producer of the statistics, the Danish Energy Agency. In close cooperation with the DEA, these improvements and updates are reflected in the emission inventory for the energy sector. The Danish energy statistics have, for the most part, been aggregated to the SNAP categorisation.

The inventories are still being improved through work to increase the number of large point sources, e.g. power plants, included in the databases as individual point sources. Such an inclusion makes it possible to use plant-specific data for emissions, etc., available e.g. in annual environmental reports from the plants in question.

Stationary Combustion

For stationary combustion plants, the emission estimates for the years 1990-2010 have been updated according to the latest energy statistics published by the Danish Energy Agency. The update included both end use and transformation sectors as well as a source category update.

In response to a recommendation during the EU ESD review in May-August of 2012 a recalculation was made regarding LPG use. In previous inventory submissions the LPG use in road transport was calculated bottom-up in the Danish road transport model. However, the difference between the bottom-up calculated LPG use and the official energy statistics was not handled. In the 2013 submission, the residual LPG use has been allocated to stationary combustion in residential plants. The allocation has been done in dialogue with the Danish Energy Agency. In general, the change in emission is very small. For most years, this has meant an increase in the reported emissions, but for some years in the early part of the time series the emissions have decreased.

The disaggregation of emissions in 1A2 Manufacturing industries and construction has been recalculated based on further improvements to the methodology that was implemented in the 2012 submission. This has caused a reallocation of emissions. The main change being that less emission are allocated to *1A2f Other* and that emissions reported for especially *1A2c Chemicals*, *1A2d Pulp, Paper and Print* and *1A2e Food Processing, Beverages and Tobacco* have increased.

A recalculation for stationary combustion was done as a consequence of the recalculation described for national navigation. An additional amount of fuel oil was allocated to stationary combustion in manufacturing industries and stationary combustion in agriculture and forestry.

A reallocation of emissions has been made from *1A1a Public Electricity and Heat Production* to *1A4a Commercial/Institutional*. This is caused by a different categorization of some combustion plants.

The reported SO_2 emission from 1A1b in 2005-2010 is lower than last year due to reallocation of emissions from refineries.

Mobile sources

The following recalculations and improvements of the emission inventories have been made since the emission reporting in 2012.

Road transport

The total mileage per vehicle category from 1985-2010 have been updated based on new data prepared by DTU Transport and minor fuel statistical changes from the Danish Energy Agency. Most importantly, the annual mileage for all vehicle types has been revised based on data from the Danish vehicle inspection and maintenance programme. Further, fuel efficiency data for new sold passenger cars in Denmark has been used to modify the default fuel consumption factors proposed by COPERT IV. Also, revisions have been made to the cut-off mileage for N2O emission deterioration for catalyst cars, being in line with the updated version of COPERT IV.

The percentage emission change interval and year of largest percentage differences (low %; high %, year) for the different emission components are: SO_2 (0 %; 0.2 %, 2010), NO_x (3.1 %; 10.7 %, 2009), NMVOC (-3.2 %; 16.1 %, 2009), CO (-11.7 %; 5.8 %, 1985), NH_3 (-14.1 %; 20.7 %, 2010) and Particulates (0.3 %; 10.6 %, 2009).

Navigation

The ferry share of round trips has been updated for the years 2008-2010 causing minor emission changes for domestic navigation. The following largest percentage differences (in brackets) for domestic navigation are noted for: SO_2 (0.2 %), NO_x (-0.1 %), NMVOC (0.0 %), CO (0.0 %), NH_3 (0.0 %) and Particulates (0.1 %)

Agriculture/forestry/fisheries

The number of machine pool tractors has been updated for the years 2008-2010, causing minor emission changes. The following largest percentage differences (in brackets) for agriculture/forestry/fisheries are noted for: SO_2 (0.1 %), NO_x (0.2 %), NMVOC (0.1 %), CO (0.1 %), NH_3 (0.5 %) and Particulates (0.3 %).

Military

Emission factors derived from the new road transport simulations have caused some emission changes from 1985-2010.The following largest percentage differences (in brackets) for military are noted for: SO_2 (0 %), NO_x (-7 %), NMVOC (-3.7 %,), CO (2.8 %), NH_3 (10.4 %) and Particulates (0.7 %,).

Fugitive emissions

Exploration

An error in the annual reports from the crude oil terminal has been corrected, resulting in a decrease of the NMVOC emission in 2010 of 221 Mg corresponding to 2.4 % of the total fugitive NMVOC in 2010.

Onshore loading

The implied emission factor is updated for 2010 due to the emission reduction initiatives at the crude oil terminal and harbor terminal, resulting in a decrease of the NMVOC emission in of 396 Mg corresponding to 4.3 % of the total fugitive NMVOC in 2010.

Refineries

A reallocation of SO2 emissions from one of the two Danish refineries has been implemented for the years 2005-2010. The reallocation has been carried out in close cooperation with the contact person at the relevant refinery. The changes have led to an increase of the SO_2 emission in the NFR category “1 B 2 a iv Refining / storage” of 32 to 182 Mg (min: 2006, max: 2007) corresponding to 3.1 % and 12 % of the total fugitive SO2 emission in 2006 and 2007, respectively.

Natural gas distribution

Natural gas distribution has been recalculated for 2009 and 2010 according to the annual reports from two of the Danish distribution companies. The recalculation has increased the fugitive NMVOC emission by 31 Mg and 1 Mg corresponding to 0.3 % and 0.01 % of the total fugitive NMVOC in 2009 and 2010 respectively.

Venting

A minor change has been applied as the 2010 annual report from a natural gas storage facility has become available. The increase of the NMVOC emission is 4 Mg corresponding to 0.04 %.

Industrial processes

Mineral products

Emission of SO_2 from brickworks and facilities for production of expanded clay products has been included for 1990-2011. EFs for SO_2 has been estimated as weighted average for the years 2008-10 based on information from environmental reports from the relevant companies. The emissions have been adjusted for energy related emissions.

Time series have been completed to 1985 for 2A5, 2A6 and 2A7d.

Chemical industry

Time series have been completed to 1985 for chemical industry regarding SO_2, NO_x, NMVOC and NH_3.

Other production

Emissions from food and drink have been added for the years 1985-1989. Activity data for sugar have been changed for 2010 and activity data for coffee have been changed for 2006, 2008-10 due to changes in the statistics.

Solvent and other product use

Improvements and additions are continuously being implemented due to the comprehensiveness and complexity of the use and application of solvents and solvent containing products in industries and households. The main recalculations and their implications on the emissions in the 2013 reporting include the following:

- Recalculations increased the 2010 NMVOC emissions with approximately 500 t. The changes are caused by updated use category distribution keys (UCN) obtained from the Substances in Preparations In the Nordic countries (SPIN) database. Comprised chemicals are ethanol, turpentine, propyl alcohol, cyanates, xylene, butanoles and glycolethers in various use categories. Emission factors are identical to previous calculations, but since distributions of used amounts of chemicals in SNAP categories are adjusted the emissions are changed.
- There are changes in the used amount of ethanol in windscreen washing agents as a result of adjusted ethanol content in imported anti frost agents. This gives changes for all years back to 1985.
- The use of candles is included for the first time in this year’s inventory.
- Cross-border shopping has been added to the activity data for tobacco smoking (2000-2011). Cross-border shopping accounts for between 4 % (2009) and 12 % (2002).

Agriculture

Compared with the previous NH_3 and PM emissions inventory (submission 2012), some changes and updates have been made. These changes cause a decrease in the NH_3 emission (2007 – 2009), an increase in the NH_3 emission in 2010 and an increase in the PM emission in 2000-2010.

Emission of NH_3 has decreased 1-2 % in the period 2007-2009 and increased 0.1 %in 2010 compared to the submission 2011. The main reason for the decrease is an adjustment of normative figures for the period 2007-2010. For 2010 a change of the number of animals for some categories is made and this influences the emission to increase. The number of animals is changed for fur animals due to updated numbers from Statistics Denmark and for weaners, fattening pigs and hens due to and error in the calculations.

Activity data for sewage sludge have been changed for 2010 due to updated data from the Danish AgriFish Agency.

Emission of PM increased all years due to correction of some data for non-dairy cattle and laying hens. Furthermore is the production cycle in 2010 changed for weaners, fattening pigs and hens due to changes in the number of animals.

Waste

No recalculations were made for sector 6.C. Waste Incineration.

For sector 6.D. Waste Other several recalculations were made. Activity data for composting of garden and park waste from the waste statistics include wood chippings, in previous submissions this relatively small part of the activity was subtracted in the whole time series with help from surrogate data (available for 1997-2000). The influence that this exclusion of wood chippings had on the activity data (3-6 %) could not justify the increase in uncertainty that it caused. Therefore, wood chippings are now included, adding in average 4 % to the total composting activity data.

For accidental building fires, emission factors for particles and heavy metals have been increased with a factor 1000 after personal contact with the author of the reference. Furthermore, a small mistake in the calculation of full-scale equivalent activity data for container fires has been corrected, giving a decrease for 1981-2010 between 2 % (2007) and 5 % (2009). Since container fires are just a small part of the fires contributing to emissions from accidental building fires, this recalculation is miniscule.

For accidental vehicle fires, an update in vehicle population data has given a very small decrease in the FSE activity data for accidental truck and passenger car fires.

Sammenfatning

I Baggrund for emissionsopgørelser

Årlig rapport

Denne rapport er Danmarks årlige rapport om emissionsopgørelser sendt til UNECE-konventionen om langtransporteret grænseoverskridende luftforurening (LRTAP) 15. marts 2013. Rapporten indeholder oplysninger om Danmarks opgørelser for alle år fra basisårene for protokollerne til 2011.

Luftforureningskomponenterne der rapporteres til LRTAP-konventionen er SO_2, NO_x, NMVOC, CO, NH_3, As, Cd, Cr, Cu, Hg, Ni, Pb, Se, Zn, dioxiner/furaner, HCB, PAH, TSP, PM_{10} og $PM_{2,5}$.

Den årlige emissionsopgørelse for Danmark rapporteres i NFR 2009-formatet. Nye retningslinjer for rapportering blev vedtaget i december 2008 og de nye retningslinjer indeholder en række nye krav til udarbejdelsen af emissionsopgørelserne. Opfyldelsen af disse nye krav er endnu ikke implementeret, da de er væsentligt mere ressourcekrævende, og der ikke er afsat ressourcer hertil.

Emnerne behandlet i rapporten er: Udvikling i emissioner, beskrivelse af hver NFR-kategori, usikkerheder, rekalkulationer, planlagte forbedringer og procedure for kvalitetssikring og -kontrol. Strukturen i rapporten følger, så vidt muligt, den foreslåede disposition.

Informationer fra denne rapport er tilgængelige for offentligheden på Aarhus Universitets hjemmeside:

http://www.dmu.dk/luft/emissioner/emissioninventory/

Den fulde rapport samt NFR-skemaer er tilgængelige på Eionets hjemmeside:

http://cdr.eionet.europa.eu/dk/Air_Emission_Inventories/Submission_EMEP_UNECE

Ansvarlig institution

DCE – Nationalt Center for Miljø og Energi, Aarhus Universitet, er på vegne af Miljøministeriet ansvarlig for udarbejdelse af den årlige danske emissionsrapport og opgørelserne i NFR. DCE deltager i møder under UNECEs arbejdsgruppe for emissionsopgørelser og –fremskrivninger samt ekspertpaneler, hvor parter i konventionen udarbejder retningslinjer og metoder for emissionsopgørelserne.

II Udviklingen i emissioner

Forsurende gasser

I 1990 var det relative bidrag af syreækvivalenter næsten ens for de tre gasarter. I 2011 var ammoniak den vigtigste forsurende faktor i Danmark og de relative bidrag for SO_2, NO_x og NH_3 var på henholdsvis 6 %, 36 % og 58 %. Med hensyn til langtransporteret luftforurening er det dog stadig SO_2 og NO_x, der er de største kilder.

Svovldioxid (SO_2)

Hovedparten af SO_2-emissionerne stammer fra forbrænding af fossile brændsler, dvs. primært kul og olie, på kraftværker, kraftvarmeværker og fjernvarmeværker. Fra 1980 til 2011 er den totale udledning reduceret med 97 %. Den store reduktion er primært opnået gennem installation af afsvovlingsanlæg og brug af brændsler med lavt svovlindhold på kraftværker og fjernvarmeværker. Trods den store reduktion er disse værker kilde til 23 % af den samlede udledning. Også emissioner fra industrielle forbrændingsanlæg, ikke-industrielle forbrændingsanlæg og andre mobile kilder er væsentlige bidragsydere til emissionen. National søfart (sejlads og fiskeri) bidrager med 13 % af den totale SO_2-emission. Dette skyldes brug af fuelolie med et højt svovlindhold.

Kvælstofilte (NO_x)

Den største kilde til emissioner af NO_x er transportsektoren efterfulgt af andre mobile kilder og forbrænding i energisektoren (hovedsageligt kraftværker og fjernvarmeværker). Transportsektoren er den sektor der bidrager mest til udledningen af NO_x, og i 2011 stammede 47 % af de danske NO_x-emissioner fra vejtransport, national søfart, jernbaner og civil luftfart. Også emissioner fra nationalt fiskeri og off-road-køretøjer (entreprenør-, landbrugsmaskiner, m.m.) bidrager betydeligt til NO_x-emissionen. For ikke-industrielle forbrændingsanlæg er de primære kilder forbrænding af gasolie, naturgas og træ i husholdninger. Emissionerne fra kraftværker og fjernvarmeværker er faldet med 75 % fra 1985 til 2011. I samme periode er den totale emission faldet med 55 %. Reduktionen skyldes øget brug af katalysatorer i biler og installation af lav-NO_x-brændere og de-NO_x-anlæg på kraftværker og fjernvarmeværker.

Ammoniak (NH_3)

Stort set alle atmosfæriske emissioner af NH_3 stammer fra aktiviteter i landbruget. Kun en mindre del skyldes vejtransport (2,2 %) og stationære kilder (0,3 %). Andelen fra transporten var stigende gennem 1990'erne og i starten af 2000'erne pga. den øgede brug af biler med katalysator. Hovedparten af emissionen fra landbruget stammer fra husdyrgødning (84 %) og de største tab af ammoniak optræder under håndtering af gødningen i stalden og under spredning på marken. Andre bidrag kommer fra brug af kunstgødning (6 %), N-udskillelse af græssende dyr (3 %), slam fra rensningsanlæg brugt som gødning, afgrøder og ammoniakbehandlet halm (8 %) og markafbrænding (< 1 %). Den totale ammoniakemission er faldet 37 % fra 1985-2011. Dette er et resultat af den nationale miljøpolitik, der er ført gennem de seneste 20 år.

Anden luftforurening

Non-methane volatile organiske komponenter (NMVOC)

Emissionen af non-methane volatile organiske komponenter (NMVOC) stammer fra mange forskellige kilder og kan opdeles i to hovedgrupper: Ufuldstændig forbrænding og fordampning. Hovedkilderne til NMVOC-emissioner fra ufuldstændige forbrændingsprocesser er brændeovne, vejtrafik og andre mobile kilder, som national sejlads og ikke vejgående maskiner. Køretøjer til vejtransport er fortsat den største bidragsyder, selvom emissionerne er faldet siden introduktionen af biler med katalysator i 1990. Emissionerne fra fordampning stammer hovedsageligt fra brugen af opløsningsmidler. Emissionerne fra energisektoren er steget igennem 1990'erne pga. øget brug af stationære gasmotorer, som har meget højere emissioner af NMVOC end konventionelle kedler. De totale menneskeskabte emissioner er faldet med 58 % fra 1985 til 2011, primært som følge af øget brug af biler med katalysator og reducerede emissioner fra brug af opløsningsmidler.

Kulilte (CO)

Selvom biler med katalysator blev introduceret i 1990, er vejtransport stadig årsag til den største del af den totale CO-emission. Også andre mobile kilder og ikke-industrielle forbrændingsanlæg bidrager betydeligt til den totale emission af denne gas. Faldet i emissioner i 1990 var en konsekvens af loven, der generelt forbyder markafbrænding af halm. Emissionen faldt med 48 % fra 1990 til 2011 hovedsageligt pga. faldende emissioner fra vejtransport.

Partikler (PM)

Emissionsopgørelsen for partikler (Particulate Matter, forkortet PM) er blevet rapporteret for år 2000 og fremefter. Opgørelsen inkluderer den totale emission af partikler: Total Suspended Particles (TSP), emissionen af partikler mindre end 10 µm (PM_{10}) og emissionen af partikler mindre end 2,5 µm ($PM_{2,5}$).

De største kilder til $PM_{2,5}$-emission er husholdninger (67 %), vejtrafik (10 %) og andre mobile kilder (9 %). For den sidstes vedkommende er offroad-køretøjer i industrien samt landbrugs- og skovbrugsmaskiner de vigtigste kilder (hhv. 32 % og 37 %). I transportsektoren tegner udstødningsemissioner sig for størstedelen (63 %). $PM_{2.5}$-emissionen er steget med 2 % fra 2000 til 2011, hovedsageligt pga. det stigende træforbrug i husholdninger, der modsvares af et fald i emissionen fra transport og i mindre grad fra fremstillingsvirksomhed og bygge- og anlægsvirksomhed.

De største kilder til TSP-emission er landbrugssektoren og husholdningerne. TSP-emissionen fra transport er også vigtig og inkluderer både udstødningsemissioner og ikke-udstødningsrelaterede emissioner fra slid af bremser, dæk og vej. De ikke-udstødningsrelaterede emissioner udgør 63 % af TSP-emissionen fra transport.

Tungmetaller

Generelt er de vigtigste kilder til emissioner af tungmetaller forbrænding af fossile brændsler og affald. Emissionerne af tungmetaller er med undtagelse af kobber, faldet betydeligt de seneste år. Reduktionerne spænder fra 28 % til 92 % for henholdsvis Zn og Pb. Årsagen til de reducerede emissioner er hovedsageligt den øgede brug af røggasrensning på kraftværker og fjernvarmeværker (inklusive affaldsforbrændingsanlæg). Den store reduktion i emissionen af Pb skyldes et løbende skift til fordel for blyfri benzin, som er nødvendigt for biler med katalysator. Den største kilde til emission af kobber er slid af køretøjers dæk og bremser (93 % i 2011). Emissionen herfra er steget 35 % fra 1990 til 2011 pga. en stigning i antal kørte kilometer.

Cadmium (Cd)

De største kilder til Cd-emissioner er forbrænding i energisektoren (hovedsageligt forbrænding af træ og husholdningsaffald) og fremstillingsvirksomhed (hovedsageligt forbrænding af fuel-olie). Emissioner fra personbiler er den dominerende kilde i transportsektoren og udgør 55 % i 2011. Emissionen fra ikke-industriel forbrænding domineres af forbrænding af træ i husholdningsanlæg (76 % i 2011). Emissionen fra stationære anlæg i husholdninger er steget med 98 % siden 1990. Faldet i emissionen fra energisektoren skyldes det faldende forbrug af kul.

Kviksølv (Hg)

Den største kilde til Hg-emission er forbrænding af affald og kul i energisektoren. Forbedret røggasrensning og faldende kulforbrug har medført et fald i emissionen fra energisektoren på 76 % fra 1990 til 2011. Emissionen fra ikke-industriel forbrænding kan hovedsageligt tilskrives forbrænding af træ i stationære husholdningsanlæg, mens den væsentligste kilde i affaldssektoren er kremering. Emissionerne fra industrielle processer varierer meget pga. lukning af elektrostålvalseværket i 2002 efterfulgt af genåbning og endnu en lukning i 2005.

Bly (Pb)

Den vigtigste kilde til emission af bly er forbrænding i husholdninger og energisektoren samt transport. I tidligere år var den største kilde forbrænding af blyholdigt benzin, men overgangen til blyfri benzin i transportsektoren har medført et fald i bly-emissionen på 94 % fra 1990 til 2011. Forbrænding af træ i husholdningsanlæg er den største kilde til emission af bly fra ikke-industriel forbrænding. Udviklingen i emissionen fra ikke-industriel forbrænding har været stort set konstant fra 1990-2011. Dette skyldes et fald i emissionen pga. overgangen til blyfri benzin, da denne sektor omfatter mobile kilder i husholdninger, havebrug, landbrug, skovbrug, fiskeri og militær, dette modvirkes dog af stigende emissioner fra husholdninger. Emissionen fra energifremstilling er faldet med 96 % i samme periode hovedsageligt pga. faldende forbrug af kul.

Polycycliske aromatiske hydrocarboner (PAH'er)

Den nuværende emissionsopgørelse for polycycliske aromatiske hydrocarboner (PAH'er) inkluderer de fire PAH'er: Benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene og indeno(1,2,3-cd)pyrene. Hovedparten af den samlede PAH-emission kan tilskrives benzo(b)fluoranthene og Benzo(a)pyrene der står for hhv. 31 % og 30 %. Den vigtigste kilde til emission af PAH er forbrænding af træ i husholdningerne, der udgør 85 % af den samlede PAH-emission i 2011. De stigende emissioner skyldes øget forbrænding af træ i brændeovne og kedler i husholdningerne. Emissionen fra stationær forbrænding i husholdninger er steget med 118 % fra 1990 til 2011.

Dioxiner og furaner

Størstedelen af dioxinemissionen skyldes forbrænding i husholdninger, hovedsageligt forbrænding af træ i brændeovne og –kedler uden røggasrensning. Forbrænding af træ i stationære anlæg i husholdninger udgør 60 % af den nationale dioxin emission i 2011. Emissioner fra affaldssektoren udgør 27 % af den nationale total i 2011, og skyldes hovedsageligt brande i bygninger. Forbrænding af træ og halm er den største kilde til dioxin emission fra energifremstilling.

Hexachlorbenzen (HCB)

98 % af den nationale HCB-emission i 2011 stammer fra stationær forbrænding, hovedsageligt forbrænding af husholdningsaffald til el- og varmeproduktion. HCB-emissionen fra stationær forbrænding er faldet 82 % siden

1990, hovedsageligt pga. forbedret røggasrensning på affaldsforbrændingsanlæg. Forbrænding i husholdninger er en anden vigtig kilde, der er steget 260 % siden 1990 pga. det stigende træforbrug.

III Genberegninger og forbedringer

Generelt pågår der et betydeligt arbejde med at forbedre emissionsopgørelserne. Nye undersøgelser og forskning fra Danmark og udlandet inkluderes så vidt muligt som basis for emissionsestimaterne. Desuden følges arbejdet med opdateringer af EMEP/CORINAIR Guidebook (Nu EMEP/EEA Guidebook) for emissionsopgørelser nøje, med henblik på at indarbejde de bedste videnskabelige informationer som basis for opgørelserne.

Opgørelserne opdateres løbende med ny viden, således at opgørelserne bedst mulig afspejler danske forhold. Ved forbedringer lægges vægt på at opdateringer omfatter hele tidsserier, for at sikre konsistente data. Disse tiltag medfører genberegning af tidligere indberettede opgørelser. Begrundelserne for genberegningerne er inkluderet i de enkelte sektorkapitler i denne rapport. De vigtigste genberegninger for de forskellige sektorer er nævnt nedenfor.

Stationære forbrændingsanlæg

Emissionerne fra stationær forbrænding for årene 1990-2010 er opdateret jf. den senest publicerede energi statistik fra Energistyrelsen. Opdateringen omfatter både slutforbrug og konverteringssektoren samt opdatering af kildekategorier.

Som opfølgning på en anbefaling under EU ESD reviewet i maj-august 2012 er der foretaget en genberegning af LPG-forbruget. I tidligere opgørelser er LPG-forbruget til vejtransport beregnet via en bottom-up metode i den danske vejtransportmodel. Imidlertid blev differencen mellem det bottom-up beregnede LPG-forbrug og den officielle energistatistik ikke håndteret. I 2013 rapporteringen er den resterende mængde LPG allokeret til stationær forbrænding i husholdninger. Allokeringen er foretaget efter dialog med Energistyrelsen. Generelt er der tale om en meget lille emission. I de fleste år har ændringen medført en stigning af emissionen, men for nogle af de tidligere år i tidsserien har ændringen medført et fald i emissionen.

Der er foretaget en genberegning af fordelingen af emissioner for 1A2 Fremstillingsvirksomhed og bygge- og anlægsvirksomhed baseret på yderligere forbedringer af metoden der blev implementeret i 2012 rapporteringen. Den største ændring er et fald i emissionerne der allokeres til 1A2f Andet samt stigning især af emissionerne, der rapporteres under 1A2c Kemisk industri, 1A2d Papir og grafisk industri og 1A2e Nærings- og nydelsesmiddelindustri.

En genberegning for stationær forbrænding er foretaget som konsekvens af genberegningen beskrevet for national søfart. Genberegningen har medført at en øget mængde fuel olie allokeres til stationær forbrænding i fremstillingsvirksomhed og i landbrug og skovbrug.

Der er foretaget en omfordeling af emissionerne fra 1A1a Offentlig el- og varmeproduktion til 1A4a Handel og service som følge af ændring i kategoriseringen af visse forbrændingsanlæg.

Som følge af en re-allokering af SO_2 fra raffinaderier er emissionerne rapporteret under 1A1b for årene 2005-2010 reduceret.

Transport

Følgende genberegninger og forbedringer af emissionsopgørelsen er udført siden 2012 rapporteringen:

Vejtransport

Antal kørte kilometer per køretøjskategori er opdateret for årene 1985-2010, baseret på nye data fra DTU Transport samt mindre ændringer i energistatistikken fra Energistyrelsen. Vigtigst er opdateringen af kørte kilometer for alle køretøjstyper, der er baseret på data fra de danske periodiske bilsyn. Desuden er data for brændstoføkonomi for nye personbiler solgt i Danmark anvendt til at modificere standardfaktorer for brændselsforbrug fra COPERT IV. Endelig er der foretaget en revision af cut-off kilometertal for N_2O-emission forringelse for biler med katalysator i overensstemmelse med den opdaterede version af COPERT IV. De procentvise intervaller for ændring af emissionerne (min %, max %, år) for de forskellige emissionskomponenter er: SO_2 (0 %; 0,2 %, 2010), NO_x (3,1 %; 10,7 %, 2009), NMVOC (-3,2 %; 16,1 %, 2009), CO (-11,7 %; 5,8 %, 1985), NH_3 (-14,1 %; 20,7 %, 2010) og partikler (0,3 %; 10,6 %, 2009).

Søfart

Ændrede forudsætninger for færgeoverfart for årene 2008-2010 har medført mindre ændringer af emissionerne for national søfart. De følgende maksimale procentvise ændringer for national søfart (i paranteser) som følge af genberegningen er: SO_2 (0,2 %), NO_x (-0,1 %), NMVOC (0,0 %), CO (0,0 %), NH_3 (0,0 %) og partikler (0,1 %).

Landbrug/skovbrug/fiskeri

Opdatering af antallet af traktorer på maskinstationer er opdateret for årene 2008-2010 har medført mindre ændringer af emissionerne. De følgende maksimale procentvise ændringer for landbrug/skovbrug/fiskeri (i paranteser) som følge af genberegningen er: SO_2 (0,1 %), NO_x (0,2 %), NMVOC (0,1 %), CO (0,1 %), NH_3 (0,5 %) og partikler (0,3 %).

Militær

Emissionsfaktorer udledt fra de nye simuleringer af vejtransport har medført ændringer af emissionerne for årene 1985-2010. De procentvise intervaller for ændring af emissionerne for militær (min %, maks. %, år) for de forskellige emissionskomponenter er: SO_2 (0 %), NO_x (-7 %), NMVOC (-3,7 %,), CO (2,8 %), NH_3 (10,4 %) og partikler (0,7 %,).

Flygtige emissioner

Udvinding af olie og gas

En fejl i årsrapporten fra råolieterminalen er blevet rettet, hvilket medfører et fald i NMVOC-emissionen i 2010 på 221 Mg, svarende til 2,4 % af den totale flygtige NMVOC-emission.

Lasting af skibe onshore

Emissionsfaktoren for NMVOC er opdateret for 2010 i overensstemmelse med de reduktionstiltag der har været på råolieterminalen. Genberegningen har resulteret i et fald i NMVOC-emissionen på 396 Mg, svarende til 4,3 % af den totale flygtige NMVOC-emission.

Raffinaderier

Der er foretaget en omfordeling af SO_2-emissionen fra et af de to danske raffinaderier for årene 2005-2010. Omfordelingen er foretaget i tæt samarbejde med kontaktpersonen på det pågældende raffinaderi. Genberegningen har medført en stigning af SO_2-emissionen i NFR-kategorien 1B2a iv Raffinering/Lagring mellem 32 og 182 Mg (min. i 2006; maks. i 2007), svarende til hhv. 3,1 % og 12 % af den totale flygtige SO_2-emission.

Naturgas distribution

Der er foretaget en genberegning for naturgas distribution for årene 2009-2010 i overensstemmelse med årsrapporterne fra to af de danske distributionsselskaber. Genberegningen har medført en stigning af NMVOC-emissionen på hhv. 31 Mg og 1 Mg, svarende til 0,3 % og 0,01 % af den totale flygtige NMVOC-emission i 2009 og 2010.

Venting

En mindre ændring foretaget da det grønne regnskab for 2010 nu er blevet tilgængeligt for det ene af de to danske naturgas lagre. Genberegningen har medført en stigning af NMVOC-emissionen på 4 Mg, svarende til 0,04 % af den totale flygtige NMVOC-emission.

Industriprocesser

Mineralske produkter

Emission af SO_2 fra teglværker og virksomheder med fremstilling af ekspanderede lerprodukter er inkluderet for årene 1990-2011. emissionsfaktorer for SO_2 er estimeret som et vægtet gennemsnit for årene 2008-2010 baseret på oplysninger fra grønne regnskaber fra de relevante virksomheder. Emissionerne er korrigeret for energirelaterede emissioner.

Tidsserien er udarbejdet tilbage til 1985 for 2A5, 2A6 og 2A7d.

Kemisk industri

Tidsserien er udarbejdet tilbage til 1985 for kemisk industri for SO_2, NO_x, NMVOC og NH_3.

Anden produktion

Emissioner fra fødevare- og nydelsesmiddelindustrien er tilføjet for årene 1985-1989. Aktivitetsdata for sukkerproduktion er opdateret for 2010 og aktivitetsdata for kaffeproduktion er opdateret for 2006 samt 2008-2010 jf. ændringer i de anvendte statistiske data.

Opløsningsmidler og anden produktanvendelse

Forbedringer og tilføjelser bliver løbende implementeret som følge af omfanget og kompleksiteten af anvendelse af opløsningsmidler, der indeholder produkter i industri og husholdninger. De vigtigste genberegninger i 2013 rapporteringen er følgende:

- Genberegninger medførte en stigning af NMVOC-emissionen i 2010 med ca. 500 Mg. Ændringerne skyldes opdaterede fordelinger for anvendelseskategorier (UCN) indhentet fra "Substances in Preparations In the

Nordic countries" (SPIN) databasen. Relevante kemikalier er ætanol, terpentin, propylalkohol, cyanater, xylen, butanoler og glycol-ætere i forskellige kategorier. Emissionsfaktorer er identiske med tidligere beregninger, men ændringer i fordelingen mellem anvendelseskategorierne har medført ændringer af emissionerne.
- Der er foretaget ændringer af anvendte mængder af ætanol i sprinklervæske som følge af opdatering af ætanol-indholdet i importeret anti-frost produkter. Genberegningen medfører ændringer for årene 1985-2010.
- Anvendelse af stearinlys er inkluderet i emissionsopgørelsen.
- Grænsehandel er tilføjet til aktivitetsdata for tobaksrygning for årene 2000-2010. Grænsehandlen udgør mellem 4 % (2009) og 12 % (2002).

Landbrug

Der er foretaget genberegninger i opgørelsen for NH_3 og PM. Ændringerne har medført et fald i emissionen af NH_3 for årene 2007-2009, en stigning i emissionen af NH_3-emissionen for 2010 samt en stigning af PM-emissionen for årene 2000-2010.

Emissionen af NH_3 er faldet med 1-2 % i årene 2007-2009 og steget med 0,1 % i 2010. Ændringen skyldes hovedsageligt en justering af normtallene for perioden 2007-2009. For 2010 er der foretaget en ændring i antallet af dyr i visse kategorier, hvilket medfører en stigende emission. Antallet af dyr er ændret for pelsfyr jf. opdaterede data fra Danmarks Statistik, samt for smågrise, slagtesvin og høns som følge af en fejl i 2012-rapporteringen.

Aktivitetsdata for slam er ændret for 2010 jf. en opdatering af data fra Natur-Erhvervstyrelsen.

Emissionen af PM er steget for alle år som følge af en korrektion af data for ikke-malkekvæg og æglæggere. Desuden er produktionscyklen for 2010 ændret for smågrise, slagtesvin og høns som følge af ændringer af antal dyr.

Affald

Der er ikke foretaget genberegninger for "6C Affaldsforbrænding".

Der er foretaget genberegninger for "6C Affald Andet". Aktivitetsdata for kompostering af have- og parkaffald fra affaldsstatistikken omfatter træflis. I tidligere rapporteringer er denne relativt lille del fratrukket for hele tidsserien baseret på surrogatdata (tilgængelige for årene 1997-2000). Betydningen som denne reduktion havde på aktivitetsdata (3-6 %) kunne ikke retfærdiggøre den stigning af usikkerheden, som den medførte. Derfor er træflis nu inkluderet, hvilket har medført en gennemsnitlig stigning på 4 % af den samlede kompostering.

For bygningsbrande er emissionsfaktorerne for partikler og tungmetaller øget med en faktor 1000 jf. kommunikation med forfatteren til den oprindelige reference. Desuden er der foretaget en mindre rettelse af beregningen af fuldskala ækvivalent aktivitetsdata for containerbrande, hvilket har medført et fald for årene 1981-2010 mellem 2 % (2007) og 5 % (2009). Da containerbrande udgør en lille del af den samlede emission fra ildebrande, er denne genberegning ubetydelig.

For bilbrande er bestandsdata opdateret, hvilket har medført et lille fald i fuldskala ækvivalent aktivitetsdata for brande i lastbiler og personbiler.

1 Introduction

1.1 Background information on emission inventories

DCE (Danish Centre for Environment and Energy), Aarhus University is contracted by the Ministry of the Environment and the Ministry of Climate, Energy and Building to complete emission inventories for Denmark. Department of Environmental Science, Aarhus University is responsible for calculation and reporting of the Danish national emission inventory to EU and the UNFCCC (United Nations Framework Convention on Climate Change) and UNECE CLRTAP (Convention on Long Range Transboundary Air Pollution) conventions.

1.1.1 Annual report

According to the guidelines for reporting emission data under the Convention on Long-Range Transboundary Air Pollution (ECE/EB.AIR/97) prepared by the Task Force on Emission Inventories and Projections and approved by the Executive Body, countries that are parties to the UNECE-Convention on Long-Range Transboundary Air Pollution should annually submit an informative inventory report to the Secretariat. The new reporting Guidelines (ECE/EB.AIR/97) were accepted at the meeting of the Executive Body in December 2008. Due to a lack of resources, it has not been possible to incorporate the new elements of the reporting guidelines in this submission.

This report is Denmark's Annual Informative Inventory Report due March 15, 2013. The report contains information on Denmark's inventories for all years from the base years of the protocols to 2011.

The annual emission inventory for Denmark is reported in the Nomenclature for Reporting (NFR) 2009 format.

The issues addressed in this report are: trends in emissions, description of each NFR category, uncertainty estimates, recalculations, planned improvements and procedures for quality assurance and control. The outline in annex V of the reporting guidelines is followed as far as possible.

This report and NFR tables are available to the public on DCE's homepage:
http://www.dmu.dk/Luft/Emissioner/Home+of+Inventory/

and on the Eionet central data repository:
http://cdr.eionet.europa.eu/dk/Air_Emission_Inventories/Submission_EMEP_UNECE

1.2 A description of the institutional arrangement for inventory preparation

DCE (Danish Centre for Environment and Energy, Aarhus University, is responsible for the annual preparation and submission to the UNECE-LRTAP Convention of the Annual Danish Emissions Report, and the inventories in the NFR Format in accordance with the guidelines. DCE participates in meetings under the UNECE Task Force on Emission Inventories and Projections and the related expert panels where parties to the convention prepare the guidelines and methodologies on inventories. DCE is also responsible for estimating emissions for reporting to the NEC Directive, but the Danish EPA is responsible for the reporting.

The work concerning the annual emission inventory is carried out in co-operation with other Danish ministries, research institutes, organisations and companies:

Danish Energy Agency (DEA), Ministry of Climate, Energy and Building:
Annual energy statistics in a format suitable for the emission inventory work and fuel-use data for the large combustion plants.

Danish Environmental Protection Agency (DEPA), Ministry of the Environment:
Company reporting to e.g. the PRTR. Database on waste.

Statistics Denmark, Ministry of Economic Affairs and the Interior:
Statistical yearbook, production statistics for manufacturing industries, agricultural statistics and import/export/production figures for solvents.

DCA (Danish Centre for Food and Agriculture), Aarhus University:
Data on use of mineral fertiliser, feeding stuff consumption and nitrogen turnover in animals.

The Road Directorate, Ministry of Transport:
Number of vehicles grouped in categories corresponding to the EU classification, mileage (urban, rural, highway), trip speed (urban, rural, highway).

Civil Aviation Agency of Denmark, Ministry of Transport:
City-pair flight data (aircraft type and origin and destination airports) for all flights leaving major Danish airports.

Danish Railways, Ministry of Transport:
Fuel-related emission factors for diesel locomotives.

Danish companies:
Audited environmental reports and direct information gathered from producers and agency enterprises.

Formerly, the provision of data was on a voluntary basis, but now formal agreements are in place with the most important data suppliers, e.g. the Danish Energy Agency and DCA.

1.3 Brief description of the process of inventory preparation. Data collection and processing, data storage and archiving

The background data (activity data and emission factors) for estimation of the Danish emission inventories is collected and stored in central databases located at DCE. The databases are in Access format and handled with software developed by the European Environmental Agency (EEA) and DCE. As input to the databases, various sub-models are used to estimate and aggregate the background data in order to fit the format and level in the central databases. The methodologies and data sources used for the different sectors are described in Chapter 1.4 and Chapters 3 to 7. As part of the QA/QC plan (Chapter 1.5), the data structure for data processing support the pathway from collection of raw data to data compilation, modelling and final reporting.

For each submission, databases and additional tools and submodels are frozen together with the resulting NFR-reporting format. This material is placed on central institutional servers, which are subject to routine back-up services. Material, which has been backed up is archived safely. A further documentation and archiving system is the official journal for DCE, for which obligations apply to DCE, as a governmental institute. In this journal system, correspondence, both in-going and out-going, is registered, which in this case involves the registration of submissions and communication on inventories with the UNECE-LRTAP Secretariat, the European Commission, review teams, etc.

Figure 1.1 shows a schematic overview of the process of inventory preparation. The figure illustrates the process of inventory preparation from the first step of collecting external data to the last step, where the reporting schemes are generated for the UNFCCC and EU (in the CRF format (Common Reporting Format)) and to the United Nations Economic Commission for Europe/Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe (UNECE/EMEP) (in the NFR format (Nomenclature For Reporting)). For data handling, the software tool is CollectER (Pulles et al., 1999) and for reporting the software tool is developed by DCE. Data files and programme files used in the inventory preparation process are listed in Table 1.1.

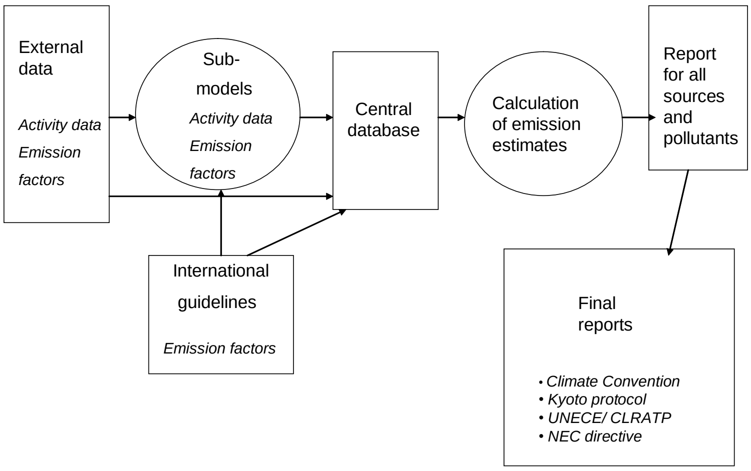

Figure 1.1 Schematic diagram of the process of inventory preparation.

Table 1.1 List of current data structure; data files and programme files in use.

QA/QC Level	Name	Application type	Path	Type	Input sources
4 store	CFR Submissions (UNFCCC and EU) NFR Submissions (UNECE and EU)	External report	I:\ROSPROJ\LUFT_EMI\Inventory\AllYears\8_AllSectors\Level_4a_Storage\	MS Excel, xml	CRF Reporter
3 process	CRF Reporter	Management tool	Working path: local machine Archive path: I:\ROSPROJ\LUFT_EMI\Inventory\AllYears\8_AllSectors\Level_3b_Processes	(exe + mdb)	manual input and Importer2CRF
3 process	Importer2CRF	Help tool	I:\ROSPROJ\LUFT_EMI\Inventory\AllYears\8_AllSectors\Level_3b_Processes	MS Access	CRF Reporter, Collec-lec-tEr2CRFand excel files
3 process	CollectER2CRF	Help tool	I:\ROSPROJ\LUFT_EMI\Inventory\AllYears\8_AllSectors\Level_3b_Processes	MS Access	NERIRep
2 process 3 store	NERIRep	Help tool	Working path: I:\ROSPROJ\LUFT_EMI\Inventory\AllYears\8_AllSectors\Level_3a_Storage	MS Access	CollectER databases; dk1972.mdb. .dkxxxx.mdb
2 process	CollectER	Management tool	Working path: local machine Archive path: I:\ROSPROJ\LUFT_EMI\Inventory\AllYears\8_AllSectors\Level_2b_Processes	(exe +mdb)	manual input
2 store	dk1980.mdb.dkxxxx.mdb	Datastore	I:\ROSPROJ\LUFT_EMI\Inventory\AllYears\8_AllSectors\Level_2a_Storage	MS Access	CollectER

1.4 Brief description of methodologies and data sources used

Denmark's air emission inventories are based on the Revised 1996 Intergovernmental Panel on Climate Change (IPCC) Guidelines for National Greenhouse Gas Inventories (IPCC, 1997), the Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories (IPCC, 2000) and the CORINAIR methodology. CORINAIR (COoRdination of INformation on AIR emissions) is a European air emission inventory programme for national sector-wise emission estimations, harmonised with the IPCC guidelines. In 2009 the EMEP/CORINAIR Guidebook changed name to the EMEP/EEA Guidebook. In this change the Guidebook switched nomenclature from SNAP to NFR.

The Danish inventory is prepared at the more detailed SNAP level rather than at the NFR level that is only suitable for reporting. To ensure estimates are as timely, consistent, transparent, accurate and comparable as possible, the inventory programme has developed calculation methodologies for most subsectors and software for storage and further data processing.

A thorough description of the CORINAIR inventory programme used for Danish emission estimations is given in Illerup et al. (2000). The CORINAIR calculation principle is to calculate the emissions as activities multiplied by emission factors. Activities are numbers referring to a specific process generating emissions, while an emission factor is the mass of emissions pr unit activity. Information on activities to carry out the CORINAIR inventory is largely based on official statistics. The most consistent emission factors have been used, either as national values or default factors proposed by international guidelines.

A list of all subsectors at the most detailed level is given in Illerup et al. (2000) together with a translation between CORINAIR and IPCC codes for sector classifications.

1.4.1 The specific methodologies regarding stationary combustion

Stationary combustion plants are part of the CRF emission sources 1A1 Energy Industries, 1A2 Manufacturing Industries and 1A4 Other sectors.

The Danish emission inventory for stationary combustion plants is based on the former CORINAIR system. In 2009 the Emission Inventory Guidebook was updated (EMEP/EEA, 2009). The emission inventory for stationary combustion is based on activity rates from the Danish energy statistics. General emission factors for various fuels, plants and sectors have been determined. Some large plants, such as power plants, are registered individually as large point sources and plant-specific emission data are used.

The fuel consumption rates are based on the official Danish energy statistics prepared by the Danish Energy Agency (DEA). DCE aggregates fuel consumption rates to SNAP categories. The fuel consumption of the NFR category 1A4 Manufacturing industries and construction is disaggregated to subsectors according to the DEA data prepared and reported to Eurostat.

For each of the fuel and SNAP categories (sector and e.g. type of plant), a set of general emission factors has been determined. Some emission factors refer to the EMEP/EEA Guidebook and some are country specific and refer to Danish legislation, Danish research reports or calculations based on emission data from a considerable number of plants.

A number of large plants, e.g. power plants, municipal waste incineration plants and large industrial plants are registered individually as large point sources. This enables use of plant-specific emission factors that refer to emission measurements stated in annual environmental reports. Emission factors of SO_2, NO_X, HM and PM are often plant specific.

Please refer to Chapter 3.2 and Annex 2A for further information on emission inventories for stationary combustion plants.

1.4.2 Specific methodologies regarding transport

The emissions from transport referring to SNAP category 07 (Road transport) and the sub-categories in 08 (Other mobile sources) are made up in the NFR categories; 1A3b (Road transport), 1A2f (Industry-other), 1A3a (Civil aviation), 1A3c (Railways), 1A3d (Navigation), 1A4c (Agriculture/forestry/-fisheries), 1A4a (Commercial/institutional), 1A4b (Residential) and 1A5 (Other).

An internal DCE model with a structure similar to the European COPERT IV emission model (EMEP/EEA, 2009) is used to calculate the Danish annual emissions for road traffic. The emissions are calculated for operationally hot engines, during cold start and fuel evaporation. The model also includes the emission effect of catalyst wear. Input data for vehicle stock and mileage is obtained from DTU Transport and Statistics Denmark, and is grouped according to average fuel consumption and emission behaviour. For each group, the emissions are estimated by combining vehicle type and annual mileage figures with hot emission factors, cold:hot ratios and evaporation factors (Tier 2 approach).

For air traffic, from 2001 onwards estimates are made on a city-pair level, using flight data provided by the Danish Civil Aviation Agency (CAA-DK) for flights between Danish airports and flights between Denmark and Greenland/Faroe Islands, and LTO and distance-related emission factors from the CORINAIR guidelines (Tier 2 approach). For previous years, the background data consists of LTO/aircraft type statistics from Copenhagen Airport and total LTO numbers from CAA-DK. With appropriate assumptions, consistent time series of emissions are produced back to 1990 and include the findings from a Danish city-pair emission inventory in 1998.

Off-road working machines and equipment are grouped in the following sectors: inland waterways (pleasure craft), agriculture, forestry, industry, and household and gardening. The sources for stock and operational data are various branch organisations and key experts. In general, the emissions are calculated by combining information on the number of different machine types and their respective load factors, engine sizes, annual working hours and emission factors (Tier 2 approach).

The inventory for navigation consists of regional ferries, local ferries and other national sea transport (sea transport between Danish ports and between Denmark and Greenland/Faroe Islands). For regional ferries, the fuel consumption and emissions are calculated as a product of number of round trips per ferry route (Statistics Denmark), sailing time per round trip, share of round trips per ferry, engine size, engine load factor and fuel consumption/emission factor. The estimates take into account the changes in emission factors and ferry specific data during the inventory period.

For the remaining navigation categories, the emissions are calculated simply as a product of total fuel consumption and average emission factors. For each inventory year, this emission factor average comprises the emission factors for all present engine production years, according to engine life times.

Please refer to Chapter 3.3 and Annex 2B for further information on emissions from transport.

1.4.3 The specific methodologies regarding fugitive emissions

Fugitive emissions from oil (1.B.2.a)

Fugitive emissions from oil are estimated according to the methodology described in the Emission Inventory Guidebook (EMEP/EEA, 2009). The sources include offshore extraction of oil and gas, onshore oil tanks, onshore and offshore loading of ships, and gasoline distribution. Activity data is given in the Danish Energy Statistics by the Danish Energy Authority. The emission factors are based on the figures given in the guidebook except in the case of onshore oil tanks and gasoline distribution where national values are included.

The VOC emissions from petroleum refinery processes cover non-combustion emissions from feed stock handling/storage, petroleum products processing, and product storage/handling. SO_2 is also emitted from non-combustion processes and includes emissions from product processing and sulphur-recovery plants. The emission calculations are based on information from the Danish refineries.

Fugitive emissions from natural gas (1.B.2.b)

Inventories of NMVOC emission from transmission and distribution of natural gas and town gas are based on annual environmental reports from the Danish gas transmission company and annual reports for the gas distribution companies. The annual gas composition is based on Energinet.dk.

Fugitive emissions from flaring (1.B.2.c)

Emissions from flaring offshore, in gas treatment and storage plants, and in refineries are included in the inventory. Emissions calculations are based on annual reports from the Danish Energy Agency and environmental reports from gas storage and treatment plants and the refineries. Calorific values are based on the reports for the EU ETS for offshore flaring, on annual gas quality data from Energinet.dk, and on additional data from the refineries. Emission factors are based on the Emission Inventory Guidebook (EMEP/EEA, 2009).

Please refer to Chapter 3.4 for further information on fugitive emissions from fuels.

1.4.4 Specific methodologies regarding industrial processes

Energy consumption associated with industrial processes and the emissions thereof is included in the inventory for stationary combustion plants. This is due to the overall use of energy balance statistics for the inventory.

Mineral products

The sub-sector includes production of cement, lime, container glass/glass wool, mineral wool, other production (consumption of lime), and roofing and road paving with asphalt. The activity data as well as emission data are primarily based on information from Environmental Reports (In Danish: "Grønne regnskaber") prepared by companies according to obligations under Danish law. The published information is supplemented with information obtained directly from companies or by use of standard emission factors. The distribution of TSP between PM_{10} and $PM_{2.5}$ is based on European average data.

Chemical industry

The sub-sector includes production of nitric and sulphuric acid (ceased in 1997 and 2004, respectively), catalysts, fertilisers and pesticides. The activity data as well as emission data are based on information from the companies as accounted for and published in the Environmental Reports combined with information obtained by contact to the companies. The distribution of TSP between PM_{10} and $PM_{2.5}$ is based on European average data. Production of nitric acid ceased in the middle of 2004.

Metal production

The sub-sector includes electro steelwork, production of steel sheets and bars (electro steelwork until 2005 and thereafter, only rolling mills), cast iron, aluminium (ceased in 2008), lead and lead products and various other metal products. The activity data as well as emission data for the steelworks are based on information from the companies as accounted for and published in the Environmental Reports, combined with information obtained by contact with the companies. The activity data or the other processes are based on information from Statistics Denmark combined with Danish average emission factors and standard emission factors. The distribution of TSP between PM_{10} and $PM_{2.5}$ is based on European average data.

Other production

The sub-sector includes breweries, production of spirits and other activities within the food sector e.g. sugar production, meat curing and production of margarine and solid cooking fats. The activity data is obtained from Statistics Denmark and the emission factors are obtained from the EMEP/EEA Guidebook combined with emission factors (EF) derived from specific emission measurements at the companies.

Please refer to Chapter 4 for further information on industrial processes.

1.4.5 Specific methodologies regarding solvent and other product use

The approach for calculating the emissions of Non-Methane Volatile Organic Carbon (NMVOC) from industrial and household use in Denmark focuses on single chemicals rather than activities. This leads to a clearer picture of the influence from each specific chemical, which enables a more detailed differentiation on products and the influence of product use on emissions. The procedure is to quantify the use of the chemicals and estimate the fraction of the chemicals that is emitted as a consequence of use.

The detailed approach in EMEP/EEA Guidebook (2009) is used. Here all relevant consumption data on all relevant solvents must be inventoried or at least those together representing more than 90 % of the total NMVOC emission. Simple mass balances for calculating the use and emissions of chemicals are set up 1) use = production + import – export, 2) emission = use emission factor. Production, import and export figures are extracted from Statistics Denmark, from which a list of more than 400 single chemicals, a few groups and products is generated. For each of these, a "use" amount in tonnes per year (from 1990 to 2010) is calculated. For some chemicals and/or products, e.g. propellants used in aerosol cans and ethanol used in windscreen washing agents, use amounts are obtained from the industry as the information from Statistics Denmark does not comply with required specificity. It is found that approx. 40 different NMVOCs comprise over 95 % of the total use and it is these 40 chemicals that are investigated further. The “use” amounts are distributed across industrial activities according to the Nordic SPIN (Substances in Preparations in Nordic Countries) database, where information on industrial use categories is available in a NACE coding system. The chemicals are also related to specific products according to the Use Category (UCN) system. Emission factors are obtained from regulators, literature or the industry.

The same method is used for calculating emissions from the use of fireworks, tobacco, candles and charcoal for barbeques (BBQ). These activities lead to emissions of SO_2, NO_x, CO, NH_3, particles, As, Cd, Cr, Cu, Hg, Ni, Pb, Se, Zn, dioxins/furans and PAHs.

Outputs from the inventory are: a list where the approx. 40 most predominant NMVOCs are ranked according to emissions to air, specification of emissions from industrial sectors and from households, contribution from each chemical to emissions from industrial sectors and households. Furthermore, trends in NMVOC emissions expressed as total NMVOC and single chemical and specified in industrial sectors and households are shown.

Please refer to Chapter 5 and Annex 5E for further information on the emission inventory for solvents.

1.4.6 Specific methodologies regarding agriculture

The emission from agricultural activities covers ammonia emission from manure management and agricultural soils and PM emission from animal production. Furthermore, the inventory includes emission from field burning of straw which covers NH_3, PM, NO_x, CO, NMVOC, SO_2, heavy metals, dioxin and PAH.

Emissions from agricultural activities are estimated according to the methodology described in the EMEP/EEA air pollutant emission inventory guidebook (EMEP/EEA, 2009). Activity data and national data regarding emission factors are collected, evaluated and discussed in cooperation with Statistics Denmark, DCA-Danish Centre for Food and Agriculture (Aarhus University), the Danish Agricultural Advisory Service, Danish Environmental Protection Agency and the Danish AgriFish Agency. It means that data are evaluated continuously according to the latest knowledge and information.

The Danish agricultural emissions are calculated and managed in a comprehensive model complex called IDA (Integrated Database model for Agricultural emissions), which is used to calculate both air pollutants compounds and greenhouse gas related emissions. The livestock production has a great influence on the Danish agricultural emissions. IDA works with approximately 38 different livestock categories, dependent on livestock category, weight class and age. Each of these subcategories is subdivided according to housing type and manure type, which results in about 200 different combinations of subcategories and housing type and the emissions are calculated from each of these combinations and aggregated to relevant main categories in the reporting format.

Most of the emissions from agricultural activities are directly related to livestock production. The remaining part comes from the use of synthetic fertiliser, growing crops, NH_3 treated straw, field burning of agricultural residues and sewage sludge applied to fields as fertiliser. The number of animals can be considered as the most important activity data in estimation of the agricultural emissions.

The number of animals is mainly based on data from Statistics Denmark. For data covering pigs, bulls and poultry, the number is based on slaughter data also collected from the Agricultural Statistics. The production of sheep, goats and horses typically take place on small farms below 5 hectare, which is not included in the annual statistics and the production of these categories as well as for deer and ostriches are therefore based on the Central House-animal farm Register (CHR) managed by the Ministry of Food, Agriculture and Fisheries.

Data concerning nitrogen excretion, distribution of housing types until 2004 and handling of manure is based on data and information from DCA-Danish Centre for Food and Agriculture at Aarhus University and the Danish Agricultural Advisory Service. From 2005 annual statistics covering housing types are available from the Danish AgriFish Agency.

Data related to use of synthetic fertiliser, both the amount of fertiliser and the nitrogen content is based on statistics published by the Danish AgriFish Agency.

Please refer to Chapter 6 and Appendix 2C for further information on emission inventories for agriculture.

1.4.7 Specific methodologies regarding waste

The waste sector consists of the four main NFR categories 6A Solid waste disposal on land, 6B Waste-Water handling, 6C Waste incineration and 6D Other waste.

Emissions from solid waste disposal on land and waste-water handling are currently not estimated.

Waste Incineration covers the cremation of human bodies and animal carcasses. Both are calculated as an activity multiplied by an emission factor.

The Other Waste category includes compost production, accidental building- and vehicle fires

Composting includes four types of biological waste; garden and park waste, organic waste from households and other sources, sludge and home composting of garden and vegetable food waste. Individual emission factors are found for each waste category.

Emissions from building fires are calculated by multiplying the number of building fires with selected emission factors. Six types of buildings are separated with different emission factors; detached houses, undetached houses, apartment buildings, industrial buildings, additional buildings and containers.

Activity data for building fires are classified in four categories; full scale, large, medium and small. The emission factors comply for full scale building fires and the activity data are therefore recalculated as a full scale equivalent where it is assumed that a large, medium and small fire leads to 75 %, 30 % and 5 % of a full scale fire respectively.

Emissions from vehicle fires are calculated by multiplying the total burnt vehicle mass with selected emission factors. 14 different vehicle types are included in the total mass of burned vehicle. Emission factors are not available for different vehicle types, why it is assumed that all the different vehicle types lead to similar emissions. As with accidental building fires, four different sizes are known in relation to damage; full scale (100 % burnout), large (75 %), medium (30 %) and small (5 %).

Please refer to Chapter 7 and Annex 2D for further information on emission inventories for agriculture.

1.5 Key categories

The determination of key categories has not been made due to insufficient resources being available at the moment.

1.6 Information on the Quality Control and Quality Assurance plan including verification and treatment of confidential issues where relevant

In the Danish National Inventory Report to UNFCCC (Nielsen et al., 2012), the plan for Quality Control (QC) and Quality Assurance (QA) for greenhouse gas emission inventories prepared by the Danish National Environmental Research Institute is outlined. The plan is in accordance with the guidelines provided by the UNFCCC (IPCC, 1997) and the "Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories" (IPCC, 2000). The ISO 9000 standards are also used as important input for the plan. The plan also, to a limited extent, includes the gases reported to the UNECE-LRTAP Convention. Due to a lack of resources it has not been possible to extend the QA/QC system for the greenhouse gas inventory to also cover the air pollutants.

1.7 General uncertainty evaluation, including data on the overall uncertainty for the inventory totals

The uncertainty estimates are based on the simple Tier 1 approach in the EMEP/CorinAir *Good Practice Guidance for LRTAP Emission Inventories* (Pulles & Aardenne, 2004).

The uncertainty estimates are based on emission data for the base year and year 2010, and on uncertainties for activity rates and emission factors for each of the main SNAP sectors. For particulate matter, the year 2000 is considered as the base year, but for all other pollutants 1990 is used as the base year.

Uncertainty estimates include uncertainty of the total emission as well as uncertainty of the trend. The estimated uncertainties are shown in Table 1.2. The uncertainty estimates include all sectors.

Table 1.2 Danish uncertainty estimates, 2011.

Pollutant	Uncertainty Total emission [%]	Trend 1990[1)]-2011 [%]	Uncertainty Trend [%-age points]
SO_2	16	-92	±1.1
NO_x	39	-55	±7
NMVOC	23	-50	±10
CO	41	-48	±14
NH_3	29	-35	±16
TSP	246	1.1	±60
PM_{10}	287	1.0	±73
$PM_{2.5}$	349	2.5	±89
Arsenic	183	-76	±26
Cadmium	330	-80	±52
Chromium	253	-85	±32
Copper	934	35	±91
Mercury	135	-87	±10
Nickel	446	-80	±55
Lead	611	-92	±23
Selenium	187	-75	±13
Zinc	729	-28	±268
PCDD/F	669	-64	±195
Benzo(b)fluoranthene	916	91	±108
Benzo(k)fluoranthene	910	100	±160
Benzo(a)pyrene	941	101	±93
Indeno(1,2,3-c,d)pyrene	931	72	±81
HCB	717	-82	±55

[1]The base year for PM is 2000.

1.8 General assessment of the completeness

Annex 3 provides a full and comprehensive explanation on the use of notation keys in the Danish inventory. The Danish emissions inventory due 15 February 2013 includes all sources identified by the EMEP/EEA guidebook except the following.

1.8.1 Industrial processes

Categories reported as not estimated:

- Emissions from quarrying and mining of minerals other than coal
- Emissions from construction and demolition
- Emissions from storage, handling and transport of mineral products
- Emissions from storage, handling and transport of chemical products
- Emissions from storage, handling and transport of metal products
- Emissions from pulp and paper production
- Emissions from wood processing
- Emissions from production of POPs
- Emissions from consumption of POPs and heavy metals

1.8.2 Agriculture

Categories reported as not estimated:

- Emissions from farm level agricultural operations

- Emissions from off-farm storage, handling and transport of agricultural products

1.8.3 Waste

Categories reported as not estimated:

- Emissions from solid waste disposal on land
- Emissions from wastewater handling
- Emissions from small scale waste burning

1.8.4 Categories reported as "included elsewhere"

The following table lists the categories reported as IE (included elsewhere) and provides information on where the associated emissions are reported, more detailed information is provided in Annex 3.

Table 1.3. List of categories reported as included elsewhere.

Category reported as NE	Category where emissions are included
1 A 5 a Other stationary (including military)	1 A 4 a i Commercial / institutional: Stationary
2 A 1 Cement production	1 A 2 f i Manufacturing industries and construction, Other
2 A 2 Lime production	1 A 2 f i Manufacturing industries and construction, Other
2 A 3 Limestone and dolomite use	1 A 2 f i Manufacturing industries and construction, Other
2 A 4 Soda ash production and use	1 A 2 f i Manufacturing industries and construction, Other
6 C a Clinical waste incineration	1 A 1 a Public electricity and heat production
6 C b Industrial waste incineration	1 A 1 a Public electricity and heat production
6 C c Municipal waste incineration	1 A 1 a Public electricity and heat production

1.8.5 General description on the use of notation keys

The NFR as reported by Denmark makes use of five notation keys: NO (Not Occurring), NA (Not Applicable), NE (Not Estimated), IE (Included Elsewhere) and NR (Not Reported).

NO is used in instances where the activity does not occur in Denmark, e.g. adipic acid production, buffaloes, etc.

NA is used in instances where the activity occurs in Denmark but the emission of a certain pollutant is not believed to be relevant, e.g. heavy metals from dairy cattle.

NE is used in instances where the activity occurs in Denmark and emissions of a certain pollutant are thought to occur but the emission has not been estimated; see Chapter 1.8.3 and Annex 3.

IE is used where emissions of a certain pollutant or the whole source category are reported under another source category; see Chapter 1.8.4 and Annex 3.

NR is used for pollutants prior to the base year, e.g. PM emissions prior to the year 2000.

1.9 References

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2 Trends in Emissions

2.1 Acidifying gases

Acid deposition of sulphur and nitrogen compounds mainly derives from emissions of SO_2, NO_X and NH_3. The effects of acidification may appear in a number of ways, including defoliation and reduced vitality of trees, and declining fish stocks in acid-sensitive lakes and rivers.

SO_2 and NO_X can be oxidised into sulphate (SO_4^{--}) and nitrate (NO_3^-) - either in the atmosphere or after deposition - resulting in the formation of two and one H^+, respectively. NH_3 may react with H^+ to form ammonium (NH_4^+) and, by nitrification in soil, NH_4^+ is oxidised to NO_3^- and H^+ ions are formed.

Weighting the individual substances according to their acidification effect, total emissions in terms of acid equivalents can be calculated as:

$$A = \frac{m_{SO_2}}{M_{SO_2}} \cdot 2 + \frac{m_{NO_x}}{M_{NO_x}} + \frac{m_{NH_3}}{M_{NH_3}} = \frac{m_{SO_2}}{64} \cdot 2 + \frac{m_{NO_x}}{46} + \frac{m_{NH_3}}{17}$$

where A is the acidification index in Mmole

m_i is the emission of pollutant *i* in tonnes

M_i is the mole weight [tonne/Mmole] of pollutant *i*

The actual effect of the acidifying substances depends on a combination of two factors: the amount of acid deposition and the natural capacity of the terrestrial or aquatic ecosystem to counteract the acidification. In areas where the soil minerals easily weather or have a high lime content, acid deposition will be relatively easily neutralised.

Figure 2.1 shows the emission of Danish acidifying gases in terms of acid equivalents. In 1990, the relative contribution in acid equivalents was almost equal for the three gases. In 2011, the most important acidification factor in Denmark is ammonia nitrogen and the relative contributions for SO_2, NO_X and NH_3 were 6 %, 36 % and 58 %, respectively. However, with regard to long-range transport of air pollution, SO_2 and NO_X are still the most important pollutants.

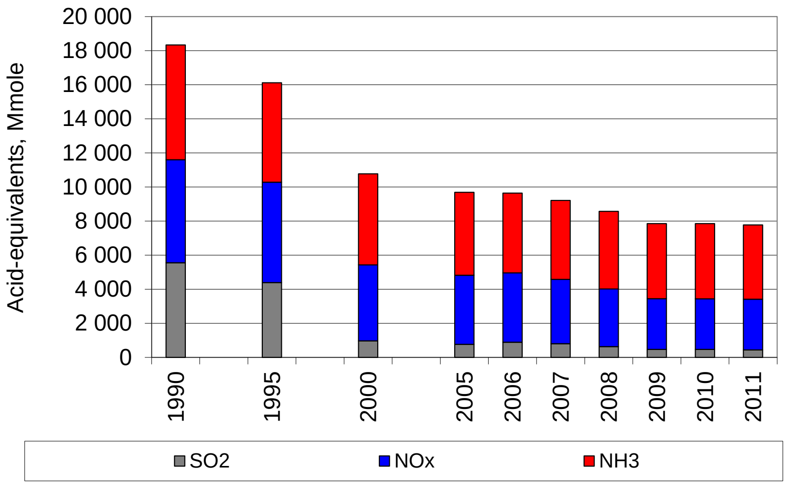


Figure 2.1 Emissions of NH_3, NO_X and SO_2 over time in acid equivalents.

2.2 Description and interpretation of emission trends by gas

2.2.1 Sulphur dioxide (SO_2)

The main part of the sulphur dioxide (SO_2) emission originates from combustion of fossil fuels, i.e. mainly coal and oil, in public power and district heating plants. From 1980 to 2010, the total emission decreased by 97 %. The large reduction is mainly due to installation of desulphurisation plant and use of fuels with lower content of sulphur in public power and district heating plants. Despite the large reduction of the SO_2 emissions, these plants make up 23 % of the total emission. Also emissions from industrial combustion plants, non-industrial combustion plants and other mobile sources are important. National sea traffic (navigation and fishing) contributes with about 13 % of the total SO_2 emission in 2011. This is due to the use of residual oil with high sulphur content.

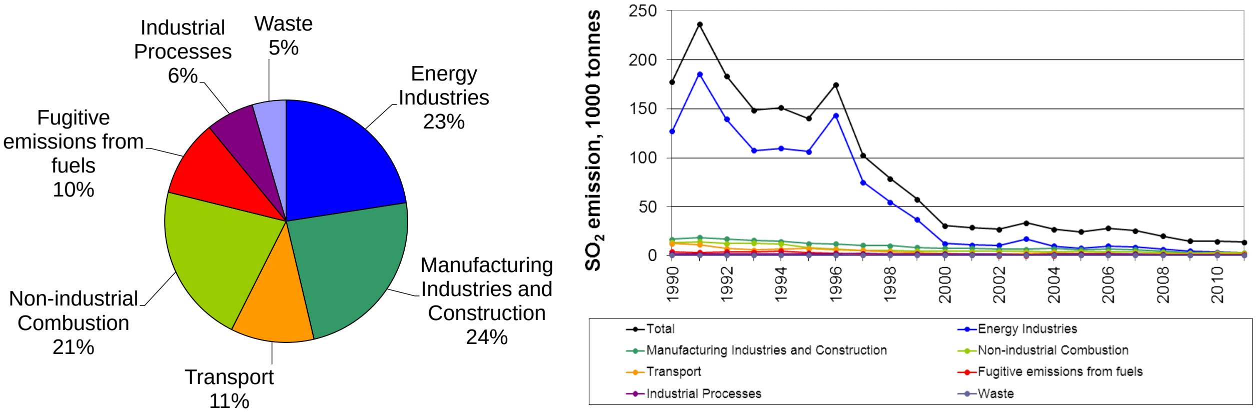


Figure 2.2 SO_2 emissions. Distribution according to the main sectors (2011) and time series for 1990 to 2011.

2.2.2 Nitrogen oxide (NO_x)

The largest sources of emissions of Nitrogen oxide (NO_x) are road transport followed by other mobile sources and combustion in energy industries (mainly public power and district heating plants). The transport sector is the sector contributing the most to the emission of NO_x and, in 2011, 47 % of the Danish emissions of NO_X stems from road transport, national navigation, railways and civil aviation. Also emissions from national fishing and off-road vehicles contribute significantly to the NO_x emission. For non-industrial combustion plants, the main sources are combustion of gas oil, natural gas and wood in residential plants. The emissions from energy industries have decreased by 75 % from 1985 to 2011. In the same period, the total emission decreased by 55 %. The reduction is due to the increasing use of catalyst cars and installation of low-NO_x burners and denitrifying units in power plants and district heating plants.

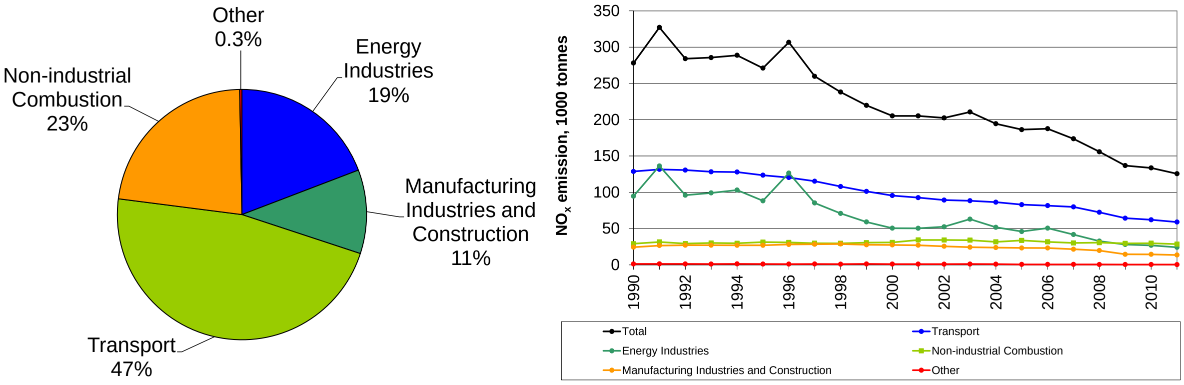


Figure 2.3 NO_X emissions. Distribution according to the main sectors (2011) and time series for 1990 to 2011.

2.2.3 Ammonia (NH_3)

Almost all atmospheric emissions of ammonia (NH_3) result from agricultural activities. Only a minor fraction originates from road transport (2.2 %) and stationary combustion (0.3 %). The share for road transport was increasing during the 1990's and early 2000's due to increasing use of catalyst cars. In more recent years the share has been decreasing due to more advanced catalysts being implemented. The major part of the emission from agriculture stems from livestock manure (81 %) and the largest losses of ammonia occur during the handling of the manure in stables and in field application. Other contributions come from use of mineral fertilisers (6 %), N-excretion on pasture range and paddock (3 %), sewage sludge used as fertiliser, crops and ammonia used for straw treatment (8 %) and field burning (less than 1 %). The total ammonia emission decreased by 37 % from 1985 to 2011. This is due to the active national environmental policy efforts over the past twenty years. Due to the action plans for the aquatic environment and the Ammonia Action Plan, a series of measures to prevent loss of nitrogen in agricultural production has been initiated. The measures have included demands for improved utilisation of nitrogen in livestock manure, a ban against field application of livestock manure in winter, prohibition of broadspreading of manure, requirements for establishment of catch crops, regulation of the number of livestock pr hectare and a ceiling for the supply of nitrogen to crops. As a result, despite an increase in the production of pigs and poultry, the ammonia emission has been reduced considerably.

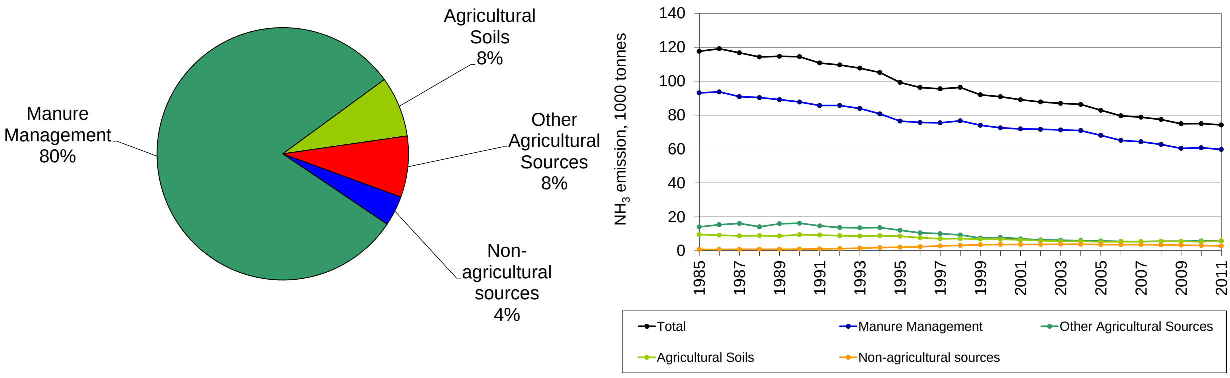


Figure 2.4 NH_3 emissions. Distribution on the main sectors (2011) and time series for 1985 to 2011.

2.3 Other air pollutants

2.3.1 Non-Methane Volatile Organic Compounds (NMVOC)

The emissions of Non-Methane Volatile Organic Compounds (NMVOC) originate from many different sources and can be divided into two main groups: incomplete combustion and evaporation. Road vehicles and other mobile sources such as national navigation vessels and off-road machinery are the main sources of NMVOC emissions from incomplete combustion processes. Road transportation vehicles are still the main contributors, even though the emissions have declined since the introduction of catalyst cars in 1990. The evaporative emissions mainly originate from the use of solvents and the extraction, handling and storage of oil and natural gas. The emissions from the energy industries have increased during the nineties due to the increasing use of stationary gas engines, which have much higher emissions of NMVOC than conventional boilers. The total anthropogenic emissions have decreased by 58 % from 1985 to 2011, largely due to the increased use of catalyst cars and reduced emissions from use of solvents.

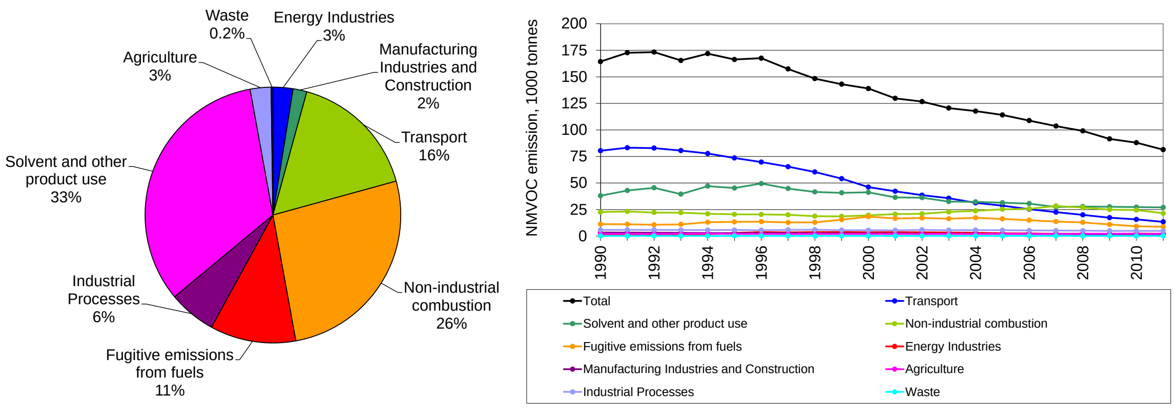


Figure 2.5 NMVOC emissions. Distribution according to the main sectors (2011) and time series for 1990 to 2011.

2.3.2 Carbonmonoxid (CO)

Other mobile sources and non-industrial combustion plants contribute significantly to the total emission of this pollutant. Transport is the second largest contributor to the total CO emission. In 1990 a law forbidding the burning of agricultural crop residues on fields was implemented. This caused significant reduction in CO emission. The emission decreased further by 48 % from 1990 to 2011, largely because of decreasing emissions from road transportation.

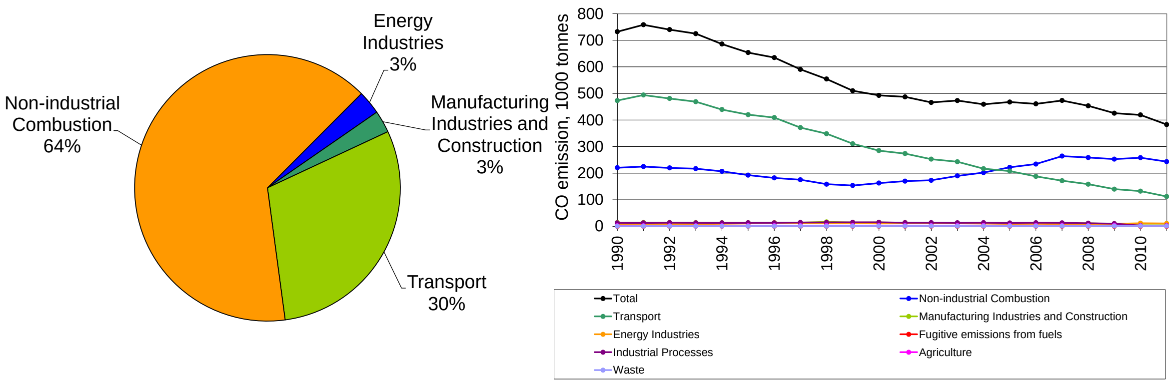


Figure 2.6 CO emissions. Distribution according to the main sectors (2011) and time series for 1990 to 2011.

2.3.3 Particulate Matter (PM)

The particulate matter (PM) emission inventory is reported for the years 2000 onwards. The inventory includes the total emission of particles TSP (Total Suspended Particles), emission of particles smaller than 10 µm (PM_{10}) and emission of particles smaller than 2.5 µm ($PM_{2.5}$).

The largest $PM_{2.5}$ emission sources are residential plants (67 %), road traffic (10 %) and other mobile sources (9 %). For the latter, the most important sources are off-road vehicles and machinery in the industrial sector and in the agricultural/forestry sector (32 % and 37 %, respectively). For the road transport sector, exhaust emissions account for the major part (63 %) of the emissions. The $PM_{2.5}$ emission increased by 2 % from 2000 to 2011 due to an increasing wood consumption in the residential sector. This increase was almost counterbalanced by the decreasing emissions from all other sectors except waste, of which the largest decrease was seen for transport.

The largest TSP emission sources are the residential sector and the agricultural sector. The TSP emissions from transport are also important and include both exhaust emissions and the non-exhaust emissions from brake and tyre wear and road abrasion. The non-exhaust emissions account for 63 % of the TSP emission from road transport in 2011.

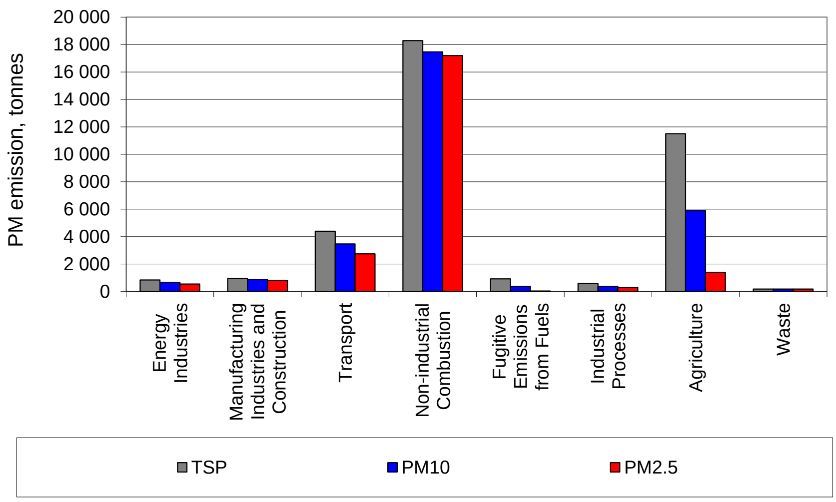


Figure 2.7 PM emissions per sector for 2011.

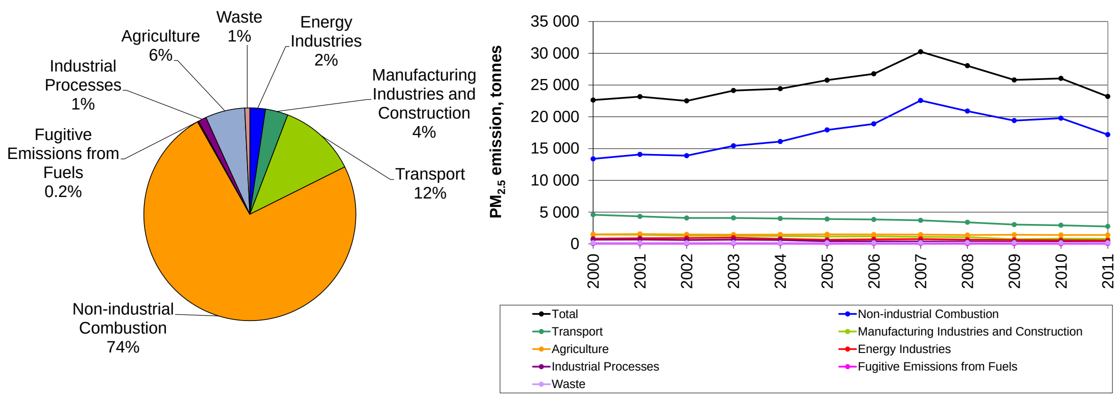


Figure 2.8 $PM_{2.5}$ emissions. Distribution according to the main sectors (2011) and time series for 2000 to 2011.

2.3.4 Heavy metals

In general, the most important sources of heavy metal emissions are combustion of fossil fuels and waste. The heavy metal emissions have decreased substantially in recent years, except for Cu. The reductions span from 28 % to 92 % for Zn and Pb, respectively. The reason for the reduced emissions is mainly increased use of gas cleaning devices at power and district heating plants (including waste incineration plants). The large reduction in the Pb emission is due to a gradual shift towards unleaded gasoline, the latter being essential for catalyst cars. The major source of Cu is automobile tyre and break wear (93 % in 2011) and the 35 % increase from 1990 to 2011 owe to increasing mileage.

Table 2.1 Emissions of heavy metals.

Heavy metals, kilogramme	As	Cd	Cr	Cu	Hg	Ni	Pb	Se	Zn
1990	1 303	988	5 992	32 922	3 063	20 582	124 582	4 924	51 717
2011	318	197	877	44 580	394	4 022	9 853	1 221	37 043
Reduction, %	76	80	85	-35	87	80	92	75	28

According to the UNECE Heavy Metal Protocol, the priority metals are Pb, Cd and Hg and the objective is to reduce emissions of these heavy metals.

Cadmium (Cd)

The main sources of emissions of cadmium (Cd) to air are combustion in energy industries (mainly combustion of wood, wood waste and municipal waste) and manufacturing industries (mainly combustion of residual oil). In the transport sector emissions from passenger cars is the main source contributing with 55 % of the sectoral emission in 2011. The emission from non-industrial combustion is dominated by wood combustion in residential plants which accounts for 76 % of the sectoral emission in 2011. Emissions from combustion in residential plants have increased by 98 % since 1990. The decreasing emission from energy industries are related to the decreasing combustion of coal.

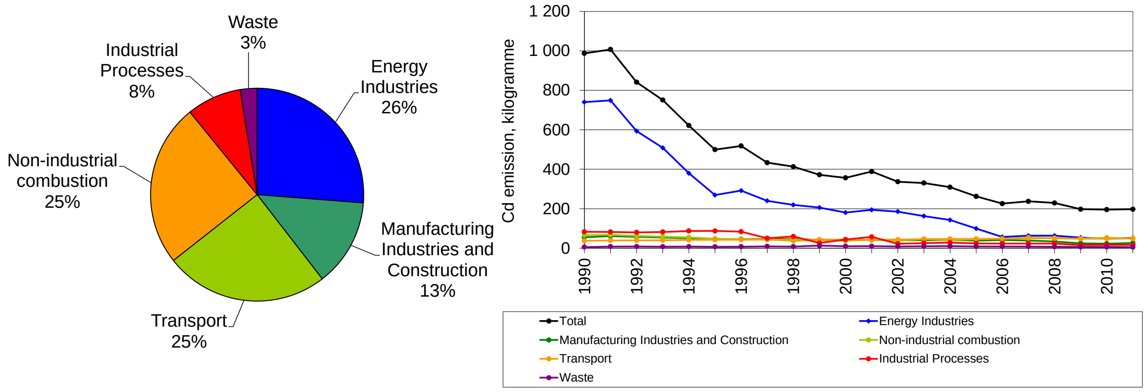


Figure 2.9 Cd emissions. Time series for 1990 to 2011 and distribution by main sector for 2011.

Mercury (Hg)

The largest sources of mercury (Hg) emissions to air are waste incineration and coal combustion in energy industries. Due to improved flue gas cleaning and decreasing coal combustion the emissions from Energy industries decreased by 76 % from 1990-2000. The trend has continued in the following years and the corresponding decrease from 1990-2011 is 90 %. Non-industrial combustion is dominated by wood combustion in residential plants while emissions from the waste sector mainly owe to cremation. The variations in emissions from industrial processes owe to shut down in 2002 followed by re-opening and a second shut down in 2005 of the only Danish electro-steelwork.

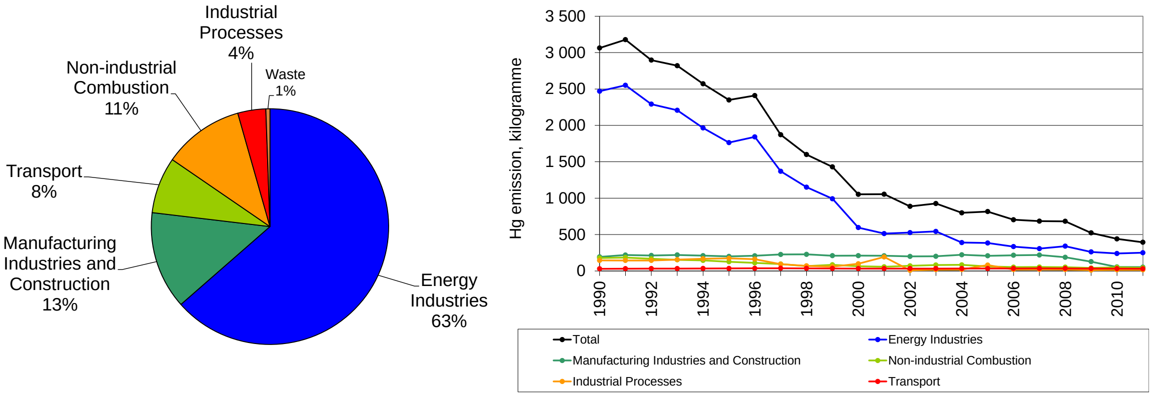


Figure 2.10 Hg emissions. Time series for 1990 to 2011 and distribution by main sector for 2011.

Lead (Pb)

The main lead (Pb) emission sources are combustion in residential plants and energy industries and transport. In earlier years combustion of leaded gasoline was the major contributor to Pb emissions to air but the shift toward use of unleaded gasoline for transport have decreased the Pb emission from transport by 94 % from 1990-2011. In the non-industrial combustion sector the dominant source is wood combustion in residential plants. The trend in the Pb emission from non-industrial combustion from 1990 to 2011 is almost constant. This is due to a decrease in emission caused by the shift towards unleaded gasoline, as this sector includes other mobile sources in household, gardening, agriculture, forestry, fishing and military. This is counteracted by an increase in the emission from residential plants. The decreasing emission from Energy industries (96 % from 1990 to 2011) is caused by the deceasing coal combustion.

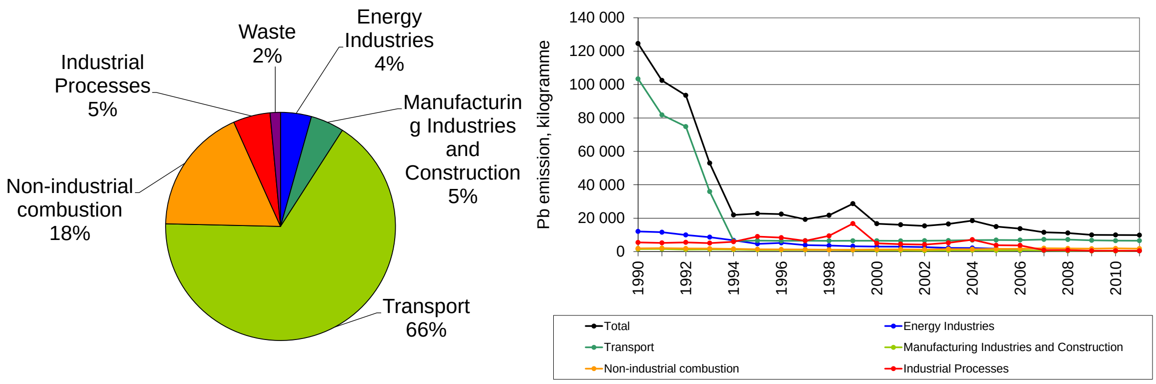


Figure 2.11 Pb emissions. Time series for 1990 to 2011 and distribution by main sector for 2011.

2.3.5 Polycyclic aromatic hydrocarbons (PAHs)

The present emission inventory for polycyclic aromatic hydrocarbons (PAH) includes four PAHs: benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene and indeno(1,2,3-cd)pyrene. Benzo(b)fluoranthene and Benzo(a)pyrene contribute the major PAH emission by 31 % and 30 %, respectively.

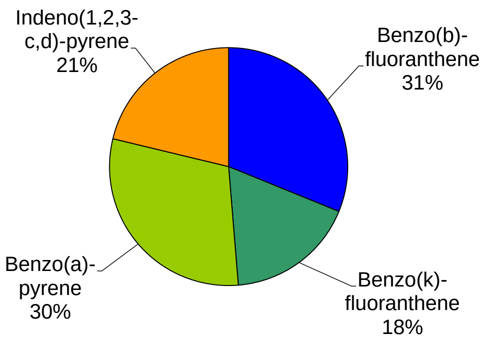


Figure 2.12 PAH emissions. Distribution according to reported PAHs in 2011.

The most important source of PAHs emissions is combustion of wood in the residential sector making up 85 % of the total emission in 2011. The increasing emission trend is due to increasing combustion of wood in the residential sector. The PAH emission from combustion in residential plants has increased by 118 % from 1990 to 2011.

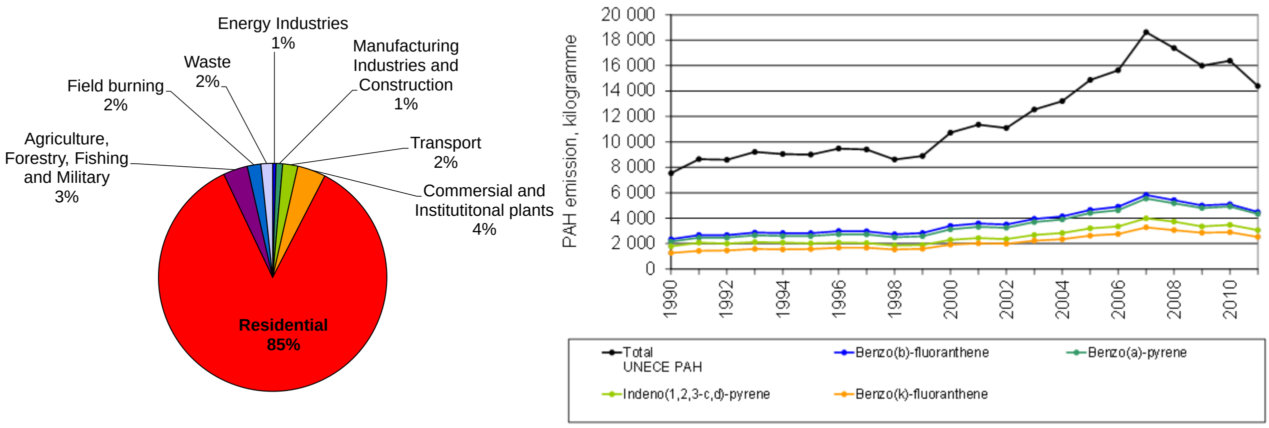


Figure 2.13 PAH emissions. Distribution according to the main sectors (2011) and time series for 1990 to 2011.

2.3.6 Dioxins and furans

The major part of the dioxin emission owes to wood combustion in the residential sector, mainly in wood stoves and ovens without flue gas cleaning. Wood combustion in residential plants accounts for 60 % of the national dioxin emission in 2011. The contribution to the total dioxin emission from the waste sector (27 % in 2011) owes to accidental fires, especially building fires. The emissions of dioxins from energy industries mainly owe to the combustion of biomass as wood, wood waste and to a less extend agricultural waste.

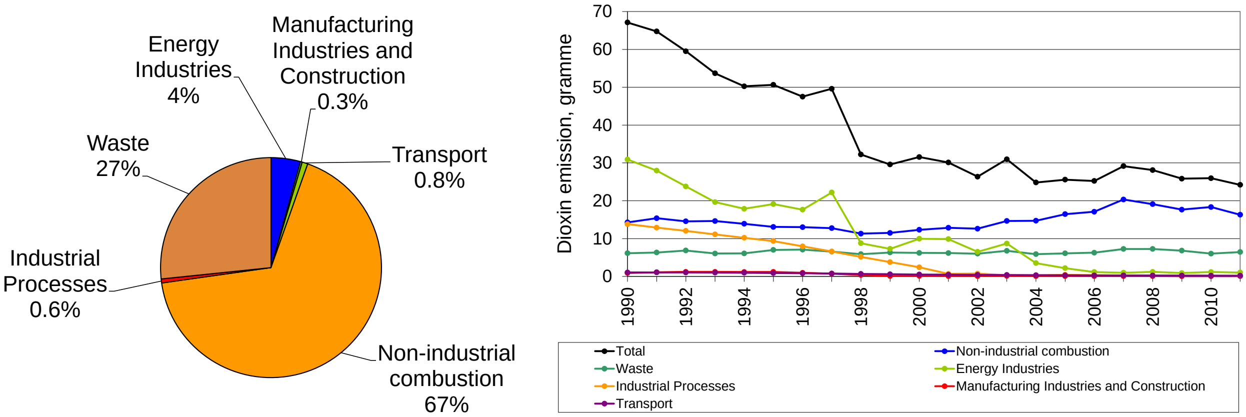


Figure 2.14 Emissions of dioxins and furans. Distribution according to the main sectors (2011) and time series for 1990 to 2011.

2.3.7 Hexachlorobenzene (HCB)

Stationary combustion accounts for 98 % of the estimated national hexachlorobenzene (HCB) emission in 2011. This owes mainly to combustion of municipal solid waste in heating and power plants. Wood combustion in households is an important source, too, and has increased by 260 % since 1990 due to increasing wood consumption. The HCB emission from stationary plants has decreased 82 % since 1990 mainly due to improved flue gas cleaning in MSW incineration plants. The emission from residential plants has increased due to increased wood consumption in this source category.

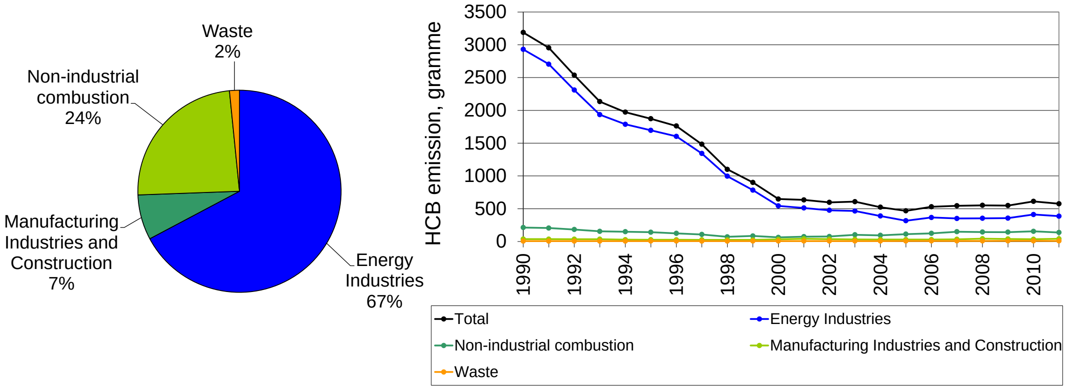


Figure 2.15 HCB emissions. Distribution according to the main sectors (2011) and time series for 1990 to 2011.

3 Energy (NFR sector 1)

3.1 Overview of the sector

The energy sector is reported in three main chapters:

3.2 Stationary combustion plants (NFR sector 1A1, 1A2 and 1A4)

3.3 Transport (NFR sector 1A2, 1A3, 1A4 and 1A5)

3.4 Fugitive emissions (NFR sector 1B)

Table 3.1.1 shows detailed source categories for the energy sector and plant category in which the sector is discussed in this report.

Table 3.1.1 NFR source categories for the energy sector.

NFR sector	DCE documentation
1 A 1 a Public electricity and heat production	Stationary combustion
1 A 1 b Petroleum refining	Stationary combustion
1 A 1 c Manufacture of solid fuels and other energy industries	Stationary combustion
1 A 2 a Stationary combustion in manufacturing industries and construction: Iron and steel	Stationary combustion, Industry
1 A 2 b Stationary Combustion in manufacturing industries and construction: Non-ferrous metals	Stationary combustion, Industry
1 A 2 c Stationary combustion in manufacturing industries and construction: Chemicals	Stationary combustion, Industry
1 A 2 d Stationary combustion in manufacturing industries and construction: Pulp, Paper and Print	Stationary combustion, Industry
1 A 2 e Stationary combustion in manufacturing industries and construction: Food processing, beverages and tobacco	Stationary combustion, Industry
1 A 2 f i Stationary combustion in manufacturing industries and construction: Other (Please specify in your IIR)	Stationary combustion, Industry
1 A 2 f ii Mobile Combustion in manufacturing industries and construction: (Please specify in your IIR)	Transport
1 A 3 a ii (i) Civil aviation (Domestic, LTO)	Transport
1 A 3 a i (i) International aviation (LTO)	Transport
1 A 3 b i Road transport: Passenger cars	Transport
1 A 3 b ii Road transport:Light duty vehicles	Transport
1 A 3 b iii Road transport:, Heavy duty vehicles	Transport
1 A 3 b iv Road transport: Mopeds & motorcycles	Transport
1 A 3 b v Road transport: Gasoline evaporation	Transport
1 A 3 b vi Road transport: Automobile tyre and brake wear	Transport
1 A 3 b vii Road transport: Automobile road abrasion	Transport
1 A 3 c Railways	Transport
1 A 3 d i (ii) International inland waterways	Transport
1 A 3 d ii National navigation (Shipping)	Transport
1 A 3 e Pipeline compressors	Transport (not occurring)
1 A 4 a i Commercial / institutional: Stationary	Stationary combustion
1 A 4 a ii Commercial / institutional: Mobile	Transport
1 A 4 b i Residential: Stationary plants	Stationary combustion
1 A 4 b ii Residential: Household and gardening (mobile)	Transport
1 A 4 c i Agriculture/Forestry/Fishing: Stationary	Stationary combustion
1 A 4 c ii Agriculture/Forestry/Fishing: Off-road vehicles and other machinery	Transport
1A 4 c iii Agriculture/Forestry/Fishing: National fishing	Transport
1 A 5 a Other stationary (including military)	Stationary combustion
1 A 5 b Other, Mobile (including military, land based and recreational boats)	Transport
1 B 1 a Fugitive emission from solid fuels: Coal mining and handling	Fugitive
1 B 1 b Fugitive emission from solid fuels: Solid fuel transformation	Fugitive
1 B 1 c Other fugitive emissions from solid fuels	Fugitive
1 B 2 a i Exploration, production, transport	Fugitive
1 B 2 a iv Refining / storage	Fugitive
1 B 2 a v Distribution of oil products	Fugitive
1 B 2 b Natural gas	Fugitive
1 B 2 c Venting and flaring	Fugitive
1 B 3 Other fugitive emissions from geothermal energy production , peat and other energy extraction not included in 1 B 2	Fugitive

Summary tables for the emissions from the energy sector are shown below.

Table 3.1.2 SO_2, NO_x, NMVOC, CO and PM emission from the energy sector, 2011.

	NO_x	NMVOC	SO_x	NH_3	$PM_{2.5}$	PM_{10}	TSP	CO
	Gg NO_2	Gg	Gg SO_2	Gg	Gg	Gg	Gg	Gg
1A1 Energy Industries	24.1	2.06	3.14	0.01	0.55	0.67	0.84	10.9
1A2 Manufacturing industries and Construction	13.6	1.42	3.30	0.00	0.80	0.87	0.95	10.1
1A3 Transport	59.0	13.40	1.54	1.60	2.75	3.47	4.39	112.2
1A4 Other Sectors	27.7	21.44	2.94	0.18	17.18	17.45	18.28	242.9
1A5 Other	0.8	0.06	0.04	0.00	0.02	0.02	0.02	0.5
1B1 Fugitive Emissions from fuels, Solid fuels	NA	NA	NA	NA	0.04	0.37	0.92	NA
1B2 Fugitive Emissions from fuels, Oil and Natural gas	0.1	8.84	1.42	0.00	0.00	0.00	0.00	0.1
1 B 3 Other fugitive emissions from geothermal energy production , peat and other energy extraction not included in 1 B 2	NA	NA	NA	NA	NA	NA	NA	NA
Energy, Total	125.3	47.22	12.38	1.80	21.33	22.84	25.39	376.7

Table 3.1.3 HM emissions from the energy sector, 2011.

	Pb	Cd	Hg	As	Cr	Cu	Ni	Se	Zn
	Mg	Mg	Mg	Mg	Mg	Mg	Mg	Mg	Mg
1A1 Energy Industries	0.43	0.05	0.25	0.14	0.21	0.27	0.50	0.77	0.58
1A2 Manufacturing industries and Construction	0.46	0.03	0.05	0.07	0.09	0.11	1.19	0.09	1.48
1A3 Transport	6.53	0.05	0.03	0.04	0.20	41.67	1.89	0.07	26.85
1A4 Other Sectors	1.72	0.05	0.04	0.04	0.12	0.35	0.20	0.09	5.15
1A5 Other	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04
1B1 Fugitive Emissions from fuels, Solid fuels	NA	NA	NA	NA	NA	NA	NA	NA	NA
1B2 Fugitive Emissions from fuels, Oil and Natural gas	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06
1 B 3 Other fugitive emissions from geothermal energy production , peat and other energy extraction not included in 1 B 2	NA	NA	NA	NA	NA	NA	NA	NA	NA
Energy, Total	9.20	0.18	0.38	0.29	0.63	42.41	3.78	1.02	34.15

Table 3.1.4 PAH, dioxin and HCB emission from the energy sector, 2011.

	PCDD/PCDF	Benzo(a)-pyrene	Benzo(b)-fluoranthene	Benzo(k)-fluoranthene	Indeno(1,2,3-cd)pyrene	HCB
	g I-Teq	Mg	Mg	Mg	Mg	kg
1A1 Energy Industries	1.04	0.01	0.03	0.02	0.01	0.39
1A2 Manufacturing industries and Construction	0.07	0.02	0.08	0.02	0.01	0.04
1A3 Transport	0.20	0.06	0.08	0.09	0.07	0.00
1A4 Other Sectors	16.31	4.08	4.12	2.31	2.86	0.14
1A5 Other	0.00	0.00	0.00	0.00	0.00	0.00
1B1 Fugitive Emissions from fuels, Solid fuels	NA	NA	NA	NA	NA	NA
1B2 Fugitive Emissions from fuels, Oil and Natural gas	0.00	0.00	0.00	0.00	0.00	0.00
1 B 3 Other fugitive emissions from geothermal energy production , peat and other energy extraction not included in 1 B 2	NA	NA	NA	NA	NA	NA
Energy, Total	17.62	4.17	4.32	2.44	2.94	0.57

3.2 Stationary combustion (NFR sector 1A1, 1A2 and 1A4)

This chapter includes stationary combustion plants in the NFR sectors 1A1, 1A2 and 1A4.

3.2.1 Source category description

Source category definition

In the Danish emission database, all activity rates and emissions are defined in SNAP sector categories (Selected Nomenclature for Air Pollution) according to the CORINAIR system[1]. The emission inventories are prepared from a complete emission database based on the SNAP sectors. Aggregation to the NFR sector codes is based on a correspondence list between SNAP and NFR enclosed in Annex 2A-1. Stationary combustion is defined as combustion activities in the SNAP sectors 01-03, not including SNAP 0303.

Stationary combustion plants are included in the emission source subcategories:

- 1A1 Energy, Fuel consumption, Energy Industries
- 1A2 Energy, Fuel consumption, Manufacturing Industries and Construction
- 1A4 Energy, Fuel consumption, Other Sectors

The emission and fuel consumption data included in tables and figures in Chapter 3.2 only include emissions originating from stationary combustion plants of a given NFR sector. The NFR sector codes have been applied unchanged, but some sector names have been changed to reflect the stationary combustion element of the source.

Emission share from stationary combustion compared to national total

Table 3.2.1 gives an overview of the emission share from stationary combustion compared to national total. Main emission sources are discussed in chapter 3.2.3. Key category analysis has not been performed.

[1] And some additional SNAP added for industrial combustion.

Table 3.2.1 Emission share from stationary combustion compared to national total.

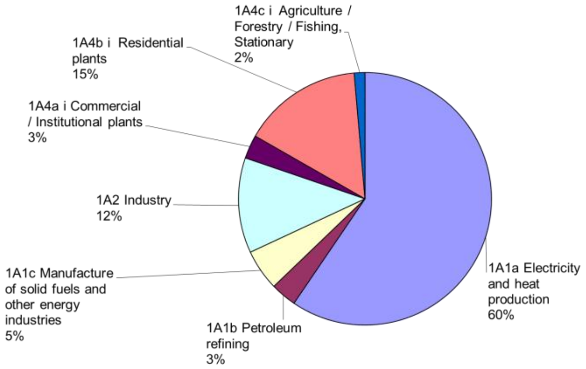
Pollutant	Emission share, %
SO_2	65
NO_x	29
NMVOC	20
CO	37
NH_3	0.3
TSP	49
PM_{10}	59
$PM_{2.5}$	73
As	76
Cd	60
Cr	45
Cu	2
Hg	84
Ni	47
Pb	26
Se	75
Zn	16
HCB	98
Dioxin	71
Benzo(a)pyrene	95
Benzo(b)fluoranthene	94
Benzo(k)fluoranthene	92
Indeno(123cd)pyrene	93

3.2.2 Fuel consumption data

In 2011, the total fuel consumption for stationary combustion plants was 478 PJ of which 354 PJ was fossil fuels and 124 PJ was biomass.

Fuel consumption distributed according to the stationary combustion subcategories is shown in Figure 3.2.1 and Figure 3.2.2. The majority - 60 % - of all fuels is combusted in the source category, *Electricity and heat production.* Other source categories with high fuel consumption are *Residential plants* and *Industry*.

Fuel consumption including biomass



Fuel consumption, fossil fuels

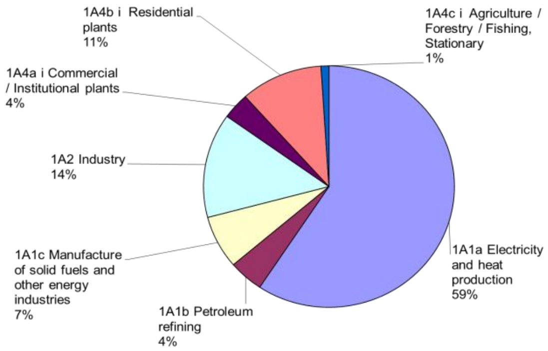


Figure 3.2.1 Fuel consumption of stationary combustion source categories, 2011. Based on DEA (2012a).

Coal and natural gas are the most utilised fuels for stationary combustion plants. Coal is mainly used in power plants and natural gas is used in power plants and decentralised combined heating and power (CHP) plants, as well as in industry, district heating, residential plants and off-shore gas turbines (see Figure 3.2.2).

Detailed fuel consumption rates are shown in Annex 2A-2.

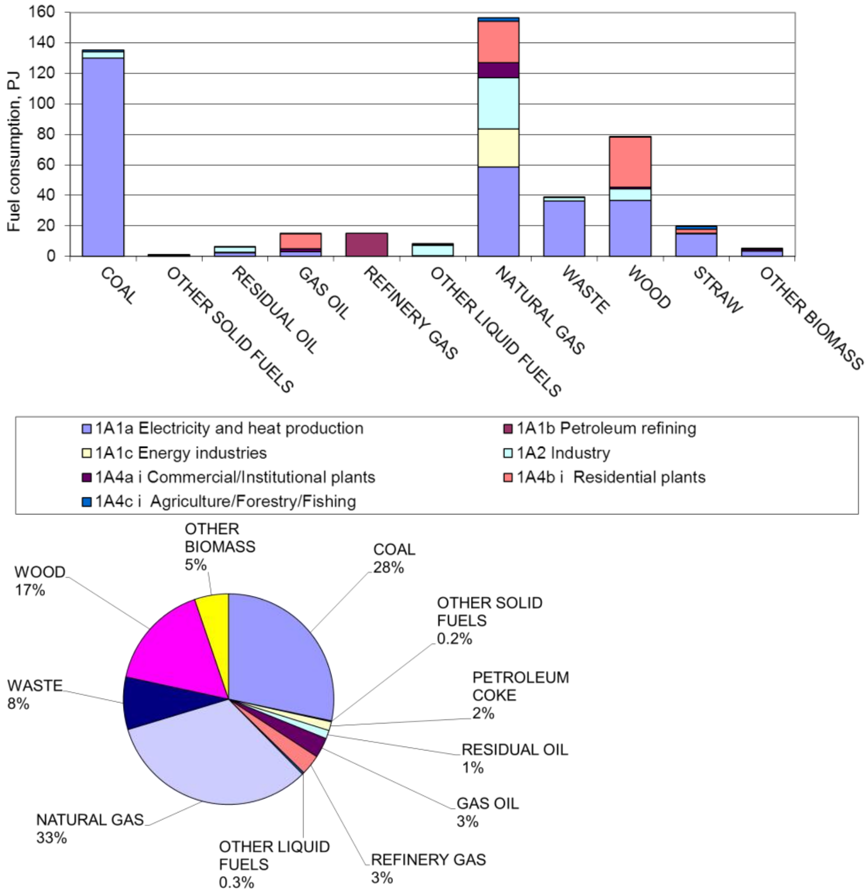
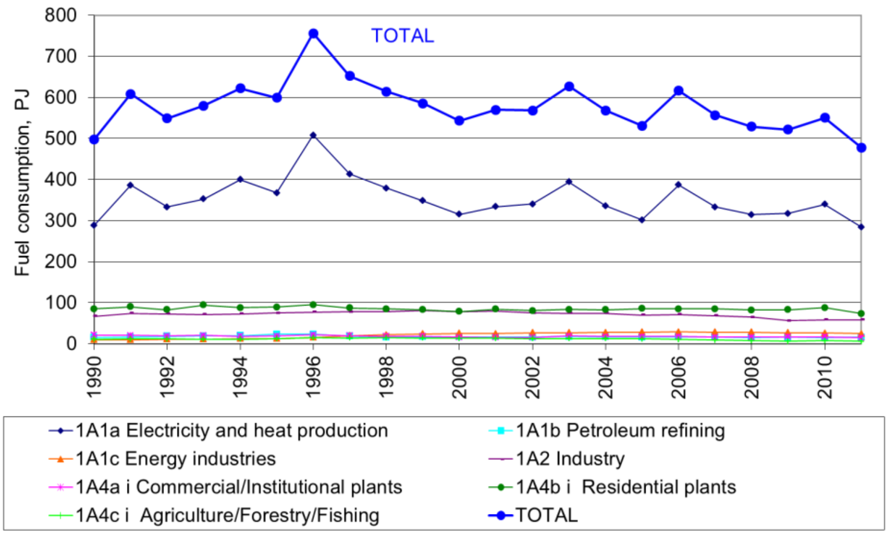


Figure 3.2.2 Fuel consumption of stationary combustion 2011, disaggregated to fuel type. Based on DEA (2012a).

Fuel consumption time series for stationary combustion plants are presented in Figure 3.2.3[2]. The fuel consumption for stationary combustion was 4 % lower in 2011 than in 1990, while the fossil fuel consumption was 23 % lower and the biomass fuel consumption 3.1 times the level in 1990.

The consumption of natural gas and biomass has increased since 1990 whereas coal consumption has decreased.



[2] Time series 1980 onwards are included in Annex 2A-10.

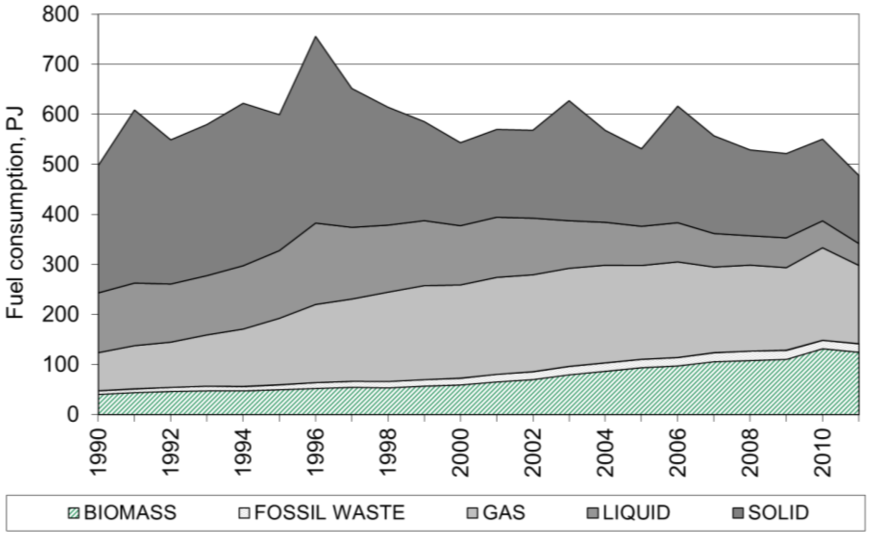


Figure 3.2.3 Fuel consumption time series, stationary combustion. Based on DEA (2012a).

The fluctuations in the time series for fuel consumption are mainly a result of electricity import/export, but also of outdoor temperature variations from year to year. This, in turn, leads to fluctuations in emission levels. The fluctuations in electricity trade, fuel consumption and NO_x emission are illustrated and compared in Figure 3.2.4. In 1990, the Danish electricity import was large causing relatively low fuel consumption, whereas the fuel consumption was high in 1996 due to a large electricity export. In 2011, the net electricity import was 4.7 PJ, whereas there was a 4.1 PJ electricity export in 2010. The large electricity export that occurs some years is a result of low rainfall in Norway and Sweden causing insufficient hydropower production in both countries.

To be able to follow the national energy consumption as well as for statistical and reporting purposes, the Danish Energy Agency produces a correction of the actual fuel consumption without random variations in electricity imports/exports and in ambient temperature. This fuel consumption trend is also illustrated in Figure 3.2.4. The corrections are included here to explain the fluctuations in the time series for fuel rate and emissions.

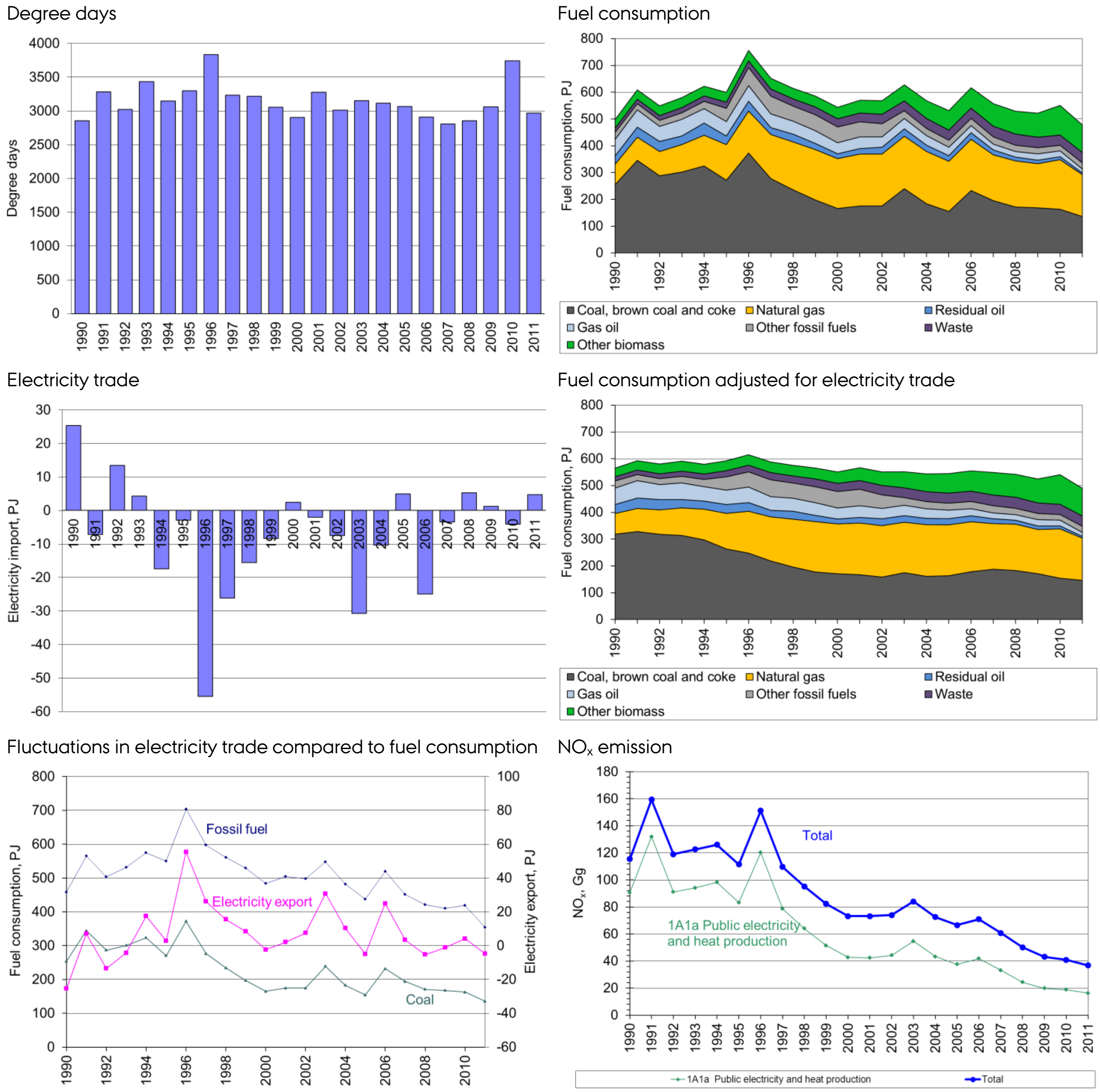


Figure 3.2.4 Comparison of time series fluctuations for electricity trade, fuel consumption and NO_x emission. Based on DEA (2012b).

Fuel consumption time series for the subcategories to stationary combustion are shown in Figure 3.2.5 – 3.2.7.

Fuel consumption for *Energy Industries* fluctuates due to electricity trade as discussed above. The fuel consumption in 2011 was 4 % higher than in 1990. The fluctuation in electricity production is based on fossil fuel consumption in the subcategory *Electricity and Heat Production*. The energy consumption in *Other energy industries* is mainly natural gas used in gas turbines in the off-shore industry. The biomass fuel consumption in *Energy Industries* 2011 added up to 75 PJ, which is 4.6 times the level in 1990 and a 5 % decrease since 2010.

The fuel consumption in *Industry* was 13 % lower in 2011 than in 1990 (Figure 3.2.6). The fuel consumption in industrial plants has decreased considerably as a result of the financial crisis. However, the fuel consumption is unchanged since 2010. The biomass fuel consumption in *Industry* in 2011 added up to 9 PJ which is a 45 % increase since 1990.

The fuel consumption in *Other Sectors* decreased 20 % since 1990 (Figure 3.2.7) and decreased 16 % since 2010. The biomass fuel consumption in *Other sectors* in 2011 added up to 41 PJ which is 2.2 times the consumption in 1990 and a 9 % decrease since 2009. Wood consumption in residential plants in 2011 was 2.3 times the consumption in year 2000.

Time series for subcategories are shown in Chapter 3.2.4.

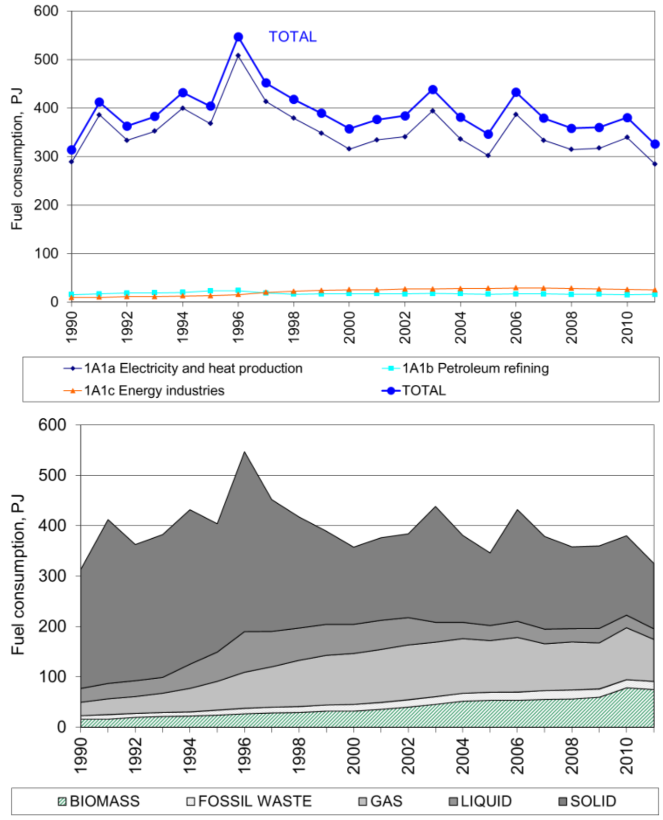


Figure 3.2.5 Fuel consumption time series for subcategories - 1A1 Energy Industries.

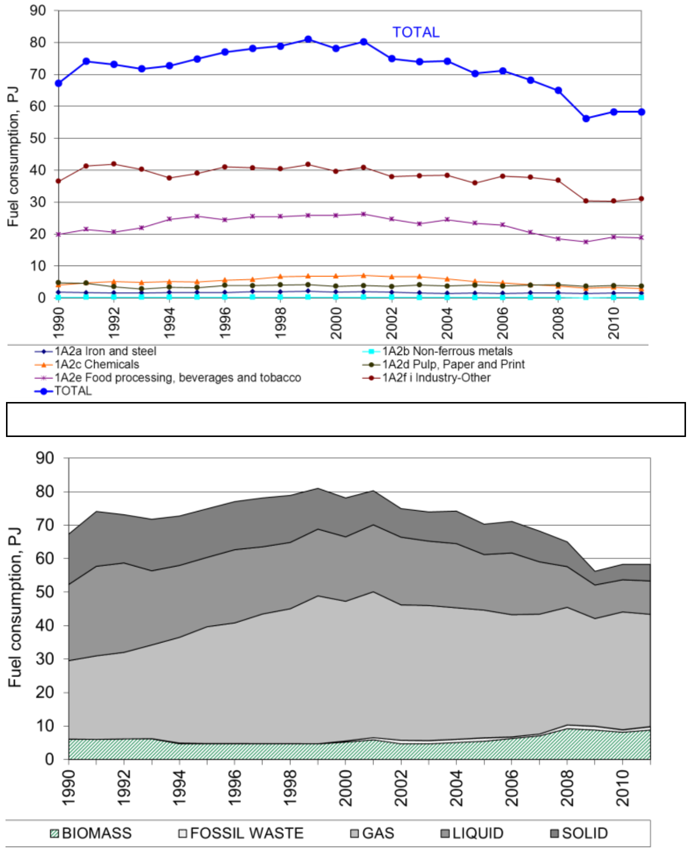


Figure 3.2.6 Fuel consumption time series for subcategories - 1A2 Industry.

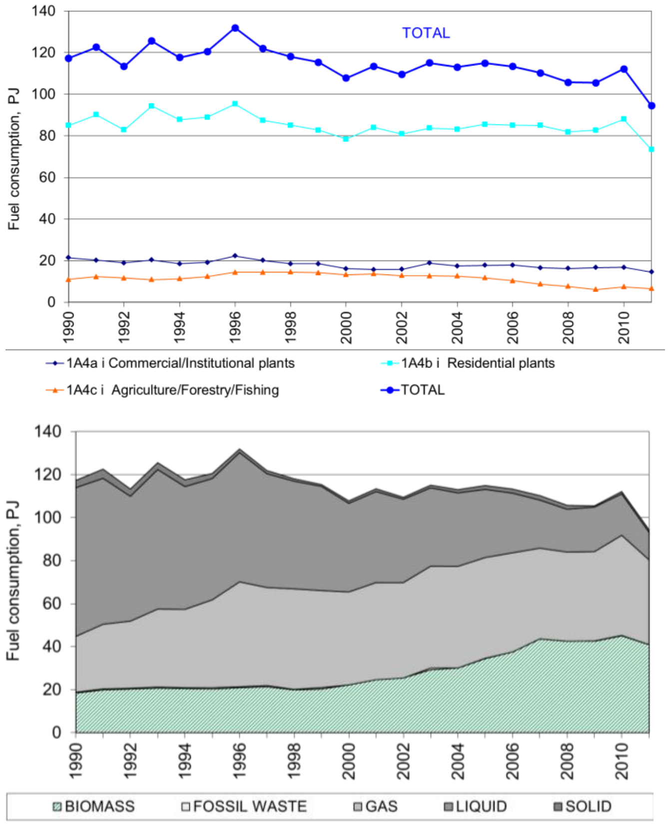


Figure 3.2.7 Fuel consumption time series for subcategories - 1A4 Other Sectors.

3.2.3 Emissions

SO_2

Stationary combustion is the most important emission source for SO_2 accounting for 65 % of the national emission. Table 3.2.2 presents the SO_2 emission inventory for the stationary combustion subcategories.

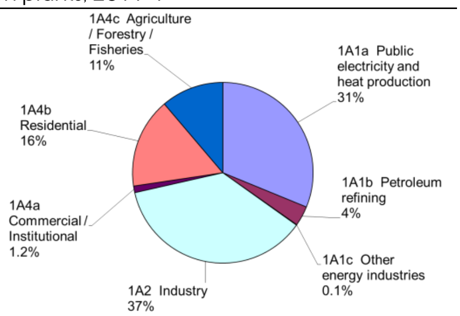
Electricity and heat production is the largest emission source accounting for 31 % of the emission. However, the SO_2 emission share is lower than the fuel consumption share for this source category, which is 60 %. This is a result of effective flue gas desulphurisation equipment installed in power plants combusting coal. In the Danish inventory, the source category *Electricity and heat production* is further disaggregated. Figure 3.2.8 shows the SO_2 emission from *Electricity and heat production* on a disaggregated level. Power plants >300MW_{th} are the main emission source, accounting for 45 % of the emission.

The SO_2 emission from industrial plants adds up to 37 % of the emission from stationary combustion, a remarkably high emission share compared with fuel consumption. The main emission sources in the industrial category are combustion of coal and residual oil, but emissions from the cement industry is also a considerable emission source. Ten years ago SO_2 emission from the industrial category only accounted for a small part of the emission from stationary combustion, but as a result of reduced emissions from power plants the share has now increased.

The time series for SO_2 emission from stationary combustion is shown in Figure 3.2.9. The SO_2 emission from stationary combustion plants has decreased by 94 % since 1990. The large emission decrease is mainly a result of the reduced emission from *Electricity and heat production*, made possible due to installation of desulphurisation plants and due to the use of fuels with lower sulphur content. Despite the considerable reduction in emission from electricity and heat production plants, these still account for 31 % of the emission from stationary combustion, as mentioned above. The emission from other source categories also decreased considerably since 1990. Time series for subcategories are shown in Chapter 3.2.4.

Table 3.2.2 SO_2 emission from stationary combustion plants, 2011 [1)].

SO_2, Mg	
1A1a Public electricity and heat production	2807
1A1b Petroleum refining	321
1A1c Other energy industries	8
1A2 Industry	3297
1A4a Commercial/Institutional	107
1A4b Residential	1452
1A4c Agriculture/Forestry/Fisheries	1010
Total	9002



[1)] Only emission from stationary combustion plants in the source categories is included.

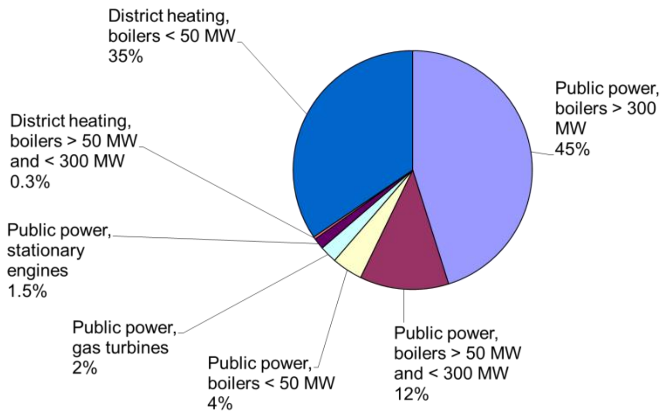


Figure 3.2.8 Disaggregated SO_2 emissions from 1A1a Energy and heat production.

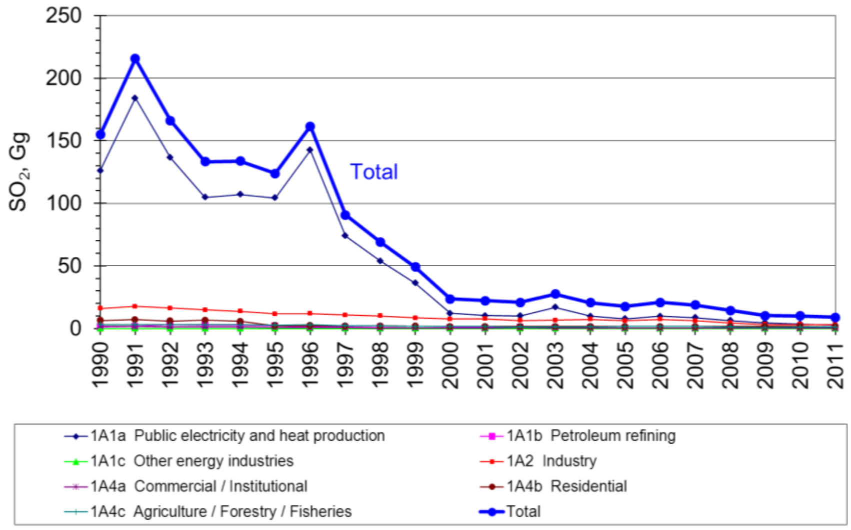


Figure 3.2.9 SO_2 emission time series for stationary combustion.

NO_x

Stationary combustion accounts for 29 % of the national NO_x emission. Table 3.2.3 shows the NO_x emission inventory for stationary combustion subcategories.

Electricity and heat production is the largest emission source accounting for 44 % of the emission from stationary combustion plants. The emission from public power boilers > 300 MW_{th} accounts for 29 % of the emission in this subcategory.

Industrial combustion plants are also an important emission source accounting for 15 % of the emission. The main industrial emission source is cement production, which accounts for 35 % of the emission.

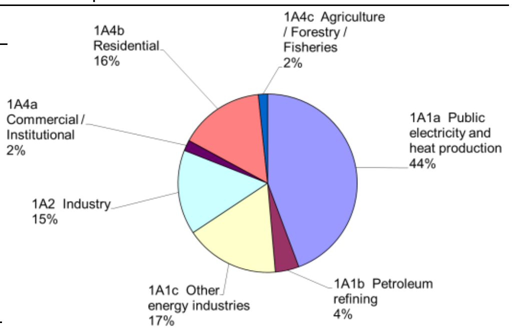
Residential plants account for 16 % of the NO_x emission. The fuel origin of this emission is mainly wood accounting for 70 % of the residential plant emission.

Other energy industries, which is mainly off-shore gas turbines accounts for 17 % of the NO_x emission.

Time series for NO_x emission from stationary combustion are shown in Figure 3.2.10. NO_x emission from stationary combustion plants has decreased by 68 % since 1990. The reduced emission is largely a result of the reduced emission from electricity and heat production due to installation of low NO_x burners, selective catalytic reduction (SCR) units and selective non-catalytic reduction (SNCR) units. The fluctuations in the time series follow the fluctuations in electricity and heat production, which, in turn, result from electricity trade fluctuations.

Table 3.2.3 NO_x emission from stationary combustion plants, 2011[1].

NO_x, Mg	
1A1a Public electricity and heat production	16295
1A1b Petroleum refining	1571
1A1c Other energy industries	6259
1A2 Industry	5636
1A4a Commercial/Institutional	716
1A4b Residential	5658
1A4c Agriculture/Forestry/Fisheries	613
Total	36748



1) Only emission from stationary combustion plants in the source categories is included.

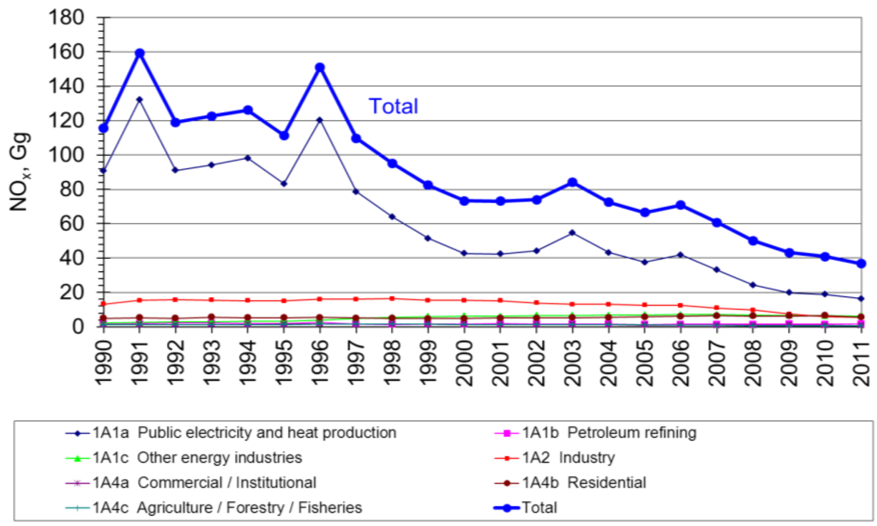


Figure 3.2.10 NO_x emission time series for stationary combustion.

NMVOC

Stationary combustion plants account for 20 % of the national NMVOC emission. Table 3.2.4 presents the NMVOC emission inventory for the stationary combustion subcategories.

Residential plants are the largest emission source accounting for 81 % of the emission from stationary combustion plants. For residential plants NMVOC is mainly emitted from wood and straw combustion, see Figure 3.2.11.

Electricity and heat production is also a considerable emission source, accounting for 13 % of the emission. Lean-burn gas engines have a relatively high NMVOC emission factor and are the most important emission source in this subcategory (see Figure 3.2.11). The gas engines are either natural gas or biogas fuelled.

The time series for NMVOC emission from stationary combustion is shown in Figure 3.2.12. The emission has increased by 14 % from 1990. The increased emission is mainly a result of the increasing wood consumption in residential plants and of the increased use of lean-burn gas engines in CHP plants.

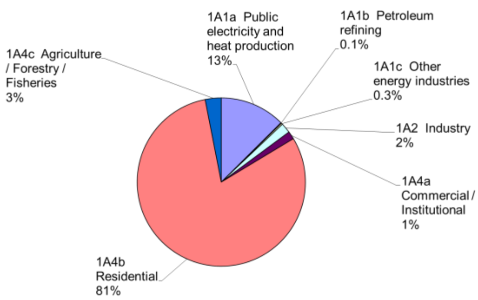
The emission from residential plants increased 12 % since 1990. The NMVOC emission from wood combustion in 2011 was 2.2 times the 1990 level due to increased wood consumption. However, the emission factor has decreased since 1990 due to installation of modern stoves and boilers with improved combustion technology. Further, the emission from straw combustion in farmhouse boilers has decreased (75 %) over this period due to both a decreasing emission factor and decrease in straw consumption in this source category.

The use of wood in residential boilers and stoves was relatively low in 1998-99 resulting in a lower emission level.

The increasing consumption of wood in residential plants ceased in 2007. The improved technology that has been implemented in residential wood combustion have led to lower emission factors and thus decreasing NMVOC emission since 2007.

Table 3.2.4 NMVOC emission from stationary combustion plants, 2011[1].

NMVOC, Mg	
1A1a Public electricity and heat production	1998
1A1b Petroleum refining	22
1A1c Other energy industries	40
1A2 Industry	305
1A4a Commercial/Institutional	242
1A4b Residential	12830
1A4c Agriculture/Forestry/Fisheries	491
Total	15930



[1] Only emission from stationary combustion plants in the categories is included.

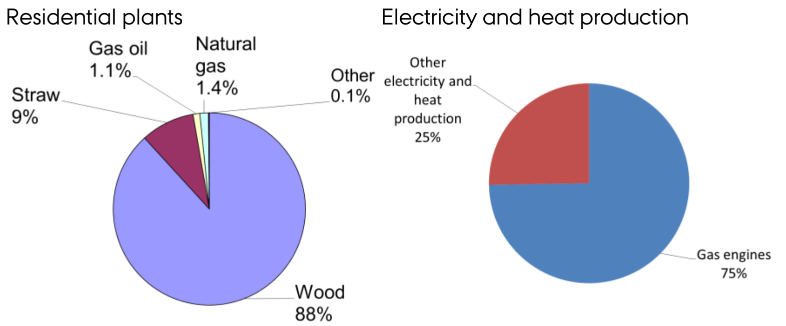


Figure 3.2.11 NMVOC emission from Residential plants and from Electricity and heat production, 2011.

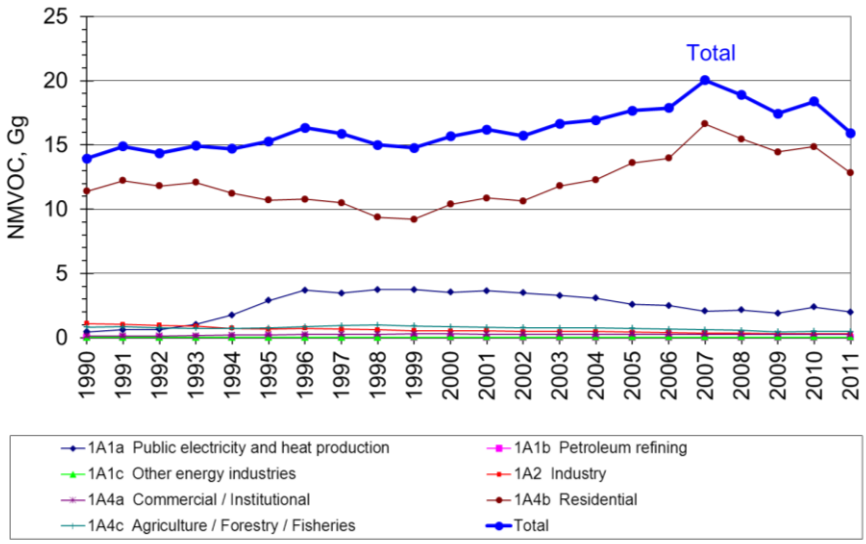


Figure 3.2.12 NMVOC emission time series for stationary combustion.

CO

Stationary combustion accounts for 37 % of the national CO emission. Table 3.2.5 presents the CO emission inventory for stationary combustion subcategories.

Residential plants are the largest emission source, accounting for 82 % of the emission. Wood combustion accounts for 89 % of the emission from residential plants, see Figure 3.2.13. This is in spite of the fact that the fuel consumption share is only 45 %. Combustion of straw is also a considerable emission source whereas the emission from other fuels used in residential plants is almost negligible.

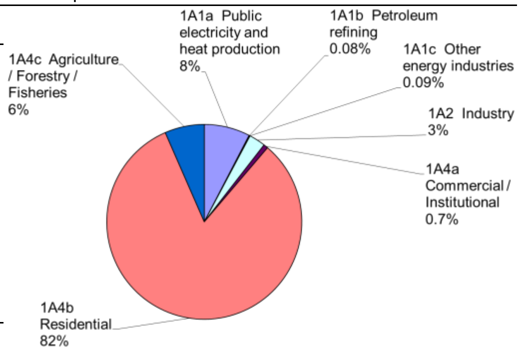
The time series for CO emission from stationary combustion is shown in Figure 3.2.14. The emission has increased by 5 % from 1990. The time series for CO from stationary combustion plants follow the time series for CO emission from residential plants.

The increase of wood consumption in residential plants in 1999-2007 is reflected in the time series for CO emission. The consumption of wood in residential plants in 2011 was 3.7 times the 1990 level. The decreased emission in 2007-2011 is a result of implementation of improved residential wood combustion technologies and the fact that the rapid increase of wood consumption until 2007 have stopped.

Both straw consumption and CO emission factor for residential plants have decreased since 1990.

Table 3.2.5 CO emission from stationary combustion plants, 2011[1].

CO, Mg	
1A1a Public electricity and heat production	10635
1A1b Petroleum refining	118
1A1c Other energy industries	120
1A2 Industry	3810
1A4a Commercial/Institutional	1024
1A4b Residential	114920
1A4c Agriculture/Forestry/Fisheries	9168
Total	139795



[1] Only emission from stationary combustion plants in the source categories is included.

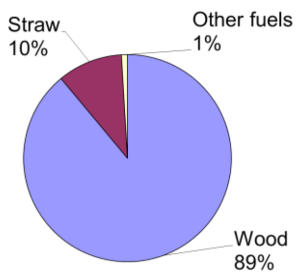


Figure 3.2.13 CO emission sources, residential plants, 2011.

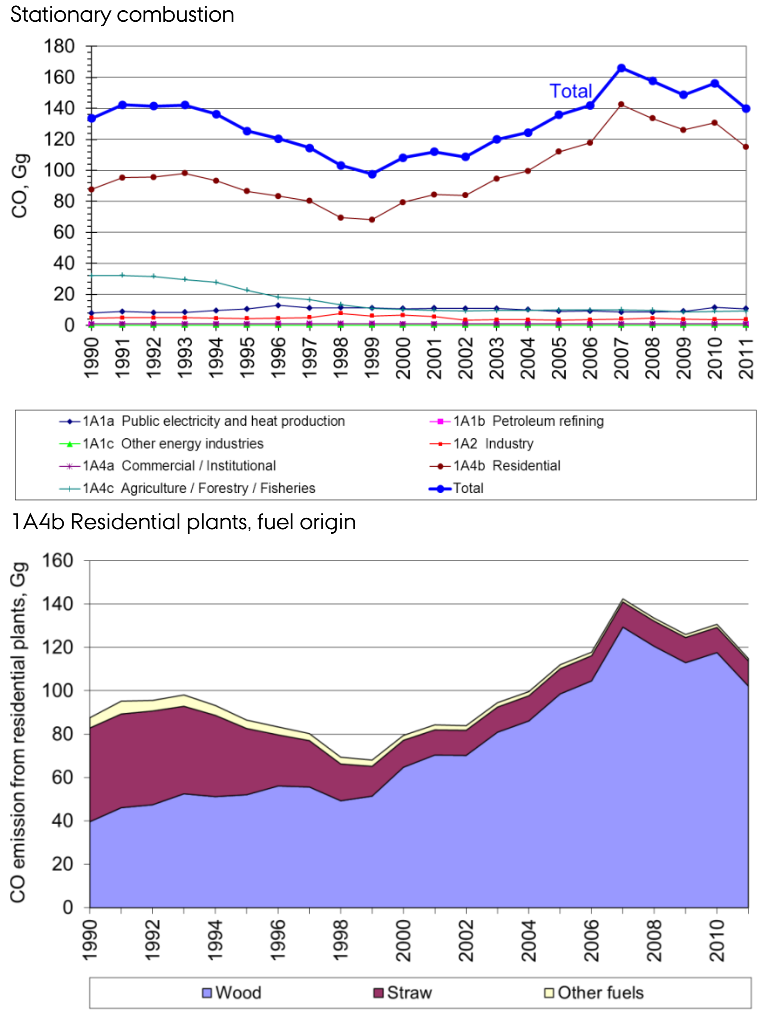


Figure 3.2.14 CO emission time series for stationary combustion.

NH_3

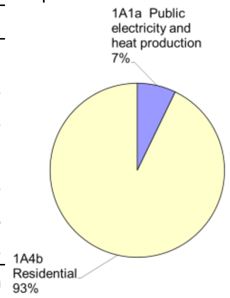
Stationary combustion plants accounted for only 0.3 % of the national NH_3 emission in 2011.

Table 3.2.6 shows the NH_3 emission inventory for the stationary combustion subcategories. Residential plants account for 93 % of the emission. Wood combustion accounts for 94 % of the emission from residential plants.

The time series for the NH_3 emission is presented in Figure 3.2.15. The NH_3 emission has increased to 2.8 times the 1990 level.

Table 3.2.6 NH_3 emission from stationary combustion plants, 2011 [1)].

NH_3, Mg	
1A1a Public electricity and heat production	14
1A1b Petroleum refining	-
1A1c Other energy industries	-
1A2 Industry	
1A4a Commercial/Institutional	-
1A4b Residential	176
1A4c Agriculture/Forestry/Fisheries	-
Total	190



1) Only the emission from stationary combustion plants in the source categories is included.

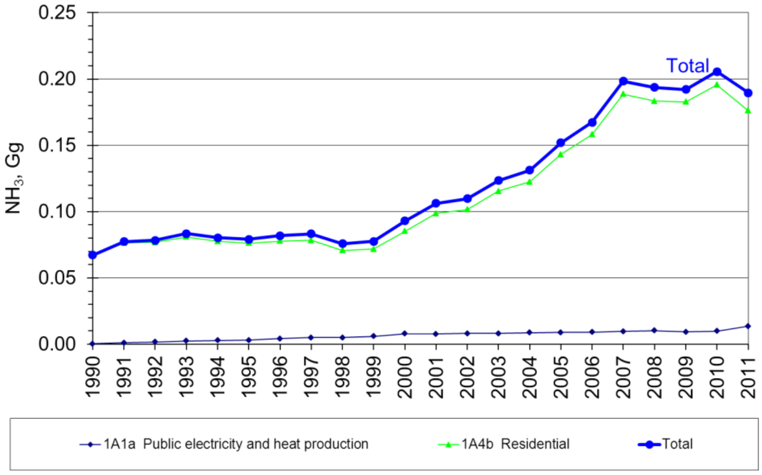


Figure 3.2.15 NH_3 emission time series, stationary combustion plants.

Particulate matter (PM)

TSP from stationary combustion accounts for 49 % of the national emission. The emission shares for PM_{10} and $PM_{2.5}$ are 59 % and 73 %, respectively.

Table 3.2.7 and Figure 3.2.16 show the PM emission inventory for the stationary combustion subcategories. Residential plants are the largest emission source accounting for 92 % of the $PM_{2.5}$ emission from stationary combustion plants.

The primary sources of PM emissions are:

- Residential boilers, stoves and fireplaces combusting wood
- Farmhouse boilers combusting straw
- Power plants primarily combusting coal
- Coal and residual oil combusted in industrial boilers and processes

The PM emission from wood combusted in residential plants is the predominant source. Thus, 88 % of the $PM_{2.5}$ emission from stationary combustion is emitted from residential wood combustion. This corresponds to 64 % of the national emission. A literature review (Nielsen et al., 2003) and a Nordic project (Sternhufvud et al., 2004) has demonstrated that the emission factor uncertainty for residential combustion of wood in stoves and boilers is notably high.

Figure 3.2.17 shows the fuel consumption and the $PM_{2.5}$ emission of residential plants. Wood combustion accounts for 96 % of the $PM_{2.5}$ emission from residential plants in spite of a wood consumption share of 45 %.

Emission inventories for PM have been reported for the years 2000-2011. The time series for PM emission from stationary combustion is shown in Figure 3.2.18. The emission of TSP, PM_{10} and $PM_{2.5}$ has increased 26 %, 27 % and 30 %, respectively, since year 2000. The increase is caused by the increased wood combustion in residential plants. However, the PM emission factors have decreased for this emission source category due to installation of modern stoves and boilers. The stabilisation of wood consumption in residential plants in 2007-2011 has resulted in a decrease of PM emission from stationary combustion in recent years.

The time series for PM emission from stationary combustion plants follows the time series for PM emission from residential plants.

Table 3.2.7 PM emission from stationary combustion plants, 2011 [1)].

		TSP, Mg	PM_{10}, Mg	$PM_{2.5}$, Mg
1A1a	Public electricity and heat production	734	571	455
1A1b	Petroleum refining	100	95	93
1A1c	Other energy industries	3	2	1
1A2	Industry	300	222	156
1A4a	Commercial/Institutional	168	166	157
1A4b	Residential	16596	15802	15572
1A4c	Agriculture/Forestry/Fisheries	502	471	441
Total		18404	17328	16875

1) Only emission from stationary combustion plants in the source categories is included.

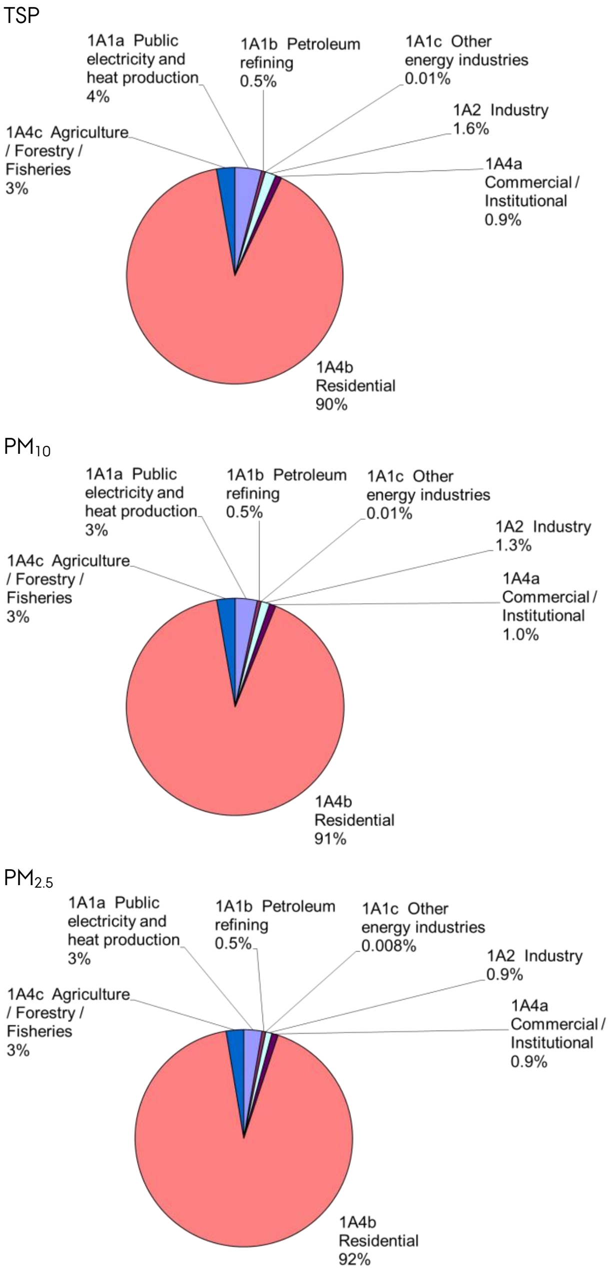


Figure 3.2.16 PM emission sources, stationary combustion plants, 2011.

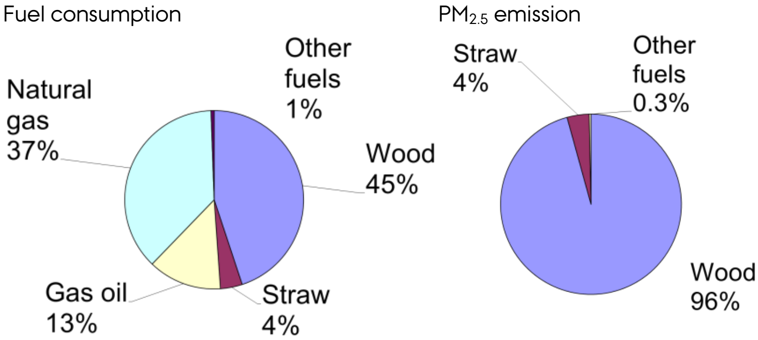


Figure 3.2.17 Fuel consumption and $PM_{2.5}$ emission from residential plants.

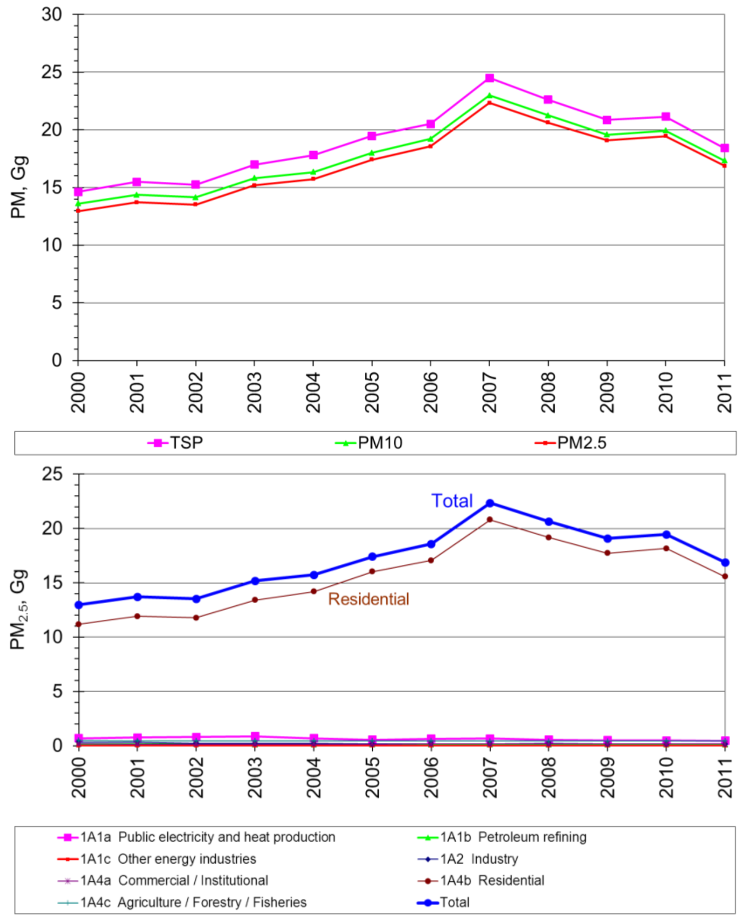


Figure 3.2.18 PM emission time series for stationary combustion.

Heavy metals

Stationary combustion plants are among the most important emission sources for heavy metals. The emission share for stationary combustion compared to national total is shown for each metal in Table 3.2.8.

Table 3.2.8 and Figure 3.2.19 present the heavy metal emission inventory for the stationary combustion subcategories. The source categories *Public electricity and heat production, Residential* and *Industry* are the main emission sources. The emission share for MSW incineration plants, that was formerly a major emission source, is now below 25 % for all HMs. The emission share for MSW incineration plants has decreased considerably since the year 2000 due to installation of new improved flue gas cleaning technology that was initiated based on lower emission limit values in Danish legislation (DEPA 2011a).

Table 3.2.8 Heavy metal emission from stationary combustion plants, 2011 [1].

	As, kg	Cd, kg	Cr, kg	Cu, kg	Hg, kg	Ni, kg	Pb, kg	Se, kg	Zn, kg
1A1a Public electricity and heat production	103	30	185	230	226	299	364	671	502
1A1b Petroleum refining	29	22	22	43	21	204	64	103	75
1A1c Other energy industries	3	0	0	0	3	0	0	0	0
1A2 Industry	74	24	83	106	51	1188	449	92	972
1A4a Commercial/Institutional	3	0	3	4	2	3	6	1	17
1A4b Residential	23	37	77	291	19	79	1439	18	3689
1A4c Agriculture/Forestry/Fisheries	8	5	22	39	11	98	235	31	511
Total	243	118	393	712	332	1871	2558	916	5765
Emission share from stationary combustion	76%	60%	45%	2%	84%	47%	26%	75%	16%

1) Only emission from stationary combustion plants in the source categories is included.

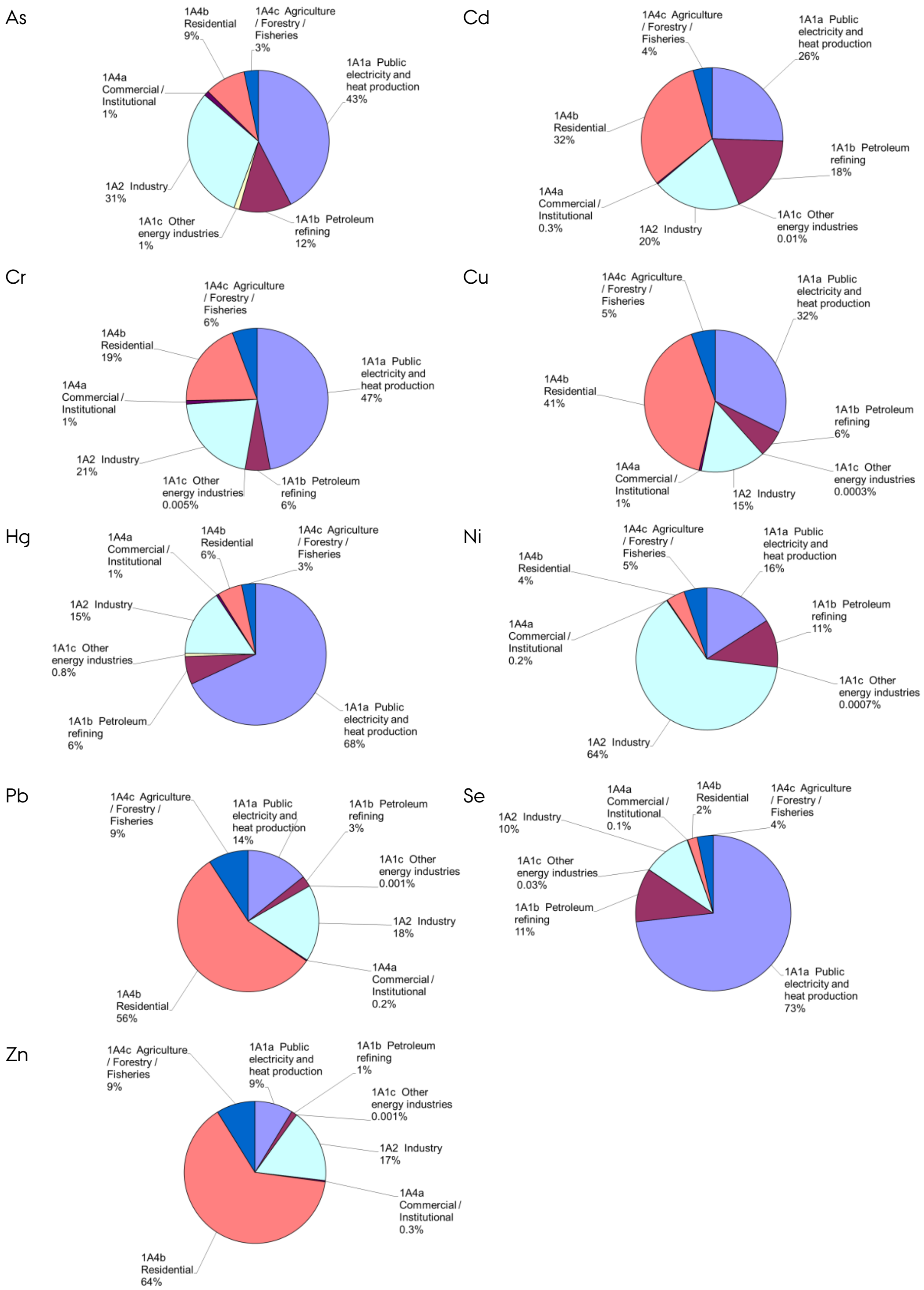


Figure 3.2.19 Heavy metal emission sources, stationary combustion plants, 2011.

The time series for heavy metal emissions are provided in Figure 3.2.20. Emissions of all heavy metals have decreased considerably (76 % - 92 %) since 1990, see Table 3.2.9. Emissions have decreased despite increased incineration of waste. This has been made possible due to installation and improved performance of gas cleaning devices in waste incineration plants and also in large power plants, the latter being a further important emission source.

Table 3.2.9 Decrease in heavy metal emission 1990-2011.

Pollutant	As	Cd	Cr	Cu	Hg	Ni	Pb	Se	Zn
Decrease since 1990, %	79	86	92	80	88	89	83	77	76

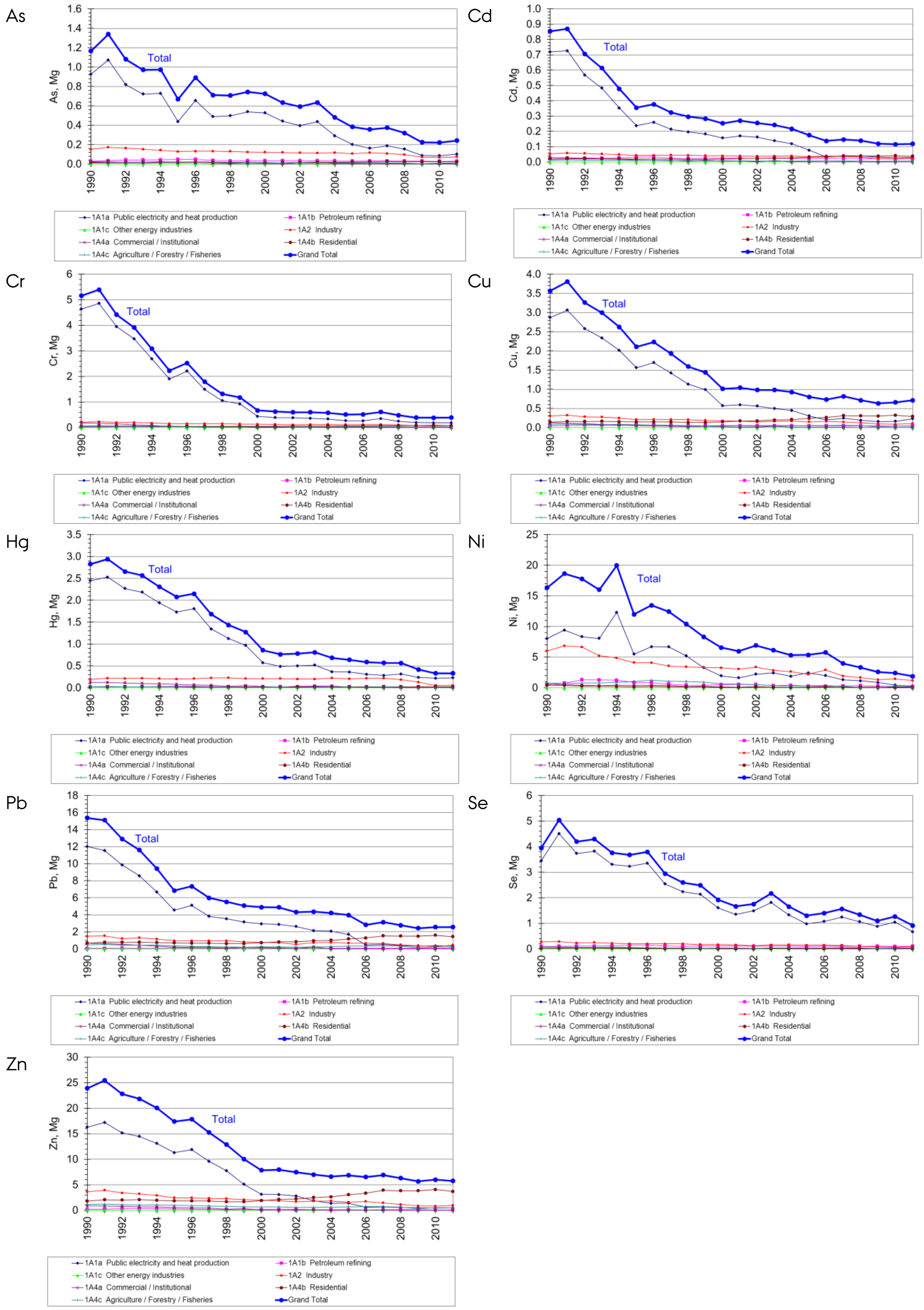


Figure 3.2.20 Heavy metal emission time series, stationary combustion plants.

PAH

Stationary combustion plants accounted for more than 92 % of the PAH emission in 2011.

Table 3.2.10 and Figure 3.2.21 present the PAH emission inventories for the stationary combustion subcategories. Residential combustion is the largest emission source accounting for more than 89 % of the emission. Combustion of wood is the predominant source, accounting for more than 98 % of the PAH emission from residential plants, see Figure 3.2.22.

The time series for PAH emissions are presented in Figure 3.2.23. The increasing (79 % - 115 %) emission trend for PAH is a result of the increased combustion of wood in residential plants. The time series for wood combustion in residential plants is also provided in Figure 3.2.23. The stabilisation of the consumption of wood in residential plants since 2007 is reflected in the PAH emission time series.

Table 3.2.10 PAH emission from stationary combustion plants, 2011 [1)].

	Benzo(a)-Pyrene, kg	Benzo(b)-fluoranthene, kg	Benzo(k)-fluoranthene, kg	Indeno(1,2,3-c,d)pyrene, kg
1A1a Public electricity and heat production	8	33	21	6
1A1b Petroleum refining	0	0	0	0
1A1c Other energy industries	0	0	0	0
1A2 Industry	21	76	14	4
1A4a Commercial/Institutional	166	218	73	118
1A4b Residential	3781	3754	2196	2560
1A4c Agriculture/Forestry/Fisheries	122	135	28	166
Total	4098	4216	2331	2853
Emission share from stationary combustion	95%	94%	92%	93%

1) Only emission from stationary combustion plants in the source categories is included.

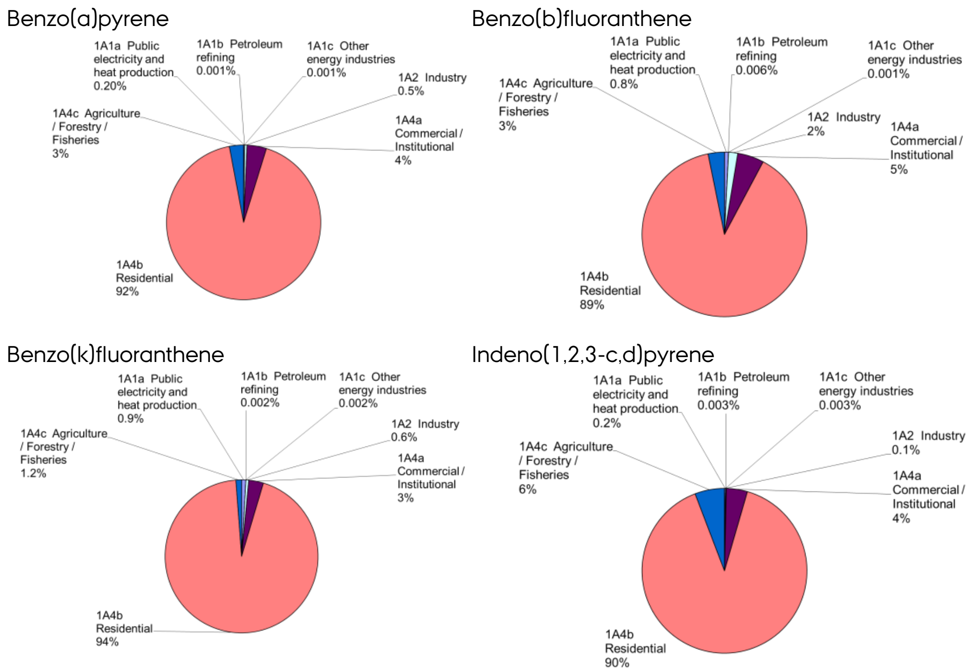


Figure 3.2.21 PAH emission sources, stationary combustion plants, 2011.

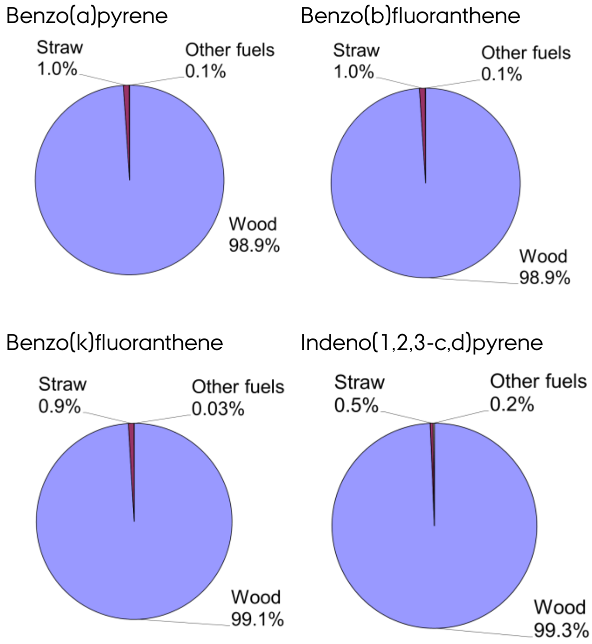


Figure 3.2.22 PAH emission from residential combustion plants (stationary), fuel origin.

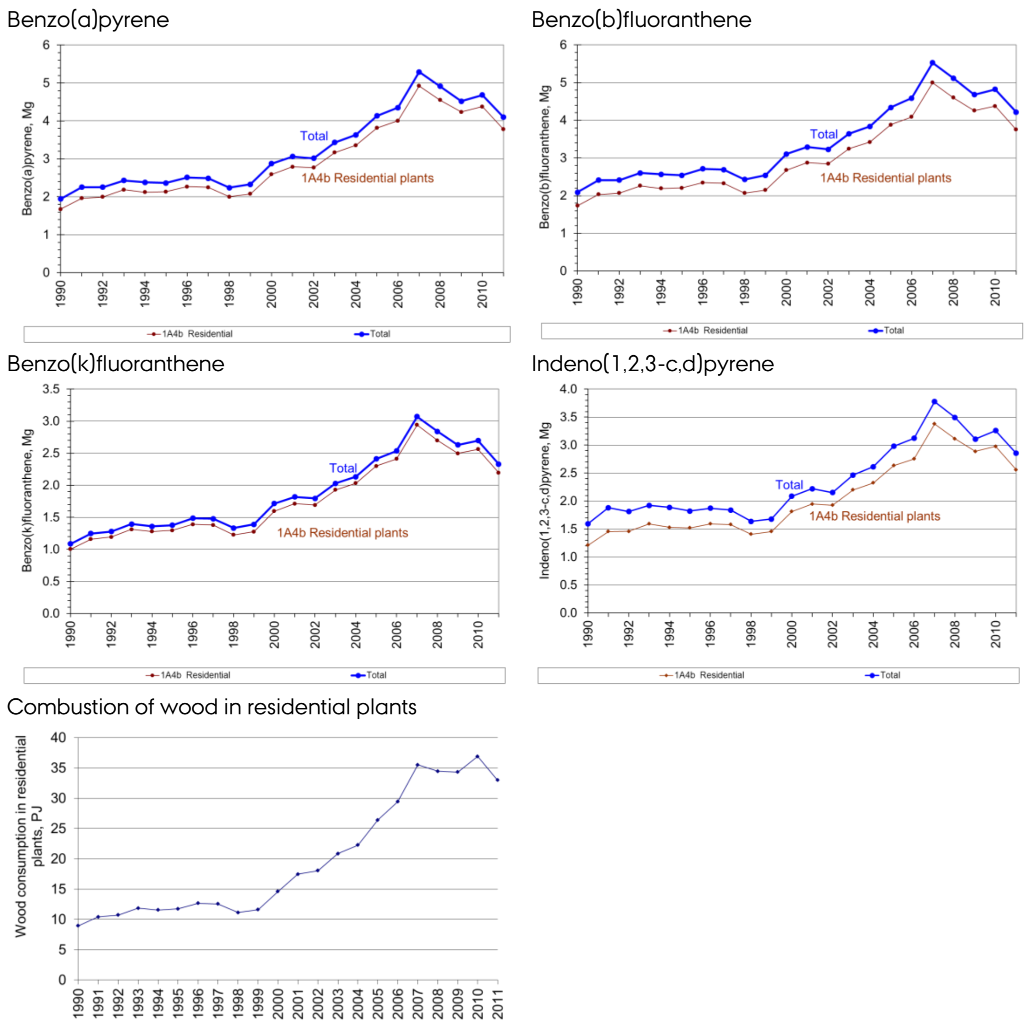


Figure 3.2.23 PAH emission time series, stationary combustion plants. Comparison with wood consumption in residential plants.

Dioxin

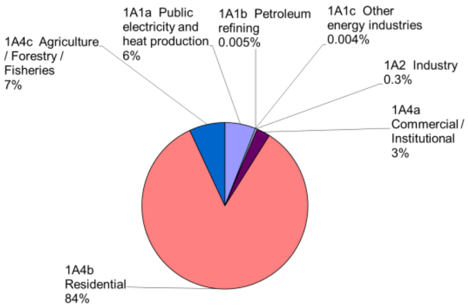
Stationary combustion plants accounted for 71 % of the national dioxin emission in 2011.

Table 3.2.11 presents the dioxin emission inventories for the stationary combustion subcategories. In 2011, the emission from residential plants accounts for 84 % of the emission. Combustion of wood is the predominant source accounting for 89 % of the emission from residential plants (Figure 3.2.24).

The time series for dioxin emission is presented in Figure 3.2.25. The dioxin emission has decreased 62 % since 1990 mainly due to installation of dioxin filters in MSW incineration plants. The emission from residential plants has increased due to increased wood consumption in this source category.

Table 3.2.11 Dioxin emission from stationary combustion plants, 2011 [1].

Dioxin, g I-teq	
1A1a Public electricity and heat production	1.0
1A1b Petroleum refining	0.0
1A1c Other energy industries	0.0
1A2 Industry	0.1
1A4a Commercial/Institutional	0.5
1A4b Residential	14.5
1A4c Agriculture/Forestry/Fisheries	1.2
Total	17.3



1) Only emission from stationary combustion plants in the source categories is included.

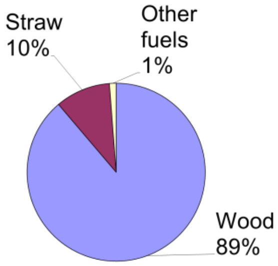


Figure 3.2.24 Dioxin emission from residential plants, fuel origin.

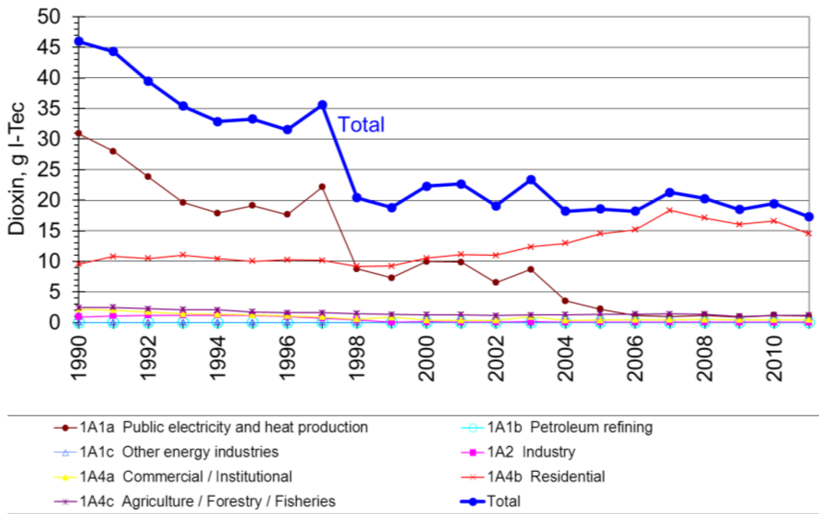


Figure 3.2.25 Dioxin emission time series, stationary combustion plants.

HCB

The HCB emission has been estimated only for stationary combustion plants and cremation. Stationary plants accounted for more than 98 % of the estimated national HCB emission in 2011.

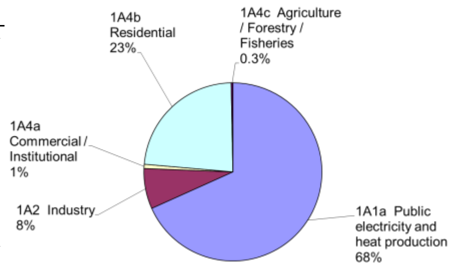
Table 3.2.12 shows the HCB emission inventory for the stationary combustion subcategories. *Public electricity and heat production* account for 68 % of the emission. Residential plants account for 23 % of the emission.

The time series for HCB emission is presented in Figure 3.2.26. The HCB emission has decreased 82 % since 1990 mainly due to improved flue gas cleaning in MSW incineration plants. The emission from residential plants has increased due to increased wood consumption in this source category.

Table 3.2.12 HCB emission from stationary combustion plants, 2011 [1)].

HCB, kg	
1A1a Public electricity and heat production	0.387
1A1b Petroleum refining	0.000
1A1c Other energy industries	0.042
1A2 Industry	0.004
1A4a Commercial/Institutional	0.132
1A4b Residential	0.002
1A4c Agriculture/Forestry/Fisheries	0.567
Total	0.387

1) Only the emission from stationary combustion plants in the source categories is included.



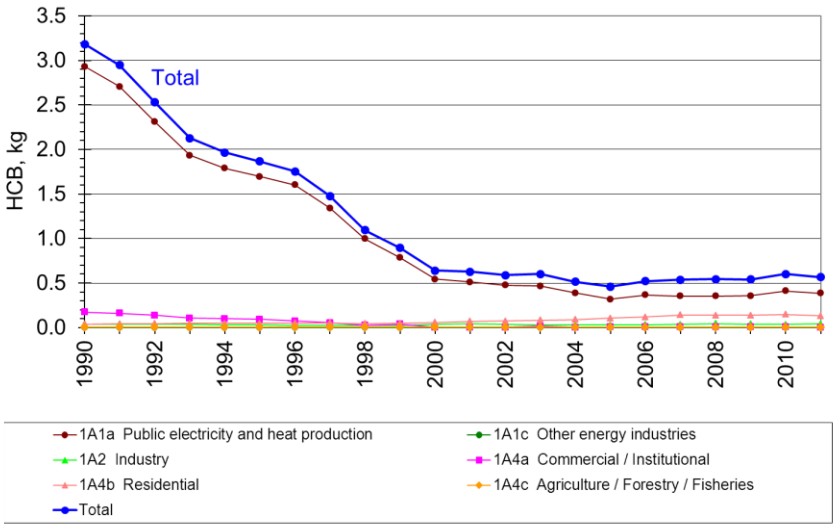


Figure 3.2.26 HCB emission time series, stationary combustion plants.

3.2.4 Trend for subsectors

In addition to the data for stationary combustion, this chapter presents and discusses data for each of the subcategories in which stationary combustion is included. Time series are presented for fuel consumption and emissions.

1A1 Energy industries

The emission source category *1A1 Energy Industries* consists of the subcategories:

- 1A1a Electricity and heat production

- 1A1b Petroleum refining
- 1A1c Other energy industries

Figure 3.2.27 – 3.2.31 present time series for the *Energy Industries*. *Electricity and heat production* is the largest subcategory accounting for the main part of all emissions. Time series are discussed below for each subcategory.

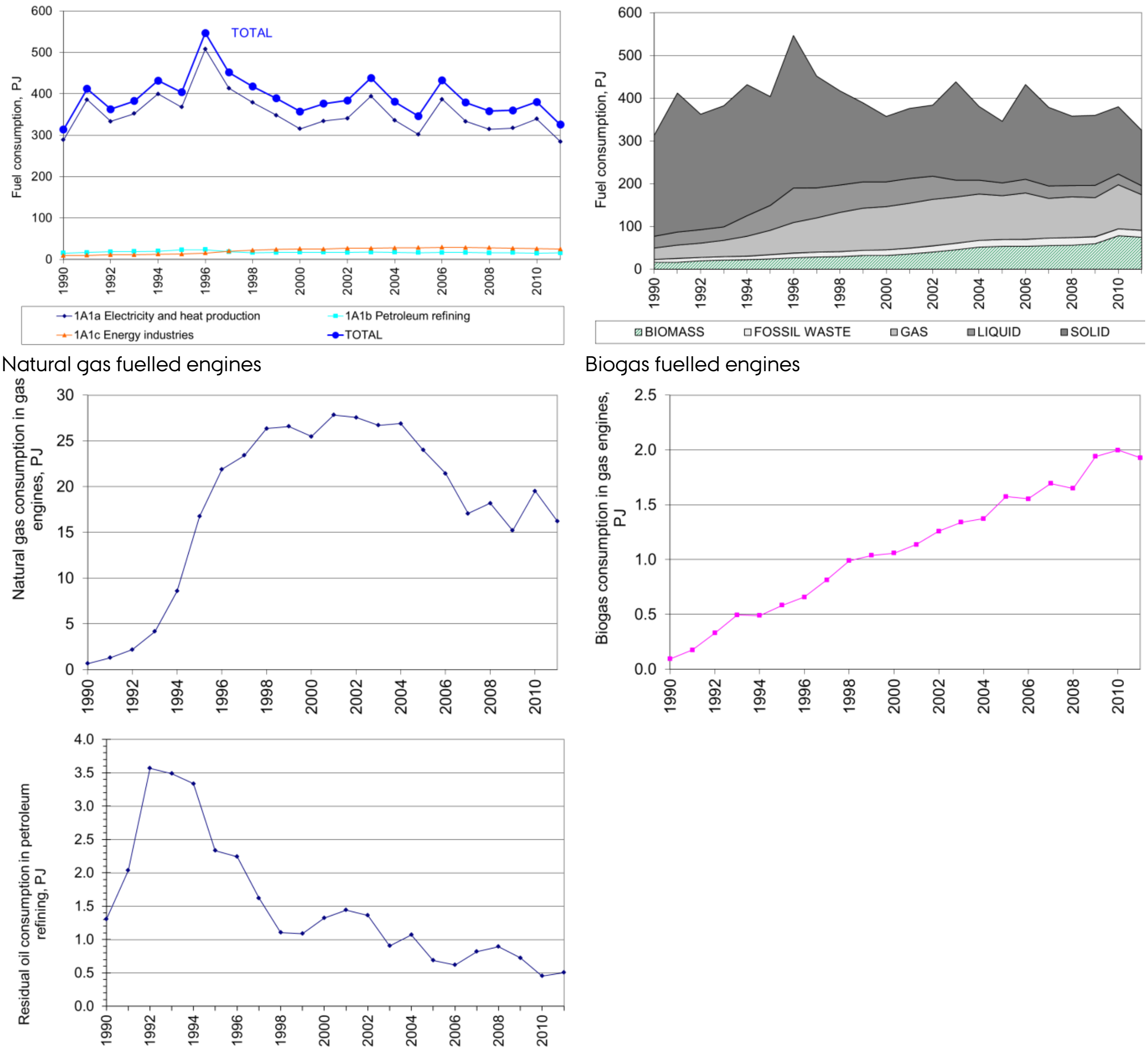


Figure 3.2.27 Time series for fuel consumption, 1A1 Energy industries.

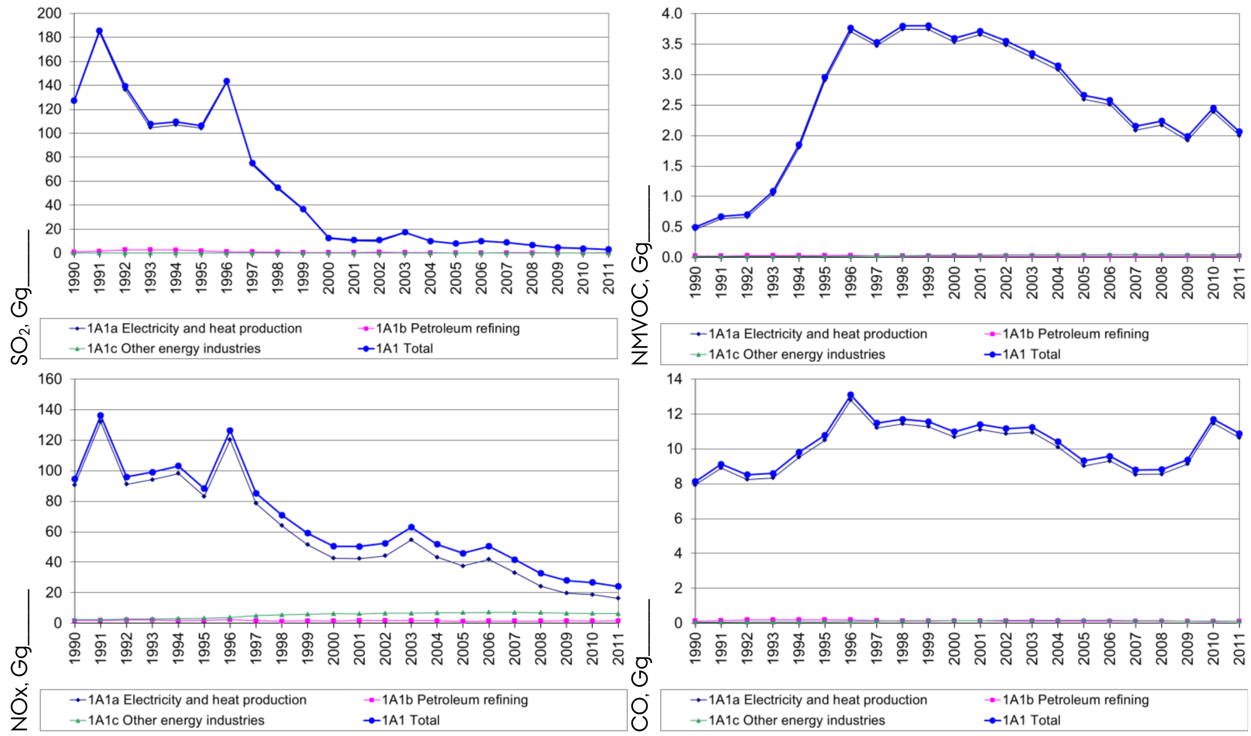


Figure 3.2.28 Time series for SO_2, NO_x, NMVOC and CO emission, 1A1 Energy industries.

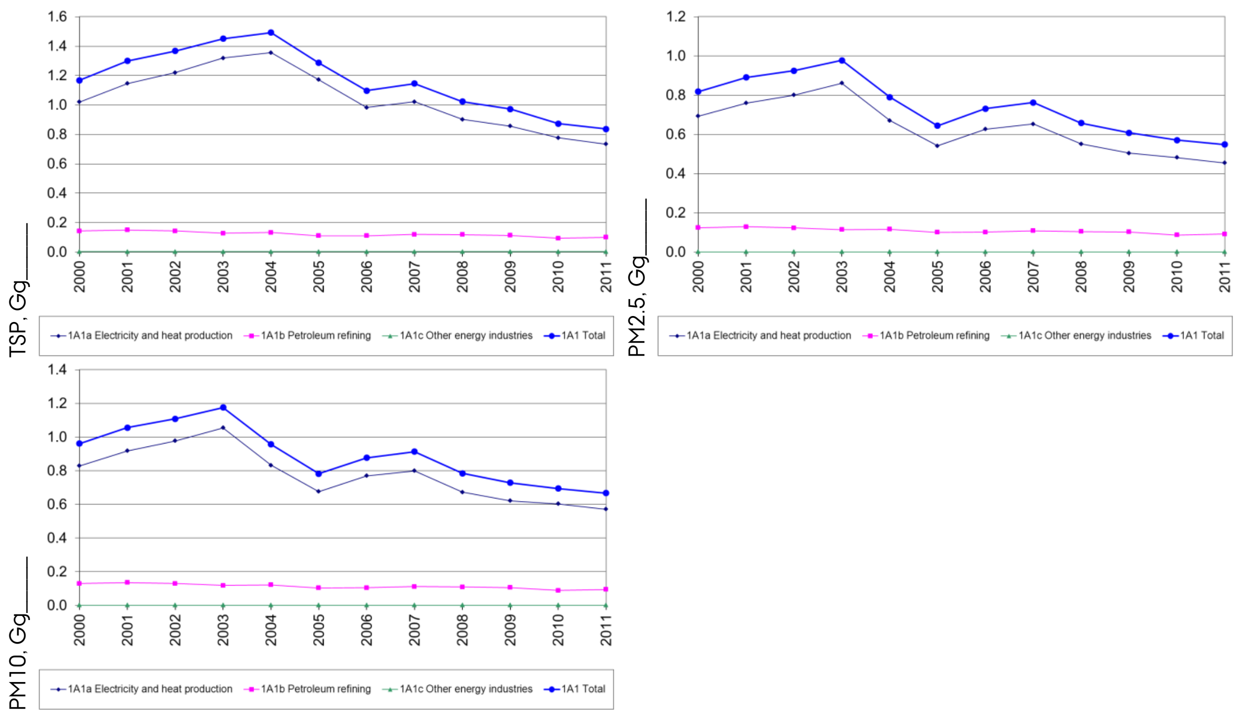


Figure 3.2.29 Time series for PM emission, 1A1 Energy industries.

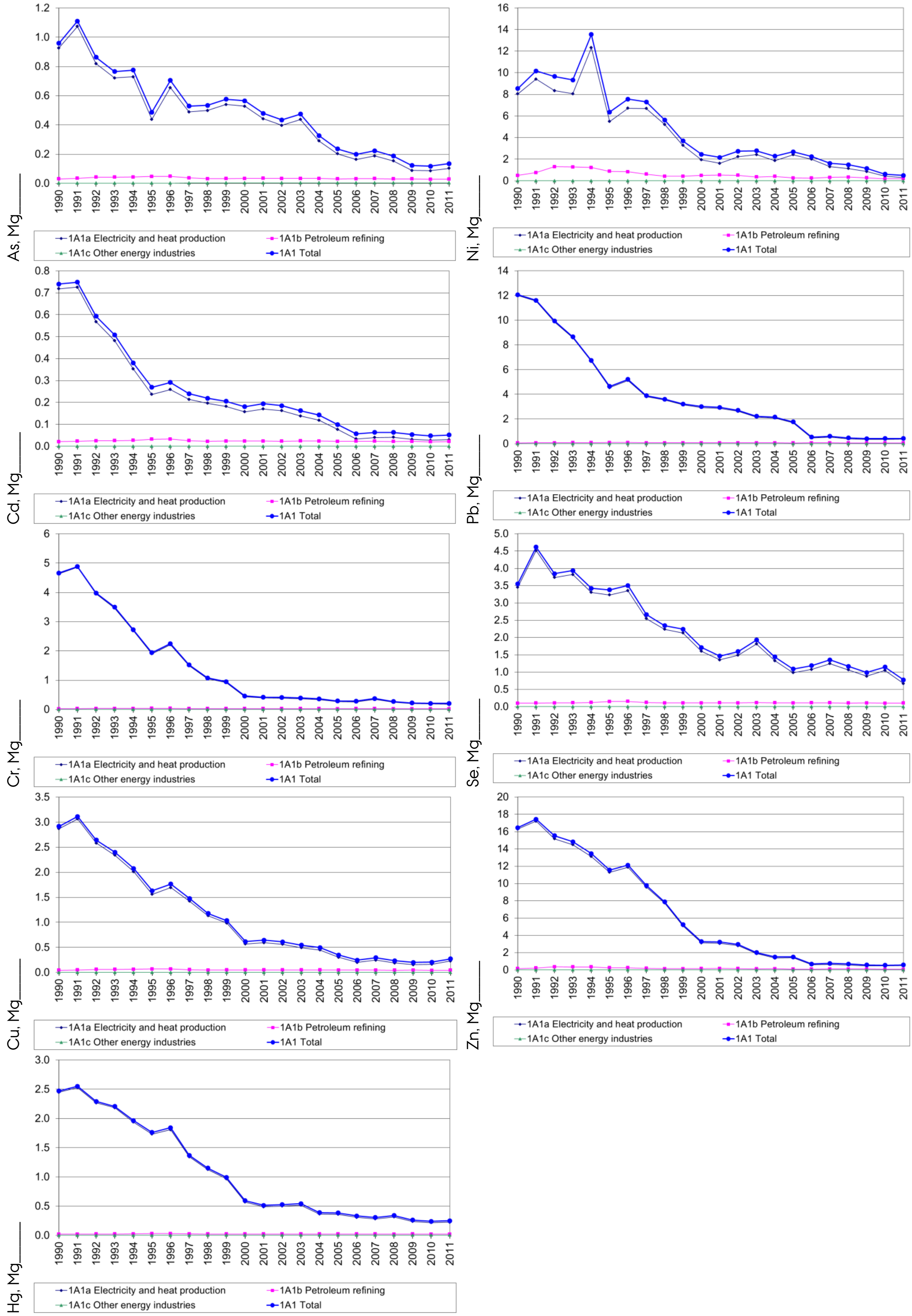


Figure 3.2.30 Time series for HM emission, 1A1 Energy industries.

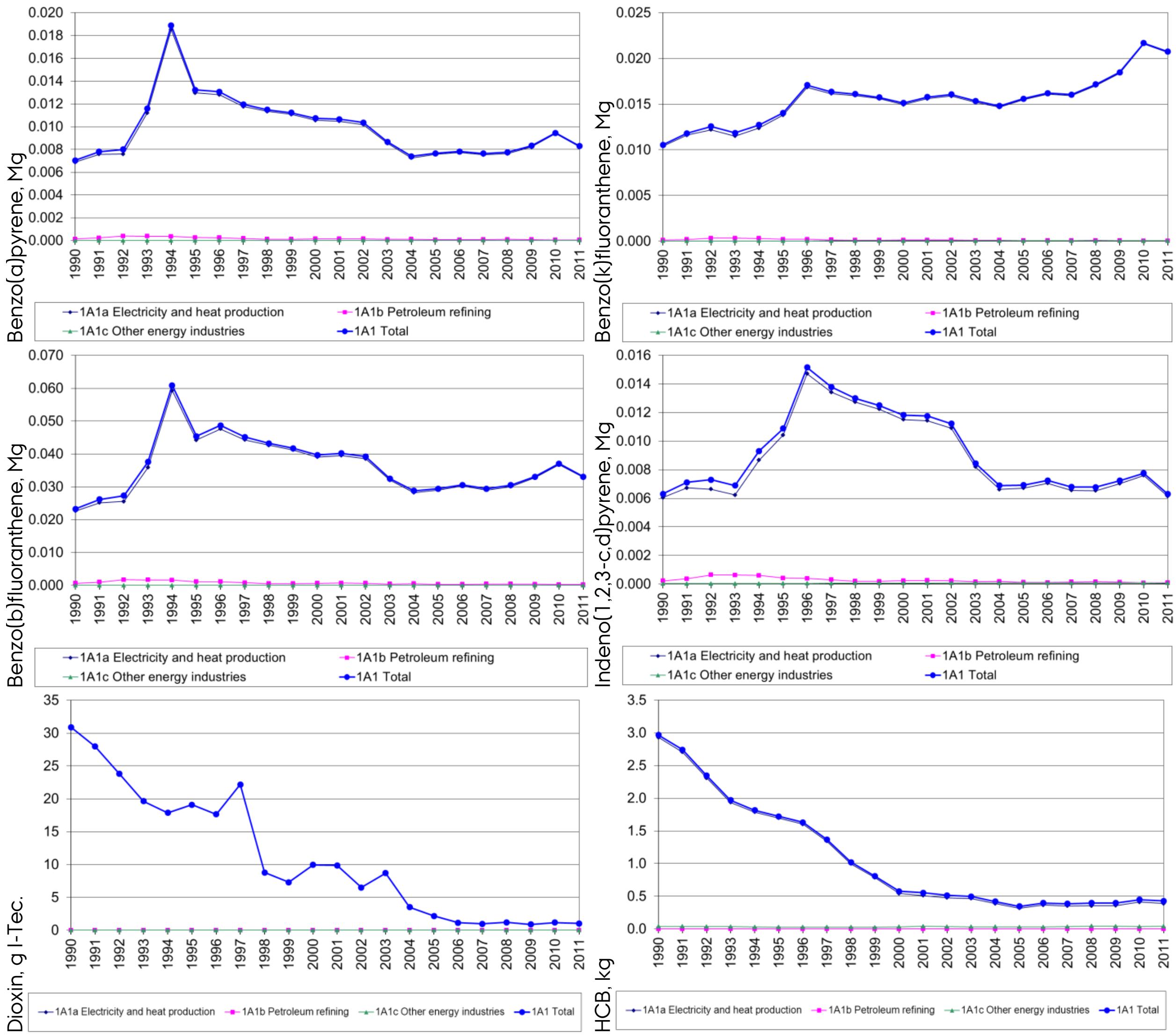


Figure 3.2.31 Time series for PAH, dioxin and HCB emission, 1A1 Energy industries.

1A1a Electricity and heat production

Public electricity and heat production is the largest source category regarding fuel consumption for stationary combustion. Figure 3.2.32 shows the time series for fuel consumption and emissions of SO_2, NO_x, NMVOC and CO.

The fuel consumption in electricity and heat production was 1 % lower in 2011 than in 1990. As discussed in Chapter 3.2.2 the fuel consumption fluctuates mainly as a consequence of electricity trade. Coal is the fuel that is affected the most by the fluctuating electricity trade. Coal is the main fuel in the source category even in years with electricity import. The coal consumption in 2011 was 45 % lower than in 1990. Natural gas is also an important fuel and the consumption of natural gas has increased since 1990. A considerable part of the natural gas is combusted in gas engines (Figure 3.2.27). The consumption of waste and biomass has increased.

The SO_2 emission has decreased 98 % from 1990 to 2011. This decrease is a result of both lower sulphur content in fuels and installation and improved performance of desulphurisation plants. The emission has also decreased in recent years and thus the 2011 emission is 25 % lower than the emission in 2010.

The NO_x emission has decreased 82 % due to installation of low NO_x burners, selective catalytic reduction (SCR) units and selective non-catalytic reduction (SNCR) units. The fluctuations in time series follow the fluctuations in fuel consumption and electricity trade.

The emission of NMVOC in 2011 was 4.3 times the 1990 emission level. This is a result of the large number of gas engines that has been installed in Danish CHP plants. The decreasing emission in 2004-2009 is results of the time series for natural gas consumption in gas engines (Figure 3.2.27). The emission of NMVOC from engines decreased in 1995-2007 as a result of introduction of an emission limits for unburned hydrocarbon[3] (DEPA 2005).

The CO emission was 34 % higher in 2011 than in 1990. The fluctuations follow the fluctuations of the fuel consumption. In addition, the emission from gas engines is considerable.

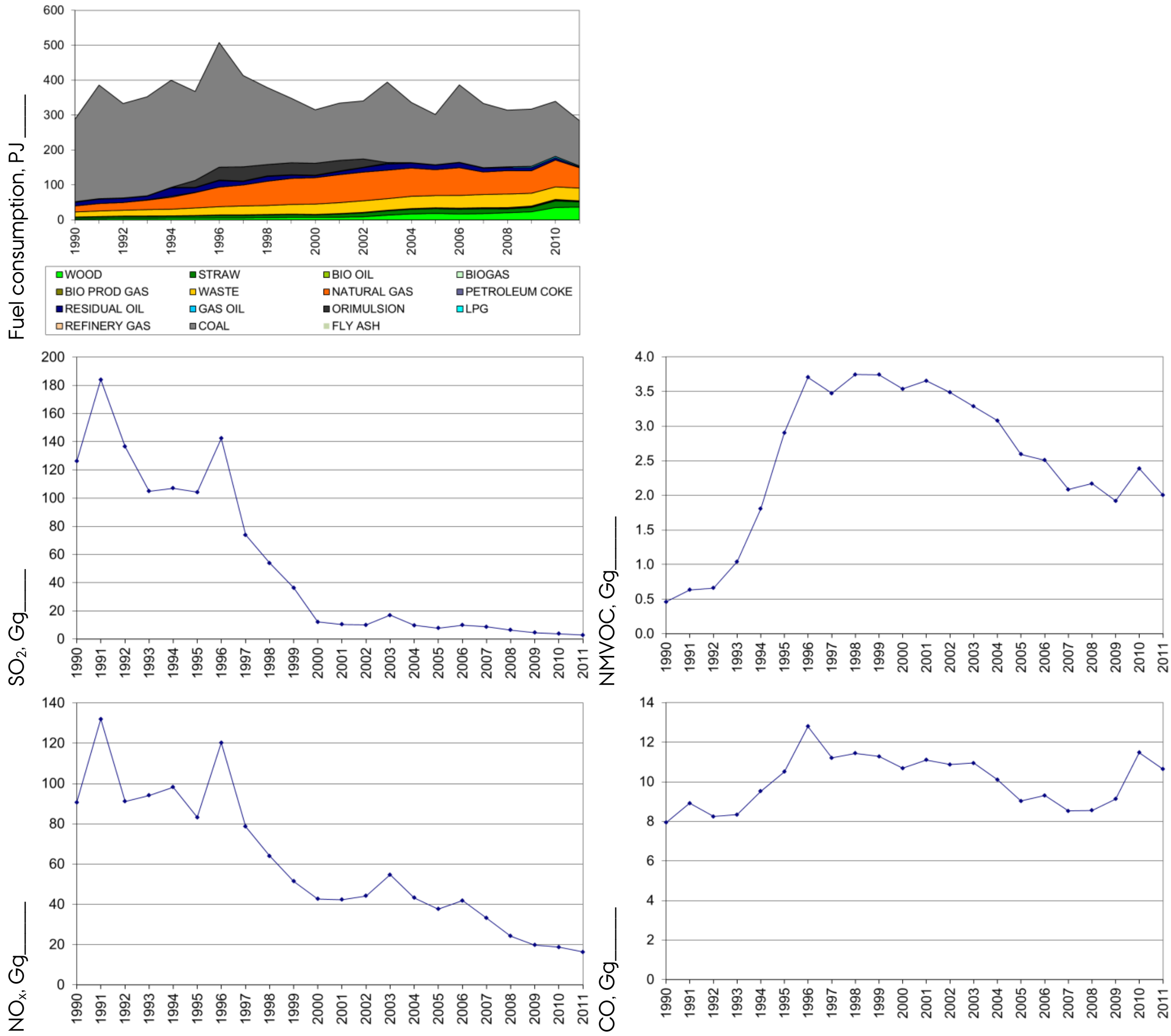


Figure 3.2.32 Time series for 1A1a Electricity and heat production.

1A1b Petroleum refining

Petroleum refining is a small source category regarding both fuel consumption and emissions for stationary combustion. Presently only two refineries

[3] Including methane.

are operating in Denmark. Figure 3.2.33 shows the time series for fuel consumption and emissions.

The significant decrease in both fuel consumption and emissions in 1996 is a result of the closure of a third refinery.

The fuel consumption has increased 4 % since 1990.

The emission of SO_2 has shown a pronounced decrease (70 %) since 1990, mainly because decreased consumption of residual oil (61%) also shown in Figure 3.2.33. The increase in SO_2 emission in 1990-1992 also follows the residual oil consumption. The NO_x emission in 2011 was 3 % lower in 2011 than in 1990. Since 2005, data for both SO_2 and NO_x are plant specific data stated by the refineries.

The NMVOC emission time series follows the time series for fuel consumption.

A description of the Danish emission inventory for fugitive emissions from fuels is given in Plejdrup et al. (2011) and in Chapter 3.4.

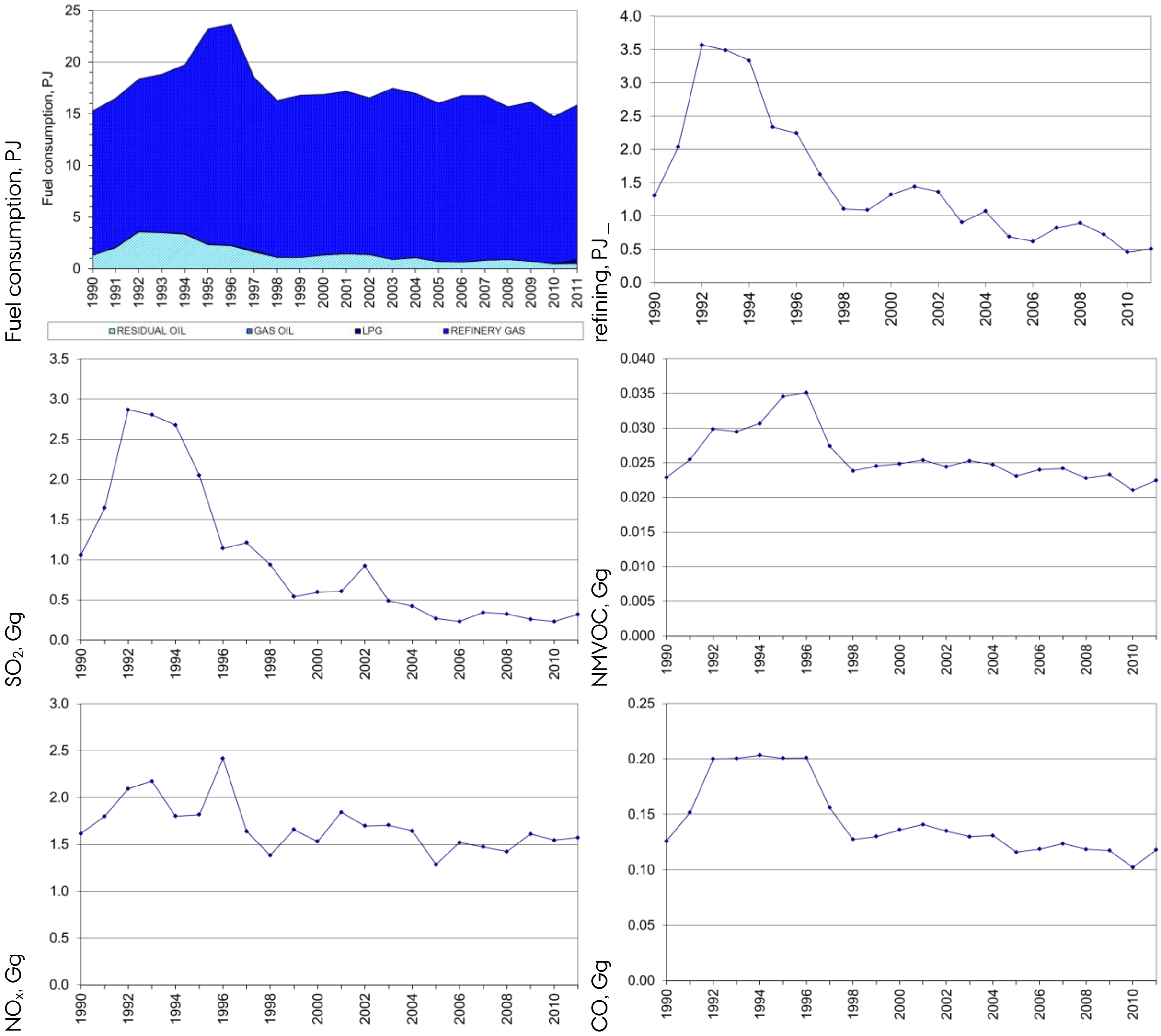


Figure 3.2.33 Time series for 1A1b Petroleum refining.

1A1c Other energy industries

The source category *Other energy industries* comprises natural gas consumption in the off-shore industry and in addition a small consumption in the Danish gas treatment plant[4]. Gas turbines are the main plant type. Figure 3.2.34 shows the time series for fuel consumption and emissions.

The fuel consumption in 2011 was 2.6 times the consumption in 1990. The fuel consumption has decreased since 2008.

The emissions follow the increase of fuel consumption.

The decrease of CO emission in 2005 – 2007 is a result of a lower emission factor. This decrease of emission factor is valid for gas turbines in cogeneration plants, but might not be valid for off shore gas turbines. However, the same emission factors have been assumed for CO emission due to the lack of data from off shore gas turbines.

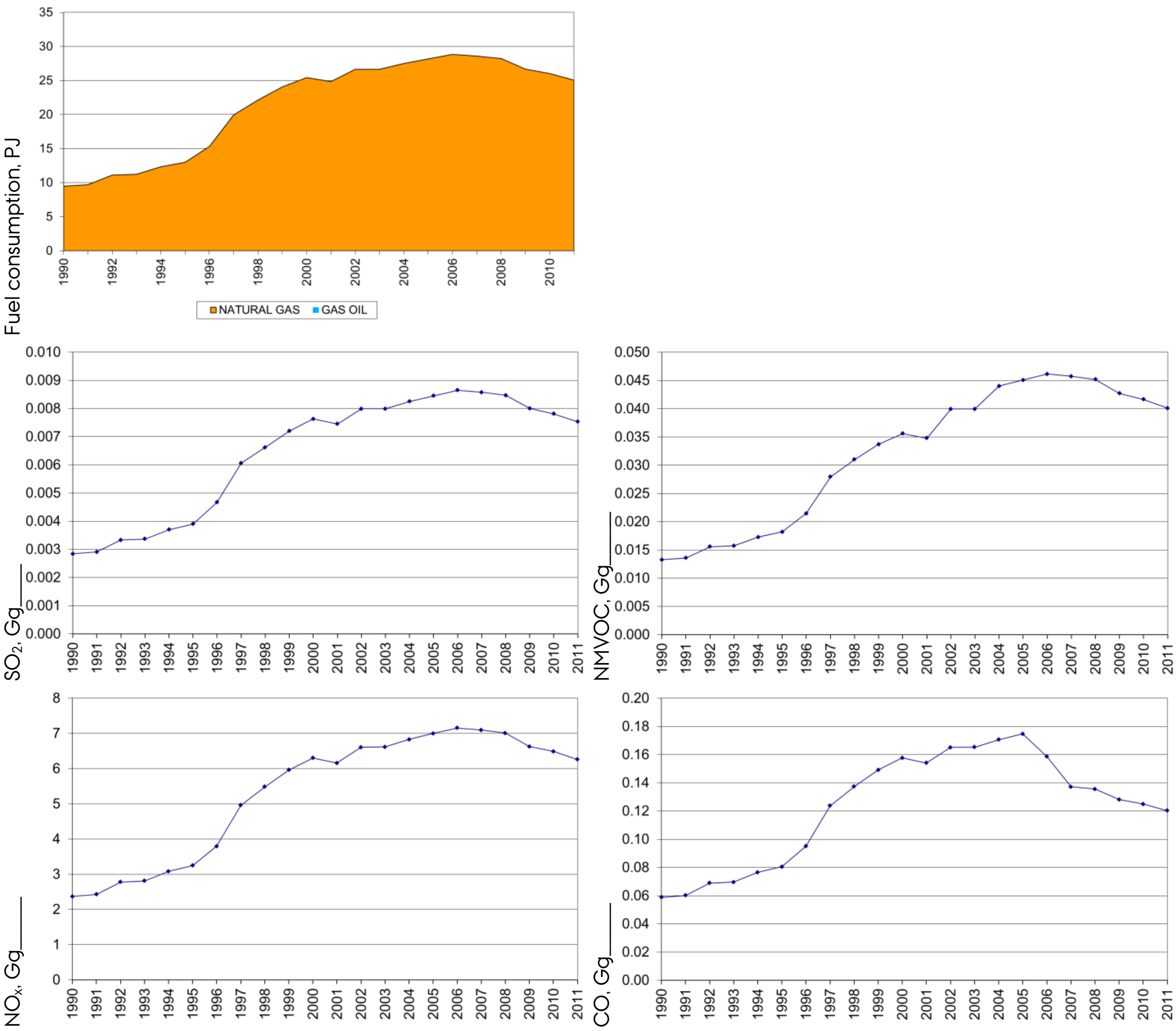


Figure 3.2.34 Time series for 1A1c Other energy industries.

1A2 Industry

Manufacturing industries and construction (Industry) consists of both stationary and mobile sources. In this chapter, only stationary sources are included.

[4] Nybro.

The emission source category *1A2 Industry* consists of the subcategories:

- 1A2a Iron and steel
- 1A2b Non-ferrous metals
- 1A2c Chemicals
- 1A2d Pulp, Paper and Print
- 1A2e Food processing, beverages and tobacco
- 1A2f i Industry-Other

Figure 3.2.35 - 3.2.39 show the time series for fuel consumption and emissions. The subsector *Industry – Other* is the main subsector for fuel consumption and emissions. *Food processing, beverages and tobacco* is also an important subsector.

The total fuel consumption in industrial combustion was 15 % lower in 2011 than in 1990. The consumption of natural gas has increased since 1990 whereas the consumption of coal has decreased. The consumption of residual oil has decreased, but the consumption of petroleum coke increased. The biomass consumption has increased 45 % since 1990.

The SO_2 emission has decreased 80 % since 1990. This is mainly a result of lower consumption of residual oil in the industrial sector (Figure 3.2.35). Further, the sulphur content of residual oil and several other fuels has decreased since 1990 due to legislation and tax laws.

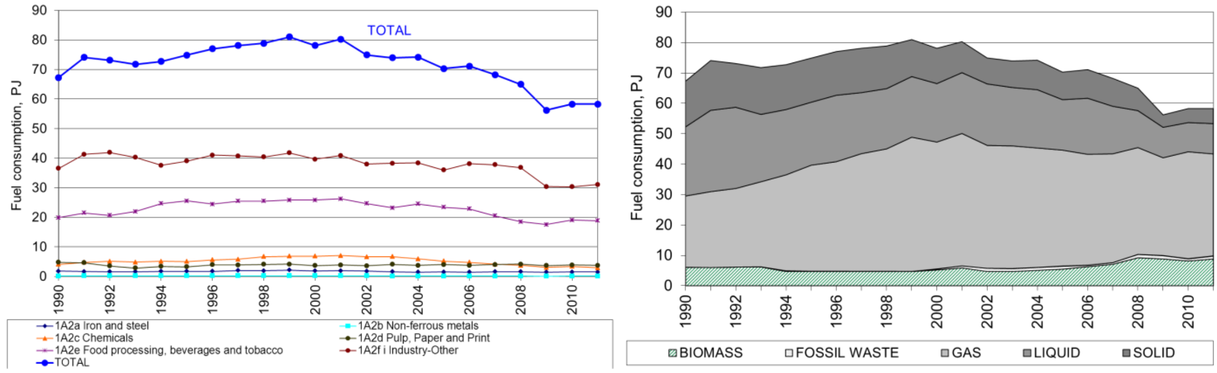
The NO_x emission has decreased 58 % since 1990 due to the reduced emission from industrial boilers in general. Cement production is the main emission source accounting for more than 49 % of the industrial emission in 1990-2009[5]. In 2011, the NO_x emission from cement industry was 35 % of the industrial emission. The NO_x emission from cement production was reduced 70 % since 1990. The reduced emission is a result of installation of SCR on all production units at the cement production plant in 2004-2007[6] and improved performance of the SCR units in recent years. A NOx tax was introduced in 2010 (DMT 2008).

The NMVOC emission has decreased 72 % since 1990. The decrease is mainly a result of decreased emission factor for combustion of wood in industrial boilers. The emission from gas engines has however increased considerably after 1995 due to the increased fuel consumption that is a result of the installation of a large number of industrial CHP plants (Figure 3.2.35). The NMVOC emission factor for gas engines is much higher than for boilers regardless of the fuel.

The CO emission in 2011 was 19 % lower than in 1990. The main source of emission is combustion in *Industry – Other*, primarily in wood and cement production. The CO emission from mineral wool production is included in the industry sector (2A7d).

The large decrease of Hg emission since 2009 is related to a large decrease of particulate matter emission and to a large decrease of coal consumption since 2009.

[5] More than 60 % of sector 1A2f i
[6] To meet emission limit



Fuel consumption in natural gas fuelled engines

Fuel consumption, residual oil and wood

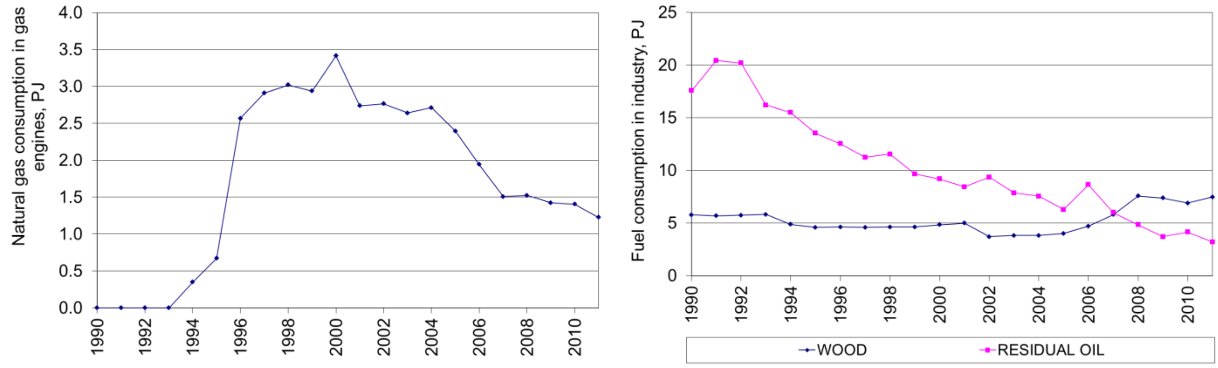


Figure 3.2.35 Time series for fuel consumption, 1A2 Industry.

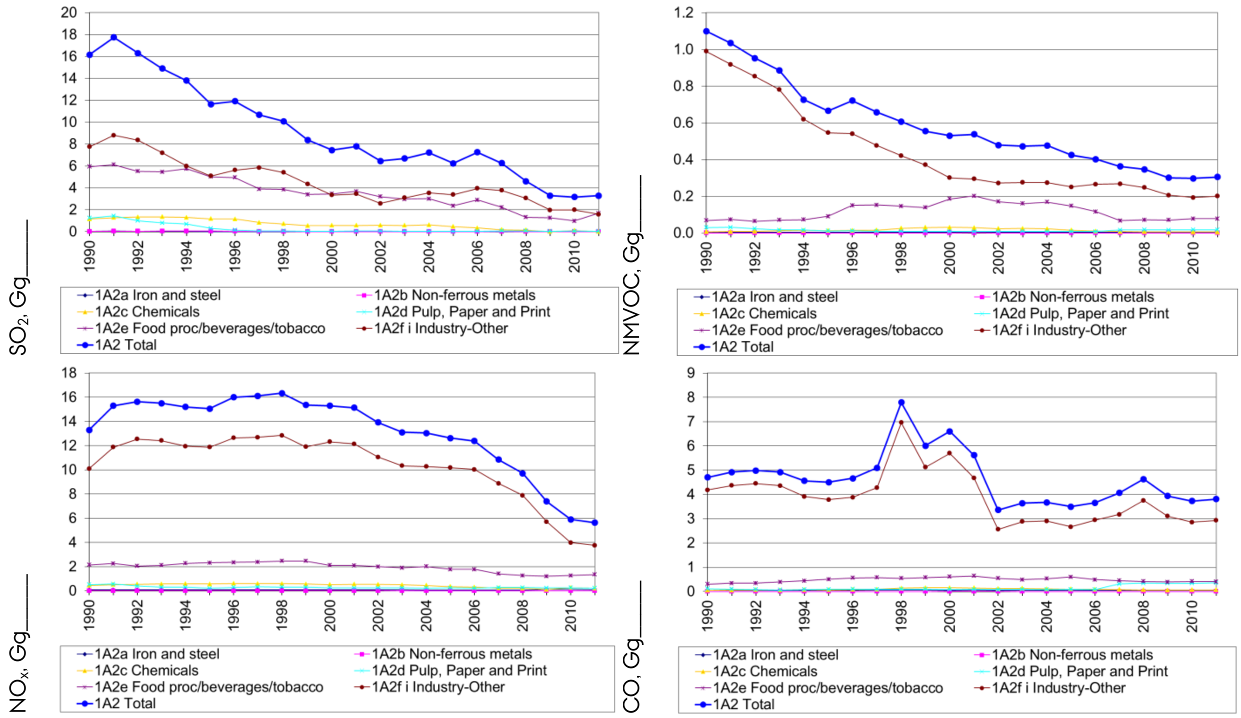


Figure 3.2.36 Time series for SO_2, NO_x, NMVOC and CO emission, 1A2 Industry.

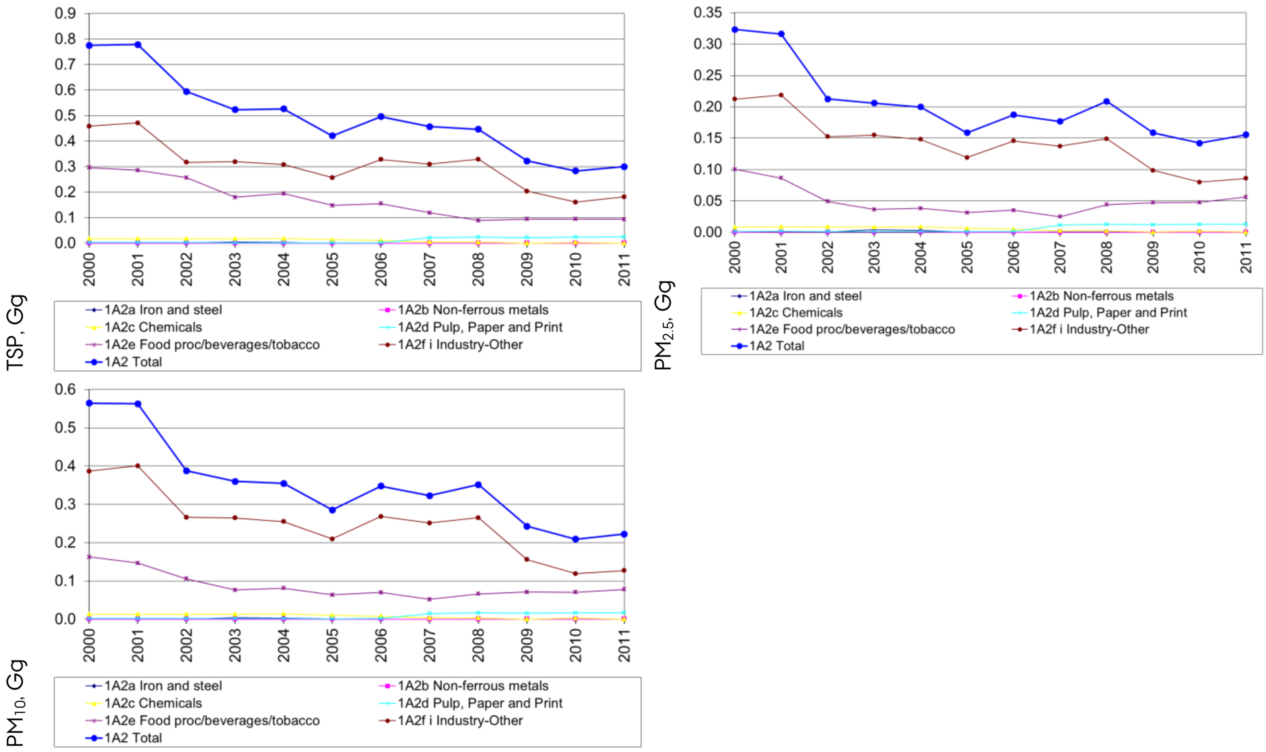


Figure 3.2.37   Time series for PM emission, 1A2 Industry.

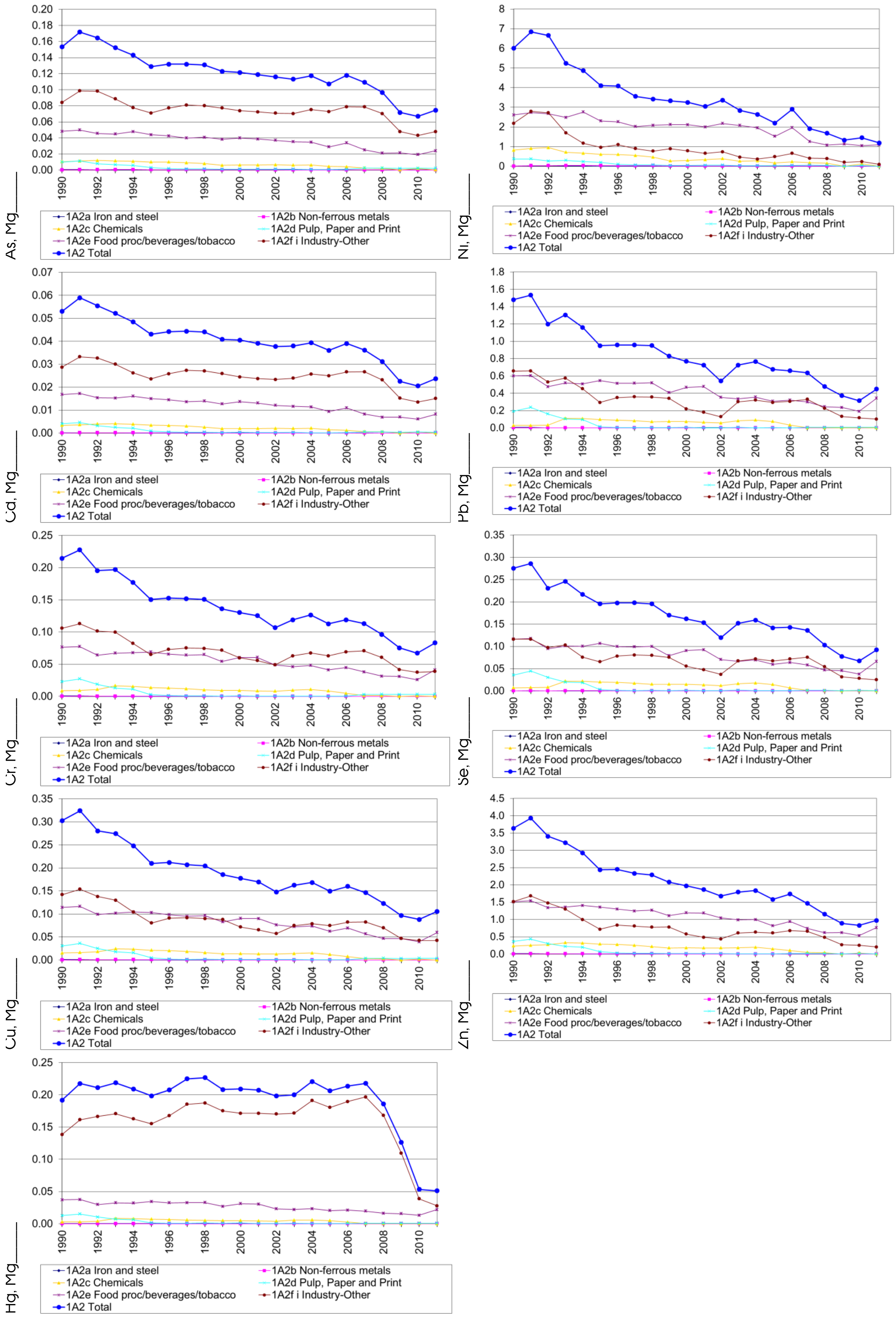


Figure 3.2.38 Time series for HM emission, 1A2 Industry.

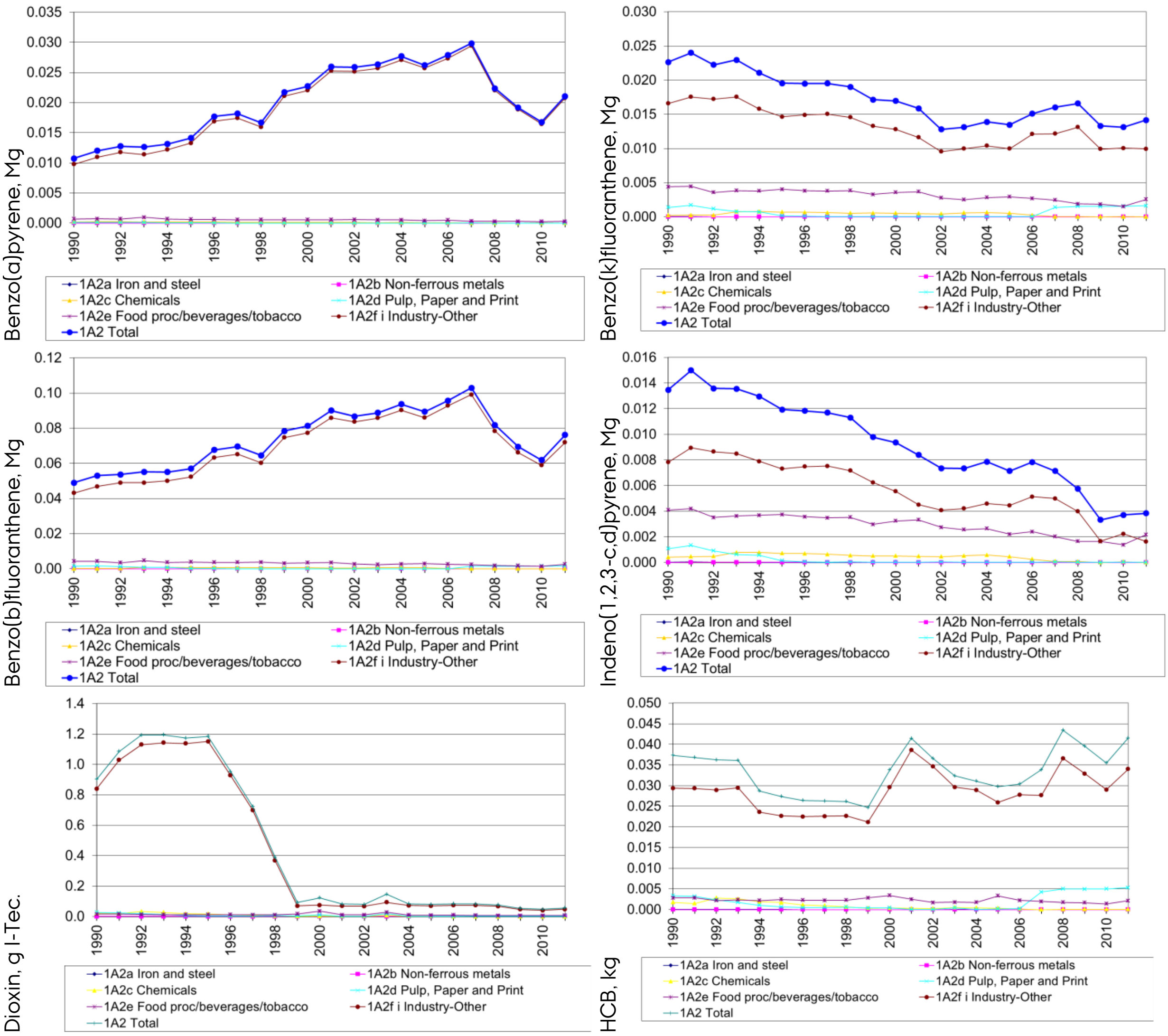


Figure 3.2.39 Time series for PAH, dioxin and HCB emission, 1A2 Industry.

1A2a Iron and steel

Iron and steel is a very small emission source category. Figure 3.2.40 shows the time series for fuel consumption and emissions of SO_2, NO_x, NMVOC and CO.

Natural gas is the main fuel in the subsector.

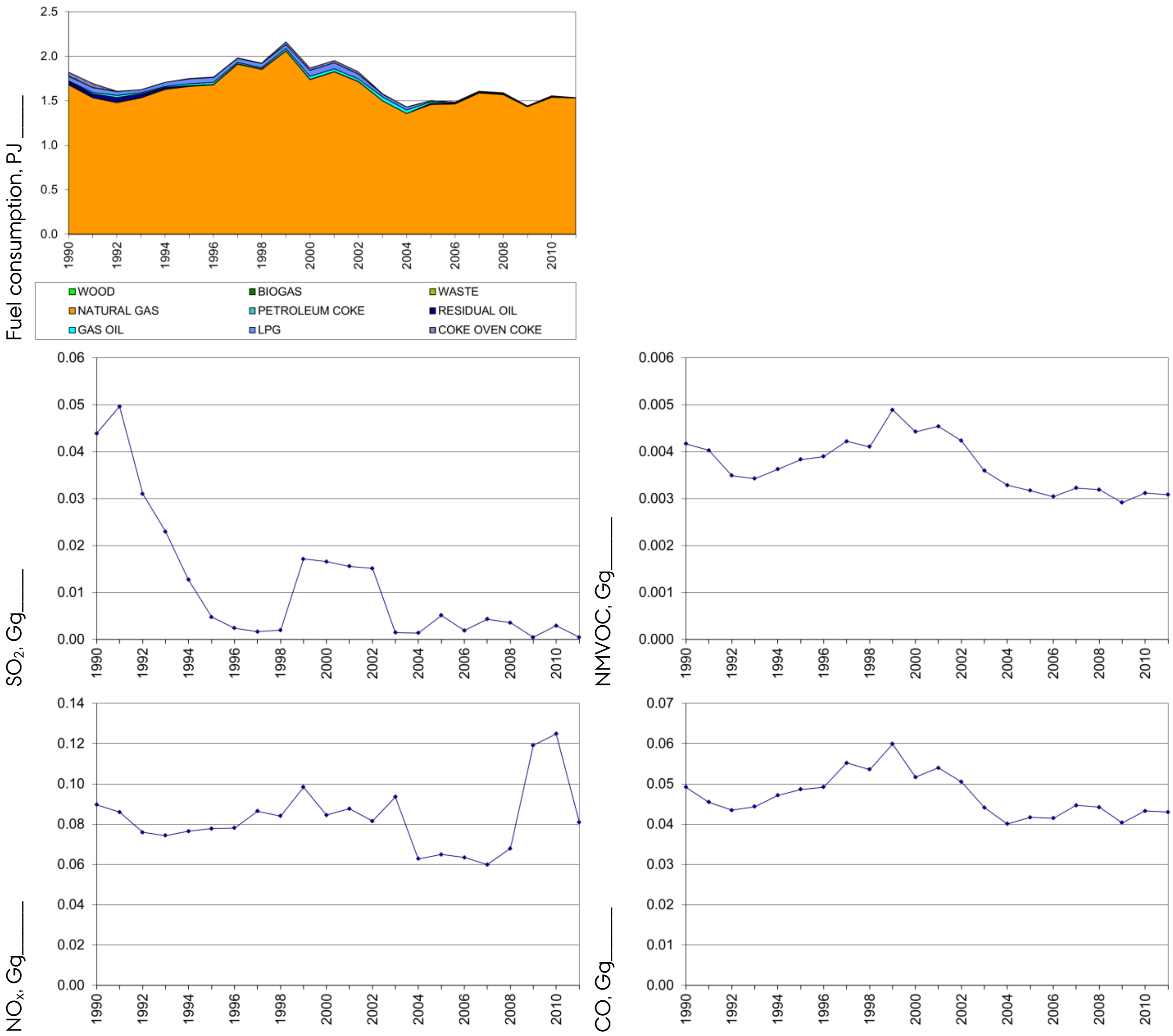


Figure 3.2.40 Time series for 1A2a Iron and steel.

1A2b Non-ferrous metals

Non-ferrous metals is a very small emission source category. Figure 3.2.41 shows the time series for fuel consumption and emissions of SO_2, NO_x, NMVOC and CO.

Natural gas is the main fuel in the subsector. The consumption of residual oil has decreased and the SO_2 emission follows this fuel consumption. The emissions of NO_x, NMVOC and CO follow the fuel consumption.

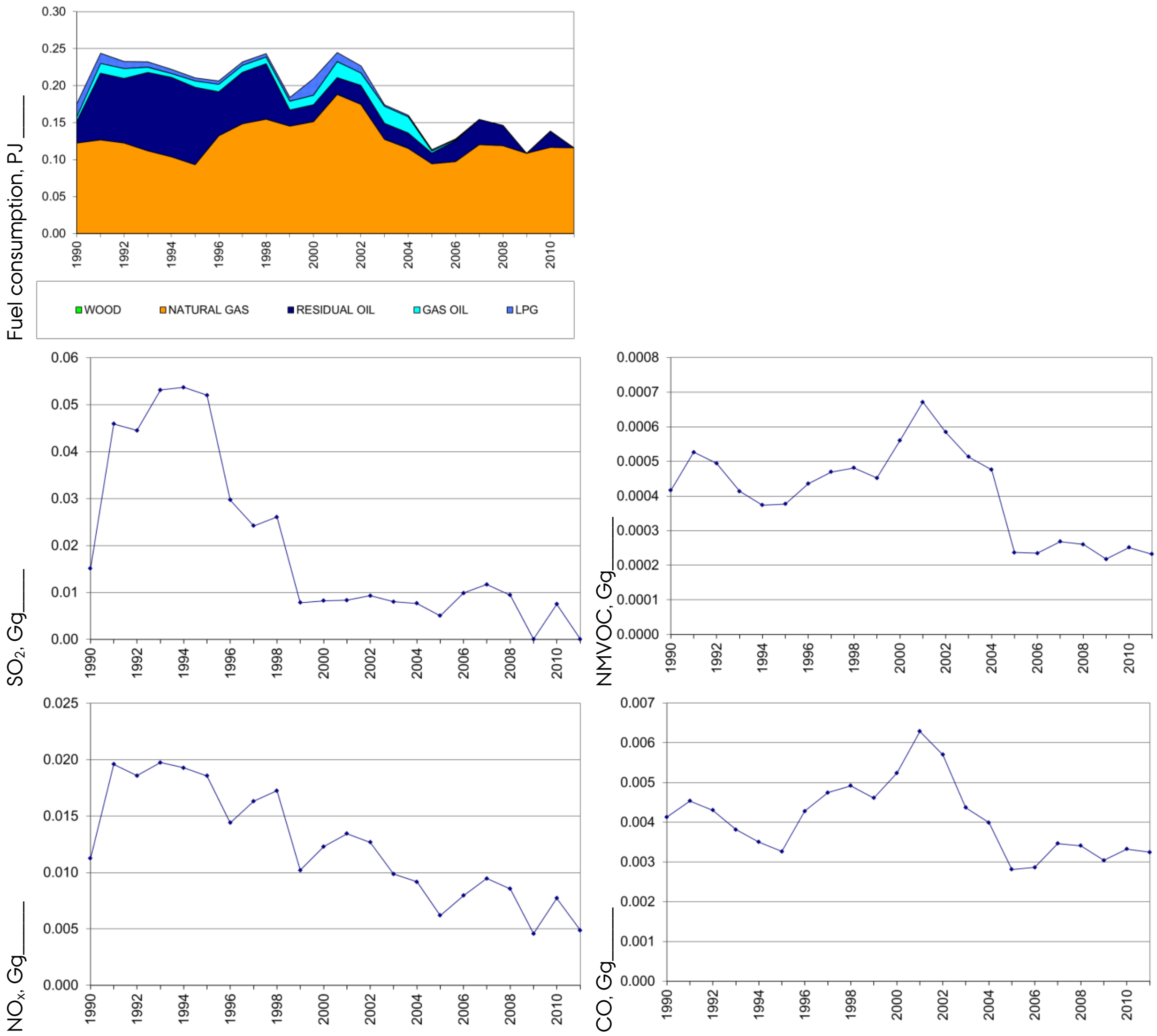


Figure 3.2.41 Time series for 1A2b Non-ferrous metals.

1A2c Chemicals

Chemicals is a minor emission source category. Figure 3.2.42 shows the time series for fuel consumption and emissions of SO_2, NO_x, NMVOC and CO.

Natural gas is the main fuel in this subsector. The consumption of residual oil has decreased and the SO_2 emission follows this fuel consumption.

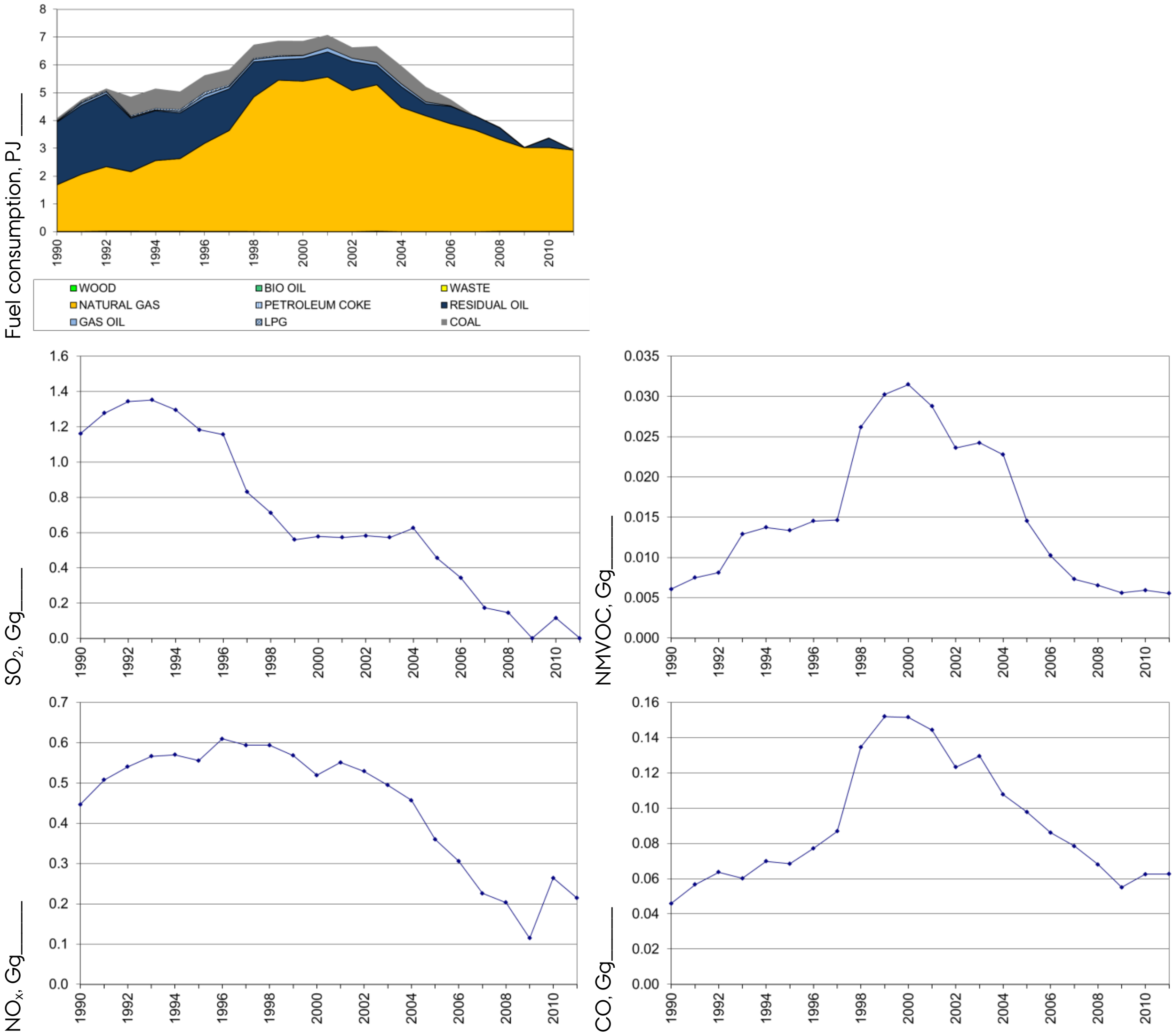


Figure 3.2.42 Time series for 1A2c Chemicals.

1A2d Pulp, paper and print

Pulp, paper and print is a minor emission source category. Figure 3.2.43 shows the time series for fuel consumption and emissions of SO_2, NO_x, NMVOC and CO.

Natural gas - and since 2007 also wood - are the main fuels in the subsector. The consumption of coal and residual oil has decreased and this is reflected in the SO_2 emission time series. The increased consumption of wood since 2007 has resulted in a considerable increase in NMVOC and CO emission in 2007.

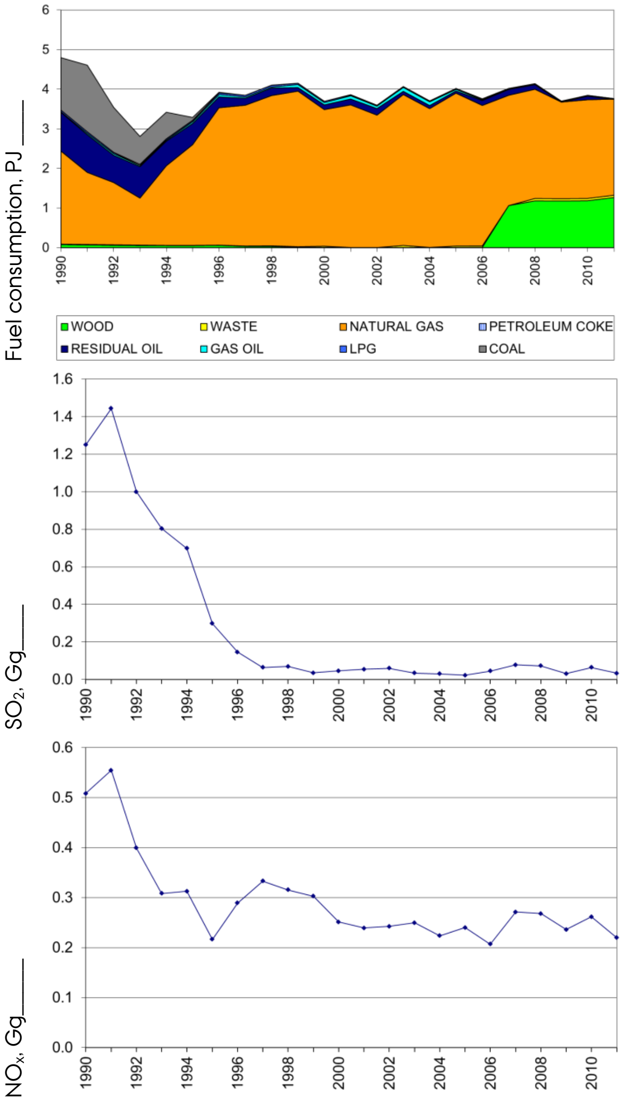


Figure 3.2.43 Time series for 1A2d Pulp, paper and print.

1A2e Food processing, beverages and tobacco

Food processing, beverages and tobacco is a considerable industrial subsector. Figure 3.2.44 shows the time series for fuel consumption and emissions of SO_2, NO_x, NMVOC and CO.

Natural gas and residual oil are the main fuels in the subsector. The consumption of residual oil has decreased whereas the consumption of natural gas has increased. This is reflected in the SO_2 emission time series.

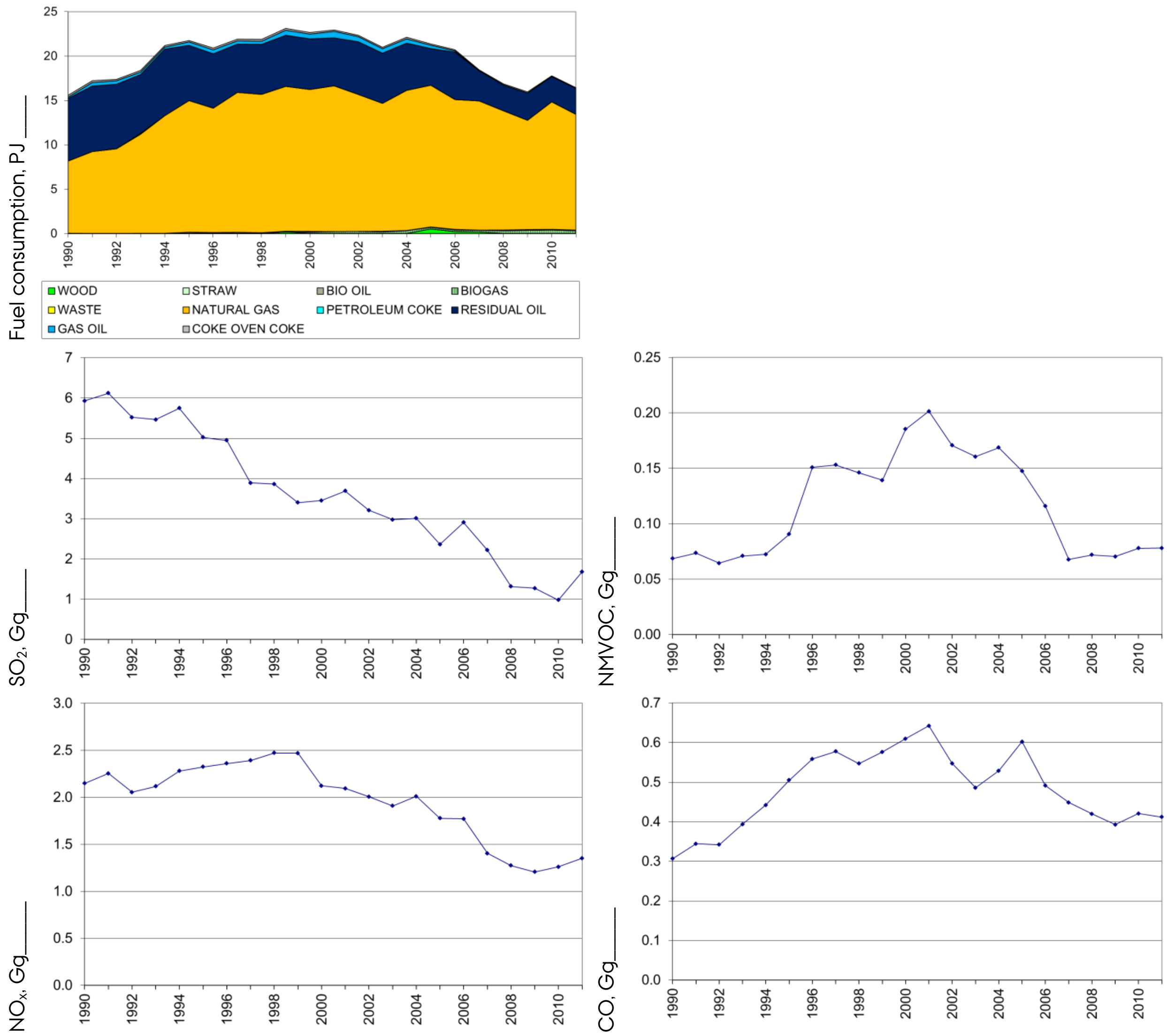


Figure 3.2.44 Time series for 1A2e Food processing, beverages and tobacco.

1A2f Industry – other

Industry - other is a considerable industrial subsector. Figure 3.2.45 shows the time series for fuel consumption and emissions of SO_2, NO_x, NMVOC and CO. The subsector includes cement production that is a major industrial emission source in Denmark.

Natural gas is the main fuels in the subsector in recent years. The consumption of coal and residual oil has decreased.

The NO_x time series is discussed above.

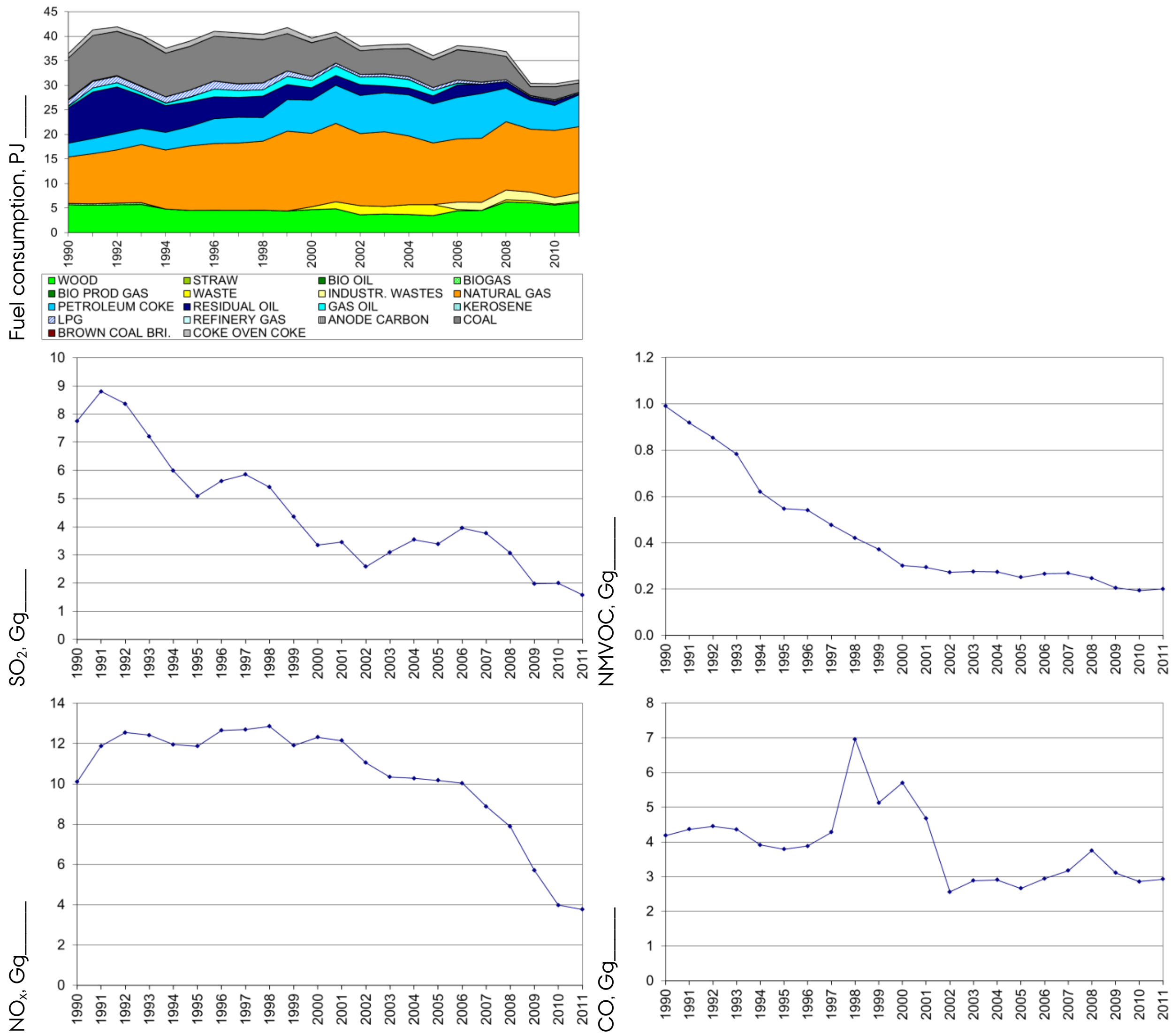


Figure 3.2.45 Time series for 1A2f Industry - other.

1A4 Other Sectors

The emission source category *1A4 Other Sectors* consists of the subcategories:

- 1A4a Commercial/Institutional plants.
- 1A4b Residential plants.
- 1A1c Agriculture/Forestry.

Figure 3.2.46 – 3.2.50 present time series for this emission source category. *Residential plants* is the largest subcategory accounting for the largest part of all emissions. Time series are discussed below for each subcategory.

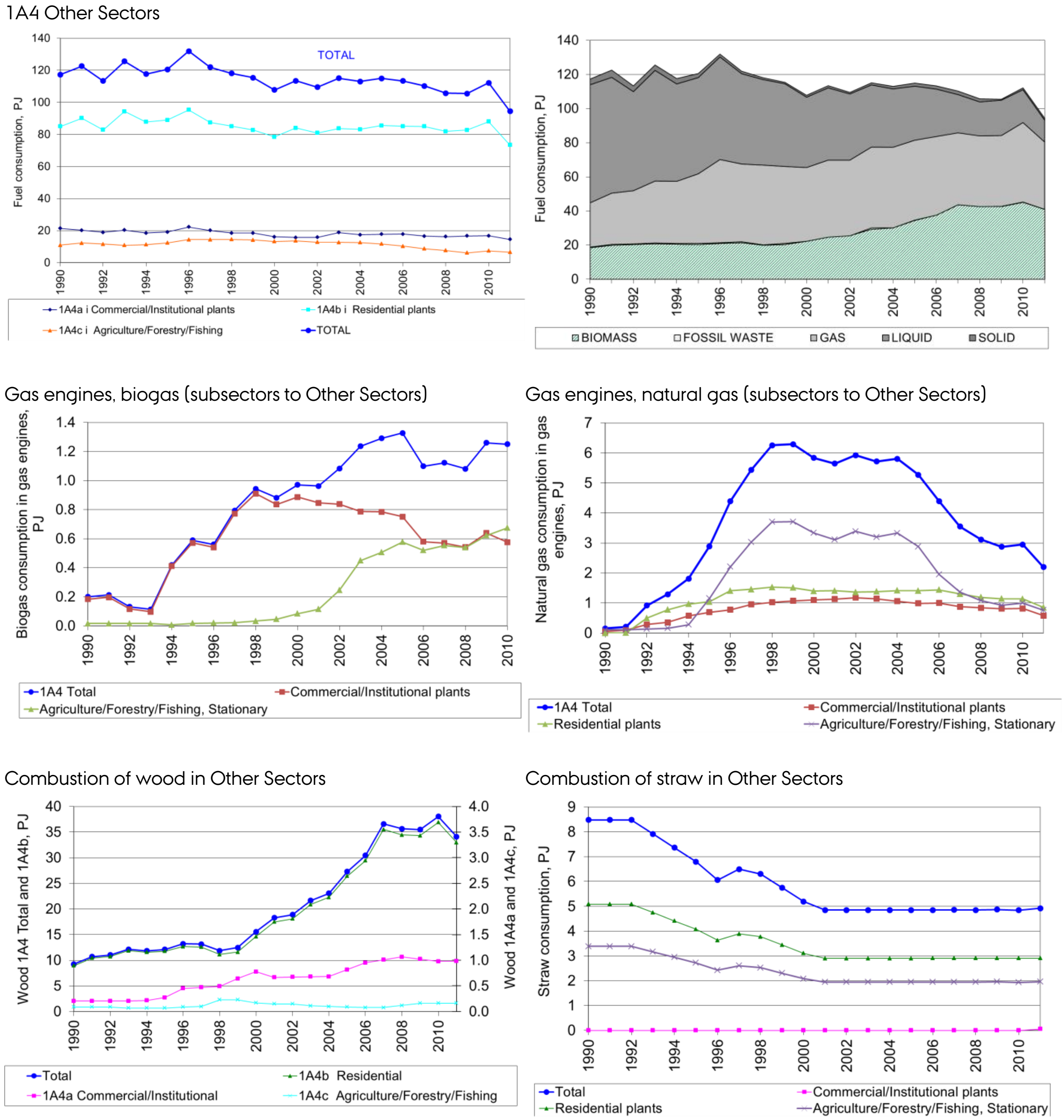


Figure 3.2.46 Time series for fuel consumption, 1A4 Other Sectors.

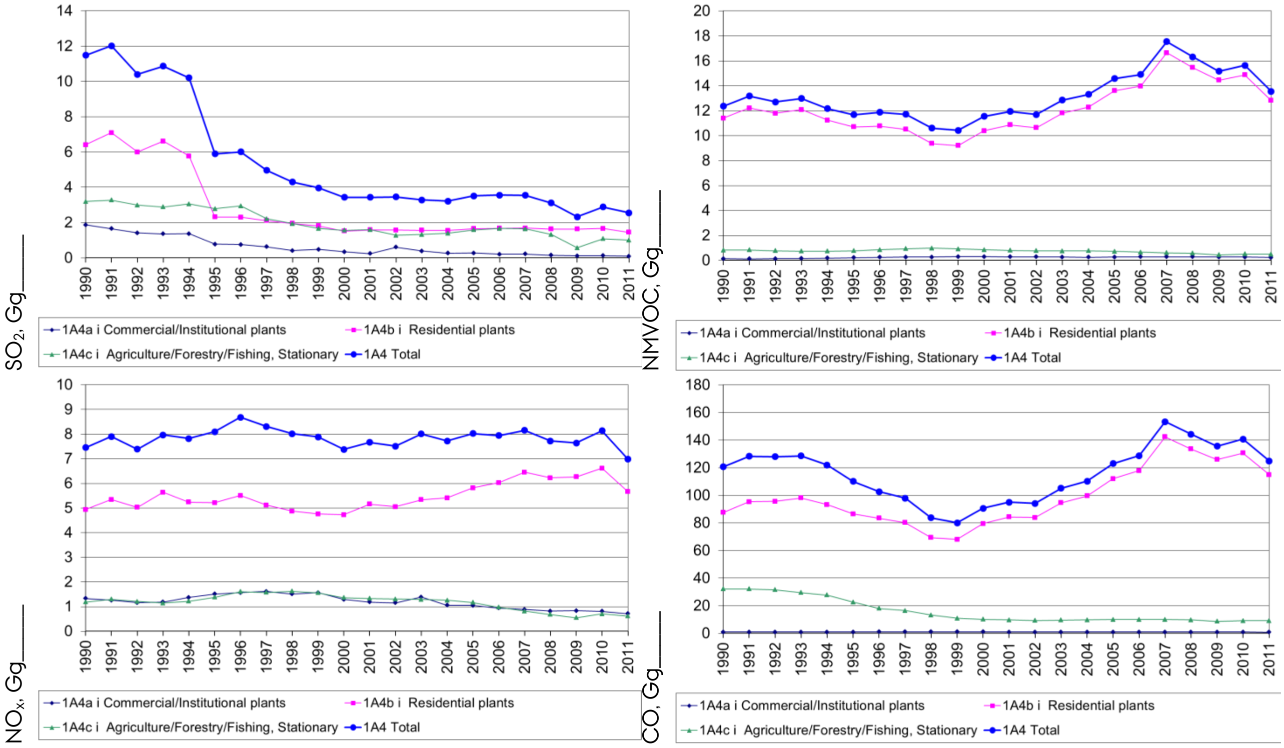


Figure 3.2.47 Time series for SO_2, NO_x, NMVOC and CO emission, 1A4 Other Sectors.

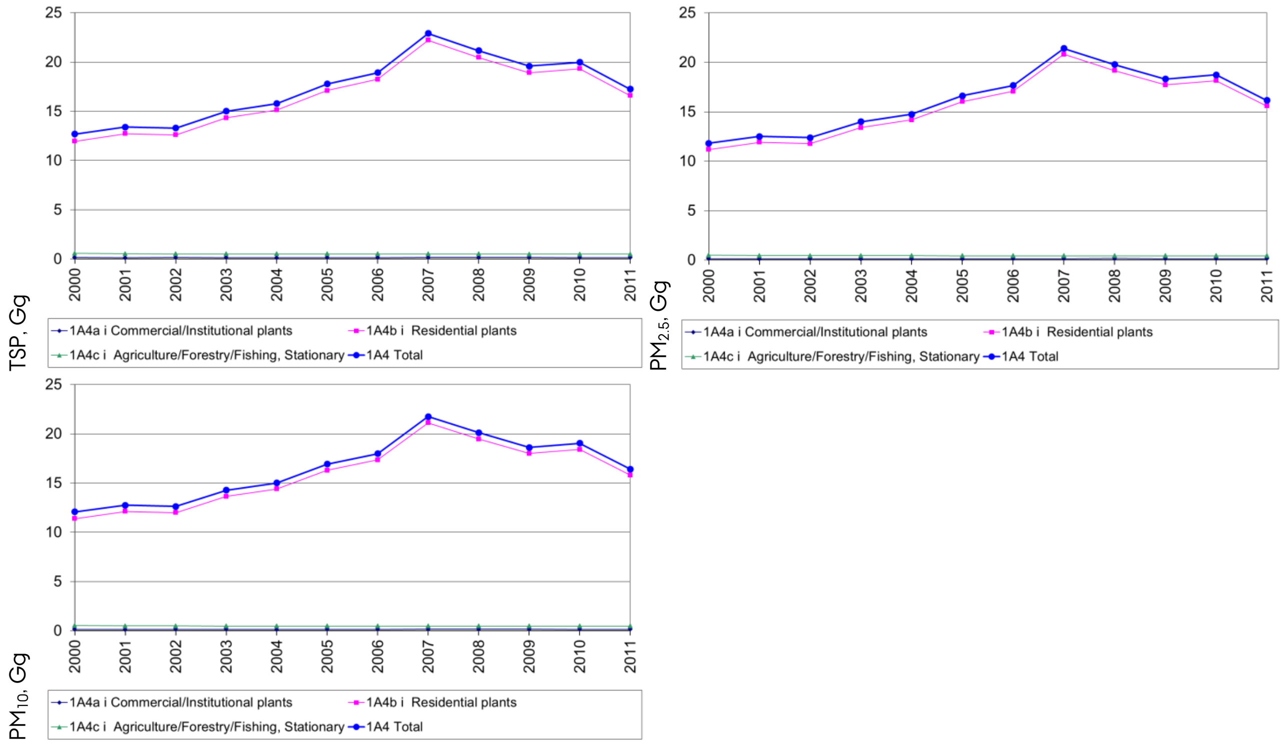


Figure 3.2.48 Time series for PM emission, 1A4 Other Sectors.

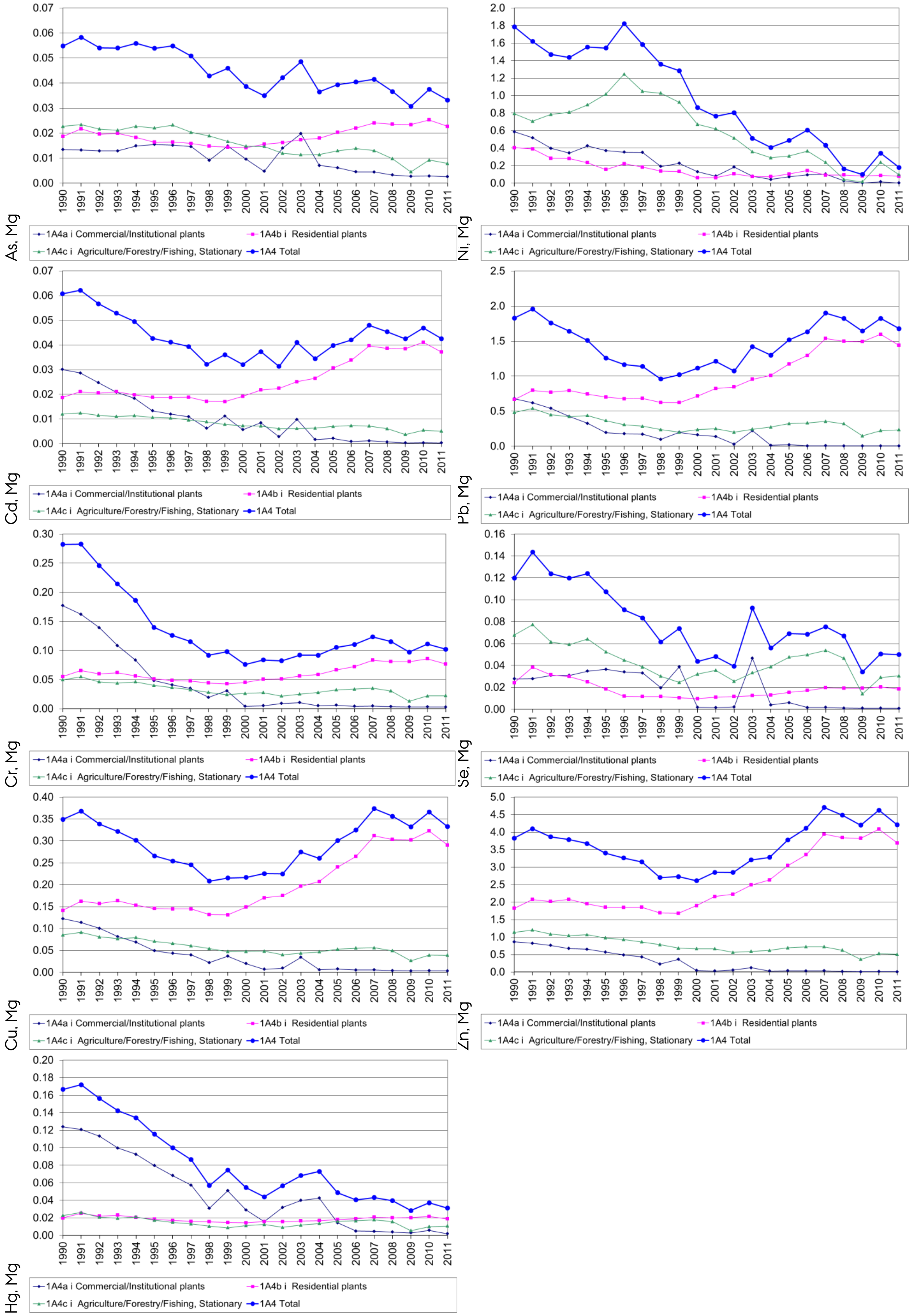


Figure 3.2.49 Time series for HM emission, 1A4 Other Sectors.

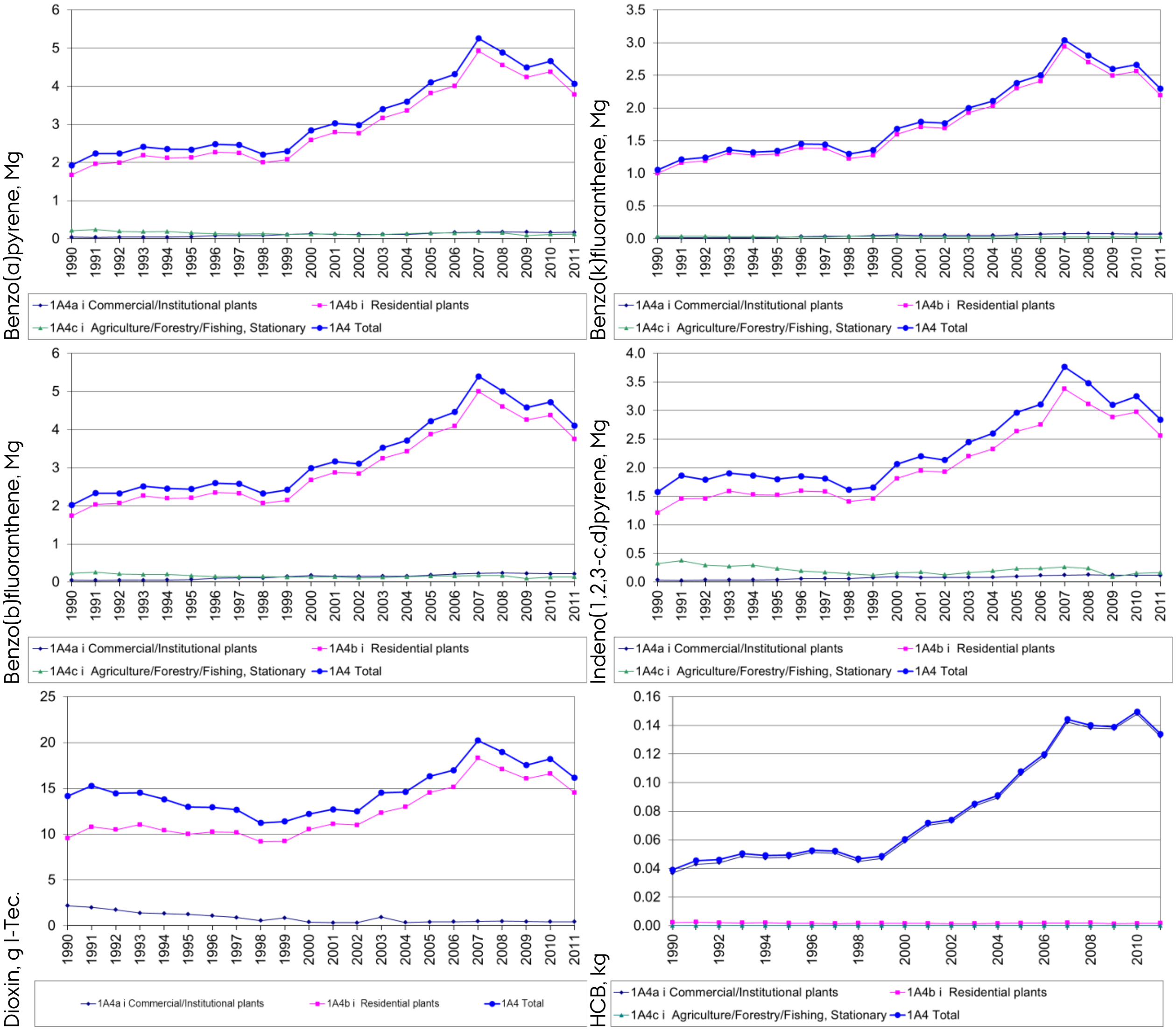


Figure 3.2.50 Time series for PAH, dioxin and HCB emission, 1A4 Other Sectors.

1A4a Commercial and institutional plants

The subcategory *Commercial and institutional plants* has low fuel consumption and emissions compared to the other stationary combustion emission source categories. Figure 3.2.51 shows the time series for fuel consumption and emissions.

The fuel consumption in commercial/institutional plants has decreased 32 % since 1990 and there has been a change of fuel type. The fuel consumption consists mainly of gas oil and natural gas. The consumption of gas oil has decreased and the consumption of natural gas has increased since 1990. The consumption of wood and biogas has also increased. The wood consumption in 2011 was 4.8 times the consumption in 1990 (see Figure 3.2.46).

The SO_2 emission has decreased 95 % since 1990. The decrease is a result of both the change of fuel from gas oil to natural gas and of the lower sulphur content in gas oil and in residual oil. The lower sulphur content (0.05 % for gas oil since 1995 and 0.7 % for residual oil since 1997) is a result of Danish tax laws (DEPA, 1998).

The NO_x emission was 47 % lower in 2011 than in 1990. The decrease is mainly a result of the lower fuel consumption but also the change from gas oil to natural gas has contributed to the decrease. The emission from gas engines and wood combustion has increased.

The NMVOC emission in 2011 was 1.8 times the 1990 emission level. The large increase is a result of the increased combustion of wood that is the main source of emission. The increased consumption of natural gas in gas engines (Figure 3.2.46) also contributes to the increased NMVOC emission.

The CO emission has decreased 16 % since 1990. The emission from wood and from natural gas fuelled engines and boilers has increased whereas the emission from gas oil has decreased. This is a result of the change of fuels used in the sector.

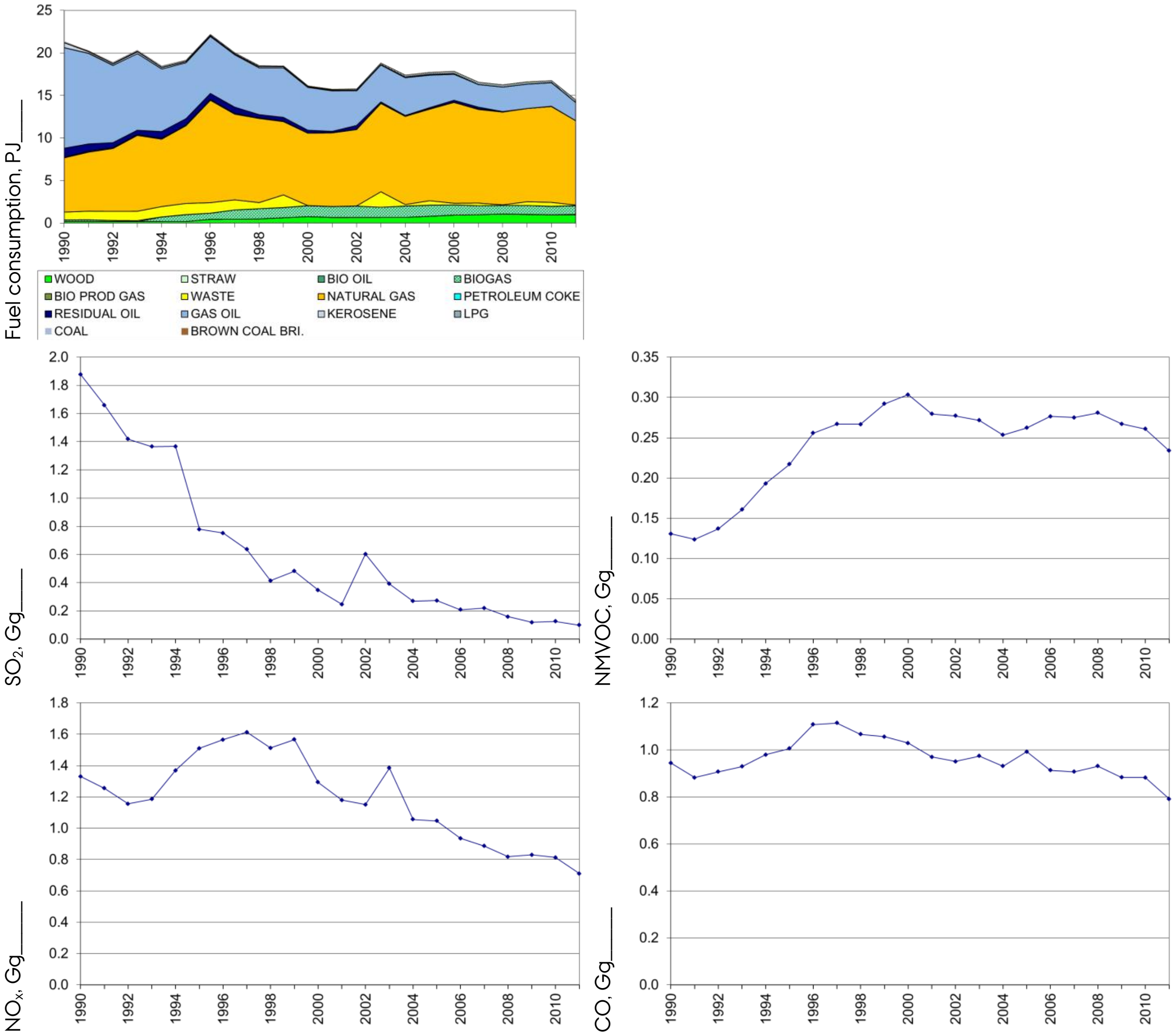


Figure 3.2.51 Time series for 1A4a Commercial /institutional.

1A4b Residential plants

The emission source category *Residential plants* consists of both stationary and mobile sources. In this chapter, only stationary sources are included. Figure 3.2.52 shows the time series for fuel consumption and emissions.

For residential plants, the total fuel consumption was 14 % lower in 2011 than in 1990. The large decrease from 2010 to 2011 is caused by higher temperature in the winter season of 2011. The consumption of gas oil has decreased since 1990 whereas the consumption of wood has increased considerably (3.7 times the 1990 level). The consumption of natural gas has also increased since 1990.

The large decrease (77 %) of SO_2 emission from residential plants is mainly a result of a change of sulphur content in gas oil since 1995. The lower sulphur content (0.05 %) is a result of Danish tax laws (DEPA, 1998). In addition, the consumption of gas oil has decreased and the consumption of natural gas that results in very low SO_2 emissions has increased.

The NO_x emission has increased by 15 % since 1990 due to the increased emission from wood combustion. The emission factor for wood is higher than for gas oil.

The emission of NMVOC has increased 13 % since 1990 as a result of the increased combustion of wood. The emission factor for wood has decreased since 1990, but not as much as the increase in consumption of wood. The emission factors for wood and straw are higher than for liquid or gaseous fuels.

The CO emission has increased 31 % due to the increased use of wood that is the main source of emission. The emission from combustion of straw has decreased since 1990.

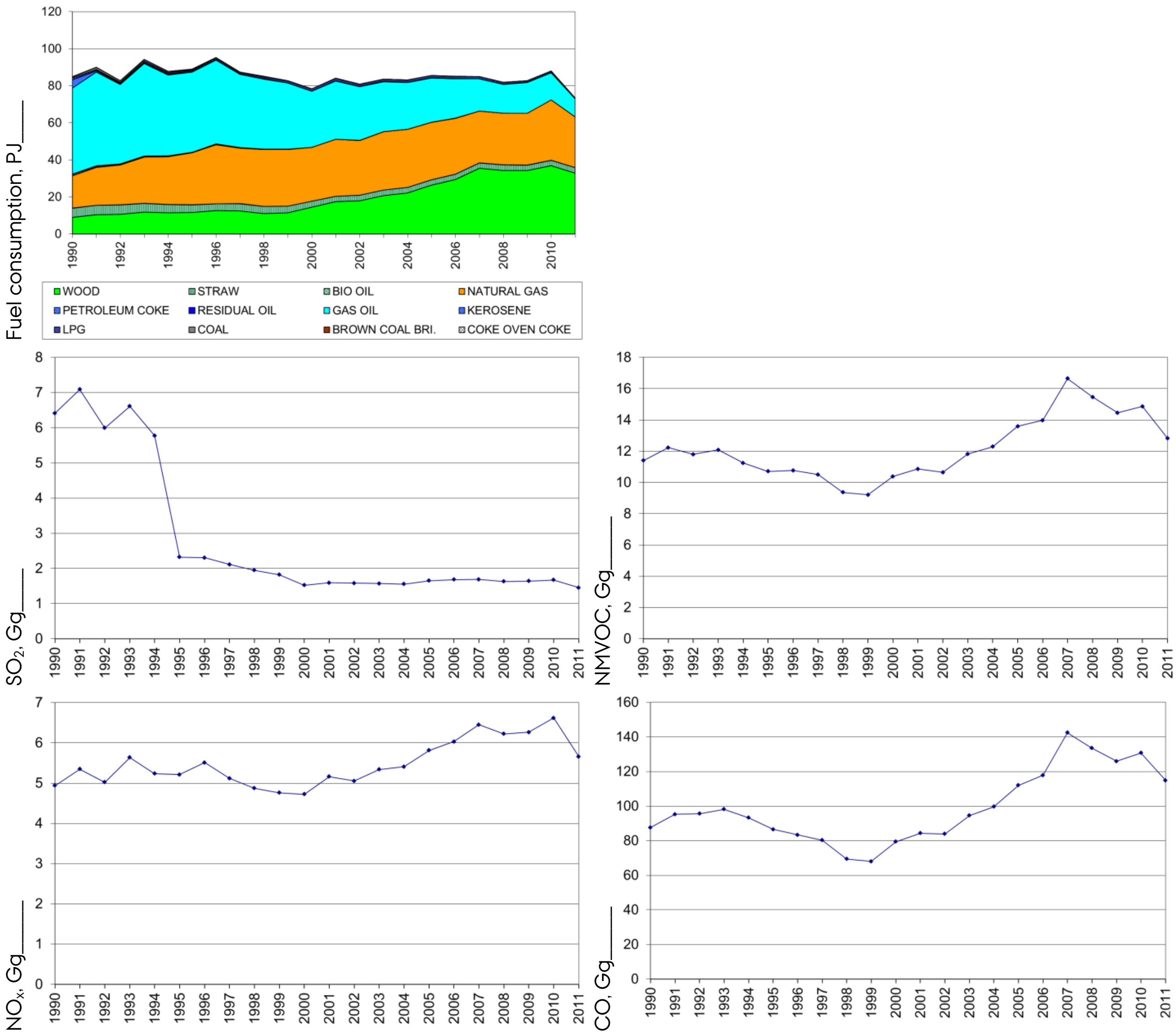


Figure 3.2.52 Time series for 1A4b Residential plants.

1A4c Agriculture/forestry

The emission source category *Agriculture/forestry* consists of both stationary and mobile sources. In this chapter, only stationary sources are included. Figure 3.2.53 shows the time series for fuel consumption and emissions.

For plants in agriculture/forestry, the fuel consumption has decreased 41 % since 1990. A remarkable decrease of fuel consumption has taken place since year 2000.

The type of fuel that has been applied has changed since 1990. In the years 1994-2004, the consumption of natural gas was high, but in recent years, the consumption decreased again. A large part of the natural gas consumption has been applied in gas engines (Figure 3.2.46). Most CHP plants in agriculture/forestry based on gas engines came in operation in 1995-1999. The decrease in later years is a result of the liberalisation of the electricity market.

The consumption of straw has decreased since 1990. The consumption of both residual oil and gas oil has increased after 1990 but has decreased again in recent years.

The SO_2 emission was 68 % lower in 2011 than in 1990. The emission decreased mainly in the years 1996-2002. The main emission sources are coal, residual oil and straw.

The emission of NO_x was 48 % lower in 2011 than in 1990.

The emission of NMVOC has decreased 41 % since 1990. The major emission source is combustion of straw. The consumption of straw has decreased since 1990. The emission from gas engines has increased mainly due to increased fuel consumption.

The CO emission has decreased 71 % since 1990. The major emission source is combustion of straw. In addition to the decrease of straw consumption, the emission factor for straw has also decreased since 1990.

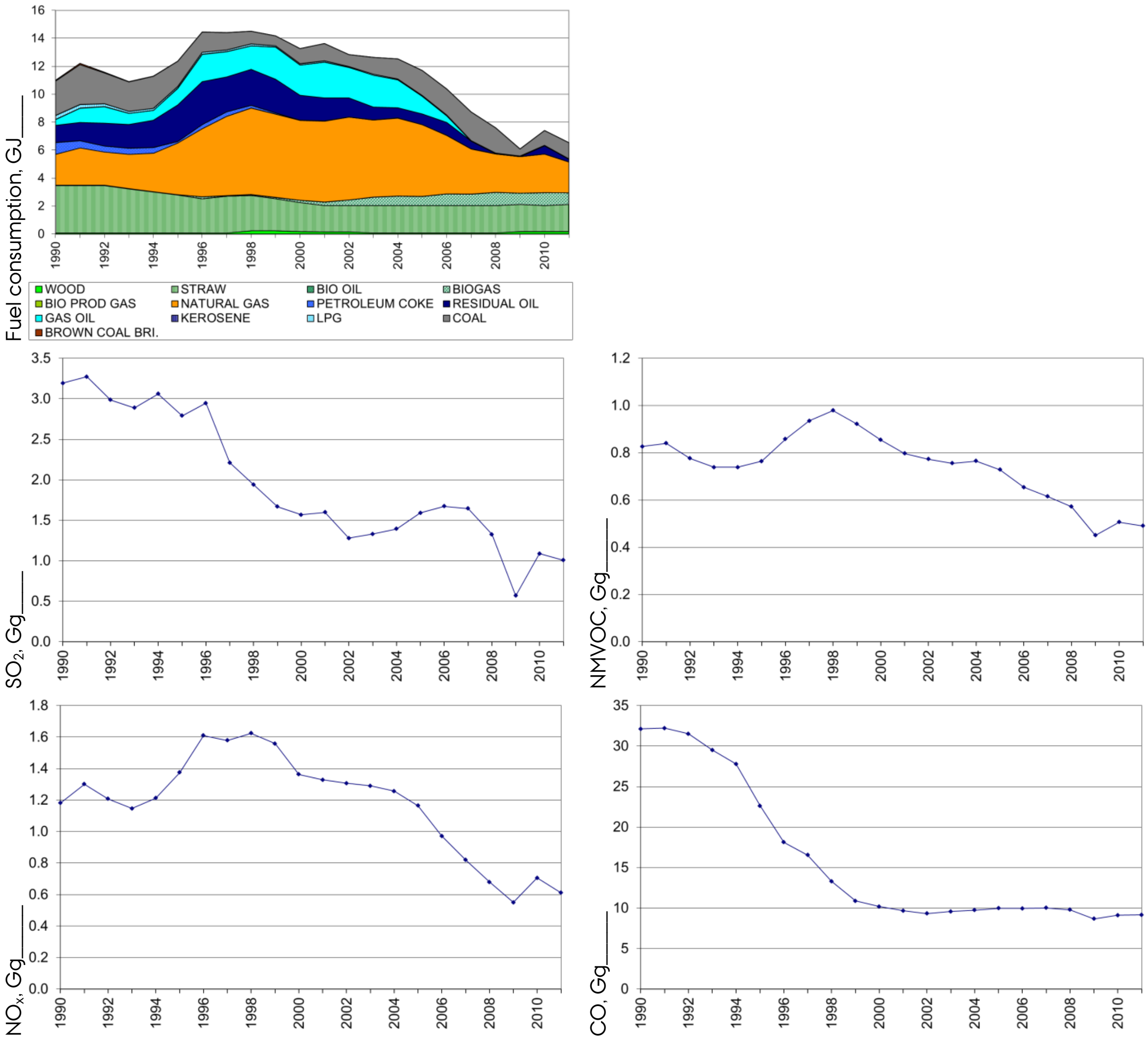


Figure 3.2.53 Time series for 1A4c Agriculture/Forestry.

3.2.5 Methodological issues

The Danish emission inventory is based on the CORINAIR (CORe INventory on AIR emissions) system, which is a European program for air emission inventories. CORINAIR includes methodology structure and software for inventories. The methodology is described in the EMEP/CORINAIR Emission Inventory Guidebook 3rd edition, 2007 update, prepared by the UNECE/EMEP Task Force on Emissions Inventories and Projections (EEA 2007). Emission data are stored in an Access database, from which data are transferred to the reporting formats.

The emission inventory for stationary combustion is based on activity rates from the Danish energy statistics. General emission factors for various fuels, plants and sectors have been determined. Some large plants, such as power plants, are registered individually as large point sources and plant-specific emission data are used.

Tiers

The emission inventory is based on the methodology referred to as Tier 2 and Tier 3 in the IPCC Guidelines (IPCC 1996).

Large point sources

Large emission sources such as power plants, industrial plants and refineries are included as large point sources in the Danish emission database. Each point source may consist of more than one part, e.g. a power plant with several units. By registering the plants as point sources in the database, it is possible to use plant-specific emission factors.

In the inventory for the year 2011, 76 stationary combustion plants are specified as large point sources. These point sources include:

- Power plants and decentralised CHP plants.
- Waste incineration plants.
- Large industrial combustion plants.
- Petroleum refining plants.

The criteria for selection of point sources consist of the following:

- All centralized power plants, including smaller units.
- All units with a capacity of above 25 MW_e.
- All district heating plants with an installed effect of 50 MW_{th} or above and significant fuel consumption.
- All waste incineration plants obligated to report environmental data annually according to Danish law (DEPA 2011).
- Industrial plants,
  - With an installed effect of 50 MW_{th} or above and significant fuel consumption.
  - With a significant process related emission.

The fuel consumption of stationary combustion plants registered as large point sources in the 2011 inventory was 277 PJ. This corresponds to 58 % of the overall fuel consumption for stationary combustion.

A list of the large point sources for 2011 and the fuel consumption rates is provided in Annex 2A-6. The number of large point sources registered in the databases increased from 1990 to 2011.

The emissions from a point source are based either on plant specific emission data or, if plant specific data are not available, on fuel consumption data and the general Danish emission factors. Annex 2A-6 shows which of the emission data for large point sources are plant-specific and the corresponding share of the emission from stationary combustion.

The emission shares from point sources with plant specific data are shown in Table 3.2.13.

Table 3.2.13 Emission share, plant specific data.

Pollutant	Share from plant specific data, %
SO_2	49
NO_x	44
NMVOC	0.03
CO	1
NH_3	2
TSP	3
PM_{10}	2
$PM_{2.5}$	2
As	20
Cd	9
Cr	22
Cu	19
Hg	65
Ni	7
Pb	4
Se	67
Zn	6
HCB	0
Dioxin	1

SO_2 and NO_x emissions from large point sources are often plant-specific based on continuous emission measurements. Emissions of CO, NMVOC, PM, heavy metals and dioxin are also plant-specific for some plants. Plant-specific emission data are obtained from:

- Annual environmental reports / environmental reporting available on the Danish EPA home page[7] (PRTR data)
- Annual plant-specific reporting of SO_2 and NO_x from power plants >25MW$_e$ prepared for the Danish Energy Agency (DEA) and Energinet.dk
- Emission data reported by DONG Energy and Vattenfall, the two major power plant operators
- Emission data reported from industrial plants

Annual environmental reports for the plants include a considerable number of emission data sets. Emission data from annual environmental reports are, in general, based on emission measurements, but some emissions have potentially been calculated from general emission factors.

If plant-specific emission factors are not available, general area source emission factors are used.

Area sources

Fuels not combusted in large point sources are included as source category specific area sources in the emission database. Plants such as residential

[7] http://www3.mst.dk/Miljoeoplysninger/PrtrPublicering/Index

boilers, small district heating plants, small CHP plants and some industrial boilers are defined as area sources. Emissions from area sources are based on fuel consumption data and emission factors. Further information on emission factors is provided below.

Activity rates, fuel consumption

The fuel consumption rates are based on the official Danish energy statistics prepared by DEA. DCE aggregates fuel consumption rates to SNAP categories. Some fuel types in the official Danish energy statistics are added to obtain a less detailed fuel aggregation level cf. Annex 2A-3. The calorific values on which the energy statistics are based are also enclosed in Annex 2A-3. The calorific values shown in the annex are default values but if available plant specific reporting to the energy statistics is based on plant specific calorific values. The correspondence list between the energy statistics and SNAP categories is enclosed in Annex 2A-9.

The fuel consumption of the NFR category *Manufacturing industries and construction* (corresponding to SNAP category 03) is disaggregated into industrial subsectors based on the DEA data set aggregated for the Eurostat reporting (DEA 2012d).

Both traded and non-traded fuels are included in the Danish energy statistics. Thus, for example, estimation of the annual consumption of non-traded wood is included.

Petroleum coke purchased abroad and combusted in Danish residential plants (border trade of 628 TJ in 2011) is not included in the Danish inventory. This is in agreement with the IPCC Guidelines (1996).

The fuel consumption data for large point sources refer to the EU Emission Trading Scheme (EU ETS) data for plants for which the Danish CO_2 emission inventory also refer to EU ETS.

For all other large point sources, the fuel consumption refers to a DEA database (DEA 2012c). The DEA compiles a database for the fuel consumption of each district heating and power-producing plant, based on data reported by plant operators.

The fuel consumption of area sources is calculated as total fuel consumption minus fuel consumption of large point sources.

The Danish national energy statistics includes three fuels used for non-energy purposes, bitumen, white spirit and lubricants. The total consumption for non-energy purposes is relatively low, e.g. 12.4 PJ in 2011. The use of white spirit is included in the inventory in *Solvent and other product use*. The emissions associated with the use of bitumen and lubricants are included in *Industrial Processes.*

In Denmark, all waste incineration is utilised for heat and power production. Thus, incineration of waste is included as stationary combustion in the source category *Energy* (subcategories *1A1*, *1A2* and *1A4)*.

Fuel consumption data are presented in Chapter 3.2.2.

Town gas

Town gas has been included in the fuel category natural gas. The consumption of town gas in Denmark is very low, e.g. 0.6 PJ in 2011. In 1990, the town gas consumption was 1.6 PJ and the consumption has been steadily decreasing throughout the time series.

In Denmark, town gas is produced based on natural gas. The use of coal for town gas production ceased in the early 1980s.

An indicative composition of town gas according to the largest supplier of town gas in Denmark is shown in Table 3.2.14 (KE, 2013).

Table 3.2.14 Composition of town gas currently used (KE, 2013).

Component	Town gas, % (mol.)
Methane	43.9
Ethane	2.9
Propane	1.1
Butane	0.5
Carbon dioxide	0.4
Nitrogen	40.5
Oxygen	10.7

In earlier years, the composition of town gas was somewhat different. Table 3.2.15 is constructed with the input from Københavns Energi (KE) (Copenhagen Energy) and Danish Gas Technology Centre (DGC), (Jeppesen, 2007; Kristensen, 2007). The data refer to three measurements performed several years apart; the first in 2000 and the latest in 2005.

Table 3.2.15 Composition of town gas, information from the period 2000-2005.

Component	Town gas, % (mol.)
Methane	22.3-27.8
Ethane	1.2-1.8
Propane	0.5-0.9
Butane	0.13-0.2
Higher hydrocarbons	0-0.6
Carbon dioxide	8-11.6
Nitrogen	15.6-20.9
Oxygen	2.3-3.2
Hydrogen	35.4-40.5
Carbon monoxide	2.6-2.8

Due to the scarce data available and the very low consumption of town gas compared to consumption of natural gas, the methodology will be applied unchanged in future inventories.

Emission factors

For each fuel and SNAP category (sector and e.g. type of plant), a set of general area source emission factors has been determined. The emission factors are either nationally referenced or based on the international guidebooks: EEA/CORINAIR Guidebook (EEA, 2009)[8] and IPCC Reference Manual (IPCC, 1996).

[8] And former editions of the EMEP/Corinair Guidebook.

A complete list of emission factors including time series and references is provided in Annex 2A-4.

SO_2, NO_x, NMVOC and CO

Emission factors for SO_2, NO_x, NMVOC and CO are listed in Annex 2A-4. The appendix includes references and time series.

The emission factors refer to:

- The EMEP/CORINAIR Guidebook (EEA, 2007 and EEA, 2009).
- The IPCC Guidelines, Reference Manual (IPCC, 1996).
- Danish legislation:
  - The Danish Environmental Protection Agency (DEPA), 2001.
  - The Danish Environmental Protection Agency (DEPA), 1990.
  - The Danish Environmental Protection Agency (DEPA), 2003.
- Danish research reports including:
  - Two emission measurement programs for decentralised CHP plants (Nielsen et al. 2010; Nielsen & Illerup, 2003).
  - Research and emission measurements programs for biomass fuels:
    - Nikolaisen et al. (1998).
    - Jensen & Nielsen (1990).
    - Serup et al. (1999).
    - Christiansen et al. (1997).
  - Research and environmental data from the gas sector:
    - Gruijthuijsen & Jensen (2000).
    - Danish Gas Technology Centre (DGC) (2001).
    - Wit & Andersen (2003).
- Aggregated emission factors for residential wood combustion based on technology distribution (Nielsen & Hessberg, 2011) and technology specific emission factors (EEA 2009; DEPA 2010). For NMVOC the emission factors also refer to Pettersson et al. (2011).
- Calculations based on plant-specific emissions from a considerable number of power plants.
- Calculations based on plant-specific emission data from a considerable number of waste incineration plants. These data refer to annual environmental reports published by plant operators.
- Sulphur content data from oil companies and the Danish gas transmission company, Energinet.dk.
- Additional personal communication.

The emission factors for NMVOC that are not nationally referenced all refer to EEA (2009).

Emission factor time series have been estimated for a considerable number of the emission factors. These are provided in Annex 2A-4.

NH_3

Emission factors have been included for residential wood combustion, residential straw combustion, waste incineration in public power production and residential combustion of coal and coke oven coke. The emission factor for waste incineration plants refers to a Danish emission measurement programme (Nielsen et al. 2010) and all other emission factors refer to the EMEP/EEA Guidebook (EEA 2009). Time series have not been estimated.

Particulate matter (PM)

Emission factors for PM and references for the emission factors are listed in Annex 2A-4. The emission factors are based on:

- The TNO/CEPMEIP emission factor database (CEPMEIP 2001).

In addition, a considerable number of country-specific factors referring to:

- Danish legislation:
  - DEPA (2001), The Danish Environmental Protection Agency, Luftvejledningen (legislation from Danish Environmental Protection Agency).
  - DEPA (1990), The Danish Environmental Protection Agency, Bekendtgørelse 698 (legislation from Danish Environmental Protection Agency).
- Calculations based on plant-specific emission data from a considerable number of waste incineration plants.
- Aggregated emission factors for residential wood combustion based on technology distribution (Nielsen & Hessberg 2011) and technology specific emission factors (EEA, 2009; DEPA, 2010).
- Two emission measurement programs for decentralised CHP plants (Nielsen et al. 2010; Nielsen & Illerup, 2003).
- An emission measurement program for large power plants (Livbjerg et al., 2001).
- Research leading to the first Danish PM emission inventory for stationary combustion (Nielsen et al. 2003)
- Additional personal communication concerning straw combustion in residential plants.

Emission factor time series have been estimated for residential wood combustion and waste incineration. All other emission factors have been considered constant in 2000-2011.

Heavy metals

Emission factors for 2011 for heavy metals (HM) are presented in Annex 2A-4. The appendix includes references and time series. The emission factors refer to:

- Two emission measurement programs carried out on Danish decentralised CHP plants (Nielsen et al. 2010; Nielsen & Illerup, 2003).
- Implied Emission Factors for power plants based on plant specific data reported by the power plant owners.
- Research concerning heavy metal emission factors representative for Denmark (Illerup et al., 1999).
- A CONCAWE study (Denier van der Gon & Kuenen, 2010)
- Data for Danish natural gas (Gruijthuijsen (2001), Energinet.dk homepage)
- Emission factors without national reference all refer to EEA (2009).

Time series have been estimated for coal and for waste incineration. For all other sources, the same emission factors have been applied for 1990-2011.

PAH

Emission factors 2011 for PAH are shown in Annex 2A-4. The appendix includes references. The PAH emission factors refer to:

- Research carried out by TNO (Berdowski et al., 1995).
- Research carried out by Statistics Norway (Finstad et al., 2001).
- An emission measurement program performed on biomass fuelled plants. The project was carried out for the Danish Environmental Protection Agency (Jensen & Nielsen, 1996).
- Two emission measurement programs carried out on Danish decentralised CHP plants (Nielsen et al. 2010; Nielsen & Illerup, 2003).
- Additional information from the gas sector (Jensen, 2001).

For residential wood combustion country specific emission factors have been aggregated based on technology distribution in the sector (Nielsen & Hessberg, 2011) and technology specific emission factors (EEA 2009; DEPA 2010).

Emission factor time series have been estimated for residential wood combustion, natural gas fuelled engines, biogas fuelled engines and waste incineration plants. All other emission factors have been considered constant from 1990 to 2011. In general, emission factors for PAH are uncertain.

Dioxin

Emission factors 2011 for dioxin are shown in Annex 2A-4.

The emission factor for residential wood combustion refers to technology specific emission factors (EEA 2009; DEPA 2010) and to updated technology distribution data (Nielsen & Hessberg, 2011).

The emission factors for decentralised CHP plants[9] refer to an emission measurement program for these plants (Nielsen et al. 2010).

All other emission factors refer to research regarding dioxin emission carried out by NERI to prepare a new dioxin emission inventory (Henriksen et al., 2006).

Time series have been estimated for residential wood combustion and for incineration of waste. For all other sources, the same emission factors have been applied for 1990-2011.

HCB

Emission factors 2011 for HCB are shown in Annex 2A-4. The emission factors for waste incineration plants, CHP plants combusting straw, biogas fuelled engines, gas oil fuelled engines and engines combusting biomass producer gas refer to a Danish emission measurement programme for decentralised CHP plants (Nielsen et al. 2010). All other HCB emission factors refer to the EMEP/EEA Guidebook (EEA, 2009). Time series have been estimated for waste incineration plants. All other emission factors have been considered constant in 1990-2011.

Emission factors for residential wood combustion

For the pollutants NMVOC, CO, TSP, PM_{10}, $PM_{2.5}$, dioxin and PAH emission factors have been based on fuel consumption data and emission factors for 10 different technologies. Technology categories, emission factors and implied emission factors for 2011 are shown in Table 3.2.16. For other pollu-

[9] Natural gas fuelled engines, biogas fuelled engines, gasoil fuelled engines, engines fuelled by biomass producer gas, CHP plants combusting straw or wood and waste incineration plants.

tants, time series have not been estimated and the emission factors are shown in Annex 2A-4.

Table 3.2.16 Emission factors for residential wood combustion.

Technology	NMVOC, g/GJ	CO, g/GJ	TSP, g/GJ	PM_{10}, g/GJ	$PM_{2.5}$, g/GJ	Dioxin, ng/GJ	Benzo (a) pyrene, mg/GJ	Benzo (b) fluoran-thene, mg/GJ	Benzo (k) fluoran-thene, mg/GJ	Indeno (1.2.3-c,d) pyrene, mg/GJ
Old stove	1200	6000	850	810	810	800	250	240	150	180
New stove	560	6000	850	810	810	800	250	240	150	180
Stove according to resent Danish legislation (2008)	250	3000	640	608	608	300	100	90	40	60
Eco labelled stove / new advanced stove	125	1500	250	240	240	150	50	45	20	30
Other stoves	1200	6000	900	860	850	800	250	240	150	180
Old boilers with hot water storage	400	4000	1000	950	900	500	130	200	100	80
Old boilers without hot water storage	400	4000	2000	1900	1800	500	130	200	100	80
New boilers with hot water storage	100	3000	150	142.5	135	300	40	14	8	6
New boilers without hot water storage	250	300	300	285	270	300	12	60	20	20
Pellet boilers	20	500	35	33	32	30	15	16	10	9
IEF residential wood combustion, 2011	343	3100	481	458	452	391	113	113	66	77

Implied emission factors

A considerable part of the emission data for waste incineration plants and large power plants are plant-specific. Thus, the area source emission factors do not necessarily represent average values for these plant categories. To attain a set of emission factors that expresses the average emission for power plants combusting coal and for waste incineration plants, implied emission factors have been calculated for these two plant categories. The implied emission factors are presented in Annex 2A-5. The implied emission factors are calculated as total emission divided by total fuel consumption.

3.2.6 Uncertainty

According to the Good Practice Guidance for LRTAP Emission Inventories (Pulles & Aardenne, 2004) uncertainty estimates should be estimated

Uncertainty estimates include uncertainty with regard to the total emission inventory as well as uncertainty with regard to trends.

Methodology

The Danish uncertainty estimates are based on the simple Tier 1 approach.

The uncertainty estimates are based on emission data for the base year and year 2011 as well as on uncertainties for fuel consumption and emission factors for each of the main SNAP source categories. For particulate matter, 2000 is considered to be the base year, but for all other pollutants, the base year is 1990. The applied uncertainties for activity rates and emission factors are default values referring to Pulles & Aardenne (2004). The uncertainty for PM is, however, estimated by DCE. The default uncertainties for emission factors are given in letter codes representing an uncertainty range. It has been assumed that the uncertainties were in the lower end of the range for all sources and pollutants. The applied uncertainties for emission factors are listed in Table 3.2.17. The uncertainty for fuel consumption in stationary combustion plants is assumed to be 2 %.

Table 3.2.17 Uncertainty rates for emission factors, %.

SNAP source category	SO_2	NO_x	NMVOC	CO	PM	HM	PAH	HCB	Dioxin	NH_3
01	10	20	50	20	50	100	100	1000	500	1000
02	20	50	50	50	500	1000	1000	1000	1000	1000
03	10	20	50	20	50	100	100	1000	1000	1000

Results

The uncertainty estimates for stationary combustion emission inventories are shown in Table 3.2.18. Detailed calculation sheets are provided in Annex 2A-7.

The total emission uncertainty is 7.7 % for SO_2, 17 % for NO_x, 43 % for NMVOC and 45 % for CO. For PM, heavy metals, HCB, dioxin and PAH the uncertainty estimates are larger than 100 %.

Table 3.2.18 Uncertainty estimates, tier 1 approach, 2011.

Pollutant	Uncertainty Total emission, %	Trend 1990-2011, %	Uncertainty Trend, %-age points
SO_2	7.7	-94	± 0.4
NO_x	17	-68	± 2
NMVOC	43	+14	± 7
CO	45	+5	± 3
NH_3	931	+182	± 268
TSP [1)]	469	+26	± 44
PM_{10} [1)]	474	+27	± 39
$PM_{2.5}$ [1)]	479	+30	± 30
As	151	-79	± 20
Cd	364	-86	± 41
Cr	267	-92	± 16
Cu	470	-80	± 74
Hg	121	-88	± 4
Ni	118	-89	± 4
Pb	658	-83	± 90
Se	101	-77	± 6
Zn	732	-76	± 138
HCB	729	-82	± 54
Dioxin	937	-62	± 262
Benzo(b)fluoranthene	974	+102	± 18
Benzo(k)fluoranthene	985	+115	± 34
Benzo(a)pyrene	993	+111	± 7
Indeno(1,2,3-c,d)pyrene	996	+79	± 17

[1)] The base year for PM is year 2000.

3.2.7 Source specific QA/QC and verification

An updated quality manual for the Danish emission inventories has been published in 2013 (Nielsen et al. 2013). The quality manual describes the concepts of quality work and definitions of sufficient quality, critical control points and a list of Point for Measuring (PM). Details about the source specific QA/QC is included in Annex 2A-11.

Documentation concerning verification of the Danish emission inventories has been published by Fauser et al. (2007).

Former editions of the sector report for stationary combustion (Nielsen et al. 2010) has been reviewed by external experts in 2004, 2006 and 2009.

3.2.8 Source specific improvements and recalculations

For stationary combustion plants, the emission estimates for the years 1990-2010 have been updated according to the latest energy statistics published by the Danish Energy Agency. The update included both end use and transformation sectors as well as a source category update.

In response to a recommendation during the EU ESD review in May-August of 2012 a recalculation was made regarding LPG use. In previous inventory submissions the LPG use in road transport was calculated bottom-up in the Danish road transport model. However, the difference between the bottom-up calculated LPG use and the official energy statistics was not handled. In the 2013 submission, the residual LPG use has been allocated to stationary combustion in residential plants. The allocation has been done in dialogue with the Danish Energy Agency. In general, the change in emission is very small. For most years, this has meant an increase in the reported emissions, but for some years in the early part of the time series the emissions have decreased.

The disaggregation of emissions in 1A2 Manufacturing industries and construction has been recalculated based on further improvements to the methodology that was implemented in the 2012 submission. This has caused a reallocation of emissions. The main change being that less emission are allocated to *1A2f Other* and that emissions reported for especially *1A2c Chemicals*, *1A2d Pulp, Paper and Print* and *1A2e Food Processing, Beverages and Tobacco* have increased.

A recalculation for stationary combustion was done as a consequence of the recalculation described for national navigation. An additional amount of fuel oil was allocated to stationary combustion in manufacturing industries and stationary combustion in agriculture and forestry.

A reallocation of emissions has been made from *1A1a Public Electricity and Heat Production* to *1A4a Commercial/Institutional*. This is caused by a different categorization of some combustion plants.

The reported SO_2 emission from 1A1b in 2005-2010 is lower than last year due to reallocation of emissions from refineries.

Recalculations for stationary combustion as a whole are shown in Table 3.2.19.

Table 3.2.19 Recalculations for stationary combustion, emissions reported in 2013 compared to emissions reported in 2012.

	1990	1995	2000	2005	2006	2007	2008	2009	2010
					%				
SO_2	100.0	100.0	100.0	99.8	99.8	99.0	99.6	99.4	99.6
NO_x	100.1	100.2	100.0	100.0	100.2	100.4	100.5	100.6	100.8
NMVOC	100.0	99.9	100.0	100.0	99.9	99.9	99.8	99.9	100.1
CO	100.0	100.0	100.0	100.1	100.0	100.0	100.0	100.0	100.3
TSP			100.0	100.0	100.0	100.0	100.0	100.0	100.1
PM_{10}			100.0	100.0	100.0	100.0	100.0	100.0	100.1
$PM_{2.5}$			100.0	100.0	100.0	100.0	100.0	100.0	100.1
NH_3	100.0	100.0	100.0	99.9	100.0	100.0	100.0	100.0	100.0
As	100.0	100.0	100.0	100.0	99.9	100.0	99.9	99.9	99.8
Cd	100.0	100.0	100.0	100.0	99.9	100.0	99.9	100.0	100.0
Cr	100.0	100.0	100.0	100.0	99.7	100.0	99.8	100.0	100.2
Cu	100.0	100.0	100.0	100.0	99.7	100.0	99.8	100.0	100.0
Hg	100.0	100.0	100.0	100.0	99.9	100.0	99.9	100.0	100.0
Ni	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.7	100.0
Pb	100.0	100.0	100.0	100.0	99.5	100.0	99.6	100.0	100.1
Se	100.0	100.0	100.0	100.0	99.8	100.0	99.9	100.0	100.0
Zn	100.0	100.0	100.0	100.0	99.7	100.0	99.7	100.0	99.8
HCB	100.0	99.9	99.8	99.7	99.6	99.7	99.7	99.3	99.9
Dioxin	100.0	100.0	100.2	99.9	99.8	100.0	99.9	100.2	100.4
Benzo(a)pyrene	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Benzo(b)fluoranthene	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Benzo(k)fluoranthene	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Indeno(123cd)pyrene	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

3.2.9 Source specific planned improvements

A number of improvements are planned for the stationary combustion inventories:

1) Improved documentation for emission factors.

The reporting of, and references for, the applied emission factors will be further developed in future inventories.

2) Documentation concerning the HM emission factor update.

A report documenting the improved HM emission inventory is expected to be published in 2013.

3) Implementation of emission factors from the updated versions of the EEA Guidebook.

Some emission factors still refer to older versions of the EMEP/CORINAIR Guidebook.

4) Improved uncertainty estimate.

The current uncertainty estimates are based on SNAP main categories and default uncertainties. The source categories will be changed to NFR categories and country specific uncertainty estimates included for some of the main emission sources.

5) Improvement of the HCB inventory

3.2.10 References

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3.3 Transport and other mobile sources (NFR sector 1A2, 1A3, 1A4 and 1A5)

The emission inventory basis for mobile sources is fuel consumption information from the Danish energy statistics. In addition, background data for road transport (fleet and mileage), air traffic (aircraft type, flight numbers, origin and destination airports), national sea transport (fuel surveys, ferry technical data, number of return trips, sailing time) and non-road machinery (engine no., engine size, load factor and annual working hours) are used to make the emission estimates sufficiently detailed. Emission data mainly comes from the EMEP/EEA Air Pollutant Emission Inventory Guidebook (EMEP/EEA, 2009). However, for railways, measurements specific to Denmark are used.

In the Danish emission database, all activity rates and emissions are defined in SNAP sector categories (Selected Nomenclature for Air Pollution), according to the CollectER system. The emission inventories are prepared from a complete emission database based on the SNAP sectors. The aggregation to the sector codes used for both the UNFCCC and UNECE Conventions is based on a correspondence list between SNAP and CFR/NFR classification codes shown in Table 3.3.1 below (mobile sources only).

Table 3.3.1 SNAP – CRF/NFR correspondence table for transport.

SNAP classification	CRF/NFR classification
07 Road transport	1A3b Transport-Road
0801 Military	1A5 Other
0802 Railways	1A3c Railways
0803 Inland waterways	1A3d Transport-Navigation
080402 National sea traffic	1A3d Transport-Navigation
080403 National fishing	1A4c Agriculture/forestry/fisheries
080404 International sea traffic	1A3d Transport-Navigation (international)
080501 Dom. airport traffic (LTO < 1000 m)	1A3a Transport-Civil aviation
080502 Int. airport traffic (LTO < 1000 m)	1A3a Transport-Civil aviation (international)
080503 Dom. cruise traffic (> 1000 m)	1A3a Transport-Civil aviation
080504 Int. cruise traffic (> 1000 m)	1A3a Transport-Civil aviation (international)
0806 Agriculture	1A4c Agriculture/forestry/fisheries
0807 Forestry	1A4c Agriculture/forestry/fisheries
0808 Industry	1A2f Industry-Other
0809 Household and gardening	1A4b Residential
0811 Commercial and institutional	1A4a Commercial and institutional

Military transport activities (land and air) refer to the CRF/NFR sector Other (1A5), while the Transport-Navigation sector (1A3d) comprises national sea transport (ship movements between two Danish ports) and recreational craft (SNAP code 0803).

For aviation, Landing and Take Off ((LTO)[1] refers to the part of flying, which is below 1000 m. This part of the aviation emissions (SNAP codes 080501 and 080502) are included in the national emissions total as prescribed by the UNECE reporting rules. According to UNFCCC the national emissions for aviation comprise the emissions from domestic LTO (0805010) and

[1] A LTO cycle consists of the flying modes approach/descent, taxiing, take off and climb out. In principle the actual times-in-modes rely on the actual traffic circumstances, the airport configuration, and the aircraft type in question.

domestic cruise (080503). The fuel consumption and emission development explained in the following are based on these latter results, in order to be consistent with the Danish NIR report.

The working machinery and equipment in industry (SNAP code 0808) is grouped in Industry-Other (1A2f), while agricultural and forestry non-road machinery (SNAP codes 0806 and 0807) is accounted for in the Agriculture/forestry/fisheries (1A4c) sector together with fishing activities.

For mobile sources, internal database models for road transport, air traffic, sea transport and non-road machinery have been set up at DCE, Aarhus University, in order to produce the emission inventories. The output results from the DCE models are calculated in a SNAP format, as activity rates (fuel consumption) and emission factors, which are then exported directly to the central Danish CollectER database.

Apart from national inventories, the DCE models are used also as a calculation tool in research projects, environmental impact assessment studies, and to produce basic emission information which requires various aggregation levels.

3.3.1 Source category description

The following description of source categories explains the development in fuel consumption and emissions for road transport and other mobile sources.

Fuel consumption

Table 3.3.2 Fuel consumption (PJ) for domestic transport in 2011 in NFR sectors.

NFR ID	Fuel consumption (PJ)
Industry-Other (1A2f)	13.8
Civil Aviation (1A3a)	2.0
Road (1A3b)	165.2
Railways (1A3c)	3.4
Navigation (1A3d)	7.5
Comm./Inst. (1A4a)	2.3
Residential (1A4b)	0.9
Agri./for./fish. (1A4c)	25.8
Military (1A5)	2.7
Total	220.9

Table 3.3.2 shows the fuel consumption for domestic transport based on DEA statistics for 2011 in NFR sectors. The fuel consumption figures in time series 1985-2011 are given in Annex 2.B.16 (NFR format) and are shown for 2011 in Annex 2.B.15 (CollectER format). Road transport has a major share of the fuel consumption for domestic transport. In 2011 this sector’s fuel consumption share is 74 %, while the fuel consumption shares for Agriculture/forestry/fisheries and Industry-Other are 12 and 6 %, respectively. For the remaining sectors the total fuel consumption share is 8 %.

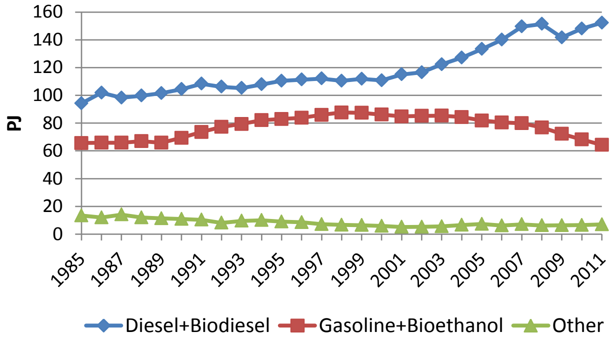


Figure 3.3.1 Fuel consumption pr fuel type for domestic transport 1985-2011.

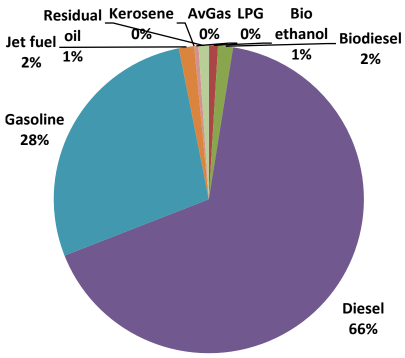


Figure 3.3.2 Fuel consumption share pr fuel type for domestic transport in 2011.

From 1985 to 2011, diesel (sum of diesel and biodiesel) and gasoline (sum of gasoline and E5) fuel consumption has changed by 62 % and - 2 %, respectively (Figure 3.3.1), and in 2011 the fuel consumption shares for diesel and gasoline were 68 % and 29 %, respectively (not shown). Other fuels only have a 3 % share of the domestic transport total (Figures 3.3.2). Almost all gasoline is used in road transportation vehicles. Gardening machinery and recreational craft are merely small consumers. Regarding diesel, there is considerable fuel consumption in most of the domestic transport categories, whereas a more limited use of residual oil and jet fuel is being used in the navigation sector and by aviation (civil and military flights), respectively[2].

Road transport

As shown in Figure 3.3.3, the fuel consumption for road transport[3] has generally increased until 2007, except from a small fuel consumption decline noted in 2000. The impact of the global financial crisis on fuel consumption for road transport becomes visible for 2008 and 2009. The fuel consumption development is due to a decreasing trend in the use of gasoline fuels from 1999 onwards combined with a steady growth in the use of diesel until 2007. Within sub-sectors, passenger cars represent the most fuel-consuming vehicle category, followed by heavy-duty vehicles, light duty vehicles and 2-wheelers, in decreasing order (Figure 3.3.4).

[2] Biofuels are sold at gas filling stations and are assumed to be used by road transport vehicles

[3] The share of bioethanol and biodiesel in the gasoline and diesel fuel blends for road transport, respectively, are 3.4 and 3.3 %, in 2011.

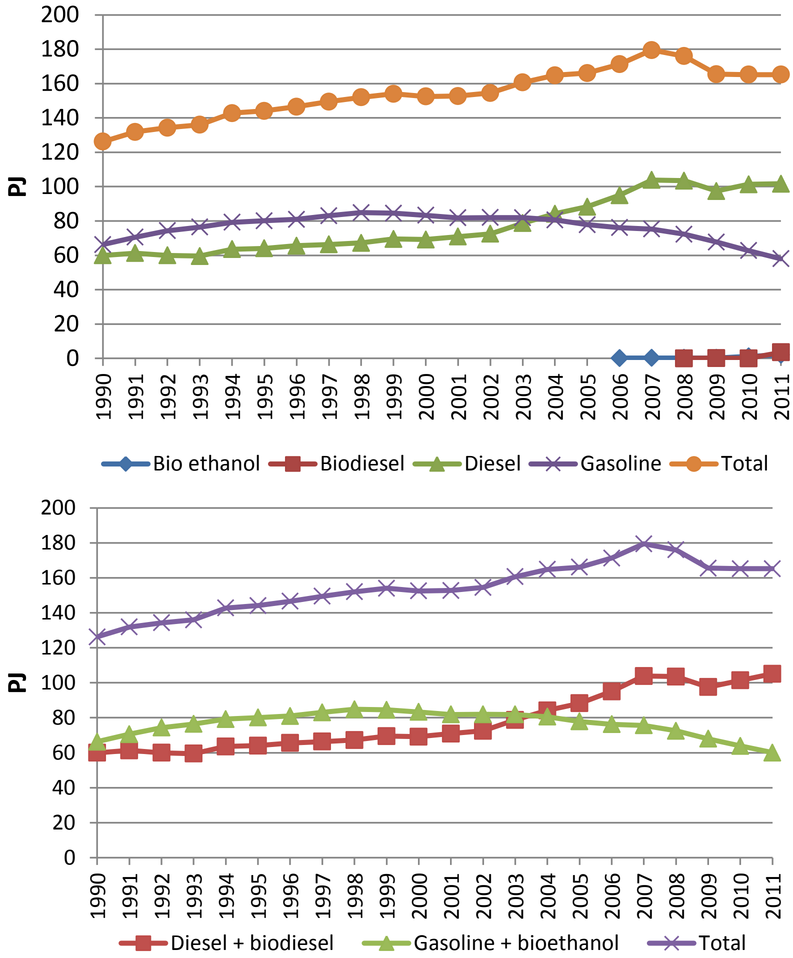


Figure 3.3.3 Fuel consumption pr fuel type and as totals for road transport 1985-2011.

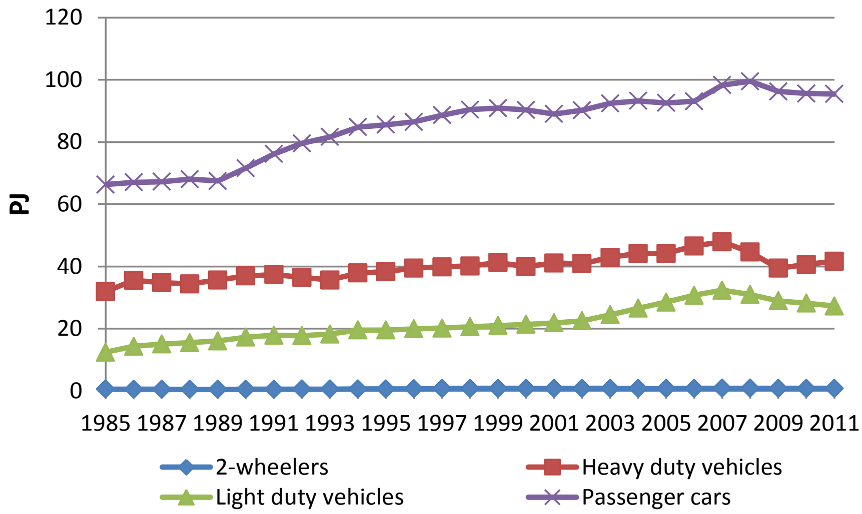


Figure 3.3.4 Total fuel consumption pr vehicle type for road transport 1985-2011.

As shown in Figure 3.3.5 fuel consumption for gasoline passenger cars dominates the overall gasoline consumption trend. The development in diesel fuel consumption in recent years (Figure 3..3.6) is characterised by increasing fuel consumption for diesel passenger cars, while declines in the fuel consumption for trucks and buses (heavy-duty vehicles) and light duty vehicles are noted for 2008 and 2009, and 2008-2011, respectively.

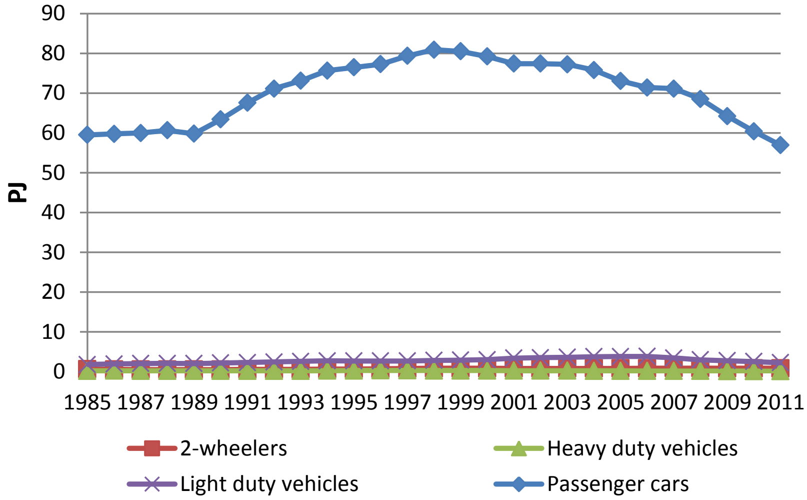


Figure 3.3.5 Gasoline fuel consumption pr vehicle type for road transport 1985-2011.

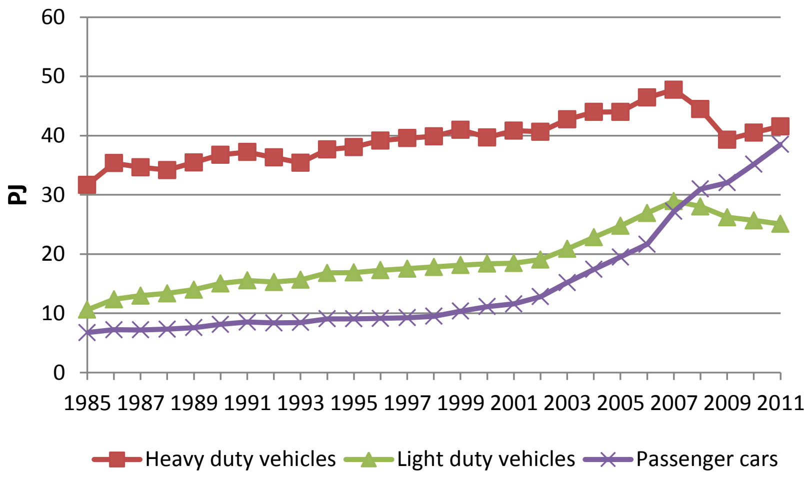


Figure 3.3.6 Diesel fuel consumption pr vehicle type for road transport 1985-2011.

In 2011, fuel consumption shares for gasoline passenger cars, heavy-duty vehicles, diesel passenger cars, diesel light duty vehicles and gasoline light duty vehicles were 35, 25, 23, 15 and 1 %, respectively (Figure 3.3.7).

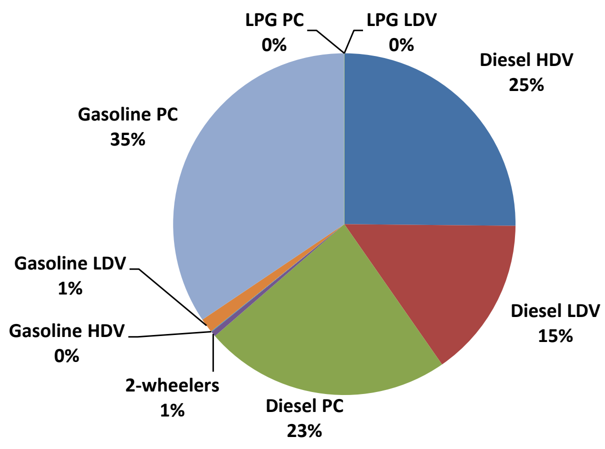


Figure 3.3.7 Fuel consumption share (PJ) pr vehicle type for road transport in 2011.

Other mobile sources

It must be noted that the fuel consumption figures behind the Danish inventory for mobile equipment in the agriculture, forestry, industry, household and gardening (residential), and inland waterways (part of navigation) sectors, are less certain than for other mobile sectors. For these types of machinery, the DEA statistical figures do not directly provide fuel consumption information, and fuel consumption totals are subsequently estimated from activity data and fuel consumption factors. For recreational craft the latest historical year is 2004.

As seen in Figure 3.3.8, classified according to CRF the most important sectors are Agriculture/forestry/fisheries (1A4c), Industry-other (mobile machinery part of 1A2f) and Navigation (1A3d). Minor fuel consuming sectors are Civil Aviation (1A3a), Railways (1A3c), Other (military mobile fuel consumption: 1A5), Commercial/institutional (1A4a) and Residential (1A4b).

The 1985-2011 time series are shown pr fuel type in Figures 3.3.9-3.3.12 for diesel, gasoline and jet fuel, respectively.

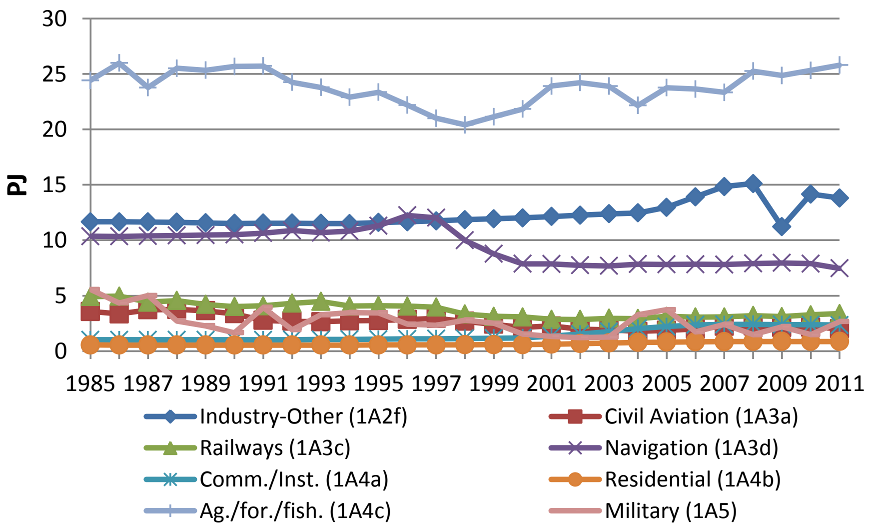


Figure 3.3.8 Total fuel consumption in CRF sectors for other mobile sources 1985-2011.

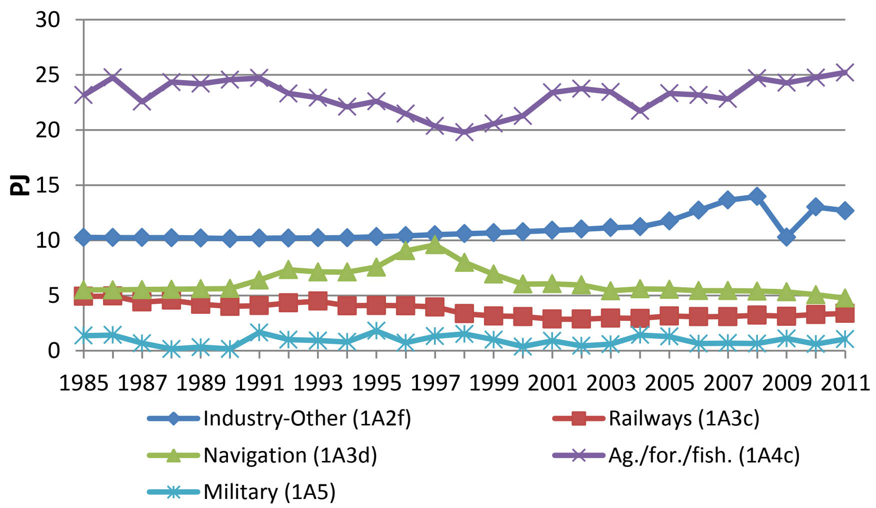


Figure 3.3.9 Diesel fuel consumption in CRF sectors for other mobile sources 1985-2011.

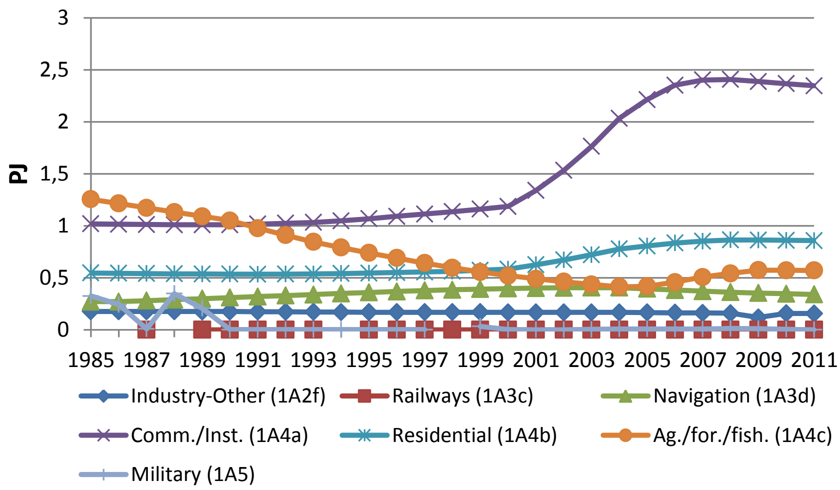


Figure 3.3.10 Gasoline fuel consumption in CRF sectors for other mobile source 1985-2011.

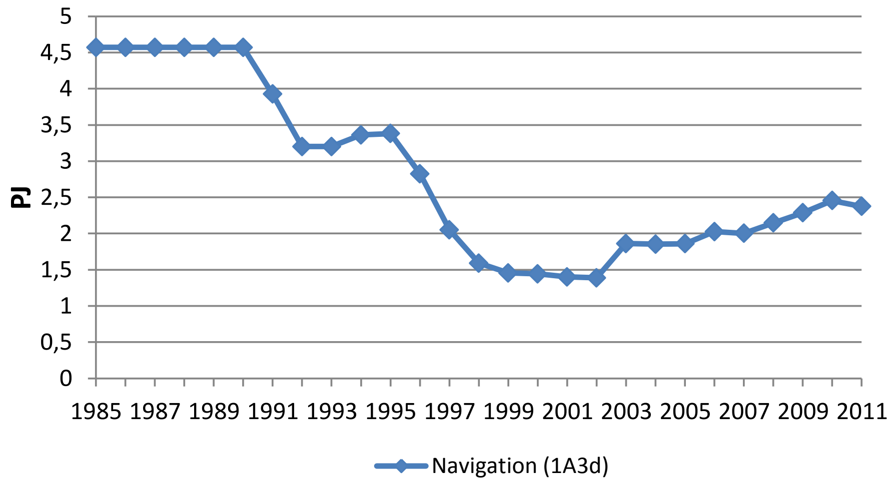


Figure 3.3.11 Residual oil fuel consumption in CRF sectors for other mobile sources 1985-2011.

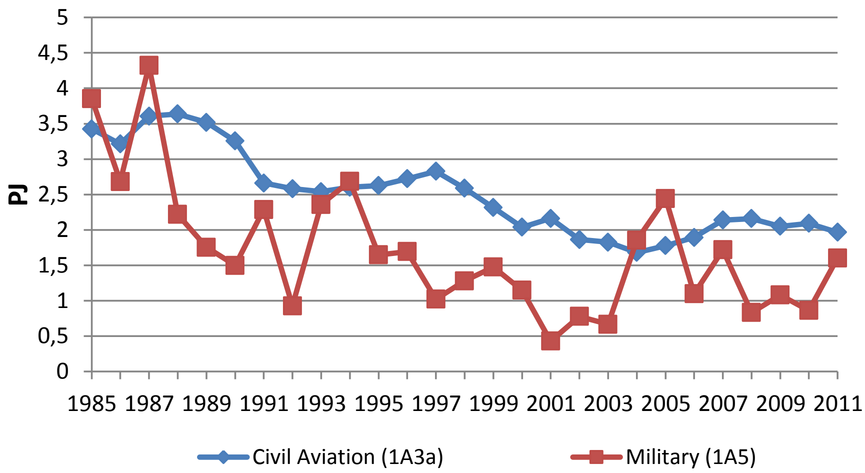


Figure 3.3.12 Jet fuel consumption in CRF sectors for other mobile sources 1985-2011.

In terms of diesel, the fuel consumption decreases for agricultural machines until 2000, due to fewer numbers of tractors and harvesters. After that, the increase in the engine sizes of new sold machines has more than outbalanced the trend towards smaller total stock numbers. The fuel consumption for industry has increased from the beginning of the 1990's, due to an increase in the activities for construction machinery. The fuel consumption increase has been very pronounced in 2005-2008, for 2009; however, the global financial crisis has a significant impact on the building and construction activities. For fisheries, the development in fuel consumption reflects the activities in this sector.

The Navigation sector comprises national sea transport (fuel consumption between two Danish ports including sea travel directly between Denmark and Greenland/Faroe Islands) and recreational craft. For the latter category, fuel consumption has increased significantly from 1990 to 2004 due to the rising number diesel-fuelled private boats. For national sea transport, the diesel fuel consumption curve reflects the combination of traffic and ferries in use for regional ferries. From 1998 to 2000, a significant decline in fuel consumption is apparent. The most important explanation here is the closing of ferry service routes in connection with the opening of the Great Belt Bridge in 1997. For railways, the gradual shift towards electrification explains the lowering trend in diesel fuel consumption and the emissions for this transport sector. The fuel consumed (and associated emissions) to produce electricity is accounted for in the stationary combustion part of the Danish inventories.

The largest gasoline fuel consumption is found for household and gardening machinery in the Commercial/Institutional (1A4a) and Residential (1A4b) sectors. Especially from 2001-2006, a significant fuel consumption increase is apparent due to considerable growth in the machinery stock. The decline in gasoline fuel consumption for Agriculture/forestry/fisheries (1A4c) is due to the gradual phasing out of gasoline-fuelled agricultural tractors.

In terms of residual oil there has been a substantial decrease in the fuel consumption for regional ferries. The fuel consumption decline is most significant from 1990-1992 and from 1997-1999.

The considerable variations from one year to another in military jet fuel consumption are due to planning and budgetary reasons, and the passing demand for flying activities. Consequently, for some years, a certain amount of jet fuel stock-building might disturb the real picture of aircraft fuel consumption. Civil aviation has decreased until 2004, since the opening of the Great Belt Bridge in 1997, both in terms of number of flights and total jet fuel consumption. After 2004 an increase in the consumption of jet fuel is noted until 2007/2008.

Bunkers
The residual oil and diesel oil fuel consumption fluctuations reflect the quantity of fuel sold in Denmark to international ferries, international warships, other ships with foreign destinations, transport to Greenland and the Faroe Islands, tank vessels and foreign fishing boats. For jet petrol, the sudden fuel consumption drop in 2002 is explained by the recession in the air traffic sector due to the events of September 11, 2001 and structural changes in the aviation business. In 2009, the impact of the global financial crisis on flying activities becomes very visible.

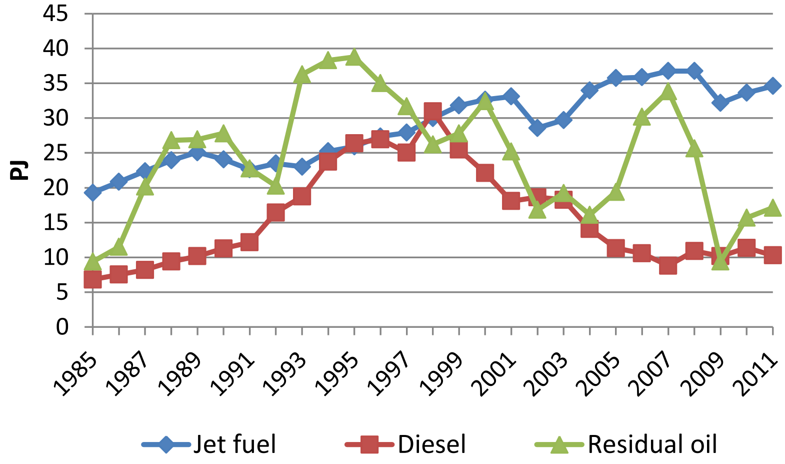


Figure 3.3.13 Bunker fuel consumption 1985-2011.

Emissions of SO_2, NO_X, NMVOC, CO, NH_3, TSP, PM_{10} and $PM_{2.5}$

In Table 3.3.3 the SO_2, NO_X, NMVOC, CO NH_3, TSP, PM_{10} and $PM_{2.5}$ emissions for road transport and other mobile sources are shown for 2011 in NFR sectors. For particulate matter (PM; TSP, PM_{10} and $PM_{2.5}$), only the exhaust emission contributions are included in Table 3.3.3. Non-exhaust TSP, PM_{10} and $PM_{2.5}$ emissions are treated in a separate section below. The emission figures in the time series 1985-2011 are given in Annex 2.B.16 (NFR format) and are shown for 2011 in Annex 2.B.15 (CollectER format).

From 1985 to 2011, the road transport emissions of SO_2, NO_X, NMVOC, CO and PM (all size fractions) have decreased by 99, 51, 84, 82 and 65 %, respectively (Figures 3.3.14-3.3.18), whereas the NH_3 emissions have increased by 2451 % during the same time period (Figure 3.3.19).

For other mobile sources, the emission changes for SO_2, NO_X, NMVOC, CO and PM (all size fractions) are -89, -20, -35, -2 and -66 %, respectively (Figures 3.3.21-3.3.25). The NH_3 emissions have increased by 18 % during the same time period (Figure 3.3.26).

Table 3.3.3 Emissions of SO_2, NO_X, NMVOC, CO NH_3, TSP, PM_{10} and $PM_{2.5}$ in 2011 for road transport and other mobile sources.

NFR ID	SO_2	NO_x	NMVOC	CO	NH_3	TSP	PM_{10}	$PM_{2.5}$
	tonnes	Tonnes	tonnes	tonnes	tonnes	Tonnes	tonnes	tonnes
Industry-Other (1A2f)	6	7 947	1 115	6 292	2	646	646	646
Civil Aviation (1A3a)	46	578	90	598	0	3	3	3
Railways (1A3c)	2	2 501	175	398	1	78	78	78
Navigation (1A3d)	1 385	9 086	842	5421	0	291	289	288
Comm./Inst. (1A4a)	1	215	3 636	72 458	0	67	67	67
Residential (1A4b)	0	89	1 993	25 915	0	15	15	15
Ag./for./fish. (1A4c)	373	20 419	2 249	19 369	4	930	928	927
Military (1A5)	37	778	59	495	0	16	16	16
Total other mobile	1 851	41 613	10 159	130 947	8	2 044	2 041	2 039
Road (1A3b)	74	46 175	12 201	105 172	1 601	1 495	1 495	1 495
Total mobile	1 925	87 788	22 360	236 120	1 609	5 998	5 096	4 391

Road transport

The step-wise lowering of the sulphur content in diesel fuel has given rise to a substantial decrease in the road transport emissions of SO_2 (Figure 3.3.14). In 1999, the sulphur content was reduced from 500 ppm to 50 ppm (reaching gasoline levels), and for both gasoline and diesel the sulphur content was reduced to 10 ppm in 2005. Since Danish diesel and gasoline fuels have the same sulphur percentages, at present, the 2009 shares for SO_2 emissions and fuel consumption for passenger cars, heavy-duty vehicles, light-duty vehicles and 2-wheelers are the same in each case: 57, 25, 17 and 1 %, respectively (Figure 3.3.20).

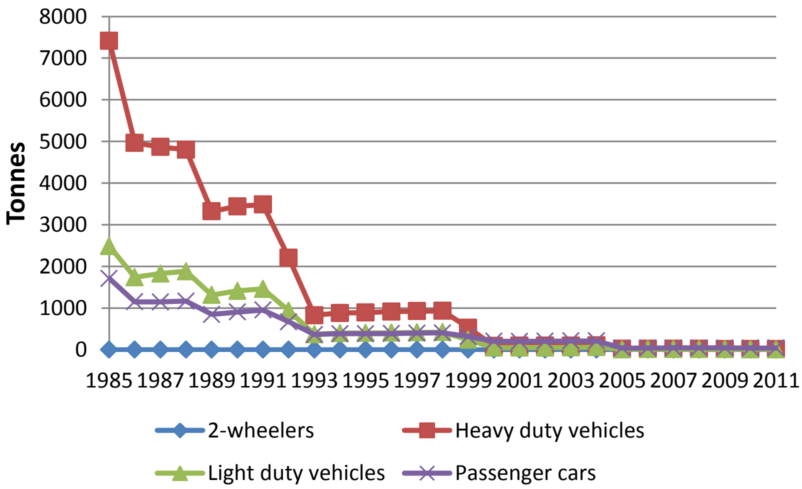


Figure 3.3.14 SO_2 emissions (tonnes) pr vehicle type for road transport 1985-2011.

Historically, the emission totals of NMVOC and CO have been very dominated by the contributions coming from private cars, as shown in Figures 3.3.16- 3.3.17. However, the NMVOC and CO (and NO_x) emissions from this vehicle type have shown a steady decreasing tendency since the introduction of private catalyst cars in 1990 (EURO I) and the introduction of even more emission-efficient EURO II, III and IV private cars (introduced in 1997, 2001 and 2006, respectively).

In the case of NO_x, the real traffic emissions for heavy duty vehicles do not follow the reductions as intended by the EU emission legislation. This is due to the so-called engine cycle-beating effect. Outside the legislative test cycle stationary measurement points, the electronic engine control for heavy duty Euro II and III engines switches to a fuel efficient engine running mode, thus leading to increasing NO_x emissions (Figure 3.3.15). However, the reduction in transport activities due to the global financial crisis causes the NO_x emissions for heavy duty vehicles to decrease significantly in 2008 and 2009.

Exhaust particulate emissions from road transportation vehicles are well below $PM_{2.5}$. The emissions from light- and heavy-duty vehicles have significantly decreased since the mid-1990s due to gradually stricter EURO emission standards. In recent years until 2008 the environmental benefit of introducing diesel private cars with lower particulate emissions since 1990 has been more than outbalanced by an increase in sales of new vehicles. After 2008 the PM emissions gradually become lower due to the increasing number of Euro V cars equipped with particulate filter sold in Denmark from 2006 onwards (Figure 3.3.18).

An undesirable environmental side effect of the introduction of catalyst cars is the increase in the emissions of NH_3 from the first two generations of catalyst cars (Euro I and II) compared to conventional cars. The emission factors for later catalytic converter technologies are considerably lower than the ones for Euro I and II, thus causing the emissions to decrease from 2001 onwards (Figure 3.3.19).

The 2011 emission shares for heavy-duty vehicles, passenger cars, light-duty vehicles and 2-wheelers for NO_x (44, 39, 17 and 0 %), NMVOC (5, 59, 7 and 15 %), CO (6, 80, 6 and 8 %), PM (22, 42, 34 and 2 %) and NH_3 (1, 96, 3 and 0 %), are also shown in Figure 3.3.20.

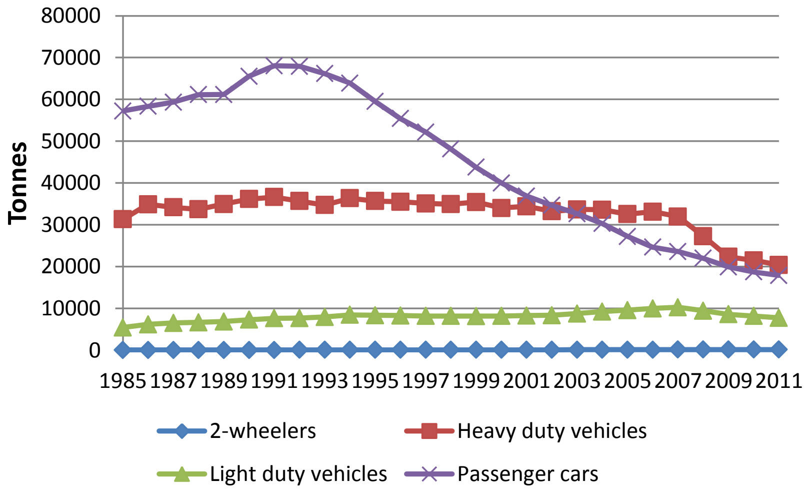


Figure 3.3.15 NO_X emissions (tonnes) pr vehicle type for road transport 1985-2011.

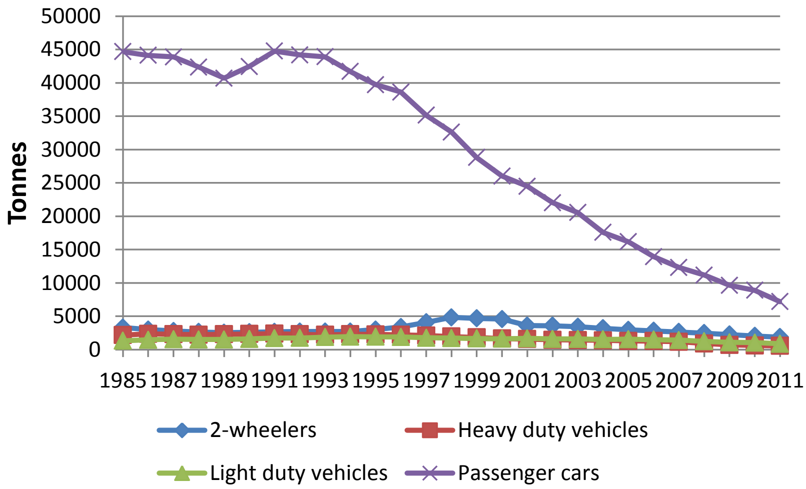


Figure 3.3.16 NMVOC emissions (tonnes) pr vehicle type for road transport 1985-2011.

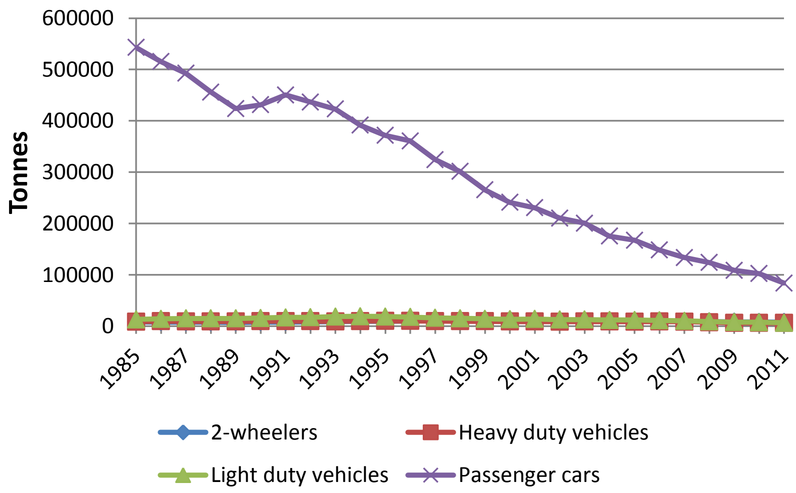


Figure 3.3.17 CO emissions (tonnes) pr vehicle type for road transport 1985-2011.

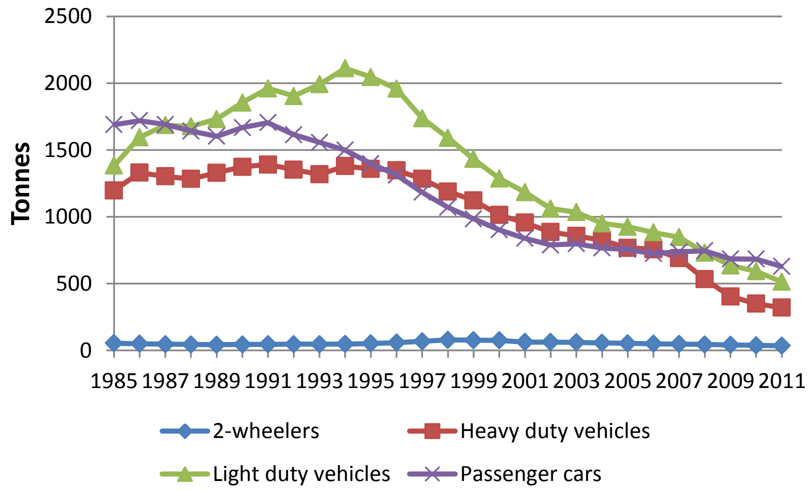


Figure 3.3.18 PM emissions (tonnes) pr vehicle type for road transport 1985-2011.

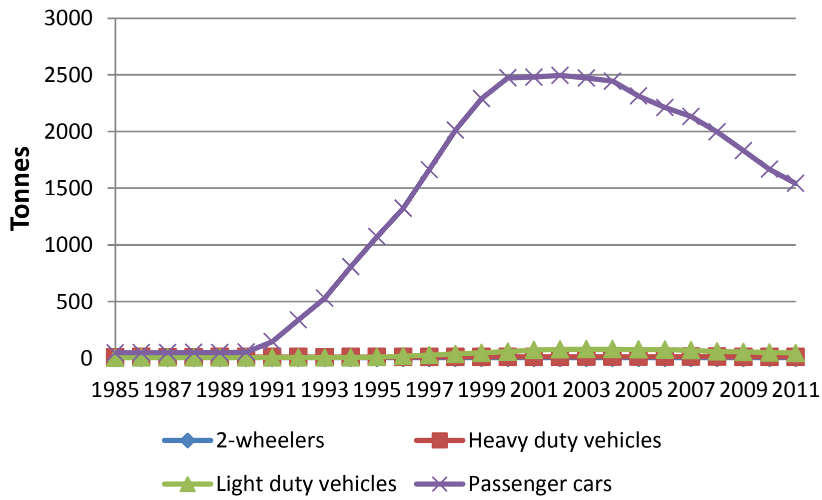


Figure 3.3.19 NH_3 emissions (tonnes) pr vehicle type for road transport 1985-2011.

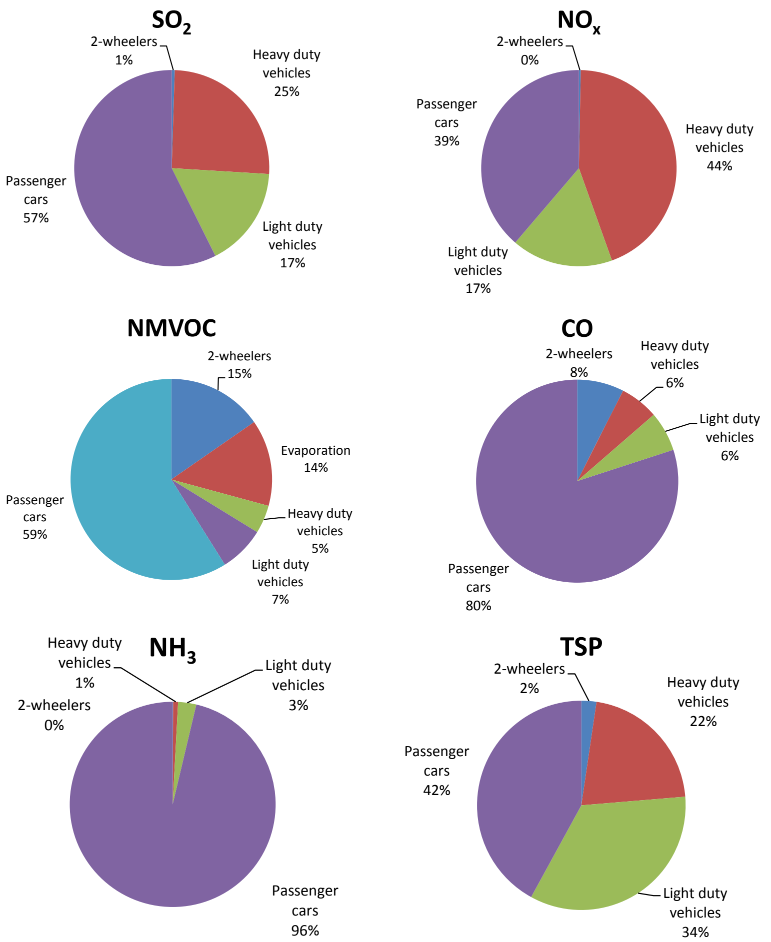


Figure 3.3.20 SO_2, NO_X, NMVOC, CO, NH_3 and PM emission shares pr vehicle type for road transport in 2011.

Other mobile sources

For SO_2 the trends in the Navigation (1A3d) emissions shown in Figure 3.3.21 mainly follow the development of the heavy fuel oil consumption (Figure 3.3.11). Though, from 1993 to 1995 relatively higher contents of sulphur in the fuel (estimated from sales) cause a significant increase in the emissions of SO_2. The SO_2 emissions for Fisheries (1A4c) correspond with the development in the consumption of marine gas oil. The main explanation for the development of the SO_2 emission curves for Railways (1A3c) and non-road machinery in Agriculture/forestry (1A4c) and Industry (1A2f), are the stepwise sulphur content reductions for diesel used by machinery in these sectors.

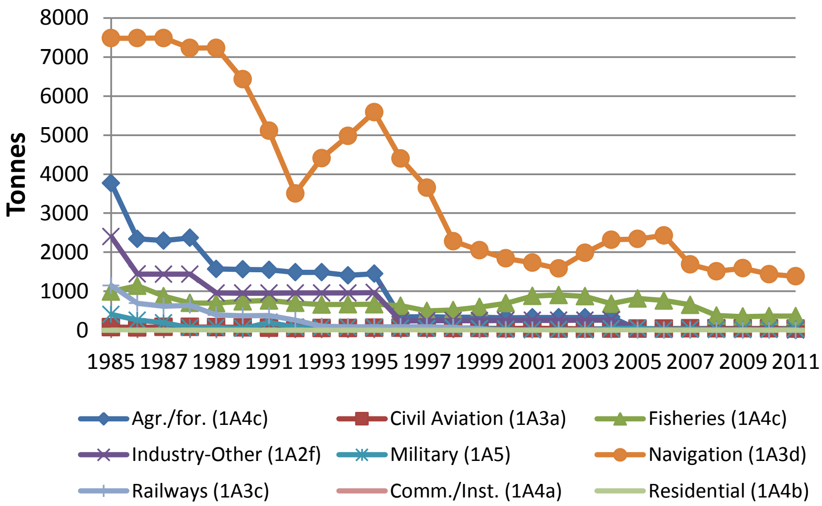


Figure 3.3.21 SO_2 emissions (ktonnes) in NFR sectors for other mobile sources 1985-2011.

In general, the emissions of NO_X, NMVOC and CO from diesel-fuelled working equipment and machinery in agriculture, forestry and industry have decreased slightly since the end of the 1990s due to gradually strengthened emission standards given by the EU emission legislation directives. For industry, the emission impact from the global financial crisis becomes very visible for 2009.

NO_X emissions mainly come from diesel machinery, and the most important sources are Agriculture/forestry/fisheries (1A4c), Navigation (1A3d), Industry (1A2f) and Railways (1A3c), as shown in Figure 3.3.22. The 2011 emission shares are 49, 22, 19 and 6 %, respectively (Figure 3.3.27). Minor emissions come from the sectors, Civil Aviation (1A3a), Military (1A5) and Residential (1A4b).

The NO_X emission trend for Navigation, Fisheries and Agriculture is determined by fuel consumption fluctuations for these sectors, and the development of emission factors. For ship engines the emission factors tend to increase for new engines until mid-1990s. After that, the emission factors gradually reduce until 2000, bringing them to a level comparable with the emission limits for new engines in this year. For agricultural machines, there have been somewhat higher NO_x emission factors for 1991-stage I machinery, and an improved emission performance for stage I and II machinery since the late 1990s.

The emission development from 1985 to 2008 for industry NO_x is the product of a fuel consumption increase, most pronounced from 2005-2008, and a development in emission factors as explained for agricultural machinery. For railways, the gradual shift towards electrification explains the declining trend in diesel fuel consumption and NO_X emissions for this transport sector until 2001.

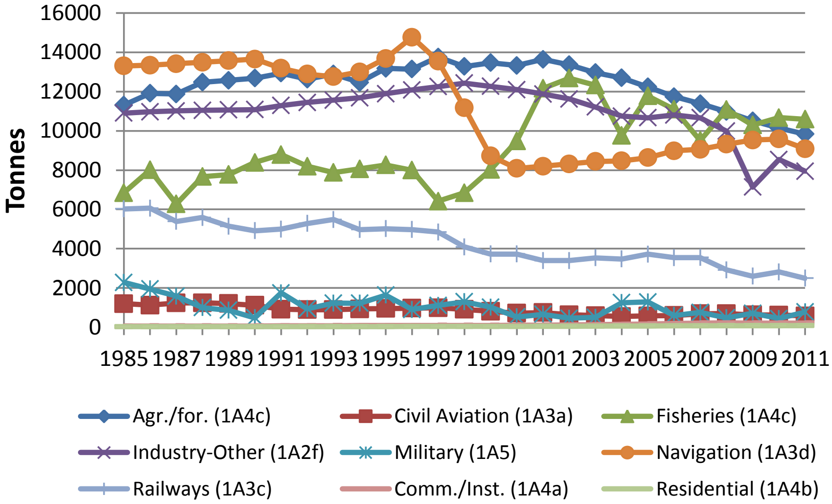


Figure 3.3.22 NO_X emissions (tonnes) in NFR sectors for other mobile sources 1985-2011.

The 1985-2011 time series of NMVOC and CO emissions are shown in Figures 3.3.23 and 3.3.24 for other mobile sources. The 2011 sector emission shares are shown in Figure 3.3.27. For NMVOC, the most important sectors are Commercial/Institutional (1A4a), Agriculture/forestry/-fisheries (1A4c), Residential (1A4b), Industry (1A2f) and Navigation (1A3d) with 2011 emission shares of 36, 22, 20, 11 and 8 %, respectively. The same five sectors also contribute with most of the CO emissions. For Commercial/Institutional (1A4a), Residential (1A4b), Agriculture/forestry/fisheries (1A4c), Industry (1A2f) and Navigation (1A3d) the emission shares are 55, 20, 15, 5 and 4 %, respectively. Minor NMVOC and CO emissions come from Railways (1A3c), Civil Aviation (1A3a) and Military (1A5).

For NMVOC and CO, the significant emission increases for the commercial/institutional and residential sectors after 2000 are due to the increased number of gasoline working machines. Improved NMVOC emission factors for diesel machinery in agriculture and gasoline equipment in forestry (chain saws) are the most important explanations for the NMVOC emission decline in the Agriculture/forestry/fisheries sector. This explanation also applies for the industrial sector, which is dominated by diesel-fuelled machinery. From 1997 onwards, the NMVOC emissions from Navigation decrease due to the gradually phase-out of the 2-stroke engine technology for recreational craft. The main reason for the significant 1985-2006 CO emission decrease for Agriculture/forestry-/fisheries is the phasing out of gasoline tractors.

As shown in Figure 3.3.27, for other mobile sources the largest TSP contributors in 2011 are Agriculture/forestry/fisheries (1A4c), Industry (1A2f) and Navigation (1A3d), with emission shares of 45, 32 and 14 %, respectively. The remaining sectors: Railways (1A3c), Civil aviation (1A3a), Military (1A5) and Residential (1A4b) represent only minor emission sources.

The 1985-2011 TSP emissions for navigation and fisheries are determined by the fuel consumption fluctuations in these years, and the development of the emission factors, which to a major extent is a function of the fuel sulphur content. The emission development for Agriculture/forestry is determined by the generally decreasing total diesel fuel consumption and gradually reducing emission factors over the time period.

The TSP emission development for industrial non-road machinery is the product of a fuel consumption increase from 1985 to 2008 and a development in emission factors, as explained for agricultural machinery. The TSP emission explanations for railways are the same as for NO_x (Figure 3.3.22).

The amounts of NH_3 emissions calculated for other mobile sources are very small. The largest emission sources are Agriculture-/forestry/fisheries (1A4c), Industry (1A2f), Railways (1A3c) and Military (1A5), with emission shares of 49, 31, 8 and 5 %, respectively.

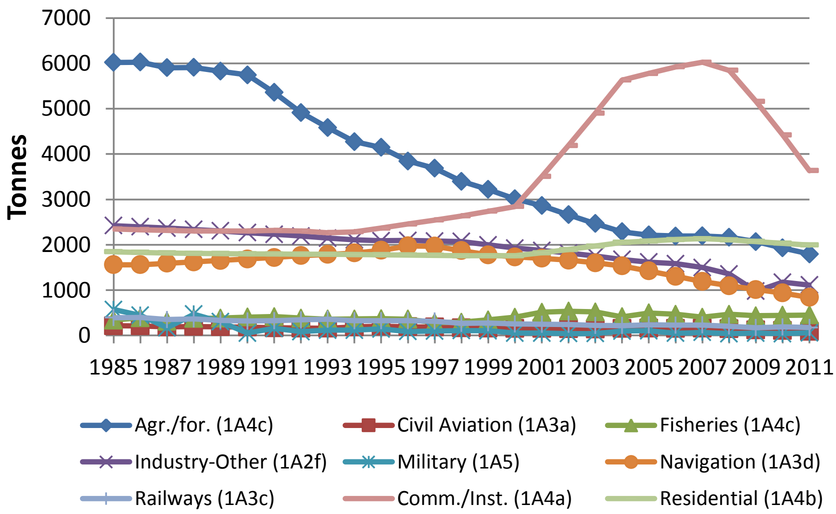


Figure 3.3.23 NMVOC emissions (tonnes) in NFR sectors for other mobile sources 1985-2011.

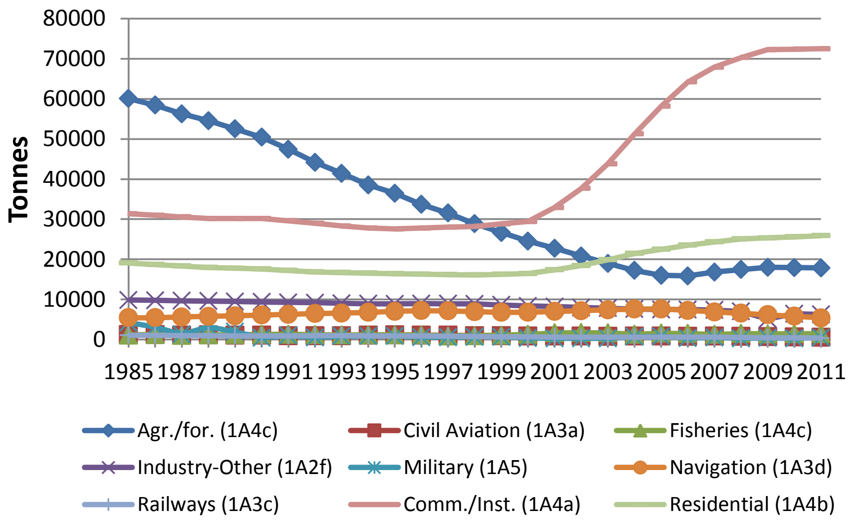


Figure 3.3.24 CO emissions (tonnes) in NFR sectors for other mobile sources 1985-2011.

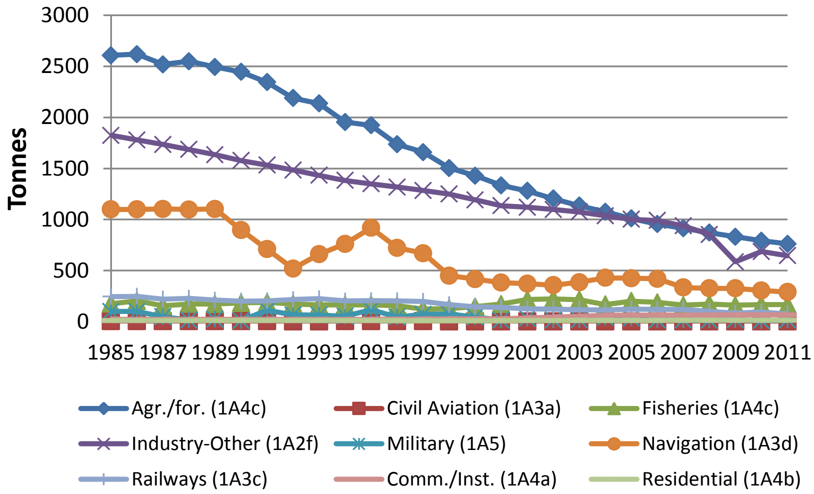


Figure 3.3.25 TSP emissions (tonnes) in NFR sectors for other mobile sources 1985-2011.

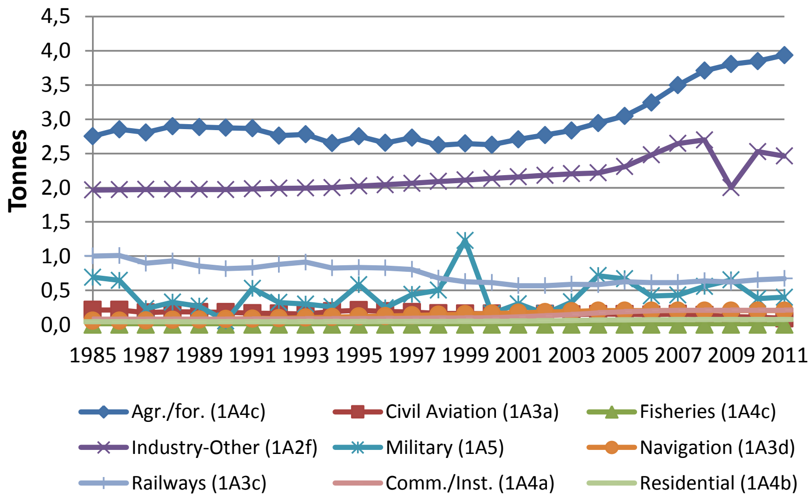


Figure 3.3.26 NH_3 emissions (tonnes) in NFR sectors for other mobile sources 1985-2011.

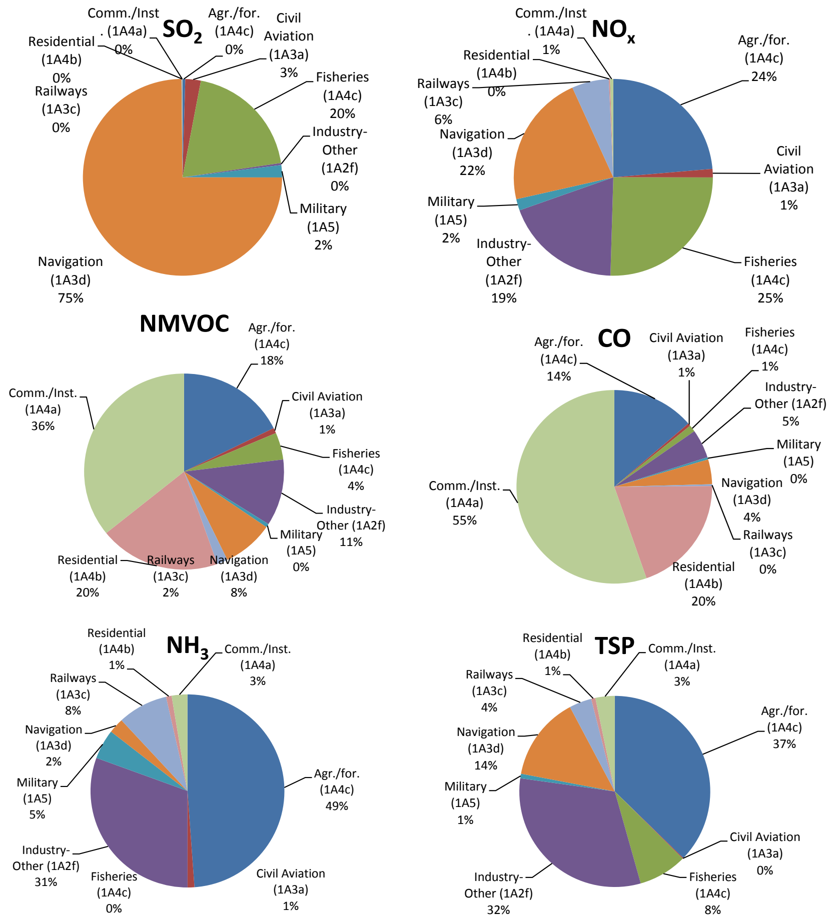


Figure 3.3.27 SO_2, NO_X, NMVOC, CO, NH_3 and PM emission shares pr vehicle type for other mobile sources in 2011.

Non-exhaust emissions of TSP, PM_{10} and $PM_{2.5}$

Apart from the exhaust emission estimates of particulate matter (PM), the Danish emission inventories also comprise the non-exhaust PM emissions coming from road transport brake and tyre wear, and road abrasion.

In Table 3.3.4, the non-exhaust TSP, PM_{10} and $PM_{2.5}$ emissions for road transport are shown for 2011 in NFR sectors. The activity data and emission factors are also shown in Annex 2.B.15.

Table 3.3.4 Emissions of TSP, PM_{10} and $PM_{2.5}$ in 2011 from road transport and other mobile sources.

NFR Sector	TSP tonnes	PM_{10} tonnes	$PM_{2.5}$ tonnes
Road brake wear	506	496	197
Road tyre wear	880	528	370
Road abrasion	1 072	536	290
Total Road non-exhaust	2 459	1 560	857

The respective source category distributions for TSP, PM_{10} and $PM_{2.5}$ emissions are identical for each of the non-exhaust emission type's brake wear, tyre wear and road abrasion, and, hence, only the PM_{10} distributions are shown in Figure 3.3.28. For tyre wear and road abrasion passenger cars caused the highest emissions in 2011, followed by trucks, light-duty vehicles, buses and 2-wheelers. For brake wear the most dominant emissions come from passenger cars followed by light-duty vehicles, trucks, buses and 2-wheelers.

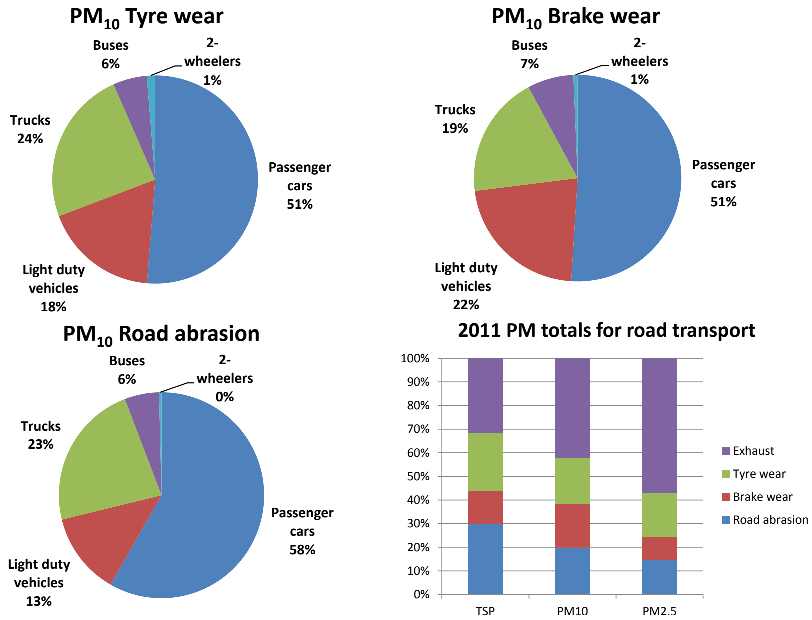


Figure 3.3.28 Brake and tyre wear and road abrasion PM_{10} emission shares and PM exhaust/non-exhaust distributions for road traffic in 2011.

Figure 3.3.28 also shows the exhaust/non-exhaust distribution of the total particulate emissions from road transport, for each of the size classes TSP, PM_{10} and $PM_{2.5}$. The exhaust emission shares of total road transport TSP, PM_{10} and $PM_{2.5}$ are 32, 42 and 57 %, respectively, in 2011 For brake and tyre wear and road abrasion the TSP shares are 14, 24 and 30 %, respectively. The same three sources have PM_{10} shares of 18, 20 and 20 %, respectively, and $PM_{2.5}$ shares of 10, 19 and 14 %, respectively. In general, the non-exhaust shares of total particulate emissions are expected to increase in the future as total exhaust emissions decline. The latter emission trend is due to the step-wise strengthening of exhaust emission standards for all vehicle types.

Heavy metals

In Table 3.3.5, the heavy metal emissions for road transport and other mobile sources are shown for 2011 in NFR sectors. The emission figures in the time series 1990-2011 are given in Annex 2.B.16 (NFR format) and are shown for 1990 and 2011 in Annex 2.B.15 (CollectER format).

Table 3.3.5 Heavy metal emissions in 2011 for road transport and other mobile sources.

NFR Sector	As	Cd	Cr	Cu	Hg	Ni	Pb	Se	Zn
	kg	kg	kg	kg	kg	kg	kg	kg	kg
Industry-Other (1A2f)	0	3	9	6	2	3	15	0	506
Civil Aviation (1A3a)	0	0	0	0	0	0	776	0	3
Railways (1A3c)	0	1	2	2	0	1	4	0	126
Navigation (1A3d)	33	3	16	34	6	1 749	22	41	151
Comm./Inst. (1A4a)	0	1	1	2	0	1	2	0	118
Residential (1A4b)	0	0	0	1	0	0	1	0	43
Agric./forestry/fish. (1A4c)	9	5	19	18	11	16	38	36	770
Military (1A5)	0	0	1	1	0	0	49	0	44
Total other mobile	43	12	48	64	20	1 770	905	77	1 761
Road exhaust (1A3b)	1	39	98	117	24	42	184	1	7 797
Road Brake wear	6	5	66	46 603		64	6 041	12	9 855
Road Tyre wear	1	2	3	13		22	69	17	9 411
Road abrasion	0	0	21	10	0	17	49	0	79
Total Road non-exhaust	6	7	89	46 627	0	102	6 159	29	19 345
Total mobile	7	46	188	46 745	24	144	6 343	29	27 142

The heavy metal emission estimates for road transport are based on a national research study made by Winther and Slentø (2010). The latter study calculate the exhaust related emissions from fuel and engine oil as well as the wear related emissions from tyre, brake and road wear. Apart from Pb, the emission factors only deviate to a less extent due to changes in fleet and mileage composition over the years, which bring relative changes in fuel consumption per fuel type, engine oil use and aggregated emission factors for brake, tyre and road wear.

The most important exhaust related emissions for road transport are Cd, Cr, Hg and Zn. the most important wear related emissions are Cu and Pb almost solely coming from tyre wear, and Zn from brake and tyre wear. For other mobile sources, the most important emission contributions are calculated for Ni, Se and As, coming from the use of marine diesel oil in fisheries and navigation and residual oil in navigation.

The Figures 3.3.29 and 3.3.30 show the heavy metal emission distributions for all road transport sources split into vehicle categories, and for other mobile sectors, respectively.

For non-road mobile machinery in agriculture, forestry, industry, commercial/institutional and recreational, as well as military and railways, fuel related emission factors from road transport are used derived for the year 2009.

For civil aviation jet fuel no emissions are estimated due to lack of emission data, whereas for aviation gasoline fuel related emission factors for road transport gasoline is used derived for the year 2009, except for Pb where national data exist.

For navigation and fisheries, the heavy metal emission factors are fuel related, and are taken from the EMEP/EEA guidebook.

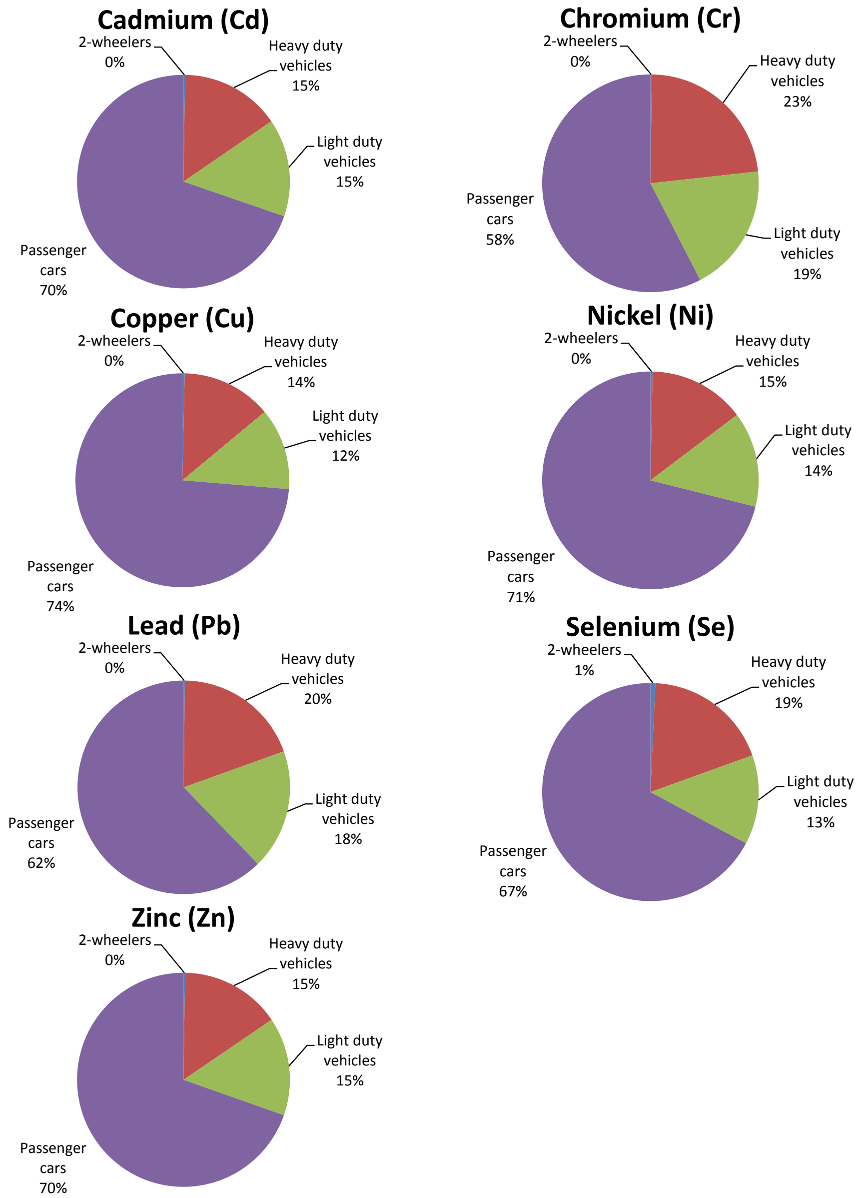


Figure 3.3.29 Heavy metal emission shares for road transport in 2011.

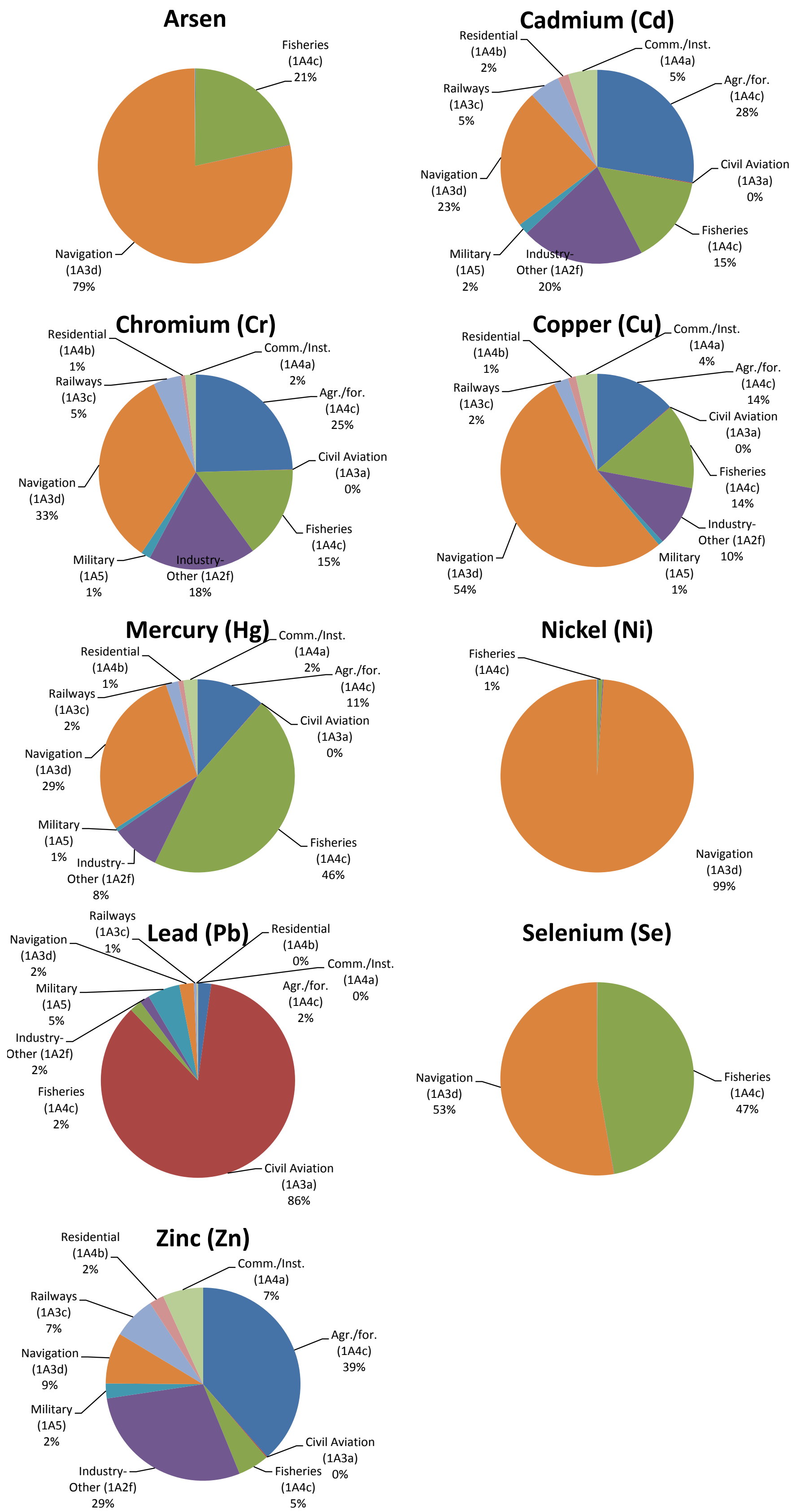


Figure 3.3.30 Heavy metal emission shares for other mobile sources in 2011.

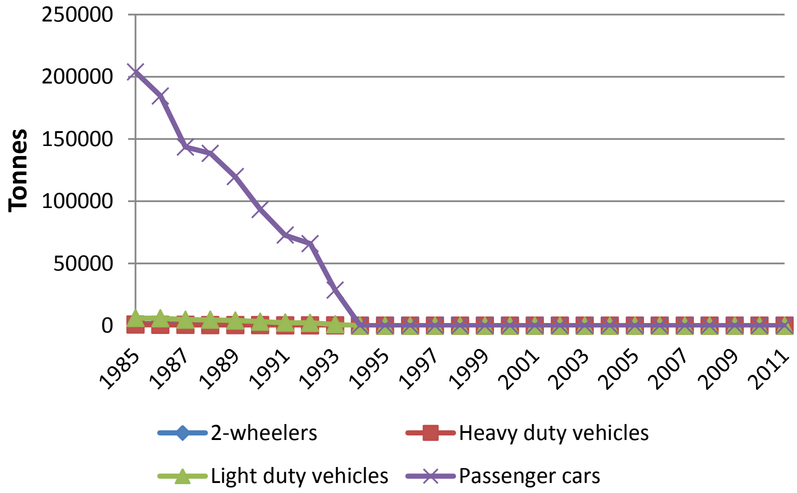


Figure 3.3.31 Pb emissions (kg) pr vehicle type for road transport 1985-2011.

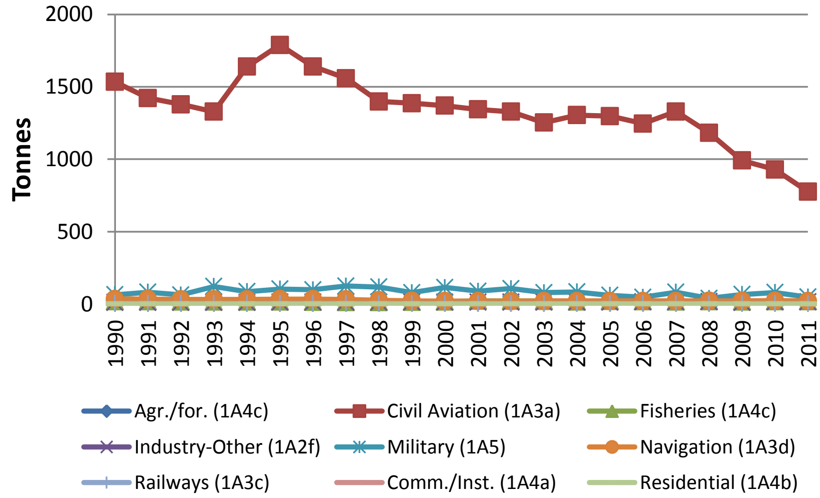


Figure 3.3.32 Pb emissions (kg) in NFR sectors for other mobile sources 1990-2011.

Dioxin and PAH

In Table 3.3.6, the dioxin and PAH emissions for road transport and other mobile sources are shown for 2011 in NFR sectors. The emission figures in the time series 1990-2011 are given in Annex 2.B.16 (NFR format) and are shown for 1990 and 2011 in Annex 2.B.15 (CollectER format).

Table 3.3.6 Dioxin and PAH emissions in 2011 for road transport and other mobile sources.

NFR ID	Dioxins/ Furans g	Flouran-thene kg	Benzo(b) flouranthene kg	Benzo(k) flouranthene kg	Benzo(a) pyrene kg	Benzo-(g,h,i) perylene kg	Indeno (1,2,3-c,d) pyrene kg
Industry-Other (1A2f)	0.010	56	7	6	3	6	3
Civil Aviation (1A3a)	0.000	0	0	0	0	0	0
Railways (1A3c)	0.002	5	1	1	0	0	0
Navigation (1A3d)	0.079	46	4	2	1	6	5
Comm./Inst. (1A4a)	0.012	10	0	0	0	2	1
Residential (1A4b)	0.004	4	0	0	0	1	0
Agri./for./fish. (1A4c)	0.109	136	14	11	6	20	14
Military (1A5)	0.001	5	1	1	0	0	0
Total other mobile	0.218	261	27	21	11	35	24
Road (1A3b)	0.120	876	77	85	64	121	67
Total mobile	0.338	1 137	103	106	74	155	91

For mobile sources, road transport displays the largest emission of dioxins and PAH. The dioxin emission share for road transport is 36 % of all mobile emissions in 2011, whereas Agriculture/forestry-/fisheries and Navigation have smaller shares of 32 and 24 %. For the different PAH components, road transport shares are around 80 % of total emissions for mobile sources. The remaining emissions almost solely come from Agriculture/forestry-/fisheries, Navigation and Industry with Agriculture/forestry/fisheries as the largest source.

Figures 3.3.33 and 3.3.34 show the dioxin and PAH emission distributions into vehicle categories and other mobile sectors, respectively.

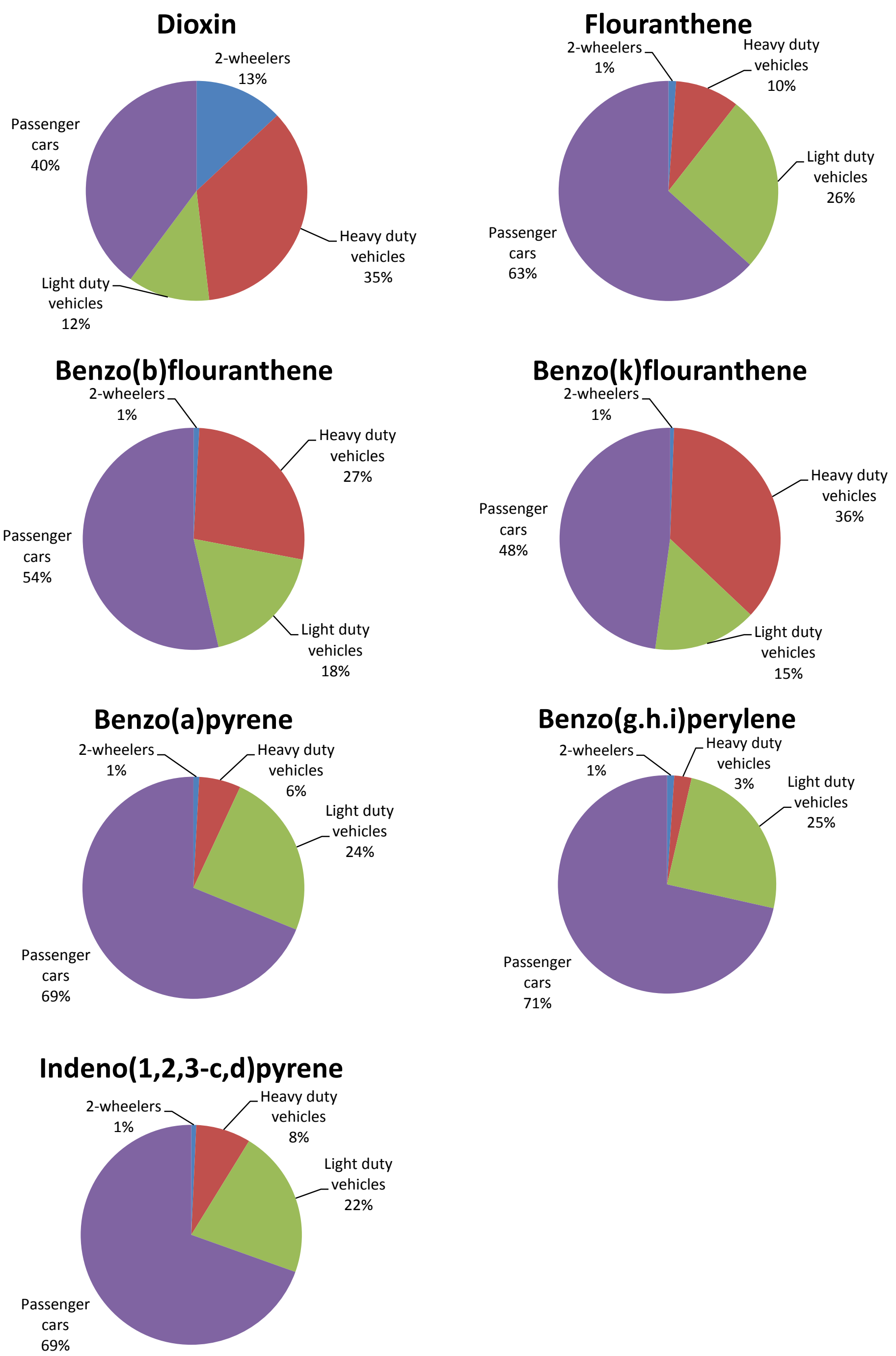


Figure 3.3.33 Dioxin and PAH emission shares for road transport in 2011.

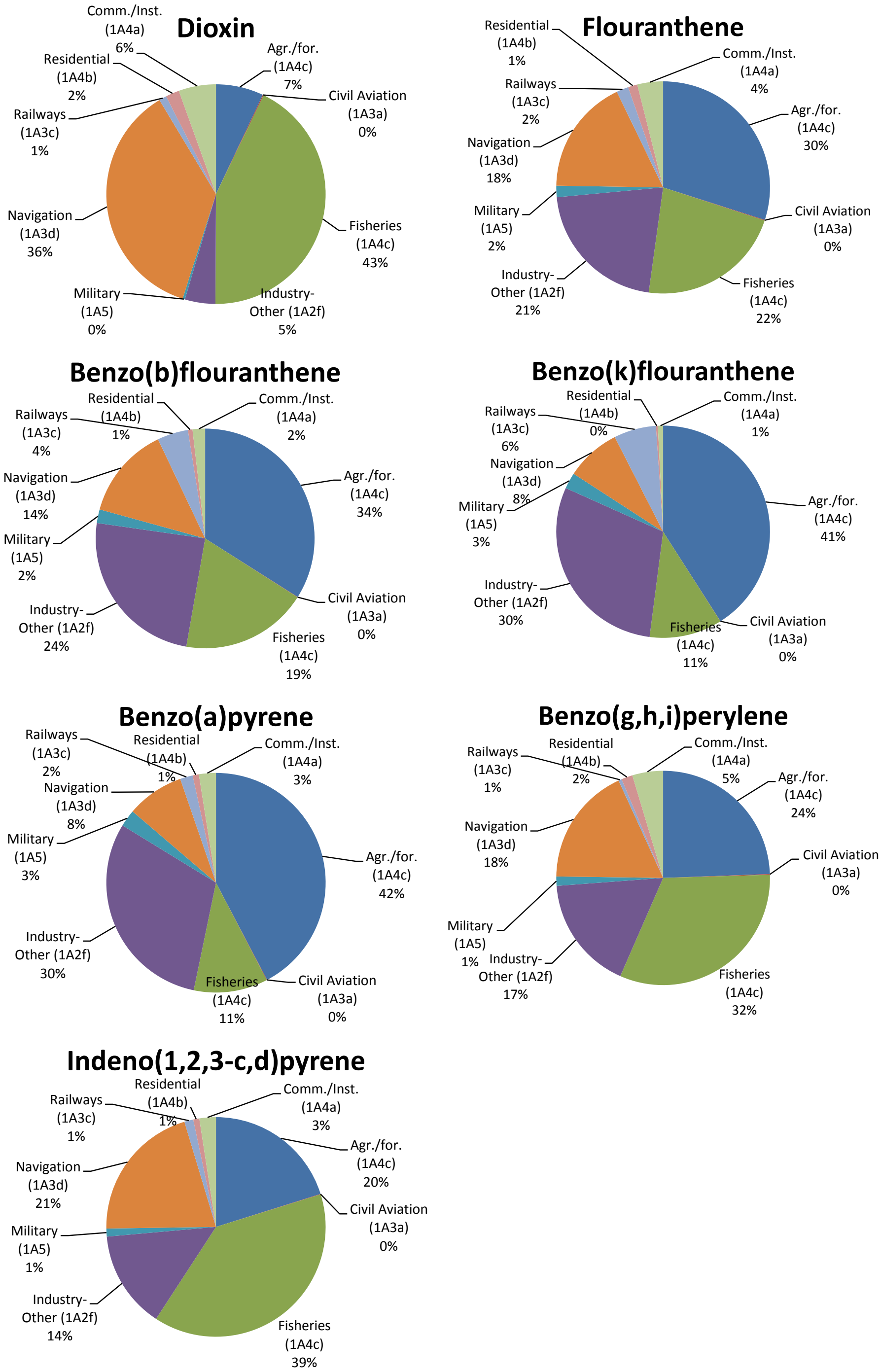


Figure 3.3.34 Dioxin and PAH emission shares for other mobile sources in 2011.

Bunkers

The most important emissions from bunker fuel consumption (fuel consumption for international transport) are SO_2 and NO_x. The bunker emission totals are shown in Table 3.3.7 for 2011, split into sea transport and civil aviation. All emission figures in the 1985-2011 time series are given in Annex 2.B.16 (NFR format). In Annex 2.B.15, the emissions are also given in CollectER format for 2011.

Table 3.3.7 Emissions in 2011 for international transport.

CRF sector	SO_2	NO_X	NMVOC	CO	NH_3	TSP
	tonnes	tonnes	tonnes	tonnes	tonnes	tonnes
Navigation int. (1A3d)	8 853	52 516	1 668	5 504		975
Civil Aviation int. (1A3a)	796	10 466	392	1 790	0	40
International total	9 649	62 981	2 060	7 295	0	1 015

The differences in emissions between navigation and civil aviation are much larger than the differences in fuel consumption and display a poor emission performance for international sea transport. In broad terms, the emission trends shown in Figure 3.3.35 are similar to the fuel consumption development.

However, for navigation minor differences occur for the emissions of SO_2 and NO_X due to varying amounts of marine gas oil and residual oil, and for SO_2 and NO_X the development in the emission factors also have an impact on the emission trends. For civil aviation, apart from the annual consumption of jet fuel, the development of the NO_X emissions is also due to yearly variations in LTO/aircraft type (earlier than 2001) and city-pair statistics (2001 onwards).

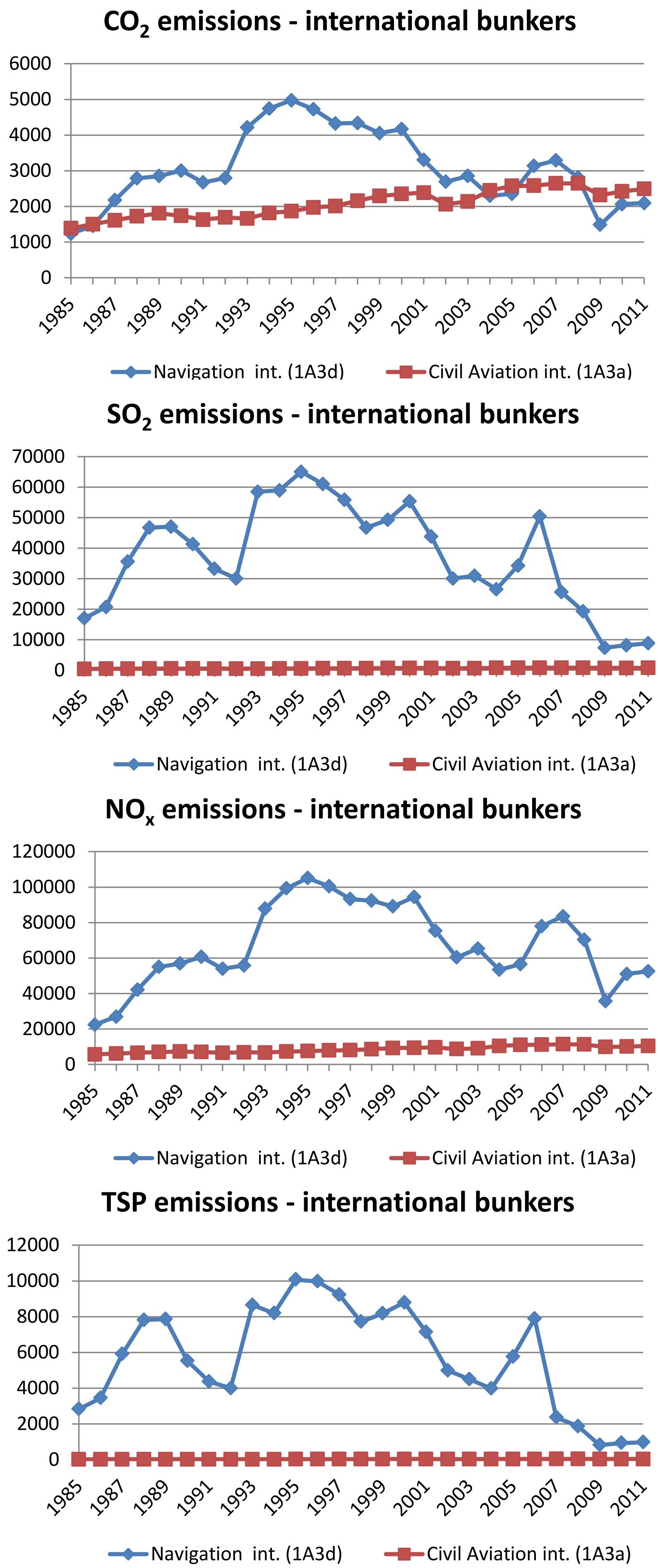


Figure 3.3.35 CO_2, SO_2, NO_X and TSP emissions for international transport 1985-2011.

3.3.2 Methodological issues

The description of methodologies and references for the transport part of the Danish inventory is given in two sections: one for road transport and one for the other mobile sources.

Methodology and references for Road Transport

For road transport, the detailed methodology is used to make annual estimates of the Danish emissions, as described in the EMEP/EEA Air Pollutant Emission Inventory Guidebook (EMEP/EEA, 2009). The actual calculations are made with a model developed by ENVS, using the European COPERT IV model methodology explained by (EMEP/EEA, 2009). In COPERT, fuel consumption and emission simulations can be made for operationally hot engines, taking into account gradually stricter emission standards and emission degradation due to catalyst wear. Furthermore, the emission effects of cold-start and evaporation are simulated.

Vehicle fleet and mileage data

Corresponding to the COPERT IV fleet classification, all present and future vehicles in the Danish fleet are grouped into vehicle classes, sub-classes and layers. The layer classification is a further division of vehicle sub-classes into groups of vehicles with the same average fuel consumption and emission behaviour, according to EU emission legislation levels. Table 3.3.8 gives an overview of the different model classes and sub-classes, and the layer level with implementation years are shown in Annex 2.B.1.

To support the emission calculations a project has been carried out by DTU Transport, in order to provide fleet and annual mileage data for the vehicle categories present in COPERT IV (Jensen, 2012). The latter source also provides information of the mileage split between urban, rural and highway driving. The respective average speeds come from The Danish Road Directorate (Ekman, 2005). Additional data for the moped fleet and motorcycle fleet disaggregation information is given by The National Motorcycle Association (Markamp, 2012).

Table 3.3.8 Model vehicle classes and sub-classes, trip speeds and mileage split.

			Trip speed [km pr h]		
Vehicle classes	Fuel type	Engine size/weight	Urban	Rural	Highway
PC	Gasoline	< 1.4 l.	40	70	100
PC	Gasoline	1.4 – 2 l.	40	70	100
PC	Gasoline	> 2 l.	40	70	100
PC	Diesel	< 2 l.	40	70	100
PC	Diesel	> 2 l.	40	70	100
PC	LPG		40	70	100
PC	2-stroke		40	70	100
LDV	Gasoline		40	65	80
LDV	Diesel		40	65	80
LDV	LPG		40	65	80
Trucks	Gasoline		35	60	80
Trucks	Diesel	Rigid 3,5 - 7,5t	35	60	80
Trucks	Diesel	Rigid 7,5 - 12t	35	60	80
Trucks	Diesel	Rigid 12 - 14 t	35	60	80
Trucks	Diesel	Rigid 14 - 20t	35	60	80
Trucks	Diesel	Rigid 20 - 26t	35	60	80
Trucks	Diesel	Rigid 26 - 28t	35	60	80
Trucks	Diesel	Rigid 28 - 32t	35	60	80
Trucks	Diesel	Rigid >32t	35	60	80
Trucks	Diesel	TT/AT 14 - 20t	35	60	80
Trucks	Diesel	TT/AT 20 - 28t	35	60	80
Trucks	Diesel	TT/AT 28 - 34t	35	60	80
Trucks	Diesel	TT/AT 34 - 40t	35	60	80
Trucks	Diesel	TT/AT 40 - 50t	35	60	80
Trucks	Diesel	TT/AT 50 - 60t	35	60	80
Trucks	Diesel	TT/AT >60t	35	60	80
Urban buses	Gasoline		30	50	70
Urban buses	Diesel	< 15 tonnes	30	50	70
Urban buses	Diesel	15-18 tonnes	30	50	70
Urban buses	Diesel	> 18 tonnes	30	50	70
Coaches	Gasoline		35	60	80
Coaches	Diesel	< 15 tonnes	35	60	80
Coaches	Diesel	15-18 tonnes	35	60	80
Coaches	Diesel	> 18 tonnes	35	60	80
Mopeds	Gasoline		30	30	-
Motorcycles	Gasoline	2 stroke	40	70	100
Motorcycles	Gasoline	< 250 cc.	40	70	100
Motorcycles	Gasoline	250 – 750 cc.	40	70	100
Motorcycles	Gasoline	> 750 cc.	40	70	100

In addition data from a survey made by the Danish Road Directorate (Hansen, 2010) has given information of the total mileage driven by foreign trucks on Danish roads in 2009. This mileage contribution has been added to the total mileage for Danish trucks on Danish roads, for trucks > 16 tonnes of gross vehicle weight. The data has been further processed by DTU Transport; by using appropriate assumptions the mileage have been backcasted to 1985 and forecasted to 2011.

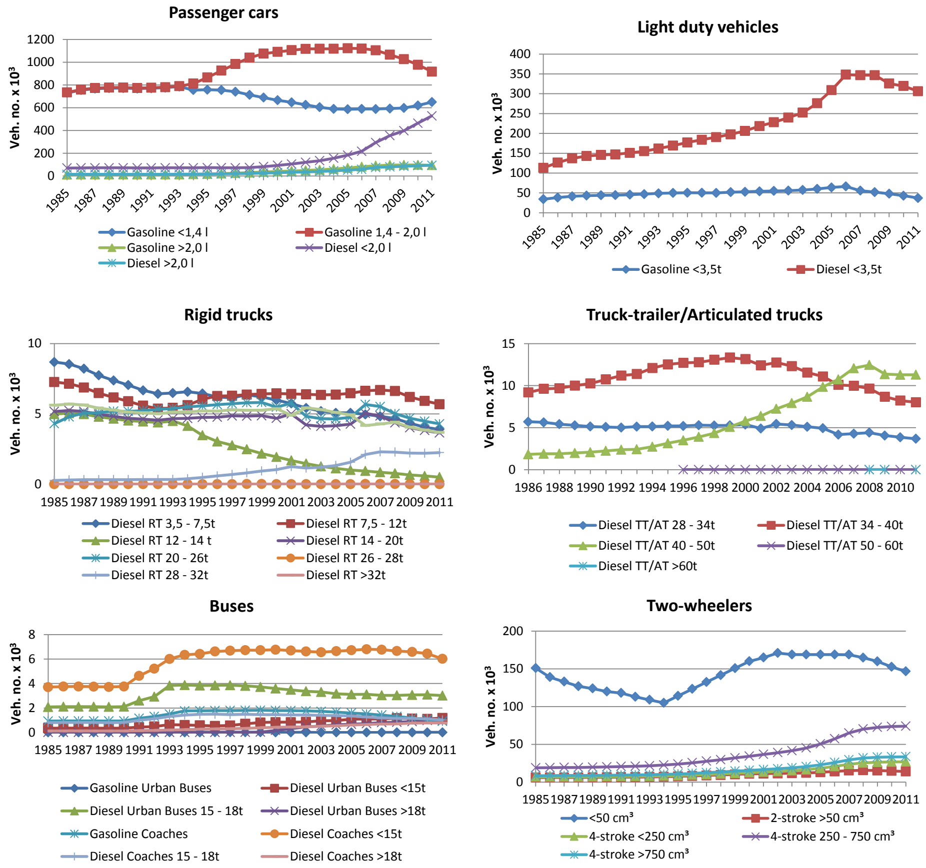


Figure 3.3.36 Number of vehicles in sub-classes in 1985-2011.

For passenger cars, the engine size differentiation is less certain for the years before 2005. The increase in the total number of passenger cars is mostly due to a growth in the number of gasoline cars with engine sizes between 1.4 and 2 litres (from 1990-2002) and diesel cars smaller than 2 litres (from the 2000's up to now). Until 2005, there has been a decrease in the number of cars with an engine size smaller than 1.4 litres. These cars, however, have also increased in numbers during the later years.

There has been a considerable growth in the number of diesel light-duty vehicles from 1985 to 2006; the number of vehicles has however decreased somewhat after 2006.

For the truck-trailer and articulated truck combinations there is a tendency towards the use of increasingly larger trucks throughout the time period. The decline in fleet numbers for many of the truck categories in 2007/2008 and until 2009 is caused by the impact of the global financial crisis and the reflagging of Danish commercial trucks to companies based in the neighbouring countries.

The number of urban buses has been almost constant between 1985 and 2011. The sudden change in the level of coach numbers from 1994 to 1995 is due to uncertain fleet data.

The reason for the significant growth in the number of mopeds from 1994 to 2002 is the introduction of the so-called Moped 45 vehicle type. For motorcycles, the number of vehicles has grown in general throughout the entire 1985-2011 period. The increase is, however, most visible from the mid-1990s and onwards.

The vehicle numbers are summed up in layers for each year (Figure 3.3.37) by using the correspondence between layers and first year of registration:

$$N_{j,y} = \sum_{i=FYear(j)}^{LYear(j)} N_{i,y} \tag{1}$$

Where N = number of vehicles, j = layer, y = year, i = first year of registration.

Weighted annual mileages pr layer are calculated as the sum of all mileage driven pr first registration year divided by the total number of vehicles in the specific layer.

$$M_{j,y} = \frac{\sum_{i=FYear(j)}^{LYear(j)} N_{i,y} \cdot M_{i,y}}{\sum_{i=FYear(j)}^{LYear(j)} N_{i,y}} \tag{2}$$

Since 2006 economical incitements have been give to private vehicle owners to buy Euro 5 diesel passenger cars and vans in order to bring down the particulate emissions from diesel vehicles. The estimated sales between 2006 and 2010 have been examined by the Danish EPA and are included in the fleet data behind the Danish inventory (Winther, 2011).

For heavy duty trucks, there is a slight deviation from the strict correspondence between EU emission layers and first registration year.

In this case, specific Euro class information for most of the vehicles from 2001 onwards is incorporated into the fleet and mileage data model developed by Jensen (2012). For inventory years before 2001, and for vehicles with no Euro information the normal correspondence between layers and first year of registration is used.

Vehicle numbers and weighted annual mileages pr layer are shown in Annex 2.B.1 and 3.B.2 for 1985-2011. The trends in vehicle numbers pr layer are also shown in Figure 3.3.37. The latter figure shows how vehicles complying with the gradually stricter EU emission levels (EURO I, II, III, IV etc.) have been introduced into the Danish motor fleet.

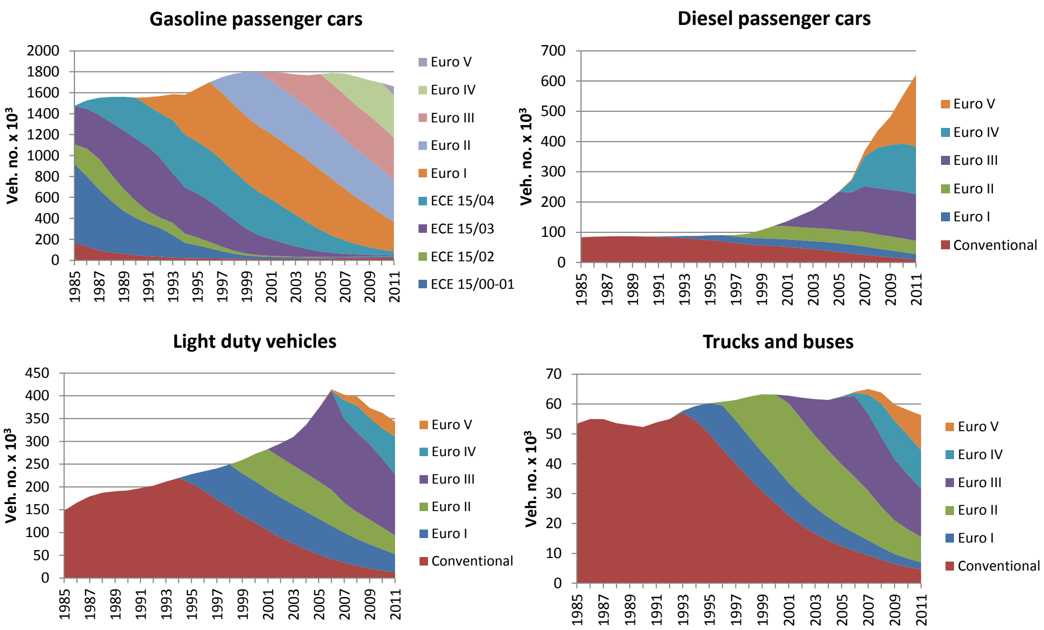


Figure 3.3.37 Layer distribution of vehicle numbers pr vehicle type in 1985-2011.

Emission legislation

For Euro 1-4 passenger cars and light duty trucks, the chassis dynamometer test cycle used in the EU for emission approval is the NEDC (New European Driving Cycle), see Nørgaard and Hansen (2004). The test cycle is also used also for fuel consumption measurements. The NEDC cycle consists of two parts, the first part being a 4-time repetition (driving length: 4 km) of the ECE test cycle. The latter test cycle is the so-called urban driving cycle[4] (average speed: 19 km pr h). The second part of the test is the run-through of the EUDC (Extra Urban Driving Cycle) test driving segment, simulating the fuel consumption under rural and highway driving conditions. The driving length of EUDC is 7 km at an average speed of 63 km pr h. More information regarding the fuel measurement procedure can be found in the EU-directive 80/1268/EØF.

For NOx, VOC (NMVOC + CH4), CO and PM, the emissions from road transport vehicles have to comply with the different EU directives listed in Table 3.3.9. The emission directives distinguish between three vehicle classes according to vehicle reference mass[5]: Passenger cars and light duty trucks (<1305 kg), light duty trucks (1305-1760 kg) and light duty trucks (>1760 kg).The specific emission limits are shown in Annex 2.B.3.

In practice, the emissions from vehicles in traffic are different from the legislation limit values and, therefore, the latter figures are considered to be too inaccurate for total emission calculations. A major constraint is that the emission approval test conditions reflect only to a small degree the large variety of emission influencing factors in the real traffic situation, such as cumulated mileage driven, engine and exhaust after treatment maintenance levels and driving behaviour.

Therefore, in order to represent the Danish fleet and to support average national emission estimates, emission factors must be chosen which derive

[4] For Euro 3 and on, the emission approval test procedure was slightly changed. The 40 s engine warm up phase before start of the urban driving cycle was removed.
[5] Reference mass: net vehicle weight + mass of fuel and other liquids + 100 kg.

from numerous emissions measurements, using a broad range of real world driving patterns and a sufficient number of test vehicles. It is similar important to have separate fuel consumption and emission data for cold-start emission calculations and gasoline evaporation (hydrocarbons).

For heavy-duty vehicles (trucks and buses), the emission limits are given in g pr kWh and the measurements are carried out for engines in a test bench, using the EU ESC (European Stationary Cycle) and ETC (European Transient Cycle) test cycles, depending on the Euro norm and exhaust gas aftertreatment system installed. A description of the test cycles is given by Nørgaard and Hansen, 2004). Measurement results in g pr kWh from emission approval tests cannot be directly used for inventory work. Instead, emission factors used for national estimates must be transformed into g pr km, and derived from a sufficient number of measurements which represent the different vehicle size classes, Euro engine levels and real world variations in driving behaviour.

In terms of the sulphur content in the fuels used by road transportation vehicles, the EU directive 2003/17/EF describes the fuel quality standards agreed by the EU. In Denmark, the sulphur content in gasoline and diesel was reduced to 10 ppm in 2005, by means of a fuel tax reduction for fuels with 10 ppm sulphur contents.

Table 3.3.9 Overview of the existing EU emission directives for road transport vehicles.

Vehicle category	Emission layer	EU directive	First reg. date
Passenger cars (gasoline)	PRE ECE	-	-
	ECE 15/00-01	70/220 - 74/290	1972[a]
	ECE 15/02	77/102	1981[b]
	ECE 15/03	78/665	1982[c]
	ECE 15/04	83/351	1987[d]
	Euro I	91/441	1.10.1990[e]
	Euro II	94/12	1.1.1997
	Euro III	98/69	1.1.2001
	Euro IV	98/69	1.1.2006
	Euro V	715/2007	1.1.2011
	Euro VI	715/2007	1.9.2015
Passenger cars (diesel and LPG)	Conventional	-	-
	ECE 15/04	83/351	1987[d]
	Euro I	91/441	1.10.1990[e]
	Euro II	94/12	1.1.1997
	Euro III	98/69	1.1.2001
	Euro IV	98/69	1.1.2006
	Euro V	715/2007	1.1.2011
	Euro VI	715/2007	1.9.2015
Light duty trucks (gasoline and diesel)	Conventional	-	-
	ECE 15/00-01	70/220 - 74/290	1972[a]
	ECE 15/02	77/102	1981[b]
	ECE 15/03	78/665	1982[c]
	ECE 15/04	83/351	1987[d]
	Euro I	93/59	1.10.1994
	Euro II	96/69	1.10.1998
	Euro III	98/69	1.1.2002
	Euro IV	98/69	1.1.2007
	Euro V	715/2007	1.1.2012
	Euro VI	715/2007	1.9.2016
Heavy duty vehicles	Euro 0	88/77	1.10.1990
	Euro I	91/542	1.10.1993
	Euro II	91/542	1.10.1996
	Euro III	1999/96	1.10.2001
	Euro IV	1999/96	1.10.2006
	Euro V	1999/96	1.10.2009
	Euro VI	595/2009	1.10.2013
Mopeds	Conventional	-	-
	Euro I	97/24	2000
	Euro II	2002/51	2004
Motor cycles	Conventional	-	-
	Euro I	97/24	2000
	Euro II	2002/51	2004
	Euro III	2002/51	2007

a,b,c,d: Expert judgement suggest that Danish vehicles enter into the traffic before EU directive first registration dates. The effective inventory starting years are a: 1970; b: 1979; c: 1981; d: 1986.

e: The directive came into force in Denmark in 1991 (EU starting year: 1993).

Fuel consumption and emission factors

Trip-speed dependent basis factors for fuel consumption and emissions are taken from the COPERT model using trip speeds as shown in Table 3.3.8. The factors are listed in Annex 2.B.4. For EU emission levels not represented by actual data, the emission factors are scaled according to the reduction factors given in Annex 2.B.5.

The fuel consumption and emission factors used in the Danish inventory come from the COPERT IV model. The source for these data is various European measurement programmes. In general the COPERT data are transformed into trip-speed dependent fuel consumption and emission factors for all vehicle categories and layers.

For passenger cars, real measurement results are behind the emission factors for Euro 1-4 vehicles, and those earlier. For light duty trucks the measurements represent Euro 1 and prior vehicle technologies. For mopeds and motorcycles, updated fuel consumption and emission figures are behind the conventional and Euro 1-3 technologies. For heavy-duty trucks and buses the experimental basis is computer simulated emission factors for Euro 0-V engines.

Adjustment for fuel efficient vehicles

In the Danish fleet and mileage database kept by DTU Transport, the type approval fuel efficiency value based on the NEDC driving cycle (TA_{NEDC}) is registered for each single car. Further, a modified fuel efficiency value (TA_{inuse}) is calculated using TA_{NEDC}, vehicle weight and engine size as input parameters. The TA_{inuse} value better reflects the fuel consumption associated with the NEDC driving cycle under real ("inuse") traffic conditions (Emisia, 2012).

From 2006 up to last historical year represented by fleet data, the average CO_2 emission factor (by fleet number) is calculated for each year's new sold cars, based on the registered TA_{NEDC} values. Using the average CO_2 emission factor for the last historical year as starting point, the average emission factor for each year's new sold cars are linearly reduced, until the emission factor reaches 95 g CO_2 /km in 2020.

From 2006 up to last historical year, the average CO_2 emission factor (by fleet number) is also calculated for each year's new sold cars, and for each fuel type/engine size combination, based on TA_{NEDC} and TA_{inuse}.

The linear reduction of the average emission factor for each year's new sold cars is then used to reduce the CO_2 emission factors for new sold cars based on TA_{inuse}, between last historical year and 2020, for each of the fuel type/engine size fleet segments.

Subsequently for each layer and inventory year, CO_2 emission factors are calculated based on TA_{inuse} and weighted by total mileage. On the same time corresponding layer specific CO_2 factors from COPERT IV are set up valid for Euro 4+ vehicles in the COPERT model. The COPERT IV CO_2 factors are derived from fuel consumption factors assessed by the developers of COPERT IV (Emisia, 2012) to represent the COPERT test vehicles under the NEDC driving cycle in real world traffic ($TA_{COPERT\ IV,inuse}$).

Adjustment for EGR, SCR and filter retrofits

In COPERT IV updated emission factors have recently been made available for Euro V heavy duty vehicles using EGR and SCR exhaust emission after-treatment systems, respectively. The estimated new sales of Euro V diesel trucks equipped with EGR and SCR during the 2006-2010 time periods has been examined by Hjelgaard and Winther (2011). These inventory fleet data are used in the Danish inventory to calculate weighted emission factors for Euro V trucks in different size categories.

During the 2000's urban environmental zones have been established in Danish cities in order to bring down the particulate emissions from diesel fuelled heavy duty vehicles. Driving in these environmental zones prescribe the use of diesel particulate filters. The Danish EPA has provided the estimated number of Euro I-III urban buses and Euro II-III trucks and tourist buses which have been retrofitted with filters during the 2000's. These retrofit data are included in the Danish inventory by assuming that particulate emissions are lowered by 80 % compared with the emissions from the same Euro technology with no filter installed (Winther, 2011).

For all vehicle categories/technology levels not represented by measurements, the emission factors are produced by using reduction factors. The latter factors are determined by assessing the EU emission limits and the relevant emission approval test conditions, for each vehicle type and Euro class.

Adjustment for biofuel usage

A literature review carried out in the Danish research project REBECA revealed no significant changes in emission factors between neat gasoline and E5 gasoline-ethanol blends for the combustion related emission components; NO_x, CO and VOC (Winther et al., 2012). Hence, due to the current low ethanol content in today's road transport gasoline, no modifications of the neat gasoline based COPERT emission factors are made in the inventories in order to account for ethanol usage.

REBECa results published by Winther (2009) have shown that the emission impact of using diesel-biodiesel blends is very small at low biodiesel blend ratios. Consequently no bio fuel emission factor adjustments are needed for diesel vehicles as well. However, adjustment of the emission factors for diesel vehicles will be made if the biodiesel content of road transport diesel fuel increases to a more significant level in the future.

Deterioration factors

For three-way catalyst cars the emissions of NO_X, NMVOC and CO gradually increase due to catalyst wear and are, therefore, modified as a function of total mileage by the so-called deterioration factors. Even though the emission curves may be serrated for the individual vehicles, on average, the emissions from catalyst cars stabilise after a given cut-off mileage is reached due to OBD (On Board Diagnostics) and the Danish inspection and maintenance programme.

For each year, the deterioration factors are calculated pr first registration year by using deterioration coefficients and cut-off mileages, as given in EMEP/EEA (2009), for the corresponding layer. The deterioration coefficients are given for the two driving cycles: "Urban Driving Cycle" (UDF) and "Extra Urban Driving Cycle" (EUDF: urban and rural), with trip speeds of 19 and 63 km pr h, respectively.

Firstly, the deterioration factors are calculated for the corresponding trip speeds of 19 and 63 km pr h in each case determined by the total cumulated mileage less than or exceeding the cut-off mileage. The Formulas 3 and 4 show the calculations for the "Urban Driving Cycle":

$$UDF = U_A \cdot MTC + U_B \text{, MTC < } U_{MAX} \tag{3}$$

$$UDF = U_A \cdot U_{MAX} + U_B \text{, MTC >= } U_{MAX} \tag{4}$$

where UDF is the urban deterioration factor, U_A and U_B the urban deterioration coefficients, MTC = total cumulated mileage and U_{MAX} urban cut-off mileage.

In the case of trip speeds below 19 km pr h the deterioration factor, DF, equals UDF, whereas for trip speeds exceeding 63 km pr h, DF=EUDF. For trip speeds between 19 and 63 km pr h the deterioration factor, DF, is found as an interpolation between UDF and EUDF. Secondly, the deterioration factors, one for each of the three road types, are aggregated into layers by taking into account vehicle numbers and annual mileage levels pr first registration year:

$$DF_{j,y} = \frac{\sum_{i=FYear(j)}^{LYear(j)} DF_{i,y} \cdot N_{i,y} \cdot M_{i,y}}{\sum_{i=FYear(j)}^{LYear(j)} DF_{i,y} \cdot N_{i,y}} \tag{5}$$

where DF is the deterioration factor.

For N_2O and NH_3, COPERT IV takes into account deterioration as a linear function of mileage for gasoline fuelled EURO 1-4 passenger cars and light duty vehicles. The level of emission deterioration also relies on the content of sulphur in the fuel. The deterioration coefficients are given in EMEP/EEA (2009), for the corresponding layer. A cut-off mileage of 250.000 km is behind the calculation of the modified emission factors, and for the Danish situation the low sulphur level interval is assumed to be most representative.

Emissions and fuel consumption for hot engines

Emissions and fuel-use results for operationally hot engines are calculated for each year and for layer and road type. The procedure is to combine fuel consumption and emission factors (and deterioration factors for catalyst vehicles), number of vehicles, annual mileage levels and the relevant road-type shares given in Table 3.3.8. For non-catalyst vehicles this yields:

$$E_{j,k,y} = EF_{j,k,y} \cdot S_k \cdot N_{j,y} \cdot M_{j,y} \tag{6}$$

Here E = fuel consumption/emission, EF = fuel consumption/emission factor, S = road type share and k = road type.

For catalyst vehicles the calculation becomes:

$$E_{j,k,y} = DF_{j,k,y} \cdot EF_{j,k,y} \cdot S_k \cdot N_{j,y} \cdot M_{j,y} \tag{7}$$

Extra emissions and fuel consumption for cold engines

Extra emissions of NO_X, VOC, CH_4, CO, PM, NH_3 and fuel consumption from cold start are simulated separately. For SO_2, the extra emissions are derived from the cold start fuel consumption results.

Each trip is associated with a certain cold-start emission level and is assumed to take place under urban driving conditions. The number of trips is distributed evenly across the months. First, cold emission factors are calculated as the hot emission factor times the cold:hot emission ratio. Secondly, the extra emission factor during cold start is found by subtracting the hot emission factor from the cold emission factor. Finally, this extra factor is applied on the fraction of the total mileage driven with a cold engine (the β-factor) for all vehicles in the specific layer.

The cold:hot ratios depend on the average trip length and the monthly ambient temperature distribution. The Danish temperatures for 2011 are given in Cappelen et al. (2012). For previous years, temperature data are taken from similar reports available from The Danish Meteorological Institute (www.dmi.dk). The cold:hot ratios are equivalent for gasoline fuelled conventional passenger cars and vans and for diesel passenger cars and vans, respectively, see EMEP/EEA (2009). For conventional gasoline and all diesel vehicles the extra emissions become:

$$CE_{j,y} = \beta \cdot N_{j,y} \cdot M_{j,y} \cdot EF_{U,j,y} \cdot (CEr - 1) \tag{8}$$

Where CE is the cold extra emissions, β = cold driven fraction, CEr = Cold:Hot ratio.

For catalyst cars, the cold:hot ratio is also trip speed dependent. The ratio is, however, unaffected by catalyst wear. The Euro I cold:hot ratio is used for all future catalyst technologies. However, in order to comply with gradually stricter emission standards, the catalyst light-off temperature must be reached in even shorter periods of time for future EURO standards. Correspondingly, the β-factor for gasoline vehicles is reduced step-wise for Euro II vehicles and their successors.

For catalyst vehicles the cold extra emissions are found from:

$$CE_{j,y} = \beta_{red} \cdot \beta_{EUROI} \cdot N_{j,y} \cdot M_{j,y} \cdot EF_{U,j,y} \cdot (CEr_{EUROI} - 1) \tag{9}$$

where β_{red} = the β reduction factor.

For CH_4, specific emission factors for cold driven vehicles are included in COPERT IV. The β and β_{red} factors for VOC are used to calculate the cold driven fraction for each relevant vehicle layer. The NMVOC emissions during cold start are found as the difference between the calculated results for VOC and CH_4.

For NH_3, specific cold start emission factors are also proposed by COPERT IV. For catalyst vehicles, however, just like in the case of hot emission factors, the emission factors for cold start are functions of cumulated mileage (emission deterioration). The level of emission deterioration also relies on the content of sulphur in the fuel. The deterioration coefficients are given in EMEP/EEA (2009), for the corresponding layer. For cold start, the cut-off mileage and sulphur level interval for hot engines are used, as described in the deterioration factors paragraph.

Evaporative emissions from gasoline vehicles
For each year, evaporative emissions of hydrocarbons are simulated in the model as hot and warm running losses, hot and warm soak loss and diurnal emissions. The calculation approach is the same as in COPERT III. All emission types depend on RVP (Reid Vapour Pressure) and ambient temperature. The emission factors are shown in Ntziachristos et al. (2000).

Running loss emissions originate from vapour generated in the fuel tank while the vehicle is running. The distinction between hot and warm running loss emissions depends on engine temperature. In the model, hot and warm running losses occur for hot and cold engines, respectively. The emissions are calculated as annual mileage (broken down into cold and hot mileage totals using the β-factor) times the respective emission factors. For vehicles equipped with evaporation control (catalyst cars), the emission factors are only one tenth of the uncontrolled factors used for conventional gasoline vehicles.

$$R_{j,y} = N_{j,y} \cdot M_{j,y} \cdot ((1-\beta) \cdot HR + \beta \cdot WR) \qquad (10)$$

Where R is running loss emissions and HR and WR are the hot and warm running loss emission factors, respectively.

In the model, hot and warm soak emissions for carburettor vehicles also occur for hot and cold engines, respectively. These emissions are calculated as number of trips (broken down into cold and hot trip numbers using the β-factor) times respective emission factors:

$$S_{j,y}^{C} = N_{j,y} \cdot \frac{M_{j,y}}{l_{trip}} \cdot ((1-\beta) \cdot HS + \beta \cdot WS) \qquad (11)$$

Where S^C is the soak emission, l_{trip} = the average trip length, and HS and WS are the hot and warm soak emission factors, respectively. Since all catalyst vehicles are assumed to be carbon canister controlled, no soak emissions are estimated for this vehicle type. Average maximum and minimum temperatures pr month are used in combination with diurnal emission factors to estimate the diurnal emissions from uncontrolled vehicles $E^d(U)$:

$$E_{j,y}^{d}(U) = 365 \cdot N_{j,y} \cdot e^{d}(U) \qquad (12)$$

Each year's total is the sum of each layer's running loss, soak loss and diurnal emissions.

Fuel consumption balance
The calculated fuel consumption in COPERT IV must equal the statistical fuel sale totals according to the UNFCCC and UNECE emissions reporting format. The statistical fuel sales for road transport are derived from the Danish Energy Authority data (see DEA, 2012). The DEA data are further processed for gasoline in order to account for e.g. non-road and recreational craft fuel consumption, which are not directly stated in the statistics, please refer to paragraph 1.1.4 for further information regarding the transformation of DEA fuel data.

The standard approach to achieve a fuel balance in annual emission inventories is to multiply the annual mileage with a fuel balance factor derived as the ratio between simulated and statistical fuel figures for gasoline and diesel, respectively. This method is also used in the present model.

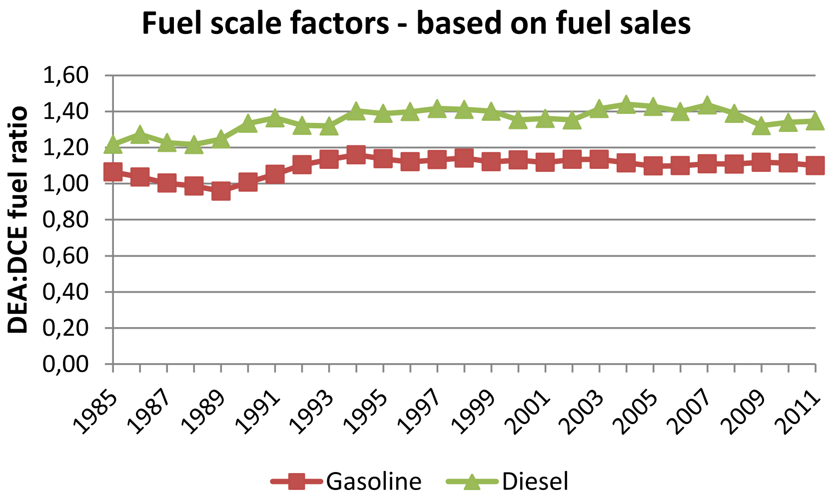


Figure 3.3.38 DEA:DCE Fuel ratios (mileage adjustment factors) based on DEA fuel sales data and DCE fuel consumption estimates.

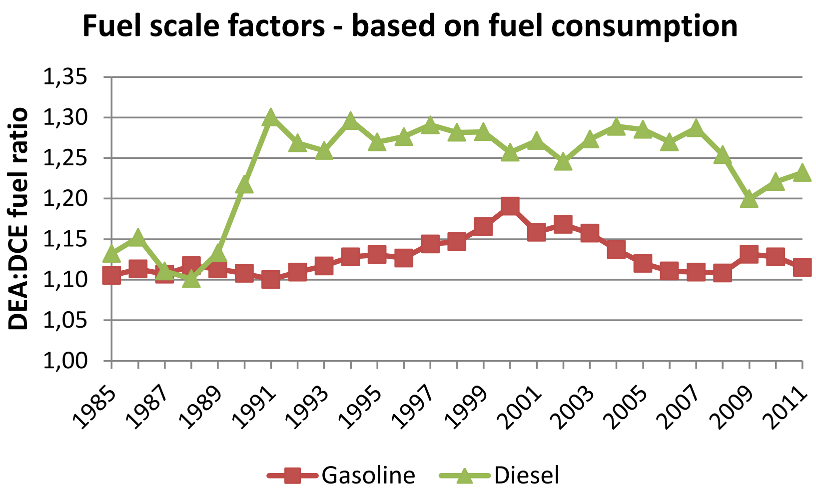


Figure 3.3.39 DEA:DCE Fuel ratios and (mileage adjustment factors) based on DEA fuel consumption data and DCE fuel consumption estimates.

In the figures 3.3.38 and 3.3.39 the COPERT IV:DEA gasoline and diesel fuel consumption ratios are shown for fuel sales and fuel consumption from 1985-2011. The data behind the figures are also listed in Annex 2.B.8. The fuel consumption figures are related to the traffic on Danish roads by Danish vehicles and foreign trucks.

Pr fuel type, all mileage numbers are equally scaled in order to obtain fuel equilibrium, and hence the mileage factors used are the reciprocal values of the COPERT IV:DEA fuel consumption: fuel sales ratio.

The reasons for the differences between DEA sales figures and bottom-up fuel estimates are mostly due to a combination of the uncertainties related to COPERT IV fuel consumption factors, allocation of vehicle numbers in sub-categories, annual mileage, trip speeds and mileage splits for urban, rural and highway driving conditions.

The final fuel consumption and emission factors are shown in Annex 2.B.7 for 1985-2011. The total fuel consumption and emissions are shown in Annex 2.B.8, pr vehicle category and as grand totals, for 1985-2011 (and NFR format in Annex 2.B.16. In Annex 2.B.15, fuel consumption and emission factors as well as total emissions are given in CollectER format for 2011.

In Table 3.3.10, the aggregated emission factors for SO_2, NO_X, NMVOC and TSP are shown in CollectER format for Danish road transport.

Table 3.3.10 Fuel-based emission factors for SO_2, NO_X, NMVOC, CO, NH_3 and TSP for road transport in Denmark (2011).

SNAP ID	Category	Fuel type	Mode	Emission factors[1] [g pr GJ]					
				SO_2	NO_X	NMVOC	CO	NH_3	TSP
070101	Passenger cars	Highway	Diesel	0.47	288.01	4.33	14.28	0.51	14.02
070101	Passenger cars	Highway	Gasoline	0.46	155.25	36.83	749.17	32.19	1.07
070101	Passenger cars	Highway	LPG	0.00	264.87	42.11	1 449.08	0.00	10.05
070102	Passenger cars	Rural	Diesel	0.47	244.82	5.69	26.79	0.54	11.50
070102	Passenger cars	Rural	Gasoline	0.46	126.17	42.11	607.75	35.85	1.04
070102	Passenger cars	Rural	LPG	0.00	288.65	64.66	551.80	0.00	14.45
070103	Passenger cars	Urban	Diesel	0.47	235.59	16.64	73.99	0.36	21.08
070103	Passenger cars	Urban	Gasoline	0.46	152.97	310.96	3 322.87	8.67	0.96
070103	Passenger cars	Urban	LPG	0.00	144.09	142.60	927.28	0.00	11.72
070201	Light duty vehicles	Highway	Diesel	0.47	292.25	19.69	126.18	0.37	20.11
070201	Light duty vehicles	Highway	Gasoline	0.46	170.40	20.27	570.88	22.88	1.44
070201	Light duty vehicles	Highway	LPG	0.00	127.95	19.27	1 005.60	0.00	10.04
070202	Light duty vehicles	Rural	Diesel	0.47	305.37	22.27	108.34	0.40	16.49
070202	Light duty vehicles	Rural	Gasoline	0.46	149.05	29.88	432.24	22.86	1.29
070202	Light duty vehicles	Rural	LPG	0.00	139.87	29.19	420.56	0.00	14.45
070203	Light duty vehicles	Urban	Diesel	0.47	284.90	43.76	142.66	0.26	26.39
070203	Light duty vehicles	Urban	Gasoline	0.46	132.56	192.71	3 607.15	4.85	0.79
070203	Light duty vehicles	Urban	LPG	0.00	76.20	66.46	527.77	0.00	12.29
070301	Heavy duty vehicles	Highway	Diesel	0.47	441.06	8.82	135.76	0.31	7.01
070301	Heavy duty vehicles	Highway	Gasoline	0.46	1 037.78	474.61	7 610.35	0.28	55.35
070302	Heavy duty vehicles	Rural	Diesel	0.47	493.50	11.78	132.39	0.30	7.46
070302	Heavy duty vehicles	Rural	Gasoline	0.46	1141.55	820.40	8 371.39	0.30	60.88
070303	Heavy duty vehicles	Urban	Diesel	0.47	589.92	17.24	146.84	0.25	9.06
070303	Heavy duty vehicles	Urban	Gasoline	0.46	456.62	696.09	7 102.99	0.20	40.59
070400	Mopeds	Urban	Gasoline	0.46	175.67	7 973.23	8 602.84	1.33	129.35
070501	Motorcycles	Highway	Gasoline	0.46	269.76	675.80	10 509.20	1.27	16.22
070502	Motorcycles	Rural	Gasoline	0.46	192.42	672.51	9 734.47	1.55	19.76
070503	Motorcycles	Urban	Gasoline	0.46	118.94	828.11	9 372.12	1.51	19.27

[1] References. SO_2: Country specific; NO_X, NMVOC, CO, NH_3 and PM: COPERT IV.

Non-exhaust particulate emissions from road transport

The TSP, PM_{10} and $PM_{2.5}$ emissions arising from tyre and brake wear (SNAP 0707) and road abrasion (SNAP 0708) are estimated for the years 2000-2011 as prescribed by the UNECE convention reporting format. The emissions are calculated by multiplying the total annual mileage pr vehicle category with the correspondent average emission factors for each source type. The calculation procedure is consistent with the COPERT IV model approach used to estimate the Danish national emissions coming from exhaust. A more thorough explanation of the calculations is given by Winther and Slentø (2010). Emission factors are taken from EMEP/EEA (2009) and specific Danish tyre wear data are gathered by Winther and Slentø (2010). The emission factors and total emissions for 2011 are shown in Annex 2.B.15.

Methodologies and references for other mobile sources

Other mobile sources are divided into several sub-sectors: sea transport, fishery, air traffic, railways, military, and working machinery and materiel in the industry, forestry, agriculture and household and gardening sectors. The emission calculations are made using the detailed method as described in the EMEP/EEA Air Pollutant Emission Inventory Guidebook (EMEP/EEA, 2009) for air traffic, off-road working machinery and equipment, and ferries, while for the remaining sectors the simple method is used.

3.3.3 Activity data

Air traffic

The activity data for air traffic consists of air traffic statistics provided by the Danish Transport Authority and Copenhagen Airport. Fuel statistics for jet fuel consumption and aviation gasoline are obtained from the Danish energy statistics (DEA, 2012).

For 2001 onwards, pr flight records are provided by the Danish Transport Authority as data codes for aircraft type, and origin and destination airports (city-pairs).

Subsequently the aircraft types are separated by DCE into larger aircraft using jet fuel (jet engines, turbo props, helicopters) and small aircraft types with piston engines using aviation gasoline. This is done by using different aircraft dictionaries, internet look-ups and by communication with the Danish Transport Authority. Each of the larger aircraft type is then matched with a representative type for which fuel consumption and emission data are available from the EMEP/EEA databank. Relevant for this selection is aircraft maximum take off mass, engine types, and number of engines. A more thorough explanation is given in Winther (2001a, b).

Annex 2.B.10 shows the correspondence table between the actual aircraft type codes and representative aircraft types behind the Danish inventory. Annex 2.B.10 also show the number of LTO's per representative aircraft type for domestic and international flights starting from Copenhagen Airport and other airports, respectively[6], in a time series from 2001-2011. The airport split is necessary to make due to the differences in LTO emission factors (c.f. section 3.3.4).

The same type of LTO activity data for the flights for Greenland and the Faroe Islands are shown in Annex 2.B.10 also, further detailed into an origin-destination airport matrix and having flight distances attached. This level of detail satisfies the demand from UNFCCC to provide precise documentation for the part of the inventory for the Kingdom of Denmark being outside the Danish mainland.

In the later years many flights in Denmark are being made by the new aircraft types CRJ9, E70, E170 and E175. These aircraft types are not represented by data in the EMEP/EEA databank. Instead new fuel consumption and

[6] Excluding flights for Greenland and the Faroe Islands. These flights are separately listed in Annex 2.B.10

emission factors have been calculated using fuel consumption and emission indexes from the ICAO Engine Exhaust Emission Database (www.caa.co.uk) for the CFM34-8C5 engine type which is installed in CRJ9, E70, E170 and E175. For LTO the fuel consumption and emission indexes are directly available from the ICAO database. For cruise, distance related indexes are calculated by weighting the baseline CFM34-8C5 indexes with the development in distance related emission indexes for the B737 400 representative aircraft type taken from the EMEP/EEA database.

The ideal flying distance (great circle distance) between the city-pairs is calculated by DCE in a separate database. The calculation algorithm uses a global latitude/altitude coordinate table for airports. In cases when airport coordinates are not present in the DCE database, these are looked up on the internet and entered into the database accordingly.

For inventory years prior to 2001, detailed LTO/aircraft type statistics are obtained from Copenhagen Airport (for this airport only), while information of total take-off numbers for other Danish airports is provided by the Danish Transport Authority. The assignment of representative aircraft types for Copenhagen Airport is done as described above. For the remaining Danish airports representative aircraft types are not directly assigned. Instead appropriate average assumptions are made relating to the fuel consumption and emission data part.

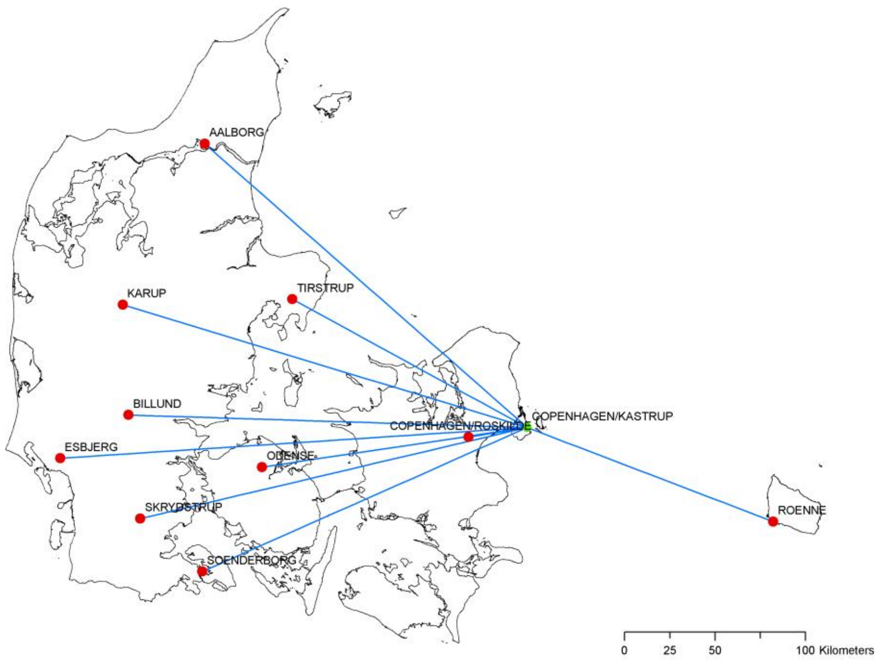
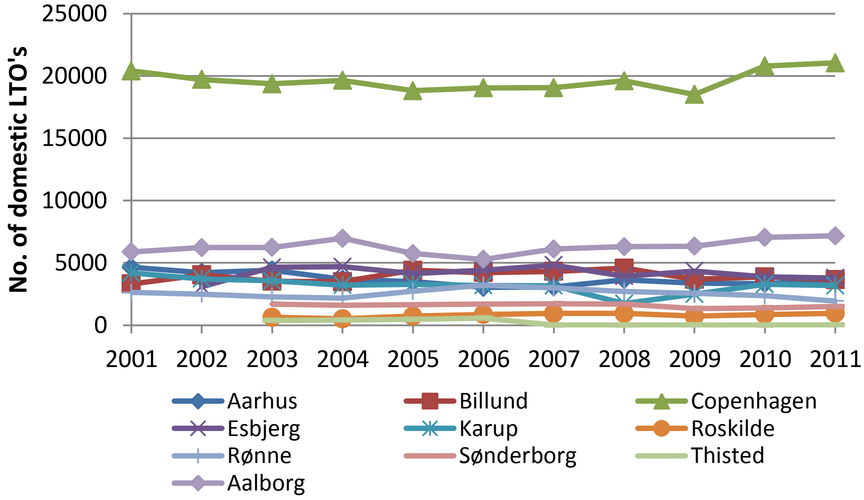


Figure 3.3.40 Most frequent domestic flying routes for large aircraft in Denmark.

Copenhagen Airport is the starting or end point for most of the domestic aviation made by large aircraft in Denmark (Figure 3.3.40; routes to Greenland/Faroe Islands are not shown). Even though many domestic flights not touching Copenhagen Airport are also reported in the flight statistics kept by the Danish Transport Authority, these flights, however, are predominantly made with small piston engine aircraft using aviation gasoline. Hence, the consumption of jet fuel by flights not using Copenhagen is merely marginal.



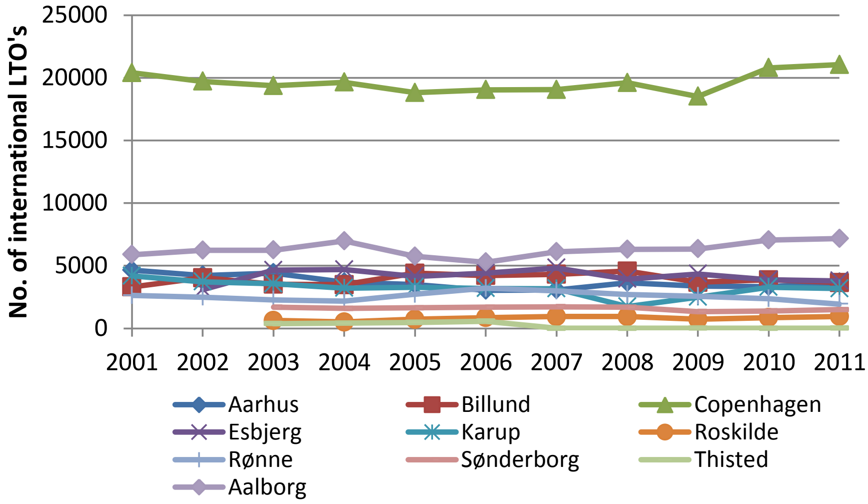


Figure 3.3.41 No. of LTO's for the most important airports in Denmark 2001-2011.

Figure 3.3.41 shows the number of domestic and international LTO's for Danish airports[7], in a time series from 2001-2011.

Non-road working machinery and equipment

Non-road working machinery and equipment are used in agriculture, forestry and industry, for household/gardening purposes and in inland waterways (recreational craft). Information on the number of different types of machines, their respective load factors, engine sizes and annual working hours has been provided by Winther et al. (2006) for the years until 2004. For later inventory years, supplementary stock data are annually provided by the Association of Danish Agricultural Machinery Dealers and the Association of Producers and Distributors of Fork Lifts in Denmark. The stock development from 1985-2011 for the most important types of machinery are shown in Figures 3.3.42-3.3.49 below. The stock data are also listed in Annex 2.B.11, together with figures for load factors, engine sizes and annual working hours. As regards stock data for the remaining machinery types, please refer to (Winther et al., 2006).

It is important to note that from key experts in the field of industrial non-road activities a significant decrease in the activities is assumed for 2009 due

[7] Flights for Greenland and the Faroe Islands are included under domestic in the figure.

to the global financial crisis. This reduction is in the order of 25 % for 2009 for industrial non-road in general (pers. comm. Per Stjernqvist, Volvo Construction Equipment 2010). For fork lifts 5 % and 20 % reductions are assumed for 2008 and 2009, respectively (pers. comm. Peter H. Møller, Rocla A/S).

For agriculture, the total number of agricultural tractors and harvesters per year are shown in the Figures 3.3.42-3.3.43, respectively. The figures clearly show a decrease in the number of small machines, these being replaced by machines in the large engine-size ranges.

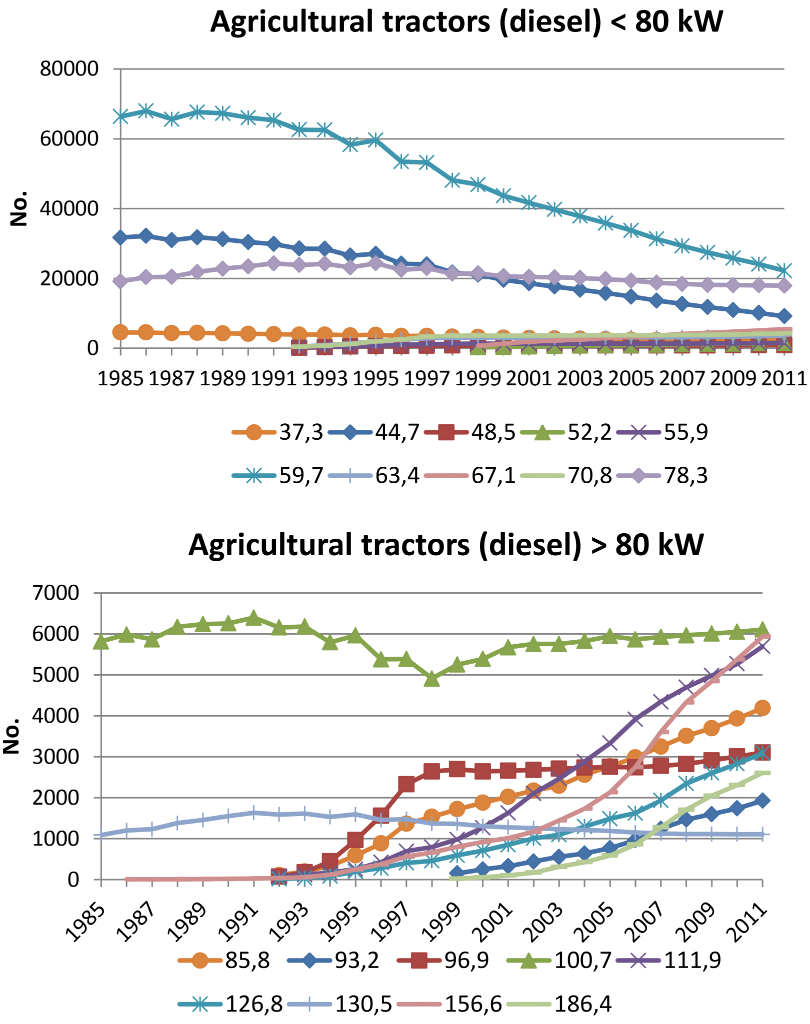
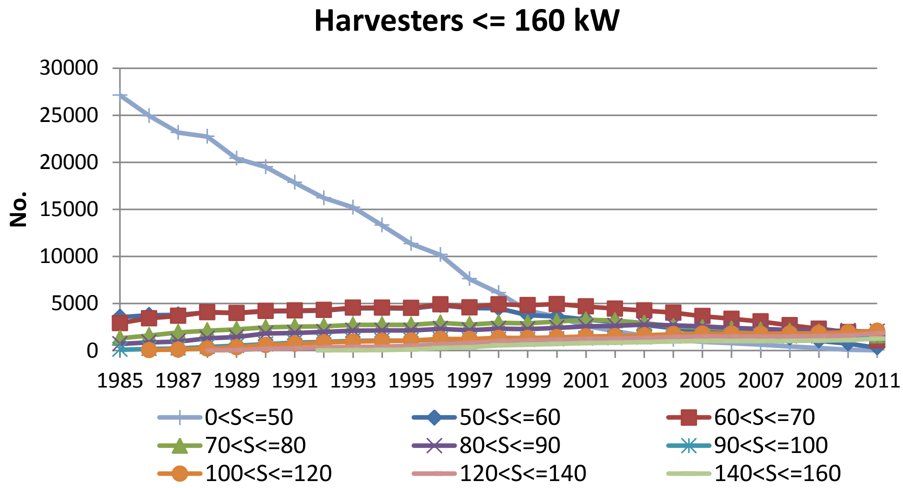


Figure 3.3.42 Total numbers in kW classes for tractors from 1985 to 2011.



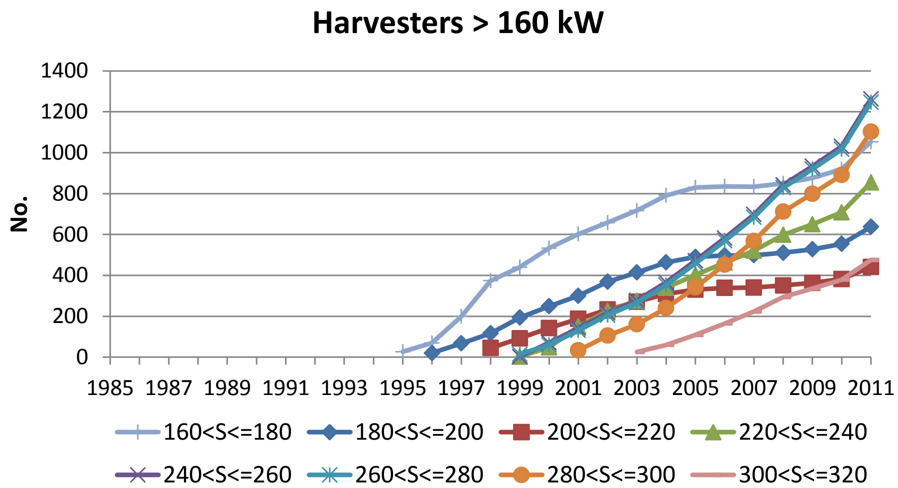


Figure 3.3.43 Total numbers in kW classes for harvesters from 1985 to 2011.

The tractor and harvester developments towards fewer vehicles and larger engines, shown in Figure 3.3.44, are very clear. From 1985 to 2011, tractor and harvester numbers decrease by around 20 % and 50 %, respectively, whereas the average increase in engine size for tractors is 35 %, and 202 % for harvesters, in the same time period.

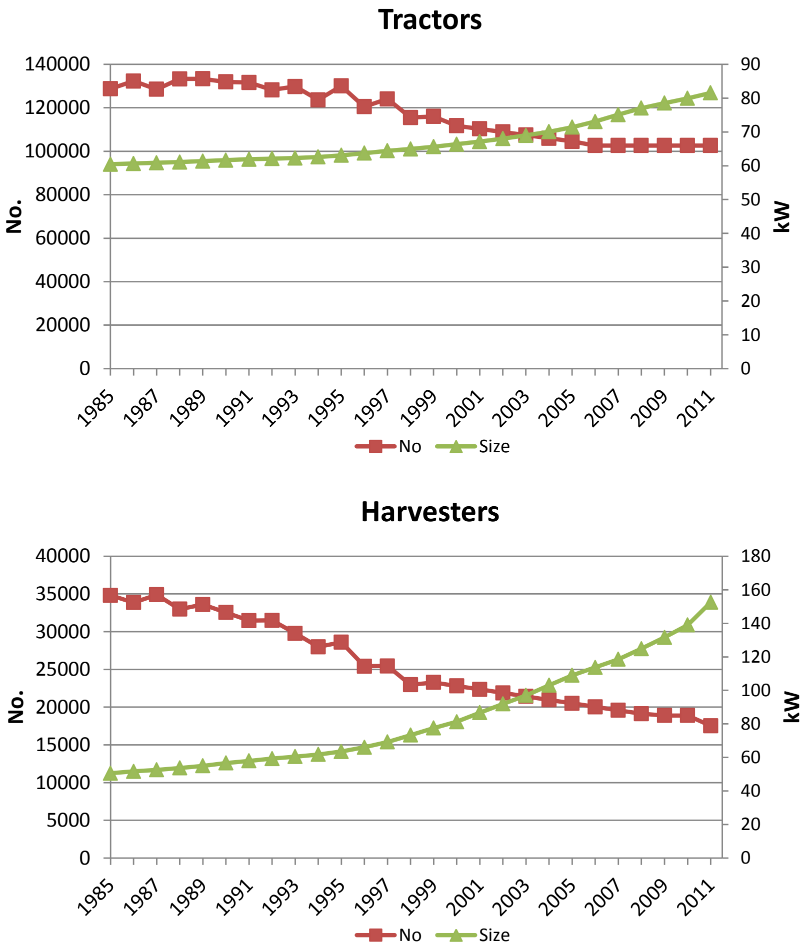


Figure 3.3.44 Total numbers and average engine size for tractors and harvesters from 1985 to 2011.

The most important machinery types for industrial use are different types of construction machinery and fork lifts. The Figures 3.3.45 and 3.3.46 show the 1985-2011 stock development for specific types of construction machinery and diesel fork lifts. Due to lack of data, the construction machinery stock for 1990 is used also for 1985-1989. For most of the machinery types there is an increase in machinery numbers from 1990 onwards, due to increased construction activities. It is assumed that track type excavators/wheel type loaders (0-5 tonnes), and telescopic loaders first enter into use in 1991 and 1995, respectively.

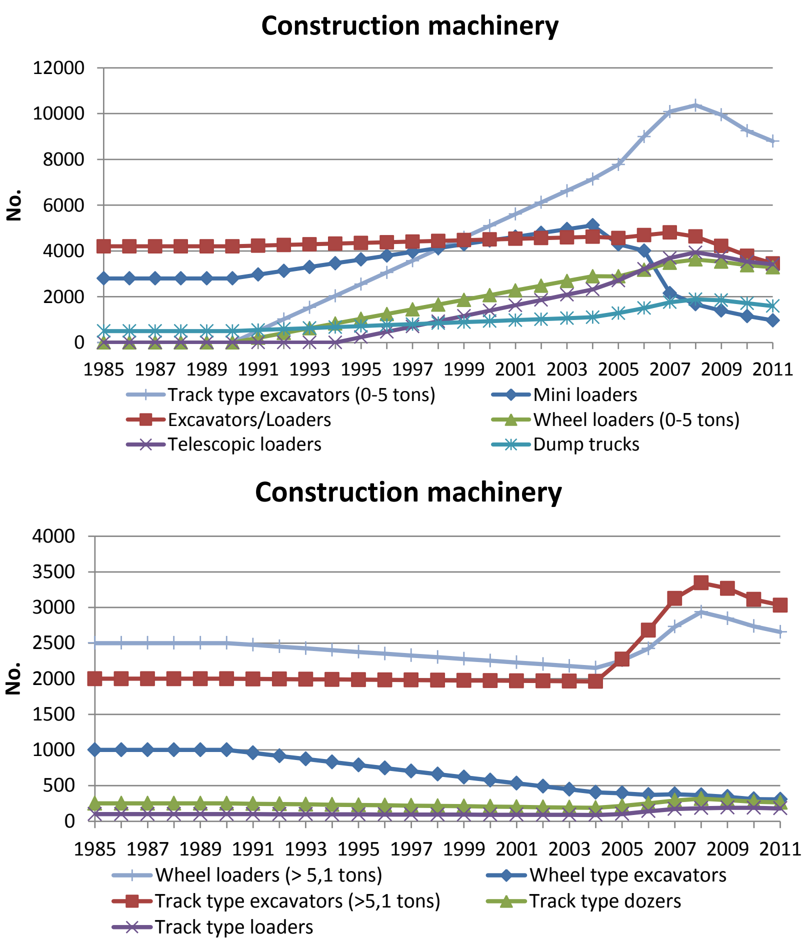


Figure 3.3.45 1985-2011 stock development for specific types of construction machinery.

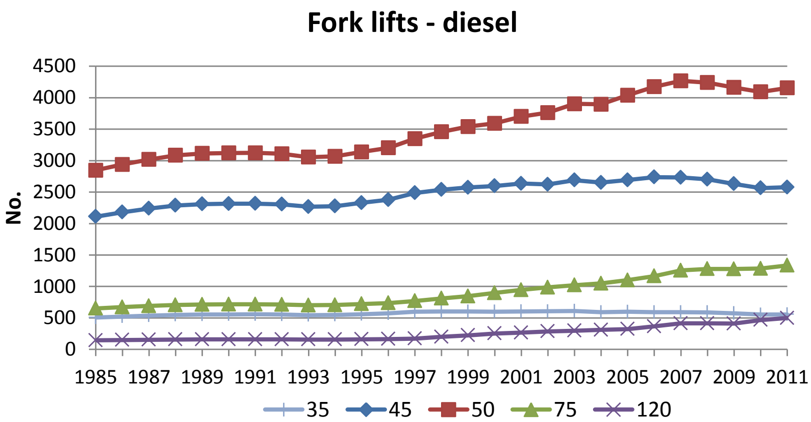


Figure 3.3.46 Total numbers of diesel fork lifts in kW classes from 1985 to 2011.

The emission level shares for tractors, harvesters, construction machinery and diesel fork lifts are shown in Figure 3.3.47, and present an overview of the penetration of the different pre-Euro engine classes, and engine stages complying with the gradually stricter EU stage I and II emission limits. The average lifetimes of 30, 25, 20 and 10 years for tractors, harvesters, fork lifts and construction machinery, respectively, influence the individual engine technology turn-over speeds.

The EU emission directive Stage I and II implementation years relate to engine size, and for all four machinery groups the emission level shares for the specific size segments will differ slightly from the picture shown in Figure 3.3.47. Due to scarce data for construction machinery, the emission level penetration rates are assumed to be linear and the general technology turnover pattern is as shown in Figure 3.3.47.

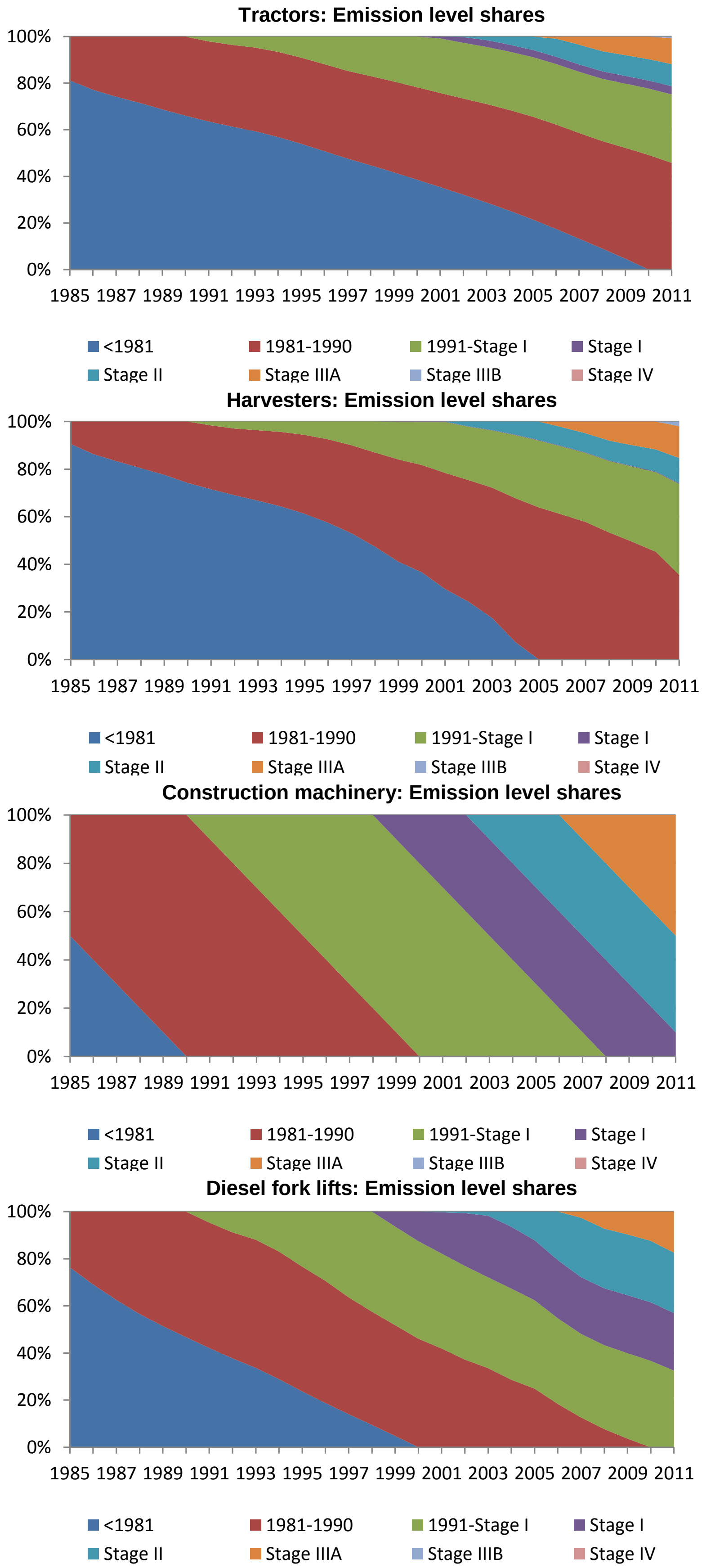


Figure 3.3.47 Emission level shares for tractors, harvesters, construction machinery and diesel fork lifts (1985 to 2011).

The 1985-2011 stock development for the most important household and gardening machinery types is shown in Figure 3.3.48.

For lawn movers and cultivators, the machinery stock remains approximately the same for all years, whereas the stock figures for riders, chain saws, shrub clearers, trimmers and hedge cutters increase from 1990 onwards. The yearly stock increases, in most cases, become larger after 2000. The lifetimes for gasoline machinery are short and, therefore, there new emission levels (not shown) penetrate rapidly.

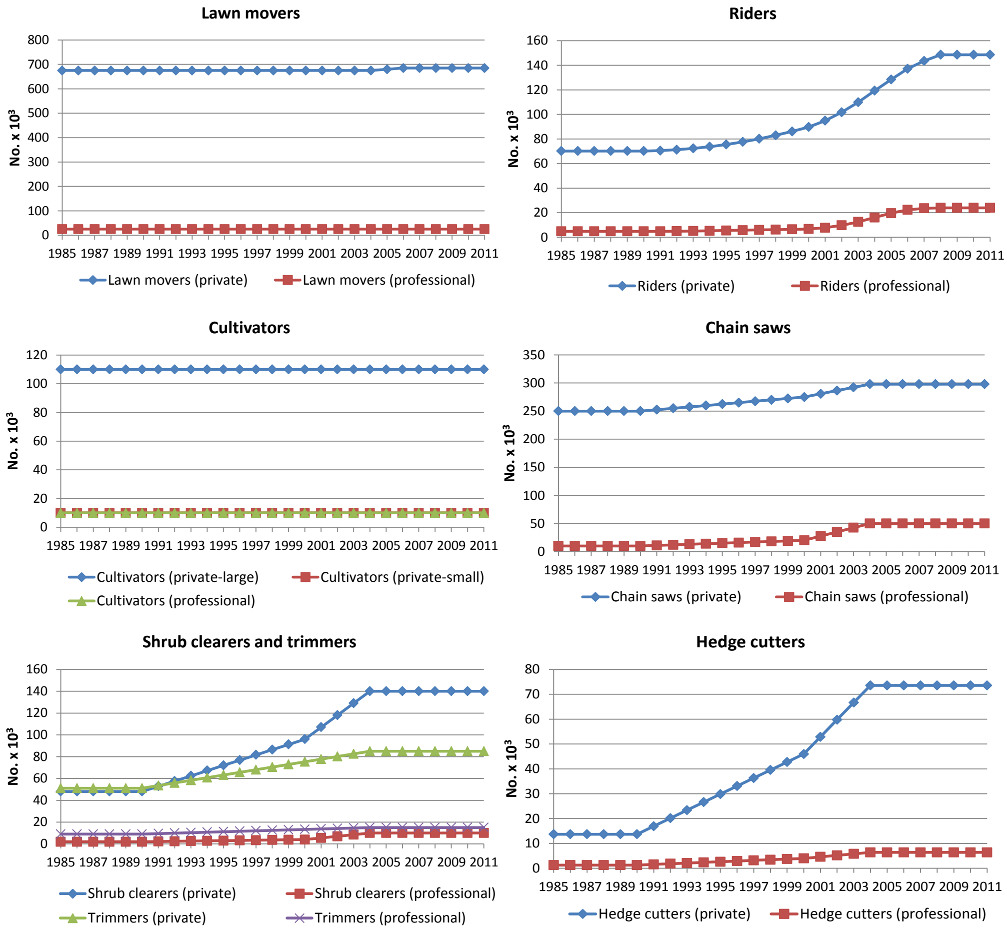


Figure 3.3.48 Stock developments 1985-2011 for the most important household and gardening machinery types.

Figure 3.3.49 shows the development in numbers of different recreational craft from 1985-2011. The 2004 stock data for recreational craft are repeated for 2005+, since no new fleet information has been obtained.

For diesel boats, increases in stock and engine size are expected during the whole period, except for the number of motor boats (< 27 ft.) and the engine sizes for sailing boats (<26 ft.), where the figures remain unchanged. A decrease in the total stock of sailing boats (<26 ft.) by 21 % and increases in the total stock of yawls/cabin boats and other boats (<20 ft.) by around 25 % are expected. Due to a lack of information specific to Denmark, the shifting rate from 2-stroke to 4-stroke gasoline engines is based on a German non-road study (IFEU, 2004).

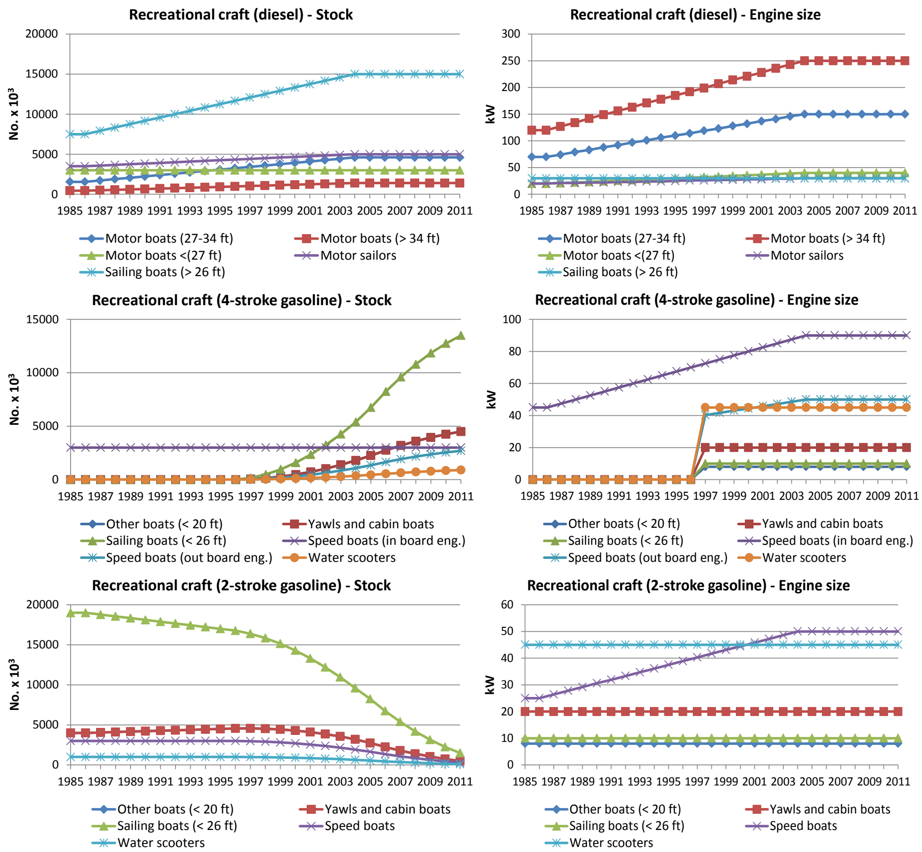


Figure 3.3.49 1985-2011 Stock and engine size development for recreational craft.

National sea transport

A new methodology is used to estimate the fuel consumption figures for national sea transport, based on fleet activity estimates for regional ferries, local ferries and other national sea transport (Winther, 2008).

Table 3.3.11 lists the most important domestic ferry routes in Denmark in the period 1990-2011. For these ferry routes and the years 1990-2005, the following detailed traffic and technical data have been gathered by Winther (2008): Ferry name, year of service, engine size (MCR), engine type, fuel type, average load factor, auxiliary engine size and sailing time (single trip).

For 2006-2011, the above mentioned traffic and technical data for specific ferries have been provided by Kristensen (2012) in the case of Mols-Linien (Sjællands Odde-Ebeltoft, Sjællands Odde-Århus, Kalundborg-Århus), by Jørgensen (2012) for Bornholmstrafikken (Køge-Rønne) and by Simonsen (2012) for Langelandstrafikken A/S (Tårs-Spodsbjerg). For Esbjerg/Hanstholm/Hirtshals-Torshavn traffic and technical data have been provided by Dávastovu (2011).

Table 3.3.11 Domestic ferry routes comprised in the Danish inventory.

Ferry service	Service period
Esbjerg-Torshavn	1990-1995, 2009+
Halsskov-Knudshoved	1990-1999
Hanstholm-Torshavn	1991-1992, 1999+
Hirtshals-Torshavn	2010
Hundested-Grenaa	1990-1996
Kalundborg-Juelsminde	1990-1996
Kalundborg-Samsø	1990+
Kalundborg-Århus	1990+
Korsør-Nyborg, DSB	1990-1997
Korsør-Nyborg, Vognmandsruten	1990-1999
København-Rønne	1990-2004
Køge-Rønne	2004+
Sjællands Odde-Ebeltoft	1990+
Sjællands Odde-Århus	1999+
Tårs-Spodsbjerg	1990+

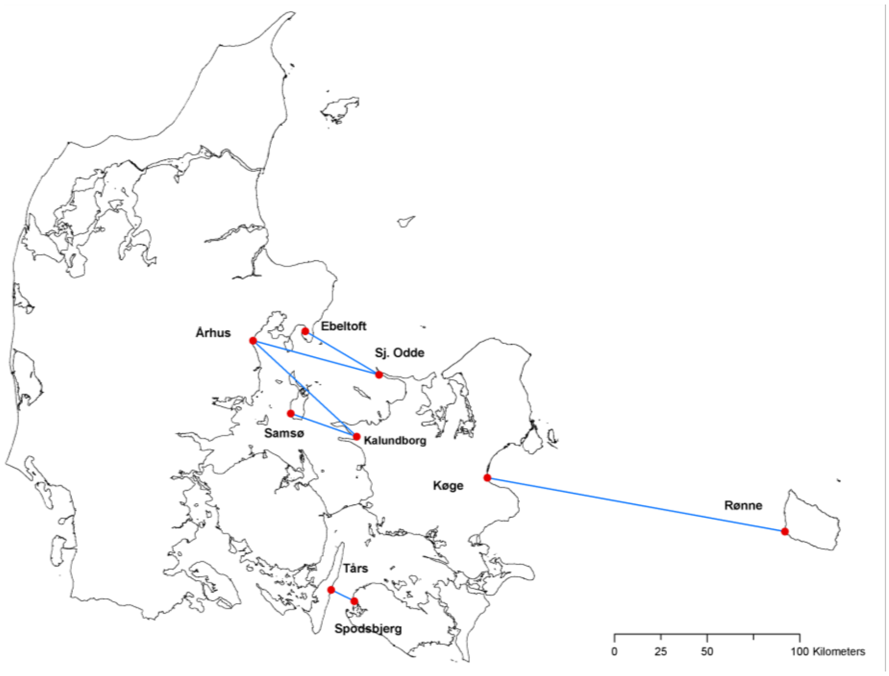


Figure 3.3.50 Domestic regional ferry routes in Denmark (2011).

The number of round trips pr ferry route from 1990 to 2011 is provided by Statistics Denmark (2012), see Figure 3.3.51 (Esbjerg/Hanstholm/Hirtshals-Torshavn not shown). The traffic data are also listed in Annex 3.B.12, together with different ferry specific technical and operational data.

For each ferry, Annex 3.B.12 lists the relevant information as regards ferry route, name, year of service, engine size (MCR), engine type, fuel type, average load factor, auxiliary engine size and sailing time (single trip). There is a lack of historical traffic data for 1985-1989, and hence, data for 1990 is used for these years, to support the fuel consumption and emission calculations.

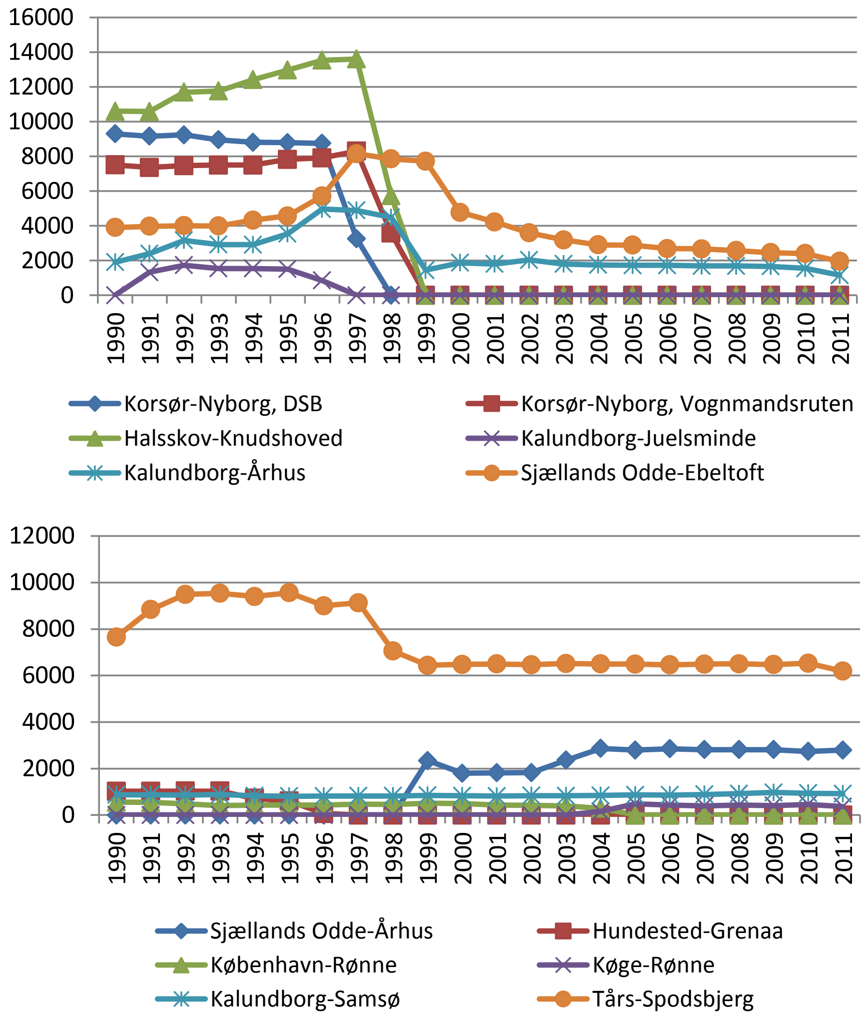


Figure 3.3.51 No. of round trips for the most important ferry routes in Denmark 1990-2011.

It is seen from Table 3.3.11 (and Figure 3.3.51) that several ferry routes were closed in the time period from 1996-1998, mainly due to the opening of the Great Belt Bridge (connecting Zealand and Funen) in 1997. Hundested-Grenaa and Kalundborg-Juelsminde was closed in 1996, Korsør-Nyborg (DSB) closed in 1997, and Halsskov-Knuds-hoved and Korsør-Nyborg (Vognmandsruten) was closed in 1998. The ferry line København-Rønne was replaced by Køge-Rønne in 2004 and from 1999 a new ferry connection was opened between Sjællands Odde and Århus.

For the local ferries, a bottom-up estimate of fuel consumption for 1996 has been taken from the Danish work in Wismann (2001). The latter project calculated fuel consumption and emissions for all sea transport in Danish waters in 1995/1996 and 1999/2000. In order to cover the entire 1990-2011 inventory period, the fuel figure for 1996 has been adjusted according to the developments in local ferry route traffic shown in Annex 3.B.12.

Fuel sold for freight transport by Royal Arctic Line between Aalborg (Denmark) and Greenland and by Eim Skip - East route between Aarhus (Denmark) and Torshavn (Faroe Islands) are included under other national sea transport in the Danish inventories. In both cases all fuel is being bought in Denmark (Rasmussen, 2012 and Thorarensen, 2012).

For the remaining part of the traffic between two Danish ports, other national sea transport, bottom-up estimates for fuel consumption have been calculated for the years 1995 and 1999 by Wismann (2007). These fuel consumption estimates are used as activity data for the inventory years until 1995 and 1999 onwards. Interpolated figures are used for the inventory years 1996-1998.

The calculations use the database set up for Denmark in the Wismann (2001) study, with actual traffic data from the Lloyd's LMIS database (not including ferries). The database was split into three vessel types: bulk carriers, container ships, and general cargo ships; and five size classes: 0-1000, 1000-3000, 3000-10000, 10000-20000 and >20000 DTW. The calculations assume that bulk carriers and container ships use heavy fuel oil, and that general cargo ships use gas oil. For further information regarding activity data for local ferries and other national sea transport, please refer to Winther (2008).

The fleet activity data for regional ferries, and the fleet activity based fuel consumption estimates for local ferries and other national sea transport replace the fuel based activity data which originated directly from the DEA statistics.

Other sectors

The activity data for military, railways, international sea transport and fishery consists of fuel consumption information from DEA (2012). For international sea transport, the basis is in principle fuel sold in Danish ports for vessels with a foreign destination, as prescribed by the IPCC guidelines.

However, it must be noted that fuel sold for sailing activities between Denmark and Greenland/Faroe Islands are reported as international in the DEA energy statistics. Hence, for inventory purposes in order to follow the IPCC guidelines the bottom-up fuel estimates for the ferry routes Esbjerg/Hanstholm/Hirshals-Torshavn, and fuel reports from Royal Arctic Line and Eim Skip is being subtracted from the fuel sales figures for international sea transport prior to inventory fuel input.

For fisheries, the calculation methodology described by Winther (2008) remains fuel based. However, the input fuel data differ from the fuel sales figures previously used. The changes are the result of further data processing of the DEA reported gas oil sales for national sea transport and fisheries, prior to inventory input. For years when the fleet activity estimates of fuel consumption for national sea transport are smaller than reported fuel sold, fuel is added to fisheries in the inventory. Conversely, lower fuel sales in relation to bottom-up estimates for national sea transport means that fuel is being subtracted from the original fisheries fuel sales figure in order to make up the final fuel consumption input for fisheries.

The updated fuel consumption time series for national sea transport lead, in turn, to changes in the energy statistics for fisheries (gas oil), industry (heavy fuel oil), and international sea transport, so the national energy balance can remain unchanged.

For all sectors, fuel-use figures are given in Annex 2.B.14 for 2011 in CollectER format.

Emission legislation

For non-road working machinery and equipment, and recreational craft and railway locomotives/motor cars, the emission directives list specific emission limit values (g pr kWh) for CO, VOC, NO_x (or VOC + NO_x) and TSP, depending on engine size (kW for diesel, ccm for gasoline) and date of implementation (referring to engine market date).

For diesel, the directives 97/68 and 2004/26 relate to non-road machinery other than agricultural and forestry tractors and the directives have different implementation dates for machinery operating under transient and constant loads. The latter directive also comprises emission limits for railway machinery. For tractors the relevant directives are 2000/25 and 2005/13. For gasoline, the directive 2002/88 distinguishes between hand-held (SH) and not hand-held (NS) types of machinery.

For engine type approval, the emissions (and fuel consumption) are measured using various test cycles (ISO 8178). Each test cycle consists of a number of measurement points for specific engine loads during constant operation. The specific test cycle used depends on the machinery type in question and the test cycles are described in more details in the directives.

Table 3.3.12 Overview of EU emission directives relevant for diesel fuelled non-road machinery.

Stage/Engine size [kW]	CO	VOC	NO_x	VOC+NO_x	PM	Diesel machinery			Tractors	
							Implement. date		EU	Implement.
	[g pr kWh]					EU Directive	Transient	Constant	Directive	date
Stage I										
37<=P<75	6.5	1.3	9.2	-	0.85	97/68	1/4 1999	-	2000/25	1/7 2001
Stage II										
130<=P<560	3.5	1	6	-	0.2	97/68	1/1 2002	1/1 2007	2000/25	1/7 2002
75<=P<130	5	1	6	-	0.3		1/1 2003	1/1 2007		1/7 2003
37<=P<75	5	1.3	7	-	0.4		1/1 2004	1/1 2007		1/1 2004
18<=P<37	5.5	1.5	8	-	0.8		1/1 2001	1/1 2007		1/1 2002
Stage IIIA										
130<=P<560	3.5	-	-	4	0.2	2004/26	1/1 2006	1/1 2011	2005/13	1/1 2006
75<=P<130	5	-	-	4	0.3		1/1 2007	1/1 2011		1/1 2007
37<=P<75	5	-	-	4.7	0.4		1/1 2008	1/1 2012		1/1 2008
19<=P<37	5.5	-	-	7.5	0.6		1/1 2007	1/1 2011		1/1 2007
Stage IIIB										
130<=P<560	3.5	0.19	2	-	0.025	2004/26	1/1 2011	-	2005/13	1/1 2011
75<=P<130	5	0.19	3.3	-	0.025		1/1 2012	-		1/1 2012
56<=P<75	5	0.19	3.3	-	0.025		1/1 2012	-		1/1 2012
37<=P<56	5	-	-	4.7	0.025		1/1 2013	-		1/1 2013
Stage IV										
130<=P<560	3.5	0.19	0.4	-	0.025	2004/26	1/1 2014		2005/13	1/1 2014
56<=P<130	5	0.19	0.4	-	0.025		1/10 2014			1/10 2014

Table 3.3.13 Overview of the EU Emission Directive 2002/88 for gasoline fuelled non-road machinery.

	Category	Engine size [ccm]	CO [g pr kWh]	HC [g pr kWh]	NO_x [g pr kWh]	$HC+NO_x$ [g pr kWh]	Implement. date
	Stage I						
Hand held	SH1	S<20	805	295	5.36	-	1/2 2005
	SH2	20=<S<50	805	241	5.36	-	1/2 2005
	SH3	50=<S	603	161	5.36	-	1/2 2005
Not hand held	SN3	100=<S<225	519	-	-	16.1	1/2 2005
	SN4	225=<S	519	-	-	13.4	1/2 2005
	Stage II						
Hand held	SH1	S<20	805	-	-	50	1/2 2008
	SH2	20=<S<50	805	-	-	50	1/2 2008
	SH3	50=<S	603	-	-	72	1/2 2009
Not hand held	SN1	S<66	610	-	-	50	1/2 2005
	SN2	66=<S<100	610	-	-	40	1/2 2005
	SN3	100=<S<225	610	-	-	16.1	1/2 2008
	SN4	225=<S	610	-	-	12.1	1/2 2007

For recreational craft, Directive 2003/44 comprises the emission legislation limits for diesel engines, and for 2-stroke and 4-stroke gasoline engines, respectively. The CO and VOC emission limits depend on engine size (kW) and the inserted parameters presented in the calculation formulas in Table 3.3.14. For NO_x, a constant limit value is given for each of the three engine types. For TSP, the constant emission limit regards diesel engines only.

Table 3.3.14 Overview of the EU Emission Directive 2003/44 for recreational craft.

Engine type	Impl. date	$CO=A+B/P^n$			$HC=A+B/P^n$			NO_x	TSP
		A	B	n	A	B	n		
2-stroke gasoline	1/1 2007	150.0	600.0	1.0	30.0	100.0	0.75	10.0	-
4-stroke gasoline	1/1 2006	150.0	600.0	1.0	6.0	50.0	0.75	15.0	-
Diesel	1/1 2006	5.0	0.0	0	1.5	2.0	0.5	9.8	1.0

Table 3.3.15 Overview of the EU Emission Directive 2004/26 for railway locomotives and motorcars.

	Engine size [kW]		CO [g pr kWh]	HC [g pr kWh]	NOx [g pr kWh]	HC+NOX [g pr kWh]	PM [g pr kWh]	Implement. date
Locomotives	Stage IIIA							
	130<=P<560	RL A	3.5	-	-	4	0.2	1/1 2007
	560<P	RH A	3.5	0.5	6	-	0.2	1/1 2009
	2000<=P and piston displacement >= 5 l/cyl.	RH A	3.5	0.4	7.4	-	0.2	1/1 2009
	Stage IIIB	RB	3.5	-	-	4	0.025	1/1 2012
Motor cars	Stage IIIA							
	130<P	RC A	3.5	-	-	4	0.2	1/1 2006
	Stage IIIB							
	130<P	RC B	3.5	0.19	2	-	0.025	1/1 2012

Aircraft engine emissions of NO_x, CO, VOC and smoke are regulated by ICAO (International Civil Aviation Organization). The engine emission certification standards are contained in Annex 16 — Environmental Protection, Volume II — Aircraft Engine Emissions to the Convention on International Civil Aviation (ICAO Annex 16, 1993). The emission standards relate to the total emissions (in grams) from the so-called LTO (Landing and Take Off) cycle divided by the rated engine thrust (kN). The ICAO LTO cycle contains the idealised aircraft movements below 3000 ft (915 m) during approach, landing, airport taxiing, take off and climb out.

For smoke all aircraft engines manufactured from 1 January 1983 have to meet the emission limits agreed by ICAO. For NO_x, CO, VOC The emission legislation is relevant for aircraft engines with a rated engine thrust larger than 26.7 kN. In the case of CO and VOC, the ICAO regulations apply for engines manufactured from 1 January 1983.

For NO_x, the emission regulations fall in four categories

a) For engines of a type or model for which the date of manufacture of the first individual production model is on or before 31 December 1995, and for which the production date of the individual engine is on or before 31 December 1999.
b) For engines of a type or model for which the date of manufacture of the first individual production model is after 31 December 1995, or for individual engines with a production date after 31 December 1999.
c) For engines of a type or model for which the date of manufacture of the first individual production model is after 31 December 2003.
d) For engines of a type or model for which the date of manufacture of the first individual production model is after 31 December 2007.

The regulations published by ICAO are given in the form of the total quantity of pollutants (D_p) emitted in the LTO cycle divided by the maximum sea level thrust (F_{oo}) and plotted against engine pressure ratio at maximum sea level thrust.

The limit values for NO_x are given by the formulae in Table 3.3.16.

Table 3.3.16 Current certification limits for NO_x for turbo jet and turbo fan engines.

	Engines first produced before 31.12.1995 & for engines manufactured up to 31.12.1999	Engines first produced after 31.12.1995 & for engines manufactured after 31.12.1999	Engines for which the date of manufacture of the first individual production model was after 31 December 2003	Engines for which the date of manufacture of the first individual production model was after 31 December 2007
Applies to engines >26.7 kN	$Dp/F_{oo} = 40 + 2\pi_{oo}$	$Dp/F_{oo} = 32 + 1.6\pi_{oo}$		
Engines of pressure ratio less than 30				
Thrust more than 89 kN			$Dp/F_{oo} = 19 + 1.6\pi_{oo}$	$Dp/F_{oo} = 16.72 + 1.4080\pi_{oo}$
Thrust between 26.7 kN and not more than 89 kN			$Dp/F_{oo} = 37.572 + 1.6\pi_{oo} - 0.208F_{oo}$	$Dp/F_{oo} = 38.54862 + (1.6823\pi_{oo}) - (0.2453F_{oo}) - (0.00308\pi_{oo}F_{oo})$
Engines of pressure ratio more than 30 and less than 62.5				
Thrust more than 89 kN			$Dp/F_{oo} = 7+2.0\pi_{oo}$	$Dp/F_{oo} = -1.04+ (2.0*\pi_{oo})$
Thrust between 26.7 kN and not more than 89 kN			$Dp/F_{oo} = 42.71 +1.4286\pi_{oo} - 0.4013F_{oo} +0.00642\pi_{oo}F_{oo}$	$Dp/F_{oo} = 46.1600 + (1.4286\pi_{oo}) - (0.5303F_{oo}) - (0.00642\pi_{oo}F_{oo})$
Engines with pressure ratio 82.6 or more			$Dp/F_{oo} = 32+1.6\pi_{oo}$	$Dp/F_{oo} = 32+1.6\pi_{oo}$

Source: International Standards and Recommended Practices, Environmental Protection, ICAO Annex 16 Volume II Part III Paragraph 2.3.2, 2nd edition July 1993, plus amendments: Amendment 3 (20 March 1997),Amendment 4 (4 November 1999),Amendment 5 (24 November 2005).

where:

D_p = the sum of emissions in the LTO cycle in g.

F_{oo} = thrust at sea level take-off (100 %).

π_{oo} = pressure ratio at sea level take-off thrust point (100 %).

The equivalent limits for HC and CO are D_p/F_{oo} = 19.6 for HC and D_p/F_{oo} = 118 for CO (ICAO Annex 16 Vol. II paragraph 2.2.2). Smoke is limited to a regulatory smoke number = 83 $(F_{oo})^{-0.274}$ or a value of 50, whichever is the lower.

A further description of the technical definitions in relation to engine certification as well as actual engine exhaust emission measurement data can be found in the ICAO Engine Exhaust Emission Database. The latter database is accessible from http://www.caa.co.uk, hosted by the UK Civil Aviation Authority.

For seagoing vessels, NO_x emissions are regulated as explained in Marpol 73/78 Annex VI, formulated by IMO (International Maritime Organisation). The legislation is relevant for diesel engines with a power output higher than 130 kW, which are installed on a ship constructed on or after 1 January 2000 and diesel engines with a power output higher than 130 kW which undergo major conversion on or after 1 January 2000.

The NO_x emission limits for ship engines in relation to their rated engine speed (n) given in RPM (Revolutions Pr Minute) are the following:

- 17 g pr kWh, n < 130 RPM
- 45 x n-0.2 g pr kWh, 130 ≤ n < 2000 RPM
- 9.8 g pr kWh, n ≥ 2000 RPM

Further, the Marine Environment Protection Committee (MEPC) of IMO has agreed amendments to MARPOL Annex VI in October 2008 in order to strengthen the emission standards for NO_x and the sulphur contents of heavy fuel oil used by ship engines.

For NO_x emission regulations, a three tiered approach is considered, which comprises the following:

- Tier I: Diesel engines (> 130 kW) installed on a ship constructed on or after 1 January 2000 and prior to 1 January 2011.
- Tier II: Diesel engines (> 130 kW) installed on a ship constructed on or after 1 January 2011.
- Tier III[8]: Diesel engines (> 130 kW) installed on a ship constructed on or after 1 January 2016.

As for the existing NO_x emission limits, the new Tier I-III NO_x legislation values rely on the rated engine speeds. The emission limit equations are shown in Table 3.3.17.

Table 3.3.17 Tier I-III NOx emission limits for ship engines (amendments to MARPOL Annex VI).

	NO_x limit	RPM (n)
Tier I	17 g pr kWh	n < 130
	$45 \cdot n^{-0.2}$ g pr kWh	130 ≤ n < 2000
	9,8 g pr kWh	n ≥ 2000
Tier II	14.4 g pr kWh	n < 130
	$44 \cdot n^{-0.23}$ g pr kWh	130 ≤ n < 2000
	7.7 g pr kWh	n ≥ 2000
Tier III	3.4 g pr kWh	n < 130
	$9 \cdot n^{-0.2}$ g pr kWh	130 ≤ n < 2000
	2 g pr kWh	n ≥ 2000

The Tier I emission limits are identical with the existing emission limits from MARPOL Annex VI.

Also agreed by IMO in October 2008, the NO_x Tier I limits are to be applied for existing engines with a power output higher than 5000 kW and a displacement per cylinder at or above 90 litres, installed on a ship constructed on or after 1 January 1990 but prior to 1 January 2000.

In relation to the sulphur content in heavy fuel and marine gas oil used by ship engines, Table 3.3.18 shows the current legislation in force, and the amendment of MARPOL Annex VI agreed by IMO in October 2008.

[8] For ships operating in a designated Emission Control Area. Outside a designated Emission Control Area, Tier II limits apply.

Table 3.3.18 Current legislation in relation to marine fuel quality.

Legislation		Heavy fuel oil		Gas oil	
		S- %	Implement. date (day/month/year)	S- %	Implement. date (day/month/year)
EU-directive 93/12		None		0.2[1]	01.10.1994
EU-directive 1999/32		None		0.2	01.01.2000
EU-directive 2005/33[2]	SECA - Baltic sea	1.5	11.08.2006	0.1	01.01.2008
	SECA - North sea	1.5	11.08.2007	0.1	01.01.2008
	Outside SECA's	None		0.1	01.01.2008
MARPOL Annex VI	SECA – Baltic sea	1.5	19.05.2006		
	SECA – North sea	1.5	21.11.2007		
	Outside SECA	4.5	19.05.2006		
MARPOL Annex VI amendments	SECA's	1	01.03.2010		
	SECA's	0.1	01.01.2015		
	Outside SECA's	3.5	01.01.2012		
	Outside SECA's	0.5	01.01.2020[3]		

[1] Sulphur content limit for fuel sold inside EU.

[2] From 1.1.2010 fuel with a sulphur content higher than 0.1 % must not be used in EU ports for ships at berth exceeding two hours

[3] Subject to a feasibility review to be completed no later than 2018. If the conclusion of such a review becomes negative the effective date would default 1 January 2025.

For non-road machinery, the EU directive 2003/17/EC gives a limit value of 10 ppm sulphur in diesel (from 2011).

Emission factors

The SO_2 emission factors are fuel related, and rely on the sulphur contents given in the relevant EU fuel directives or in the Danish legal announcements. However, for jet fuel the default factor from IPCC (1996) is used. Road transport diesel is assumed to be used by engines in military and railways, and road transport gasoline is assumed to be used by non-road working machinery and recreational craft. Hence, these types of machinery have the same SO_2 emission factors, as for road transport.

For all mobile sources, the emission factor source for NH_3, heavy metals and PAH is the EMEP/EEA guidebook (EMEP/EEA, 2009). The heavy metal emission factors for road transport and other mobile sources except national sea transport and fisheries originate from Winther and Slentø (2010). For civil aviation jet fuel, no heavy metal emission factors are proposed due to lack of data.

In the case of military ground equipment, aggregated emission factors for gasoline and diesel are derived from road traffic emission simulations. For piston engine aircraft using aviation gasoline, aggregated emission factors for conventional cars are used.

For railways, specific Danish measurements from the Danish State Railways (DSB) (Delvig, 2012) are used to calculate the emission factors of NO_x, VOC, CO and TSP, and a $NMVOC/CH_4$ split is made based on expert judgment.

For agriculture, forestry, industry, household gardening and inland waterways, the NO_x, VOC, CO and TSP emission factors are derived from various

European measurement programmes; see IFEU (2004) and Winther et al. (2006). The NMVOC/CH_4 split is taken from USEPA (2004).

For national sea transport and fisheries, the NO_x emission factors predominantly come from the engine manufacturer MAN Diesel, as a function of engine production year. The CO, VOC and TSP emission factors come from the Danish TEMA2000 emission model (Trafikministeriet, 2000), whereas the PM_{10} and $PM_{2.5}$ size fractions are obtained from MAN Diesel.

Specifically for the ferries used by Mols Linjen new NO_x, VO and CO emission factors are provided by Kristensen (2008), originating from measurement results by Hansen et al. (2004), Wismann (1999) and PHP (1996).

For ship engines VOC/CH_4 splits are taken from EMEP/EEA (2009), and all emission factors are shown in Annex 2.B.13.

The source for aviation (jet fuel) emission factors is the EMEP/EEA guidebook (EMEP/EEA, 2009). For a number of different representative aircraft types, the EMEP/EEA guidebook comprises fuel flow and NO_x, CO and VOC emission indices for the four LTO modes and distance based emission factors for cruise.

For all sectors, emission factors are given in CollectER format in Annex 2.B.15 for 2011. Table 3.3.19 shows the emission factors for SO_2, NO_X, NMVOC, CO, NH_3 and TSP in CollectER format used to calculate the emissions from other mobile sources in Denmark.

Factors for deterioration, transient loads and gasoline evaporation for non-road machinery

The emission effects of engine wear are taken into account for diesel and gasoline engines by using the so-called deterioration factors. For diesel engines alone, transient factors are used in the calculations, to account for the emission changes caused by varying engine loads. The evaporative emissions of NMVOC are estimated for gasoline fuelling and tank evaporation. The factors for deterioration, transient loads and gasoline evaporation are taken from IFEU(2004), and are shown in Annex 2.B.10. For more details regarding the use of these factors, please refer to paragraph 3.1.4 or Winther et al. (2006).

Table 3.3.19 Fuel based emission factors for SO_2, NO_X, NMVOC, CO, NH_3 and TSP for other mobile sources in Denmark (2011).

			Emission factors[1] [g pr GJ]					
SNAP ID	Category	Fuel type	SO_2	NO_X	NMVOC	CO	NH_3	TSP
080100	Military	AvGas	22,99	859,00	1 242,60	6 972,00	1,60	10,00
080100	Military	Diesel	0,45	356,88	14,23	96,32	0,38	13,26
080100	Military	Jet fuel	22,99	250,57	24,94	229,89	0,00	1,16
080200	Railways	Diesel	0,47	742,00	52,00	118,00	0,20	23,00
080300	Inland waterways	Diesel	46,84	825,62	158,45	441,24	0,17	96,88
080300	Inland waterways	Gasoline	0,46	553,37	1 012,43	12 234,24	0,10	25,88
080402	National sea traffic	Diesel	46,84	937,63	50,45	87,65	0,00	21,55
080402	National sea traffic	Residual oil	489,00	1915,27	62,82	207,25	0,00	43,98
080403	Fishing	Diesel	46,84	1357,45	57,57	189,92	0,00	21,55
080403	Fishing	LPG	0,00	1249,00	384,94	443,00	0,00	0,20
080404	International sea traffic	Diesel	46,84	1581,64	57,33	189,13	0,00	21,55
080404	International sea traffic	Residual oil	489,00	2117,61	63,03	207,93	0,00	43,98
080501	Air Dom. LTO, other airports	AvGas	22,83	859,00	1 242,60	6 972,00	1,60	10,00
080501	Air Dom. LTO, other airports	Jet fuel	22,99	284,89	11,54	136,44	0,00	1,16
080502	Air Int. LTO, other airports	AvGas	22,83	859,00	1 242,60	6 972,00	1,60	10,00
080502	Air Int. LTO, other airports	Jet fuel	22,99	298,32	26,20	172,60	0,00	1,16
080503	Air Dom. cruise, other airports	Jet fuel	22,99	260,08	6,28	104,78	0,00	1,16
080504	Air Int. cruise, other airports	Jet fuel	22,99	237,65	5,96	47,45	0,00	1,16
080600	Agriculture	Diesel	0,47	562,43	52,92	324,09	0,18	42,64
080600	Agriculture	Gasoline	0,46	111,27	1 198,19	21 945,38	1,52	31,17
080700	Forestry	Diesel	0,47	374,90	28,01	238,70	0,18	26,08
080700	Forestry	Gasoline	0,46	54,79	3 964,24	17 915,98	0,09	82,19
080800	Industry	Diesel	0,47	522,00	57,77	315,59	0,18	50,33
080800	Industry	Gasoline	0,46	210,48	1 532,21	13 987,88	0,10	18,98
080800	Industry	LPG	0,00	1328,11	146,09	104,85	0,21	4,89
080900	Household and gardening	Gasoline	0,46	104,08	2 323,91	30 217,30	0,09	16,95
081100	Commercial and institutional	Gasoline	0,46	91,70	1 548,53	30 858,88	0,09	28,48
080501	Air Dom. LTO, Copenhagen	AvGas	22,83	859,00	1 242,60	6 972,00	1,60	10,00
080501	Air Dom. LTO, Copenhagen	Jet fuel	22,99	276,53	12,78	182,87	0,00	1,16
080502	Air Int. LTO, Copenhagen	AvGas	22,83	859,00	1 242,60	6 972,00	1,60	10,00
080502	Air Int. LTO, Copenhagen	Jet fuel	22,99	339,69	32,74	238,55	0,00	1,16
080503	Air Dom. cruise, Copenhagen	Jet fuel	22,99	268,00	9,89	61,85	0,00	1,16
080504	Air Int. cruise, Copenhagen	Jet fuel	22,99	307,14	9,61	31,96	0,00	1,16

[1] References. SO_2: Country-specific; Military: Aggregated emission factors for road transport; Railways (NO_x, NMVOC and TSP): Danish State Railways; Agriculture, forestry, industry, household gardening and inland waterways (NO_x, VOC and TSP): IFEU (2004); National sea transport and fishing: MAN B&W (NO_x) and TEMA2000 (NMVOC, TSP); Aviation - jet fuel (NO_X, NMVOC and TSP): EMEP/EEA; Aviation - av.gasoline: Aggregated emission factors for conventional gasoline cars.

3.3.4 Calculation method

Air traffic

For aviation, the domestic and international estimates are made separately for landing and take-off (LTOs < 3000 ft), and cruising (> 3000 ft).

By using the LTO mode specific fuel flow and emission indices from EMEP/EEA (2009), the fuel consumption and emission factors for the full LTO cycle can be estimated for each of the representative aircraft types used in the Danish inventory.

The fuel consumption for one LTO cycle is calculated according to the following sum formula:

$$FC_{LTO}^{a} = \sum_{m=1}^{4} t_m \cdot ff_{a,m} \tag{13}$$

Where FC = fuel consumption (kg), m = LTO mode (approach/landing, taxiing, take off, climb out), t = times in mode (s), ff = fuel flow (kg pr s), a = representative aircraft type.

The emissions for one LTO cycle are estimated as follows:

$$E_{LTO}^{a} = \sum_{m=1}^{4} FC_{a,m} \cdot EI_{a,m} \tag{14}$$

Due to lack of specific airport data, for approach/descent, take off and climb out, standardised times-in-modes of 4, 0.7 and 2.2 mins are used as defined by ICAO (ICAO, 1995), whereas for taxiing the appropriate time interval is 13 mins in Copenhagen Airport and 5 mins in other airports present in the Danish inventory.

For each representative aircraft type, the calculated fuel consumption and emission factors per LTO are shown in Annex 2.B.10 for Copenhagen Airport and other airports.

The calculations for cruise use the distance specific fuel consumption and emissions given by EMEP/EEA (2009) per representative aircraft type. Data interpolations or extrapolations are made – in each case determined by the great circle distance between the origin and the destination airports.

If the great circle distance, y, is smaller than the maximum distance for which fuel consumption and emission data are given in the EMEP/EEA data bank the fuel consumption or emission E (y) becomes:

$$E(y) = E_{x_i} + \frac{(y - x_i)}{x_{i+1} - x_i} \cdot (E_{x_{i+1}} - E_{x_i}) \quad y<x_{max},\ i = 0,1,2....max-1 \tag{15}$$

In (15) x_i and x_{max} denominate the separate distances and the maximum distance, respectively, with known fuel consumption and emissions. If the flight distance y exceeds x_{max} the maximum figures for fuel consumption and emissions must be extrapolated and the equation then becomes:

$$E(y) = E_{x_{max}} + \frac{(y - x_{max})}{x_{max} - x_{max-1}} \cdot (E_{x_{max}} - E_{x_{max-1}}) \quad y>x_{max} \tag{16}$$

Total results are summed up and categorised according to each flight's destination airport code in order to distinguish between domestic and international flights.

Annex 2.B.10 shows the average fuel consumption and emission factors per representative aircraft type for cruise flying, as well as total distance flown, for 2011[9]. The factors are split between Copenhagen Airport and other airports and distinguish between domestic and international flights.

[9] Excluding flights for Greenland and the Faroe Islands.

Specifically for flights between Denmark and Greenland or the Faroe Islands, for each representative aircraft type, the flight distances are directly shown in Annex 2.B.10, which go into the cruise calculation expressions 15 and 16.

The overall fuel precision in the model is around 0.8, derived as the fuel ratio between model estimates and statistical sales. The fuel difference is accounted for by adjusting cruising fuel consumption and emissions in the model according to domestic and international cruising fuel shares.

Prior to 2001, the calculation procedure was first to estimate each year's fuel consumption and emissions for LTO. Secondly, total cruising fuel consumption was found year by year as the statistical fuel consumption total minus the calculated fuel consumption for LTO. Lastly, the cruising fuel consumption was split into a domestic and international part by using the results from a Danish city-pair emission inventory in 1998 (Winther, 2001a). For more details of this latter fuel allocation procedure, see Winther (2001b).

Non-road working machinery and recreational craft

Prior to adjustments for deterioration effects and transient engine operations, the fuel consumption and emissions in year X, for a given machinery type, engine size and engine age, are calculated as:

$$E_{Basis}(X)_{i,j,k} = N_{i,j,k} \cdot HRS_{i,j,k} \cdot P \cdot LF_i \cdot EF_{y,z} \qquad (17)$$

where E_{Basis} = fuel consumption/emissions in the basic situation, N = number of engines, HRS = annual working hours, P = average rated engine size in kW, LF = load factor, EF = fuel consumption/emission factor in g pr kWh, i = machinery type, j = engine size, k = engine age, y = engine-size class and z = emission level. The basic fuel consumption and emission factors are shown in Annex 2.B.11.

The deterioration factor for a given machinery type, engine size and engine age in year X depends on the engine-size class (only for gasoline), y, and the emission level, z. The deterioration factors for diesel and gasoline 2-stroke engines are found from:

$$DF_{i,j,k}(X) = \frac{K_{i,j,k}}{LT_i} \cdot DF_{y,z} \qquad (18)$$

where DF = deterioration factor, K = engine age, LT = lifetime, i = machinery type, j = engine size, k = engine age, y = engine-size class and z = emission level.

For gasoline 4-stroke engines the deterioration factors are calculated as:

$$DF_{i,j,k}(X) = \sqrt{\frac{K_{i,j,k}}{LT_i}} \cdot DF_{y,z} \qquad (19)$$

The deterioration factors inserted in (18) and (19) are shown in Annex 2.B.11. No deterioration is assumed for fuel consumption (all fuel types) or for LPG engine emissions and, hence, DF = 1 in these situations.

The transient factor for a given machinery type, engine size and engine age in year X, relies only on emission level and load factor, and is denominated as:

$$TF_{i,j,k}(X) = TF_z \qquad (20)$$

Where i = machinery type, j = engine size, k = engine age and z = emission level.

The transient factors inserted in (20) are shown in Annex 2.B.11. No transient corrections are made for gasoline and LPG engines and, hence, TF_z = 1 for these fuel types.

The final calculation of fuel consumption and emissions in year X for a given machinery type, engine size and engine age, is the product of the expressions 17-20:

$$E(X)_{i,j,k} = E_{Basis}(X)_{i,j,k} \cdot TF(X)_{i,j,k} \cdot (1 + DF(X)_{i,j,k}) \qquad (21)$$

The evaporative hydrocarbon emissions from fuelling are calculated as:

$$E_{Evap,\,fueling,i} = FC_i \cdot EF_{Evap,\,fueling} \qquad (22)$$

Where $E_{Evap,fueling}$, = hydrocarbon emissions from fuelling, i = machinery type, FC = fuel consumption in kg, $EF_{Evap,fueling}$ = emission factor in g NMVOC pr kg fuel.

For tank evaporation, the hydrocarbon emissions are found from:

$$E_{Evap,\tan k,i} = N_i \cdot EF_{Evap,\tan k,i} \qquad (23)$$

Where $E_{Evap,tank,i}$ = hydrocarbon emissions from tank evaporation, N = number of engines, i = machinery type and $EF_{Evap,fueling}$ = emission factor in g NMVOC pr year.

Ferries, other national sea transport and fisheries

The fuel consumption and emissions in year X, for regional ferries are calculated as:

$$E(X) = \sum_i N_i \cdot T_i \cdot S_{i,j} \cdot P_i \cdot LF_j \cdot EF_{k,l,y} \qquad (24)$$

Where E = fuel consumption/emissions, N = number of round trips, T = sailing time pr round trip in hours, S = ferry share of ferry service round trips, P = engine size in kW, LF = engine load factor, EF = fuel consumption/emission factor in g pr kWh, i = ferry service, j = ferry, k = fuel type, l = engine type, y = engine year.

For the remaining navigation categories, the emissions are calculated using a simplified approach:

$$E(X) = \sum_i EC_{i,k} EF_{k,l,y} \qquad (25)$$

Where E = fuel consumption/emissions, EC = energy consumption, EF = fuel consumption/emission factor in g pr kg fuel, i = category (local ferries, other national sea, fishery, international sea), k = fuel type, l = engine type, y = average engine year.

The emission factor inserted in (25) is found as an average of the emission factors representing the engine ages which are comprised by the average lifetime in a given calculation year, X:

$$EF_{k,l,y} = \frac{\sum_{year=X}^{year=X-LT} EF_{k,l}}{LT_{k,l}} \qquad (26)$$

Other sectors

For military and railways, the emissions are estimated with the simple method using fuel-related emission factors and fuel consumption from the DEA:

$$E = FC \cdot EF \qquad (27)$$

where E = emission, FC = fuel consumption and EF = emission factor. The calculated emissions for other mobile sources are shown in CollectER format in Annex 2.B.15 for the years 2011 and as time series 1985-2011 in Annex 2.B.16 (NFR format).

Energy balance between DEA statistics and inventory estimates

Following convention rules, the DEA statistical fuel sales figures are the basis for the full Danish inventory. However, in some cases for mobile sources the DEA statistical sectors do not fully match the inventory sectors. This is the case for non-road machinery, where relevant DEA statistical sectors also include fuel consumed by stationary sources.

In other situations, fuel consumption figures estimated by DCE from specific bottom-up calculations are regarded as more reliable than DEA reported sales. This is the case for national sea transport.

In the following the transferral of fuel consumption data from DEA statistics into inventory relevant categories is explained for national sea transport and fisheries, non-road machinery and recreational craft, and road transport. A full list of all fuel consumption data, DEA figures as well as intermediate fuel consumption data, and final inventory input figures is shown in Annex 2.B.14.

National sea transport and fisheries

For national sea transport in Denmark, the fuel consumption estimates obtained by DCE (see 3.3.3 Activity data – national sea transport) are regarded as much more accurate than the DEA fuel sales data, since the large fluctuations in reported fuel sales cannot be explained by the actual development in the traffic between different national ports. As a consequence, the DCE bottom-up estimates are used in the Danish inventory for national sea transport.

There are different potential reasons for the differences between estimated fuel consumption and reported sales for national sea transport in Denmark. According to the DEA, the latter fuel differences are most likely explained by inaccurate costumer specifications made by the oil suppliers. This inaccuracy can be caused by a sector misallocation in the sales statistics between national sea transport and fisheries for gas oil, and between national sea transport and industry for heavy fuel oil (Peter Dal, DEA, personal communication, 2007). Further, fuel sold for vessels sailing between Denmark and Greenland/Faroe Islands are reported as international in the DEA statistics, and this fuel categorisation is different from the IPCC guideline definitions (see following paragraph “Bunkers”).

Following this, for fisheries and industry the updated fuel consumption time series for national sea transport lead, in turn, to changes in the fuel activity data for fisheries (gas oil), industry (heavy fuel oil) and international sea transport, so the national energy balance can remain unchanged.

For fisheries, fuel investigations made prior to the initiation of the work made by Winther (2008) have actually pointed out a certain area of inaccuracy in the DEA statistics. No engines installed in fishing vessels use heavy fuel oil, even though a certain amount of heavy fuel oil is listed in the DEA numbers for some statistical years (H. Amdissen, Danish Fishermen's Association, personal communication, 2006). Hence, for fisheries small amounts of fuel oil are transferred to national sea transport, and in addition small amounts of gasoline and diesel are transferred to recreational craft.

Non-road machinery and recreational craft

For diesel and LPG, the non-road fuel consumption estimated by DCE is partly covered by the fuel-use amounts in the following DEA sectors: agriculture and forestry, market gardening, and building and construction. The remaining quantity of non-road diesel and LPG is taken from the DEA industry sector.

For gasoline, the DEA residential sector, together with the DEA sectors mentioned for diesel and LPG, contribute to the non-road fuel consumption total. In addition, a certain amount of fuel from road transport is needed to reach the fuel-use goal.

The amount of diesel and LPG in DEA industry not being used by non-road machinery is included in the sectors, “Combustion in manufacturing industry” (0301) and “Non-industrial combustion plants” (0203) in the Danish emission inventory.

For recreational craft, the calculated fuel-use totals for diesel and gasoline are subsequently subtracted from the DEA fishery sector. For gasoline, the DEA reported fuel consumption for fisheries is far too small to fill the fuel gap, and hence the missing fuel amount is taken from the DEA road transport sector.

Bunkers

The distinction between domestic and international emissions from aviation and navigation should be in accordance with the Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories. For the national emission inventory this, in principle, means that fuel sold (and associated emissions) for flights/sea transportation starting from a seaport/airport in the Kingdom of Denmark, with destinations inside or outside the Kingdom of Denmark, are regarded as domestic or international, respectively.

Aviation

As prescribed by the IPCC guidelines, for aviation, the fuel consumption and emissions associated with flights inside the Kingdom of Denmark are counted as domestic.

This report includes flights from airports in Denmark and associated jet fuel sales. Hence, the flights between airports in Denmark and flights from Denmark to Greenland and the Faroe Islands are classified as domestic and flights from Danish airports with destinations outside the Kingdom of Denmark are classified as international flights.

In Greenland and in the Faroe Islands, the jet fuel sold is treated as domestic. This decision becomes reasonable when considering that almost no fuel is bunkered in Greenland/the Faroe Islands by flights other than those going to Denmark.

Navigation

In DEA statistics, the domestic fuel total consists of fuel sold to Danish ferries and other ships sailing between two Danish ports. The DEA international fuel total consists of the fuel sold in Denmark to international ferries, international warships, other ships with foreign destinations, transport to Greenland and the Faroe Islands, tank vessels and foreign fishing boats.

In order to follow the IPCC guidelines the bottom-up fuel estimates for the ferry routes between Denmark and the Faroe Islands, and freight transport between Denmark and Greenland/Faroe Islands are being subtracted from the fuel sales figures for international sea transport prior to inventory fuel input.

In Greenland, all marine fuel sales are treated as domestic. In the Faroe Islands, fuel sold in Faroese ports for Faroese fishing vessels and other Faroese ships is treated as domestic. The fuel sold to Faroese ships bunkering outside Faroese waters and the fuel sold to foreign ships in Faroese ports or outside Faroese waters is classified as international (Lastein and Winther, 2003).

Conclusively, the domestic/international fuel split (and associated emissions) for navigation is not determined with the same precision as for aviation. It is considered, however, that the potential of incorrectly allocated fuel quantities is only a small part of the total fuel sold for navigational purposes in the Kingdom of Denmark.

3.3.5 Uncertainties and time series consistency

Emission uncertainty estimates are made for road transport and other mobile sources using the guidelines formulated in the Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories (IPCC, 2000). However, for TSP the latter source indicates no uncertainty factor and, instead, this factor is based on expert judgement.

The activity data uncertainty factor is assumed to be 2 and 10 % for road transport and other mobile sources, respectively, based on expert judgement.

The uncertainty estimates should be regarded as preliminary only and may be subject to changes in future inventory documentation. The calculations are shown in Annex 2.B.17 for all emission components.

Table 3.3.20 Uncertainties for activity data, emission factors and total emissions in 2011 and as a trend.

Pollutant	Emission factor uncertainties [%] Road	Other	Emission uncertainties [%] Overall 2011	Trend
SO_2	50	50	49	3
NO_x	50	100	55	10
NMVOC	50	100	53	8
CO	50	100	60	16
NH_3	1 000	1 000	995	2164
TSP	50	100	47	4
PM_{10}	50	100	50	4
$PM_{2.5}$	50	100	54	4
Arsenic	1 000	1 000	877	63
Cadmium	1 000	1 000	816	146
Chromium	1 000	1 000	819	189
Copper	1 000	1 000	998	5
Mercury	1 000	1 000	710	97
Nickel	1 000	1 000	930	35
Lead	1 000	1 000	868	11
Selenium	1 000	1 000	777	130
Zinc	1 000	1 000	940	35
Dioxins	1 000	1 000	736	172
Flouranthene	1 000	1 000	804	7
Benzo(b) flouranthene	1 000	1 000	786	41
Benzo(k) flouranthene	1 000	1 000	825	64
Benzo(a) pyrene	1 000	1 000	868	59
Benzo(g,h,i) perylene	1 000	1 000	808	57
indeno(1,2,3-c,d) pyrene	1 000	1 000	785	155

As regards time series consistency, background flight data cannot be made available on a city-pair level from 2000 or earlier. However, aided by LTO/aircraft statistics for these years and the use of proper assumptions, a good level of consistency is still obtained in this part of the transport inventory.

The time series of emissions for mobile machinery in the agriculture, forestry, industry, household and gardening (residential), and inland waterways (part of navigation) sectors are less certain than time series for other sectors, since DEA statistical figures do not explicitly provide fuel consumption information for working equipment and machinery.

3.3.6 Quality assurance/quality control (QA/QC)

It is the intention to publish every second year a sector report for road transport and other mobile sources. The last sector report concerned the 2010 inventory (Winther, 2012).

The QA/QC descriptions of the Danish emission inventories for transport are given in Nielsen et al. (2012).

3.3.7 Recalculations

The following recalculations and improvements of the emission inventories have been made since the emission reporting in 2011.

Road transport

The total mileage per vehicle category from 1985-2010 have been updated based on new data prepared by DTU Transport and minor fuel statistical changes from the Danish Energy Agency. Most importantly, the annual mileage for all vehicle types has been revised based on data from the Danish vehicle inspection and maintenance programme. Further, fuel efficiency data for new sold passenger cars in Denmark has been used to modify the default fuel consumption factors proposed by COPERT IV. Also, revisions have been made to the cut-off mileage for N2O emission deterioration for catalyst cars, being in line with the updated version of COPERT IV.

The percentage emission change interval and year of largest percentage differences (low %; high %, year) for the different emission components are: SO_2 (0 %; 0.2 %, 2010), NO_x (3.1 %; 10.7 %, 2009), NMVOC (-3.2 %; 16.1 %, 2009), CO (-11.7 %; 5.8 %, 1985), NH_3 (-14.1 %; 20.7 %, 2010) and Particulates (0.3 %; 10.6 %, 2009).

Navigation

The ferry share of round trips has been updated for the years 2008-2010 causing minor emission changes for domestic navigation. The following largest percentage differences (in brackets) for domestic navigation are noted for: SO_2 (0.2 %), NO_x (-0.1 %), NMVOC (0.0 %), CO (0.0 %), NH_3 (0.0 %) and Particulates (0.1 %)

Agriculture/forestry/fisheries

The number of machine pool tractors has been updated for the years 2008-2010, causing minor emission changes. The following largest percentage differences (in brackets) for agriculture/forestry/fisheries are noted for: SO_2 (0.1 %), NO_x (0.2 %), NMVOC (0.1 %), CO (0.1 %), NH_3 (0.5 %) and Particulates (0.3 %).

Military

Emission factors derived from the new road transport simulations have caused some emission changes from 1985-2010.The following largest percentage differences (in brackets) for military are noted for: SO_2 (0 %), NO_x (-7 %), NMVOC (-3.7 %,), CO (2.8 %), NH_3 (10.4 %) and Particulates (0.7 %,).

3.3.8 Improvements

Fuel consumption and emission factors for road transport vehicles will be updated by the time when new data becomes available from COPERT model updates.

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3.4 Fugitive emissions (NFR sector 1B)

This chapter includes fugitive emissions in the NFR sector 1B.

3.4.1 Source category description

According to the categorisation in the reporting format (NFR) for the UNECE CLRTAP fugitive emissions is a sub-category under the main-category Energy (Sector 1). Fugitive emissions (Sector 1B) is segmented into sub-categories covering emissions from solid fuels (1B1), oil (1B2a), natural gas (1B2b) and from venting and flaring (1B2c). The sub-sectors relevant for the Danish emission inventory are shortly described below according to Danish conditions:

- 1B1c Fugitive emission from solid fuels: Coal mining is not occurring in Denmark. However, a large part of the electricity supply is based on coal fired power plants, and emissions from storage and handling of coal do occur. Emissions from solid fuels are therefore only relevant for the Danish national emission inventories in the case of particulate emissions. Emissions of other pollutants (e.g. CO) are not reported, as these emissions should be included in the inventory for the countries where the coal mining occurs.
- 1B2a Fugitive emissions from oil include emissions from extraction, storage, and transmission of crude oil, distribution of oil products and emissions from refineries. Emission data for offshore extraction of oil and gas are not available separately, and consequently emissions from gas extraction are included in 1B2a.
- 1B2b Fugitive emissions from natural gas include emissions from transmission and distribution of natural gas. Emissions from gas extraction are included in 1B2a.
- 1B2c Venting and flaring include activities onshore and offshore. Flaring occur both offshore and onshore in gas treatment and storage plants and in refineries. Venting occur in gas storage plants. Venting of gas is not occurring in extraction and in refineries as controlled venting enters the gas flare system.

Activity data, emission factors and emissions are stored in the Danish emission database on SNAP sector categories (Selected Nomenclature for Air Pollution). In Table 3.4.1 the corresponding SNAP codes and NFR sectors relevant to fugitive emissions are shown. Further, the table holds the SNAP names for the SNAP codes and the overall activity (e.g. oil and natural gas).

Table 3.4.1 List of NFR sectors relevant for fugitive emissions, and the corresponding SNAP codes and emission sources.

NFR sector	SNAP ID	SNAP name	Source
1 B 1 a	050103	Storage of solid fuel	Coal mining and handling
1 B 2 a	040101	Petroleum products processing	Oil
1 B 2 a	040103	Sulphur Recovery Plants	Oil
1 B 2 a	040104	Storage and handling of petroleum products in refinery	Oil
1 B 2 a	050201	Land-based activities	Oil
1 B 2 a	050202 *	Off-shore activities	Oil
1 B 2 a	050503	Service stations (including refuelling of cars)	Oil
1 B 2 b	050601	Pipelines	Natural gas / transmission
1 B 2 b	050602	Distribution networks	Natural gas / distribution
1 B 2 c	050699	Venting in gas treatment facilities	Venting and flaring
1 B 2 c	090203	Flaring in oil refinery	Venting and flaring
1 B 2 c	090206	Flaring in oil and gas extraction	Venting and flaring

In the Danish emission inventory emissions from extraction of gas are included in "Extraction, 1st treatment and loading of liquid fossil fuels / Off-shore activities" (NFR 1B2a / SNAP 050202).

Table 3.4.2 summarizes the Danish fugitive emissions in 2011. The methodologies, activity data and emission factors used for calculation are described in the following chapters.

Table 3.4.2 Summary of the Danish fugitive emission in 2011. P refers to point source and A to area source.

IPCC code	SNAP code	Source	Pollutant	Emission	Unit
1B2a iv	40101	P	SO_2	0*	Mg
1B2a iv	40101	P	NMVOC	3868	Mg
1B2a iv	40103	P	SO_2	1179	Mg
1B2a iv	40104	A	NMVOC	**	Mg
1B1a	50103	A	TSP	920	Mg
1B1a	50103	A	PM_{10}	368	Mg
1B1a	50103	A	$PM_{2.5}$	37	Mg
1B2a i	50201	A	NMVOC	1709	Mg
1B2a i	50202	A	NMVOC	2086	Mg
1B2a v	50503	A	NMVOC	1013	Mg
1B2b	50601	A	NMVOC	43	Mg
1B2b	50603	A	NMVOC	62	Mg
1B2c	50699	P	NMVOC	24	Mg
1B2c	90203	P	SO_2	242	Mg
1B2c	90203	P	NO_x	18	Mg
1B2c	90203	P	NMVOC	25	Mg
1B2c	90203	P	CO	59	Mg
1B2c	90203	P	TSP	0.3	Mg
1B2c	90203	P	PM_{10}	0.3	Mg
1B2c	90203	P	$PM_{2.5}$	0.3	Mg
1B2c	90203	P	As	< 0.1	kg
1B2c	90203	P	Cd	0.2	kg
1B2c	90203	P	Cr	0.2	kg
1B2c	90203	P	Cu	0.1	kg
1B2c	90203	P	Hg	< 0.1	kg
1B2c	90203	P	Ni	0.3	kg

IPCC code	SNAP code	Source	Pollutant	Emission	Unit
Continued					
1B2c	90203	P	Pb	0.1	kg
1B2c	90203	P	Se	< 0.1	kg
1B2c	90203	P	Zn	4.7	kg
1B2c	90203	P	Dioxin	< 0.01	g
1B2c	90203	P	Benzo(b)flouranthene	< 0.01	kg
1B2c	90203	P	Benzo(k)flouranthene	< 0.01	kg
1B2c	90203	P	Benzo(a)pyrene	< 0.01	kg
1B2c	90203	P	Indeno(1,2,3-c,d)pyrene	< 0.01	kg
1B2c	90206	A	SO_2	1.1	Mg
1B2c	90206	A	NO_x	95	Mg
1B2c	90206	A	NMVOC	8	Mg
1B2c	90206	A	CO	82	Mg
1B2c	90206	A	TSP	3	Mg
1B2c	90206	A	PM_{10}	3	Mg
1B2c	90206	A	$PM_{2.5}$	3	Mg
1B2c	90206	A	As	0.3	kg
1B2c	90206	A	Cd	1.8	kg
1B2c	90206	A	Cr	2.6	kg
1B2c	90206	A	Cu	1.5	kg
1B2c	90206	A	Hg	0.4	kg
1B2c	90206	A	Ni	3.6	kg
1B2c	90206	A	Pb	0.7	kg
1B2c	90206	A	Se	< 0.1	kg
1B2c	90206	A	Zn	51	kg
1B2c	90206	A	Dioxin	< 0.01	g
1B2c	90206	A	Benzo(b)flouranthene	< 0.01	kg
1B2c	90206	A	Benzo(k)flouranthene	< 0.01	kg
1B2c	90206	A	Benzo(a)pyrene	< 0.01	kg
1B2c	90206	A	Indeno(1,2,3-c,d)pyrene	< 0.01	kg
1B2c	90206	P	SO_2	0.01	Mg
1B2c	90206	P	NO_x	8	Mg
1B2c	90206	P	NMVOC	0.4	Mg
1B2c	90206	P	CO	0.9	Mg
1B2c	90206	P	TSP	< 0.1	Mg
1B2c	90206	P	PM_{10}	< 0.1	Mg
1B2c	90206	P	$PM_{2.5}$	< 0.1	Mg
1B2c	90206	P	As	< 0.1	kg
1B2c	90206	P	Cd	< 0.1	kg
1B2c	90206	P	Cr	< 0.1	kg
1B2c	90206	P	Cu	< 0.1	kg
1B2c	90206	P	Hg	< 0.1	kg
1B2c	90206	P	Ni	< 0.1	kg
1B2c	90206	P	Pb	< 0.1	kg
1B2c	90206	P	Se	< 0.1	kg
1B2c	90206	P	Zn	0.5	kg
1B2c	90206	P	Dioxin	< 0.01	g
1B2c	90206	P	Benzo(b)flouranthene	< 0.01	kg
1B2c	90206	P	Benzo(k)flouranthene	< 0.01	kg
1B2c	90206	P	Benzo(a)pyrene	< 0.01	kg
1B2c	90206	P	Indeno(1,2,3-c,d)pyrene	< 0.01	kg

* SO_2 from SNAP 040101 is included in SNAP 010306.

** Not occurring in 2011.

3.4.2 Methodological issues

The following chapters give descriptions on the methods of calculation used in the Danish emission inventory. Further, the activity data and emission factors that form the basis for the calculations are described according to data source and values.

Fugitive emissions from solid fuels

The emissions of particulate matter from storage of coal are estimated on basis of the imported amount of coal (equation 3.4.1).

$$E_{coal\_storage} = EMF_{coal\_storage} \cdot I_{coal} \qquad \text{(Eq. 3.4.1)}$$

where $EMF_{coal\_storage}$ is the emission factor for storage of coal in coal piles and I_{coal} is the amount of coal imported in the actual year.

Fugitive emissions from oil

The emissions from oil derive from offshore activities, service stations and refineries. Emissions from offshore activities include emissions from extraction, onshore oil tanks and onshore and offshore loading of ships. In the case of service stations emissions from reloading of tankers and refuelling of vehicles are included. The emissions from refineries derive from petroleum products processing (oil refining). Emissions from flaring in refineries are included in the chapters concerning flaring.

Offshore activities

Fugitive emissions from oil include emissions from offshore extraction, from onshore oil tanks and from onshore and offshore loading of ships.

The total emission can be expressed as:

$$E_{total} = E_{extraction} + E_{ship} + E_{oil\,tanks} \qquad \text{(Eq. 3.4.2)}$$

Fugitive emissions from extraction

According to the EMEP/EEA Guidebook (EMEP/EEA, 2009) the total fugitive emissions of volatile organic compounds (VOC) from extraction of oil and gas can be estimated by means of equation 3.4.3.

$$E_{extraction,VOC} = 40.2 \cdot N_P + 1.1 \cdot 10^{-2} P_{gas} + 8.5 \cdot 10^{-6} \cdot P_{oil} \qquad \text{(Eq. 3.4.3)}$$

where $E_{extraction,VOC}$ is the emission of VOC in Mg/year, N_P is the number of platforms, P_{gas} is the production of gas, 10^6 Nm^3 and P_{oil} is the production of oil, 10^6 tonnes.

It is assumed that the VOC contains 75 % CH_4 and 25 % NMVOC and consequently the total emission of NMVOC for extraction of oil and gas can be calculated as:

$$E_{extraction,NMVOC} = 0.25 \cdot E_{extraction,VOC} \qquad \text{(Eq. 3.4.4)}$$

Loading of ships

Fugitive emissions of NMVOC from loading of ships include the transfer of oil from storage tanks or directly from the well into ships. The activity also includes losses during transport. When oil is loaded hydrocarbon vapour will be displaced by oil and new vapour will be formed, both leading to emissions. The emissions from ships are calculated by equation 3.4.5.

$$E_{ships} = EMF_{ships,onshore} \cdot L_{oil,onshore} + EMF_{ships,offshore} \cdot L_{oil,ofshor} \quad \text{(Eq. 3.4.5)}$$

where EMF_{ships} is the emission factor for loading of ships and L_{oil} is the amount of oil loaded.

Oil tanks

The NMVOC emissions for storage of crude oil are given in the environmental reports from DONG Oil Pipe for 2011 (DONG Oil Pipe A/S, 2012). An implied emission factor is calculated on the basis of the amount of oil transported in pipelines according to equation 3.4.6.

$$IEF_{tanks} = E_{tanks} / T_{oil} \quad \text{(Eq. 3.4.6)}$$

where IEF_{tanks} is the implied emission factor for storage of raw oil in tanks, E_{tanks} is the emission and T_{oil} is the amount of oil transported in pipelines.

Service stations

NMVOC emissions from service stations are estimated as outlined in equation 3.4.7.

$$E_{service\,stations} = \left(EMF_{reloading} \cdot T_{fuel}\right) + \left(EMF_{refuelling} \cdot T_{fuel}\right) \quad \text{(Eq. 3.4.7)}$$

where $EMF_{reloading}$ is the emission factor for reloading of tankers to underground storage tanks at the service stations, $EMF_{refuelling}$ is the emission factor for refuelling of vehicles and T_{fuel} is the amount of gasoline used for road transport.

Oil refining

When oil is processed in the refineries, part of the volatile organic compounds (VOC) is emitted to the atmosphere. The VOC emissions from the oil refinery process include non-combustion emissions from handling and storage of feedstock (raw oil), from the petroleum product processing and from handling and storage of products.

Emissions from flaring in refineries are described under “Flaring”.

Emissions related to process furnaces in refineries are included in stationary combustion with the relevant emission factors. In cases where only the total VOC emission is given by the refinery the emission of NMVOC is estimated based on the assumption that 10 % of VOC is CH_4 and the remaining 90 % is NMVOC.

Both the non-combustion processes, product processing and sulphur recovery plants emit SO_2. The SO_2 emissions are calculated by the refineries and implemented in the emission inventory without further calculation.

Transmission and distribution of gas

The fugitive emission from transmission, storage and distribution of natural gas is based on information from the gas companies. The transmission and distribution companies give data on the transported amount and length and material of the pipeline systems.

The fugitive losses from pipelines are only given for some companies, here among the transmission company. The available distribution data are used for the remaining companies too. The emissions of NMVOC are calculated from the fugitive losses from transmission and distribution pipelines due to the gas quality measured by Energinet.dk.

Calculations of emissions from distribution of town gas are based on data from the distribution companies on distribution losses. At present, there are two areas with town gas distribution and correspondingly distribution companies. Two others companies in other areas were closed in 2004 and 2006, and it have not been possible to collect data for all years in the time series. The emissions have been calculated for the years with available data and the distribution loss for the first year with data has been applied for the previous years in the time series. Data is missing for the later years (1996-2003) for one of the distribution companies. The distribution amount is assumed to decrease linearly to cero over these years, and the share ("distribution loss"/"distribution amount") are assumed equal to the value for 1995.

Flaring

Emissions from flaring are estimated from the amount of gas flared offshore, in gas treatment/storage plants and in refineries and from the corresponding emission factors. From 2006 offshore flaring is given in the reports for the European Union Greenhouse Gas Emission Trading System (EU ETS) and thereby flaring can be split to the individual production units. Before 2006 only the summarised flared amount is available.

3.4.3 Activity data

Coal storage

The activity data are the imported amount of coal converted using the calorific values of coal (Danish Energy Agency, 2012b). In 2011 the imported amount was 6 136 Gg (Figure 3.4.1) which is an increase since 2010.

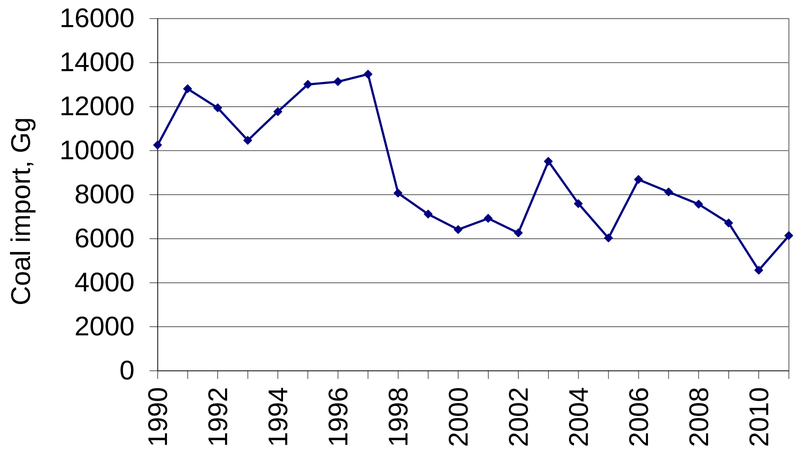

Figure 3.4.1 Amount of imported coal.

Extraction of oil and gas and loading of ships

Activity data used in the calculations of the emissions from oil and gas production and loading of ships are shown in Table 3.4.3. Data are based on information from the Danish Energy Agency (2012a) and from the environmental reports from DONG Oil Pipe (2012).

Table 3.4.3 Activity data for 2011

Activity	Symbols	Value	Data source
Number of platforms	N_p	54	Danish Energy Agency, 2012a
Produced gas, 10^6 Nm^3	P_{gas}	6 511	Danish Energy Agency, 2012a
Produced oil, 10^3 m^3	$P_{oil,vol}$	12 834	Danish Energy Agency, 2012a
Produced oil, 10^3 tonnes	P_{oil}	11 037	Danish Energy Agency, 2012a
Oil loaded, 10^3 m^3	$L_{oil\ off\text{-}shore}$	1 773	Danish Energy Agency, 2012a
Oil loaded, 10^3 tonnes	$L_{oil\ off\text{-}shore}$	1 525	Danish Energy Agency, 2012a
Oil loaded, 10^3 m^3	$L_{oil\ on\text{-}shore}$	8 300	DONG Oil Pipe A/S, 2012
Oil loaded, 10^3 tonnes	$L_{oil\ on\text{-}shore}$	7 138	DONG Oil Pipe A/S, 2012

Mass weight raw oil = 0.86 tonnes per m^3

As seen in Figure 3.4.2 the production of oil and gas in the North Sea has generally increased in the years 1990-2004. Since 2004 the production has decreased. The number of platforms is, however, still increasing (Figure 3.4.3). Five major platforms were completed in 1997-1999, which is the main reason for the great increase in the oil production in the years 1998-2000.

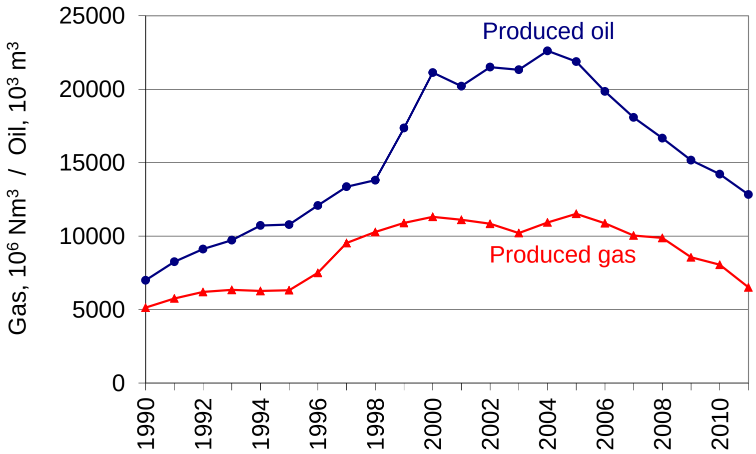

Figure 3.4.2. Production of oil and gas in the Danish part of the North Sea.

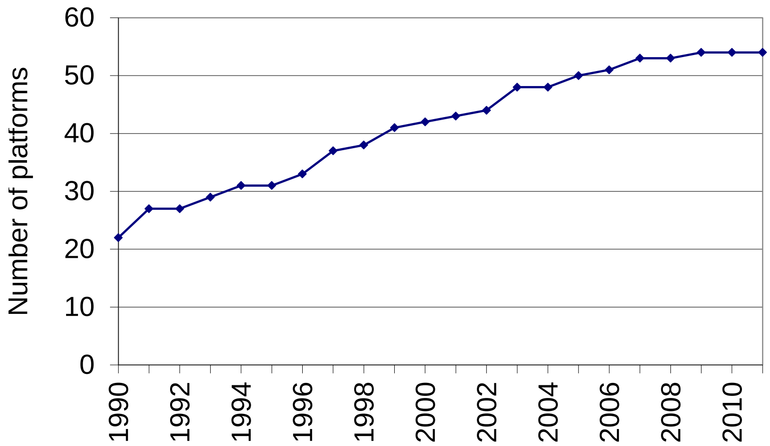

Figure 3.4.3. The number of platforms in the Danish part of the North Sea.

The amount of oil loaded offshore on ships roughly follows the trend of the oil and gas production (Figure 3.4.4). In case of onshore loading of ships the trend is more smoothed.

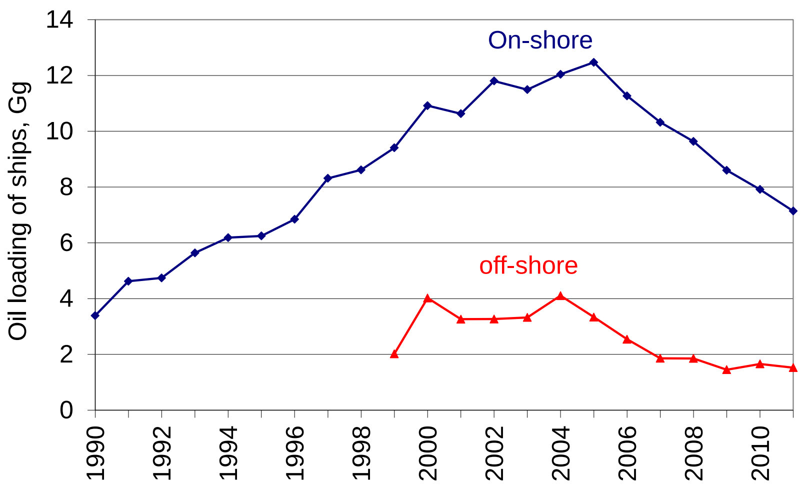

Figure 3.4.4 Onshore and offshore loading of ships.

Oil refining

Data on the amount of crude oil processed in the two Danish refineries are given by the refineries in their annual environmental report (A/S Dansk Shell, 2012 and Statoil A/S, 2012). Until 1996 a third refinery was in operation, leading to a decrease in the crude oil amount from 1996 to 1997. Data are shown in Figure 3.4.5. The amount of crude oil being processed was 8 706 Gg in 2011.

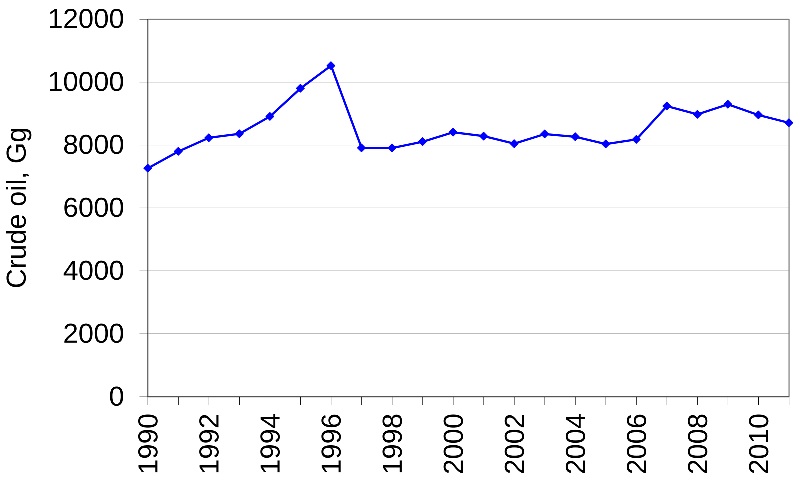

Figure 3.4.5 Oil refineries. Processed crude oil in Danish refineries.

Service stations

The Danish Energy statistics holds data on the sale of gasoline that is the basis for estimating emissions of NMVOC from service stations. The gasoline sales show an increase from 1990-1998 and a decreasing trend from 1999-2011 as shown in Figure 3.4.6. In 2011 the gasoline sale was 1 441 Gg.

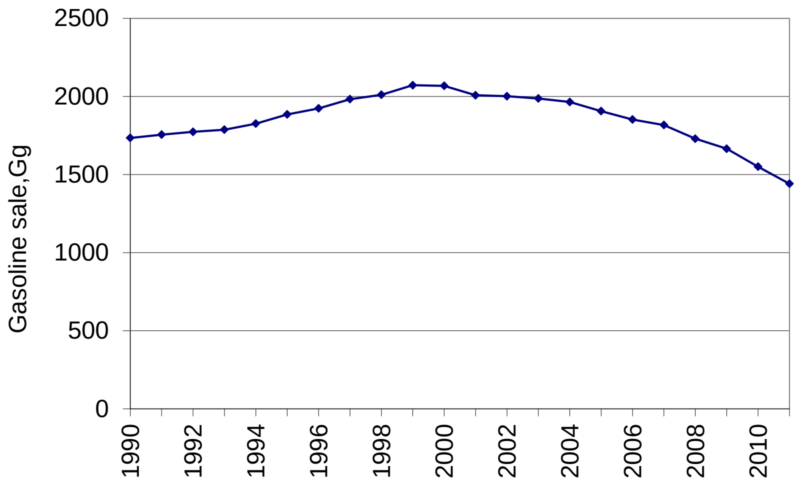

Figure 3.4.6 Gasoline sales in Denmark.

Transmission, storage and distribution of gas

The activity data used in the calculation of the emissions from natural gas is shown in Table 3.4.4. Transmission rates for 1990-1997 refer to the Danish energy statistics and to the annual environmental report of DONG Energy for 1998. The distribution rates for 1990-1998 are estimated according to the transmission rates. Transmissions and distribution rates for 1999-2006 refers to Dong Energy, Danish Gas Technology Centre and the Danish gas distribution companies. Since 2007 the transmission rate is taken from the annual environmental report by Energinet.dk (2012a). Since 2007 the distribution rates have been given by the distribution companies, either in their annual reports or through personal communication.

Table 3.4.4 Activity data on transmission and distribution of gas for selected years of the time series. Town gas is included in distribution.

	1990	1995	2000	2005	2008	2009	2010	2011
Transmission, Mm3 *	2739	4689	7079	7600	7565	6500	7462	6181
Distribution of natural gas, Mm3 **	1870	3054	3477	3265	3113	2870	3416	2933
Distribution of town gas, Mm3 **	35	35	34	32	22	20	22	21

* In 1990-1997 transmission rates refer to Danish energy statistics, in 1998 the transmission rate refers to the annual environmental report of DONG Energy, in 1999-2006 emissions refer to DONG/Danish Gas Technology Centre (Karll 2003, Karll 2005, Oertenblad 2006, Oertenblad 2007). Since 2007 transmission data refer to the annual environmental report by Energinet.dk.

**) In 1990-98 distribution rates are estimated from the Danish energy statistics. Distribution rates are assumed to equal total Danish consumption rate minus the consumption rates of sectors that receive the gas at high pressure. The following consumers are assumed to receive high pressure gas: town gas production companies, production platforms and power plants. In 1999-2006 distribution rates refer to DONG Energy / Danish Gas Technology Centre / Danish gas distribution companies (Karll 2003, Karll 2005, Oertenblad 2006, Oertenblad 2007). Since 2007 the distribution rates are given by the companies. The distribution of town gas is based on the available data from the Danish town gas distribution companies of which more are closed down today.

In 2010 the gas transmission rate was 6 181 Mm^3 and the distribution rate was 2 954 Mm_n^3, hereof 21 Mm_n^3 town gas (Figure 3.4.7). The variation over the time series owes mainly to variations in the winter temperature and to the variation of import/export of electricity from Norway and Sweden.

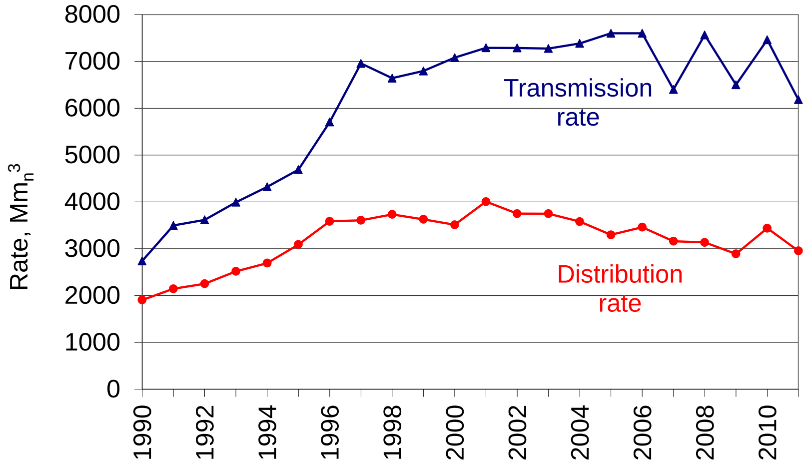

Figure 3.4.7 Rates for transmission and distribution of gas. Distribution covers both natural gas and town gas.

Data on the transmission pipelines excluding offshore pipelines and on the distribution network are given by Energinet.dk, DGC and the distribution companies concerning length and material. In 2011 the length of the transmission pipelines was 813 km. Because the distribution system in Denmark is relatively new most of the distribution network is made of plastic (PE). In 2010 the length of the distribution network was a round 20 000 km. The major part is made of plastic (approximately 90 %) and the remaining part is made of steel. For this reason the fugitive emission is negligible under normal operating conditions as the distribution system is basically tight with no fugitive losses. However, the plastic pipes are vulnerable and therefore most of the fugitive emissions from the pipes are caused by losses due to excavation damages and construction and maintenance activities performed by the gas companies. These losses are either measured or estimated by calculation in each case by the gas companies. About 5 % of the distribution network is used for town gas. This part of the network is older and the fugitive losses are greater. The fugitive losses from this network are associated with more uncertainty as it is estimated as a percentage (15 %) of the meter differential. This assumption is based on expert judgement from one of the town gas companies. It must be noted that two town gas distribution companies have been closed in recent years (one in 2004 and another in 2006). There are only two town gas distribution companies left, and therefore the data availability is scarce.

Venting and Flaring

In Denmark there are two natural gas storage facilities. Both are obligated to make an environmental report on annual basis. Data on gas input and withdrawal are included and were 532 Mm^3 and 391 Mm^3 in 2011, respectively. Venting and flaring at the gas storage plants are included in the inventory. Venting of gas is assumed to be not occurring in extraction and in refineries as controlled venting enters the gas flare system. Venting rates in gas storage facilities are shown in Figure 3.4.8. As venting rates are not available before 1995 the mean value for the following three years are adopted as basis for the emission calculation for the years 1990-1994.

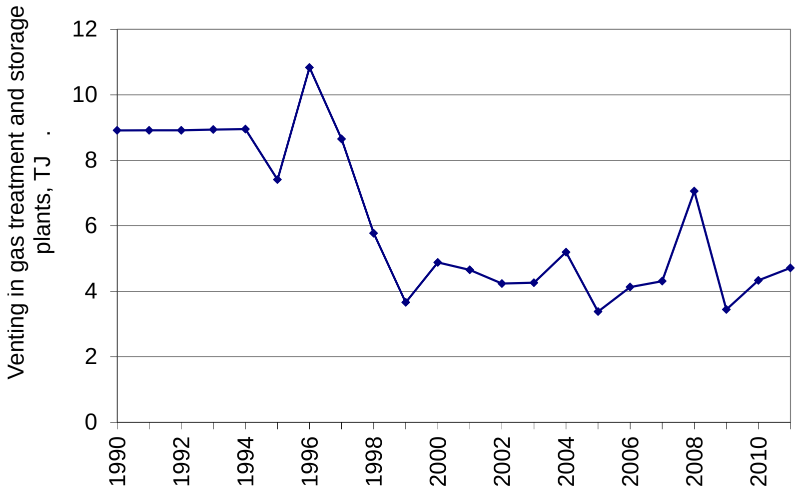

Figure 3.4.8. Amount vented in gas treatment and storage plants.

Offshore flaring amounts are given in Denmark's oil and gas production (Danish Energy Agency, 2011a) while flaring in treatment/storage plants are given in DONG Energy's environmental reports (Dong Energy, 2012; Energinet.dk, 2012a). Flaring rates for the two Danish refineries are given in their environmental reports and in additional data provided by the refineries directly to DCE. From 2006 flaring amounts are given in the EU ETS reporting.

Flaring rates are shown in Figure 3.4.9 and 3.4.10. Flaring rates in gas treatment and gas storage plants are not available until 1995. The mean value for the following ten years (1995 to 2004) has been adopted as basis for the emission calculation for the years 1990-1994. The large amount of flared gas in 2007 owe to a larger maintenance work at the gas treatment plant.

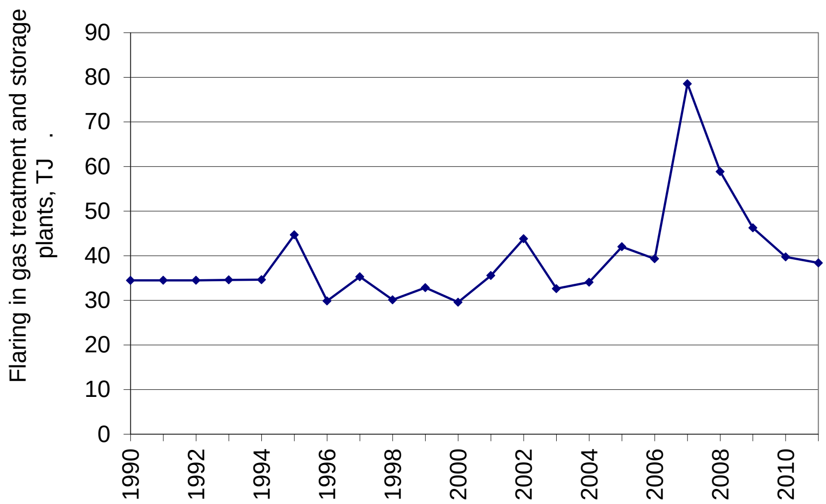

Figure 3.4.9 Amount flared in gas treatment and storage plants.

Offshore flaring amounts have been decreasing over the last 10 years period in accordance with the decrease in production as seen in Figure 3.4.2.. Further, there is focus on reduction of the amount being flared for environmental reasons.

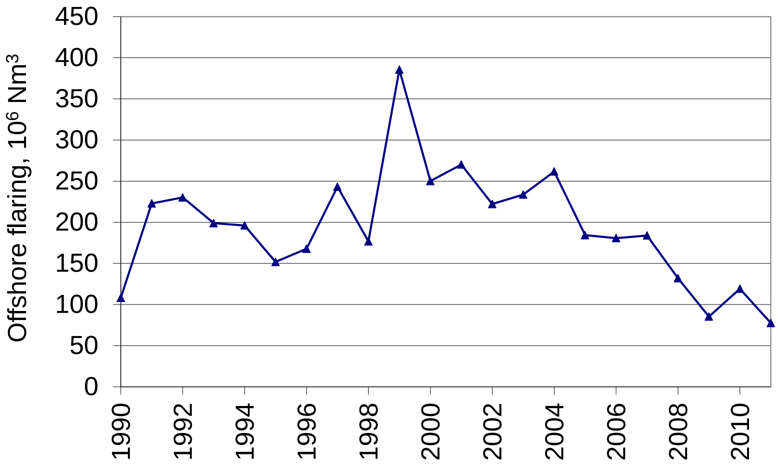

Figure 3.4.10 Amounts of gas flared in offshore exploration.

3.4.4 Emission factors

Coal storage

Emissions of particulate matter (PM) from coal storage are estimated by the emission factors used in the emission inventory of Poland (Olendry´nski et al., 2004). The emission factors are listed in Table 3.4.5.

Table 3.4.5 Emission factors used to estimate particulate emissions from coal storage.

Emission factor	TSP	PM_{10}	$PM_{2.5}$
Emission factor, g per Mg	150	60	6

Loading of ships

In the EMEP/EEA Guidebook standard emission factors for different countries are given (EMEP/EEA, 2009). In the Danish emission inventory the Norwegian emission factors are used for estimation of fugitive emissions from loading of ships onshore and offshore for the years 1990-2009. During 2009 new emission reducing technologies (degassing unit) were installed at the crude oil terminal. Measurements were carried out at the terminal before and after installation show a decrease of 25 % of the NMVOC emission from loading of ships. The reduced emission factors are used for 2010 onwards. The emission factors are listed in Table 3.4.6.

Table 3.4.6 Emission factors for loading of ships onshore and offshore.

	NMVOC, fraction of loaded	Reference
Ships off-shore	0.001	EMEP/EEA, 2009
Ships on-shore, 1990-2009	0.0002	EMEP/EEA, 2009
Ships on-shore, 2010 onwards	0.00015	EMEP/EEA, 2009; Miljøcenter Odense, 2010

Oil refining

The refineries provide information on consumption of fuel gas and fuel oil. The calorific values are given by the refineries in the reporting for EU ETS since 2006. Before 2006 the calorific values given by the refineries were used when available. When not available standard calorific values from the Danish Energy Agency combined with the conversion factor between fuel gas and fuel oil given by the refinery were used for calculation.

Emissions of SO_2, NO_x and VOC are given by the refineries. Only one of the two refineries has made a split between NMVOC and CH_4. For the other refinery it is assumed that 10 % of the VOC emission is CH_4 and the remaining 90 % is NMVOC.

Service stations

The NMVOC emission from service stations is calculated by use of different emission factors for the time series as shown in Table 3.4.7. In 1994 the emission factors for NMVOC from service stations were investigated by Fenhann and Kilde (1994) for the years 1990, 1991 and 1992, individually. The emission factors reported for reloading and refuelling for 1990 were used for the years 1985-1990, while the emission factors for 1991 was used for that year only. For the years 1992-1995 only emission factor for refuelling reported by Fenhann and Kilde (1994) was used in the Danish emission inventory. For reloading of tankers the British emission factor - as given in the UK Emission Factor Database - was adopted for the years 1992-2000. From 2008 the emission factors from the EMEP/EEA guidebook 2009 are used for reloading and refuelling. For the years 2001-2007 and 1996-2007 the emission factors for reloading and refuelling, respectively, are estimated by using interpolation.

Table 3.4.7 Emission factors used for estimating NMVOC from service stations.

Year	Reloading of tankers, kg NMVOC pr tonnes gasoline	Refuelling of vehicles, kg NMVOC pr tonnes gasoline	Sum of reloading and refuelling, kg NMVOC pr tonnes gasoline	Source
1985-1990	1.28	1.52	2.80	Fenhann & Kilde,1994
1991	0.64	1.52	2.16	Fenhann & Kilde,1994
1992-1995	0.08	1.52	1.60	UK emf. database / Fenhann & Kilde,1994
1996	0.08	1.45	1.53	UK emf. database / interpolation 1995-2008
1997	0.08	1.39	1.47	UK emf. database / interpolation 1995-2008
1998	0.08	1.32	1.40	UK emf. database / interpolation 1995-2008
1999	0.08	1.25	1.33	UK emf. database / interpolation 1995-2008
2000	0.08	1.19	1.27	UK emf. database / interpolation 1995-2008
2001	0.077	1.12	1.20	Interpolation 2000-2008 / 1995-2008
2002	0.073	1.05	1.13	Interpolation 2000-2008 / 1995-2008
2003	0.070	0.99	1.05	Interpolation 2000-2008 / 1995-2008
2004	0.067	0.92	0.98	Interpolation 2000-2008 / 1995-2008
2005	0.063	0.85	0.91	Interpolation 2000-2008 / 1995-2008
2006	0.060	0.78	0.84	Interpolation 2000-2008 / 1995-2008
2007	0.056	0.72	0.77	Interpolation 2000-2008 / 1995-2008
2008 onwards	0.053	0.65	0.70	EMEP/EEA 2009

Transmission, storage and distribution of gas

The fugitive emissions from transmission, storage and distribution of natural gas are based on data on gas losses from the companies and on the average annual natural gas composition given by Energinet.dk.

Table 3.4.8 Annual gas composition, lower heating value and density for Danish natural gas (Energinet.dk)

		Unit	1990	2000	2005	2008	2009	2010	2011
Methane	CH_4	molar-%	90.92	86.97	88.97	89.80	90.08	89.95	89.10
Ethane	C_2H_6	molar-%	5.08	6.88	6.14	5.77	5.70	5.71	5.98
Propane	C_3H_8	molar-%	1.89	3.17	2.50	2.26	2.17	2.19	2.36
i-Butane	i-C_4H_{10}	molar-%	0.36	0.43	0.40	0.37	0.37	0.37	0.37
n-Butane	n-C_4H_{10}	molar-%	0.50	0.61	0.55	0.53	0.52	0.54	0.55
i-Petane	i-C_5H_{12}	molar-%	0.14	0.11	0.11	0.13	0.13	0.13	0.13
n-Petane	n-C_5H_{12}	molar-%	0.10	0.08	0.08	0.08	0.08	0.08	0.09
n-Hexane and heavier hydrocarbons	C^{6+}	molar-%	0.09	0.06	0.05	0.06	0.06	0.06	0.06
Nitrogen	N_2	molar-%	0.31	0.34	0.29	0.30	0.29	0.31	0.37
Carbon dioxide	CO_2	molar-%	0.60	1.35	0.90	0.71	0.59	0.66	0.98
Lower heating value	H_n	MJ/m^3_n	39.176	40.154	39.671	39.485	39.459	39.461	39.507
Density	ρ	kg/m^3_n	0.808	0.846	0.825	0.817	0.814	0.816	0.824

Venting and flaring

Venting

Emissions of NMVOC from venting are given in the environmental reports for the gas storage plants (DONG Energy, 2012; Energinet.dk, 2012a).

Flaring in refineries

The composition of fuel gas is given for 2008 by one of the two refineries. As the composition for fuel gas is marked different than the composition of natural gas, which has been used in earlier year's calculations, the same fuel gas composition is used in calculations for the other Danish refinery.

The emission factor for NMVOC has been applied in the inventory for all years from 1990 and onwards. For NO_x and CO the emission factors from the EMEP/EEA guidebook 2009 are used. For trace metals, dioxin and PAHs the emission factors given in the guidebook (EMEP/EEA, 2009) for stationary combustion Tier 1 are adopted for flaring in refineries. The refinery emission factors are listed in Table 3.4.9.

Table 3.4.9 Emission factors for flaring in refineries.

Pollutant	Emission factor	Unit
NO_x*	32.2	g per GJ
NMVOC	76.4	g per GJ
CO	177	g per GJ
TSP	0.90	g per GJ
PM_{10}	0.90	g per GJ
$PM_{2.5}$	0.90	g per GJ
As	0.09	mg per GJ
Cd	0.50	mg per GJ
Cr	0.70	mg per GJ
Cu	0.40	mg per GJ
Hg	0.10	mg per GJ
Ni	1.00	mg per GJ
Pb	0.20	mg per GJ
Se	0.01	mg per GJ
Zn	14.0	mg per GJ
Dioxin	0.03	ng I-TEQ per GJ
Benzo(b)fluoranthene	0.08	µg per GJ
Benzo(k)fluoranthene	0.08	µg per GJ
Benzo(a)pyrene	0.06	µg per GJ
Indeno(1,2,3-c,d)pyrene	0.08	µg per GJ

* Direct measured emission of NO_x is available for one refinery and the emission factor is used for the remaining refinery only.

Flaring offshore

The emission factors for offshore flaring are shown in Table 3.4.10. The dioxin emission factor originates from a Danish study by Henriksen et al. (2006) and is, like emission factors for PM and SO_2, the same as the emission factors used for combustion of natural gas in Danish public power plants.

The NO_x emission factor is based on the conclusion in a Danish study of NO_x emissions from offshore flaring carried out by the Danish Environmental Protection Agency (2008). The recommended NO_x emission factor (31 008 g per GJ or 0.0015 tonnes NO_x per tonnes gas) corresponds well with the emission factors used to estimate NO_x emission in other countries with oil production in the North Sea (Netherlands: approximately 0.0014 tonnes NO_x per tonnes gas and United Kingdom: approximately 0.0013 tonnes NO_x per tonnes gas). Emission factors for NMVOC and CO are based on the EMEP/EEA Guidebook.

For trace metals, dioxin and PAH's the emission factors given in the guidebook (EMEP/EEA, 2009) for stationary combustion Tier 1 are adopted for flaring in refineries. Emissions from flaring in gas treatment and storage plants are calculated from the same emission factors, which are used for offshore flaring.

Table 3.4.10 Emission factors for offshore flaring.

Pollutant	Emission factor	Unit
SO_2	0.014	g per Nm^3
NO_x	1.227	g per Nm^3
NMVOC	0.105	g per Nm^3
CO	1.055	g per Nm^3
TSP	0.042	g per Nm^3
PM_{10}	0.042	g per Nm^3
$PM_{2.5}$	0.042	g per Nm^3
As	0.004	mg per Nm^3
Cd	0.023	mg per Nm^3
Cr	0.033	mg per Nm^3
Cu	0.019	mg per Nm^3
Hg	0.005	mg per Nm^3
Ni	0.047	mg per Nm^3
Pb	0.009	mg per Nm^3
Se	0.0005	mg per Nm^3
Zn	0.652	mg per Nm^3
Dioxin	0.001	ng I-TEQ per Nm^3
Benzo(b)fluoranthene	0.037	µg per Nm^3
Benzo(k)fluoranthene	0.037	µg per Nm^3
Benzo(a)pyrene	0.028	µg per Nm^3
Indeno(1,2,3-c,d)pyrene	0.037	µg per Nm^3

3.4.5 Emissions

Coal storage

The emission from storage of coal is 920 Mg TSP in 2011 (368 Mg PM_{10} and 37 Mg $PM_{2.5}$). The coal consumption and the related emissions vary from year to year mainly due to the extent of electricity import/export and temperature variations (Table 3.4.11). Note that PM was only included in the inventory from 2000.

Table 3.4.11 PM_{10} from storage of solid fuels for selected years of the time series.

	2000	2005	2006	2007	2008	2009	2010	2011
TSP, Mg	962	905	1303	1218	1135	1007	686	920
PM_{10}, Mg	385	362	521	487	454	403	274	368
$PM_{2.5}$, Mg	38	3652	52	49	45	40	27	37

Extraction of oil and gas and loading of ships

From the activity data in Table 3.4.3 and equation 3.4.3 the fugitive emissions of NMVOC from extraction of oil and gas are calculated. Corresponding emissions from loading of ships can be estimated by combining the information in Table 3.4.3, Table 3.4.7 and equation 3.4.5. The emissions are listed in Table 3.4.12 along with the emissions from storage of oil given in the environmental reports from DONG Oil Pipe (2012). A degassing system has been established at the crude oil terminal leading to reduced VOC emissions from storage and handling. The degassing system has been in operation since the summer of 2009 and measurements of VOC emissions were carried out in September 2009 after a period with constant operation. The measurements show a decrease of around 80 % for the VOC emission. The emission factor for NMVOC from oil tanks has decreased by 39 % from 2008 to 2009 and further by 50 % from 2009 to 2010.

Table 3.4.12 NMVOC emissions for 2011.

	NMVOC, Mg
Onshore loading of ships	1 071
Oil tanks	638
Fugitive emissions from extraction	562
Offshore loading of ships	1 525
Total	3 796

The emissions from extraction of oil and gas are aggregated in two sources; emissions related to onshore and offshore activities, respectively. The time series for onshore and offshore activities related to extraction of oil and natural gas are shown in Table 3.4.13 and Table 3.4.14.

Table 3.4.13 NMVOC (Mg) from onshore activities related to extraction of oil.

NMVOC, Mg	1990	1995	2000	2005	2008	2009	2010	2011
Onshore loading of ships	678	1249	2183	2494	1926	1720	1187	1071
Oil tanks	1726	2664	4000	4500	3625	2098	763	638

Table 3.4.14 NMVOC from offshore activities related to extraction of oil and natural gas.

NMVOC emission, Mg	1990	1995	2000	2005	2008	2009	2010	2011
Fugitive emissions from extraction	236	330	455	536	561	568	566	562
Offshore loading of ships *	0	0	4021	3337	1856	1451	1658	1525

* Offshore loading were not occurring until 1999.

Oil refining

NMVOC emissions from oil refining at the Danish refineries are listed for selected years of the time series in Table 3.4.15. Further, the emissions of SO_2 from oil refining and sulphur recovery in refineries are shown. The emission of SO_2 has shown a pronounced decrease since 1990 because of technical improvements at the refineries. Note that SO_2 from refining and recovery prior to 1994 was summarised and reported as an area source in category 1B2a vi, and that SO_2 from oil refining from 2001 are included in stationary combustion.

Table 3.4.15 Oil Refineries. Emissions of NMVOC and SO_2 from oil refining and SO_2 from sulphur recovery.

	1990[1]	1995	2000	2005[2]	2008[2]	2009[2]	2010[2]	2011[2]
NMVOC, Mg	3335	2437	803	390	987	481	1019	1179
SO_2, oil refining, Mg		585	178					
SO_2, sulphur recovery, Mg	3667	5815	4845	3442	3588	3877	3867	3868

1) Prior to 1994 SO_2 emissions from oil refining and sulphur recovery are reported as area sources in category 1B2a vi.

2) From 2001 SO_2 emissions from oil refining are included in stationary combustion.

Service stations

Emissions from service stations are calculated using the emission factors in Table 3.4.7 and the sales of gasoline given by the Danish Energy statistics. The NMVOC emissions are listed in Table 3..4.16.

Table 3.4.16 Emissions of NMVOC from service stations for selected years of the time series.

	1990	1995	2000	2005	2008	2009	2010	2011
NMVOC, Mg	4 856	3 016	2 616	1 742	1 216	1 171	1 090	1 013

Transmission and distribution of gas

The gas transmission company reports emissions of CH_4. Calculations of the CH_4 emissions for transmission are based on registered loss in the transmission grid and the emission from the natural gas consumption in the pressure regulating stations. The distribution companies give data on fugitive losses, and the CH_4 emissions are estimated due to the gas quality given by Energinet.dk. Calculations of the NMVOC emissions are based on the CH_4 emission according to the gas quality measured by Energinet.dk (Table 3.4.7) according to equation 3.4.8.

$$E_{NMVOC} = E_{CH_4} \times \left(w_{NMVOC} / w_{CH_4} \right) \qquad \text{(eq. 3.4.8)}$$

where w_{NMVOC} is the weight-% NMVOC and w_{CH4} is the weight-% CH_4 according to the gas quality of the current year.

As the pipelines in Denmark are relatively new, most emissions are due to construction and maintenance. The decrease in NMVOC emission from transmission in 2007 (Table 3.4.17) is caused by the completion of a greater construction work and rerouting of a major pipeline. In preparation for construction work on a new compressor station, there has been laid a number of new line valve stations in 2011. Before this work could be done, larger amounts of natural gas were vented to drain the pipes. Therefore emissions from transmission of natural gas are significantly higher in 2011 than in the previous years.

Emissions from distribution of gas mainly owe to excavations and maintenance of the pipelines, but also difference between the calendar year and the meter reading year might influence the annual variations. As the town gas distribution network is significant older the gas losses and thus the emissions are larger than for the natural gas distribution network, even though the distribution rates for natural gas far exceeds the rates for town gas (Table 3.4.4).

Table 3.4.17 NMVOC emission from transmission, storage of natural gas and distribution of natural gas and town gas for selected years of the time series.

NMVOC emission, Mg	1990	1995	2000	2005	2008	2009	2010	2011
Transmission	36	121	52	36	4	2	6	43
Distribution, natural gas	12	20	15	16	15	14	9	12
Distribution, town gas	45	49	51	45	23	48	25	50

Venting and flaring

Venting

Emissions of NMVOC from venting are given in the environmental reports for the gas storage plants (DONG Energy, 2012; Energinet.dk, 2012a). The time series are shown in Figure 3.4.11.

Flaring

The time series for the emission of NMVOC from offshore flaring fluctuates due to the fluctuations in the fuel rate. As shown in Figure 3.4.11 there were marked peaks in the amount of offshore flaring in 1997 and, especially, in

1999. The increase in 1997 was due to the new Dan field and the completion of the Harald field. The increase in 1999 was due to the opening of three new fields; Halfdan, Siri and Syd Arne.

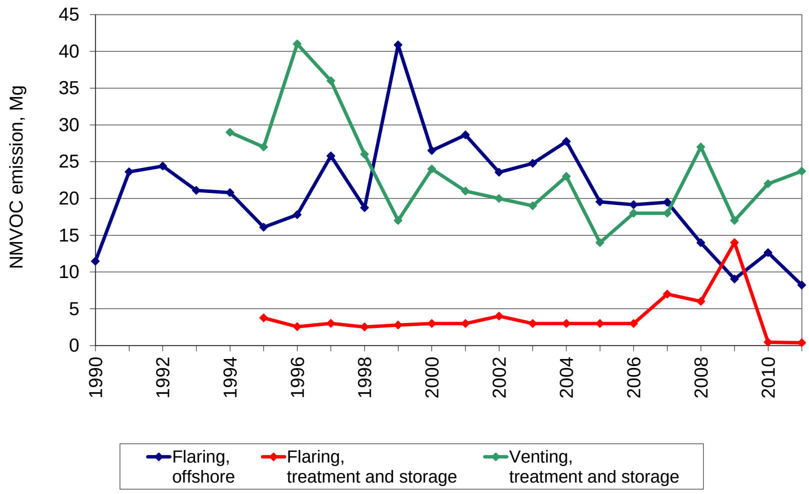

Figure 3.4.11 NMVOC emissions from venting and flaring of gas.

The emissions from offshore flaring are estimated from the same set of emission factors for all years in the time series and the variations reflect only the variations in the flared amounts. Emissions of selected components from flaring in oil and gas extraction including offshore flaring and flaring in gas treatment and storage facilities are shown in Table 3.4.18. The decrease in the NMVOC emission from 2009 to 2010 owes to change from continuous to regulating power operation of the power producing gas turbine at the gas storage plant.

Table 3.4.18 Emissions from flaring in oil and gas extraction.

Year	1990	1995	2000	2005	2008	2009	2010	2011
	Mg	Mg	Mg	Mg	Mg	Mg	Mg	Mg
SO_2	2	2	4	3	2	1	2	1
NO_x	133	188	310	231	168	111	155	103
NMVOC	11	20	30	23	20	23	13	9
CO	114	161	265	195	141	91	127	83

Flaring also occur in refineries. Flaring in refineries is a significant fugitive emission source to emissions of SO_2. In 1990-1993 emissions from petroleum product processing were included in emissions from flaring in refineries (NFR category 1B2c). From 1994 the data delivery format was changed, which made it possible to split the emissions into contributions from flaring and processing, respectively. Emissions from processing are from 1994 included in NFR category 1B2a iv.

Emissions for selected years and components are shown in Table 3.4.19. Until 1996 a third refinery was in operation in Denmark leading to larger emissions in 1990-1996. The decreasing emissions of SO_2 from 1996 to 1998 are due to technical improvements of the sulphur recovery system at one of the two Danish refineries. The large emissions from 2005 and onwards owe to shut-downs due to maintenance and accidents. Further, construction and initialisation of new facilities and problems related to the ammonium thiosulphate (ATS) plant at the one refinery has led to increased emissions. In 2007 the capacity of the ATS plant was increased followed by commissioning difficulties.

Table 3.4.19 Emissions from flaring in refineries.

Year	1990*	1995	2000	2005	2006	2007	2008	2009	2010	2011
	Mg	Mg	Mg	Mg	Mg	Mg	Mg	Mg	Mg	Mg
SO_2 *	943	203	51	296	257	526	380	453	288	242
NO_x	41	13	11	26	22	24	26	17	19	18
NMVOC	34	31	26	32	31	33	38	23	27	25
CO	5	73	60	73	73	77	88	53	62	59

*In 1990-1993 emissions from petroleum product processing were included in flaring in refineries due to the data delivery form. From 1994 emissions from petroleum product processing were given in 1B2a iv.

3.4.6 Uncertainties and time series consistency

Methodology

The applied methodology for uncertainty estimates refers to Pulles & Aardenne (2004). The Danish uncertainty estimates are based on the simple Tier 1 approach described in IPCC Good Practice Guidance (IPCC, 2000).

The uncertainty estimates are based on the calculated emissions for the base year and for the latest inventory year and on the uncertainty rates for both activity data and emission factors. Data is aggregated for the NFR category 1 B - Fugitive Emissions from Fuels. Base year refers to 2000 for particulate matter and to 1990 for the remaining pollutants.

The uncertainty rates are based on the EMEP/EEA emission inventory guidebook (2009), on uncertainty estimates from companies and on estimates and assumptions by DCE. The applied uncertainty levels for activity data and emission factors are given in Table 3.4.20.

Table 3.4.20 Uncertainty levels for activity data and emission factors.

Pollutant	Activity Data Uncertainty level, %	Emission Factor Uncertainty level, %
SO_2	10	25
NO_x	8	15
NMVOC	15	40
CO	8	125
TSP	2	50
PM_{10}	2	50
$PM_{2.5}$	2	50
As	8	225
Cd	8	225
Cr	8	225
Cu	8	125
Hg	8	75
Ni	8	125
Pb	8	225
Se	8	200
Zn	8	200
Benzo(b)	8	200
Benzo(k)	8	200
Benzo(a)	8	200
Indeno	8	200

Results

The uncertainty model estimates uncertainties for both the emission level and the trend. The uncertainty on the emission level for SO_2, NO_x, NMVOC and CO is 27 %, 17 %, 43 % and 125 %, respectively.

For PM the uncertainty is 50 % and for most heavy metals and PAHs the uncertainty is around 200 %. The individual uncertainty estimates for the fugitive emission inventory are shown in Table 3.4.21.

Table 3.4.21 Estimated emission uncertainty and trend uncertainty for fugitive emissions. The trend refers to the years 1990-2011 for all pollutants except PM where the trend refers to 2000-2011.

Pollutant	Emission uncertainty %	Trend uncertainty %
SO_2	27	5
NO_x	17	7
NMVOC	43	17
CO	125	13
TSP	50	3
PM_{10}	50	3
$PM_{2.5}$	50	2
As	225	8
Cd	225	8
Cr	225	8
Cu	125	8
Hg	75	8
Ni	125	8
Pb	225	8
Se	200	8
Zn	200	8
Benzo(b)	200	8
Benzo(k)	200	8
Benzo(a)	200	8
Indeno	200	8

3.4.7 Source specific QA/QC and verification

A list of QA/QC tasks are performed directly in relation to the fugitive emission part of the Danish emission inventories. The following procedures are carried out to ensure the data quality:

- The emission from the large point sources (refineries, gas treatment and gas storage plants) is compared with the emission reported the previous year.
- Annual environmental reports are kept for subsequent control of plant-specific emission data.
- Checks of data transfer are incorporated in the fugitive emission models, e.g. sum checks.
- Verification of activity data from external data when data are available through more data sources (offshore fuel and flaring rates).
- Data sources are incorporated in the fugitive emission models
- A manual log table in the emission databases is applied to collect information about recalculations.

- Comparison with the inventory of the previous year. Any major changes are verified.
- Total emission, when aggregated to reporting tables, is compared with totals based on SNAP source categories (control of data transfer).
- Checking of time series in the NFR and SNAP source categories. Significant dips and jumps are controlled and explained.

The QC work will continue in future years.

Data deliveries

Table 3.4.22 lists the external data deliveries used for the inventory of fugitive emissions. Further the table holds information on the contacts at the data delivery companies.

Table 3.4.22 List of external data sources.

Category	Data description	Activity data, emission factors or emissions	Reference	Contact(s)	Data agreement/ Comment
Offshore activities	Gas and oil production. Dataset for production of oil, gas and number of platforms. Amounts of off-shore loading of ships	Activity data	The Danish Energy Agency	Jan H. Andersen	Not necessary due to obligation by law
Offshore flaring	Flaring offshore in oil and gas extraction (ETS data)	Activity data	The Danish Energy Agency	Dorte Maimann	Data agreement
Service stations	Data on gasoline sales from the Danish energy statistics.	Activity data	The Danish Energy Agency	Jane Rusberg	Data agreement
Gas transmission	Natural gas from the transmission company, sales and losses (meter differences)	Activity data	Energinet.dk	Christian Friberg B. Nielsen	Not necessary due to obligation by law
Onshore activities	Amounts of oil transport in pipeline and onshore loading to ships. Emissions from storage of raw oil in the terminal.	Activity data and emission data	DONG Olierør A/S	Stine B. Bergmann	No formal data agreement.
Gas distribution	Natural gas from the distribution company, sales and losses (meter differences)	Activity data	Naturgas Fyn, DONG Energy, HNG and MN	Gert Nielsen, Ida Pernille Schou	No formal data agreement.
Air emissions from refinery	Fuel consumption and emission data.	Activity data and emission data	Statoil A/S, A/S Danish Shell	Anette Holst, Lis Rønnow Rasmussen	No formal data agreement.
Storage and treatment of gas	Environmental reports from plants defined as large point sources (Lille Torup, Stenlille, Nybro)	Activity data	Various plants		Not necessary due to obligation by law
Emission factors	Emission factors origin from a large number of sources	Emission factors	See chapter regarding emission factors		

3.4.8 Source specific recalculations

The following recalculations regarding fugitive emissions from fuels have been applied for the time series:

Exploration

An error in the annual reports from the crude oil terminal has been corrected, resulting in a decrease of the NMVOC emission in 2010 of 221 Mg corresponding to 2.4 % of the total fugitive NMVOC in 2010.

Onshore loading

The implied emission factor is updated for 2010 due to the emission reduction initiatives at the crude oil terminal and harbor terminal, resulting in a decrease of the NMVOC emission in of 396 Mg corresponding to 4.3 % of the total fugitive NMVOC in 2010.

Refineries

A reallocation of SO_2 emissions from one of the two Danish refineries has been implemented for the years 2005-2010. The reallocation has been carried out in close cooperation with the contact person at the relevant refinery. The changes have led to an increase of the SO_2 emission in the NFR category "1 B 2 a iv Refining / storage" of 32 to 182 Mg (min: 2006, max: 2007) corresponding to 3.1 % and 12 % of the total fugitive SO_2 emission in 2006 and 2007, respectively.

Natural gas distribution

Natural gas distribution has been recalculated for 2009 and 2010 according to the annual reports from two of the Danish distribution companies. The recalculation has increased the fugitive NMVOC emission by 31 Mg and 1 Mg corresponding to 0.3 % and 0.01 % of the total fugitive NMVOC in 2009 and 2010 respectively.

Venting

A minor change has been applied as the 2010 annual report from a natural gas storage facility has become available. The increase of the NMVOC emission is 4 Mg corresponding to 0.04 %.

3.4.9 Source specific planned improvements

The following future improvements are suggested.

<u>Emissions from storage of fuels in tank facilities</u>: The recent edition of the Danish emission inventory holds emissions from extraction of fuels, combustion of fuels and from service stations. To make the inventory complete emissions from storage of fuels in tank facilities should be included in the future if data is available. Work is going on to locate greater tank facilities in Denmark and collect the available data. In cases where no emission estimates or measurements are available a set of emission factors have to be set up.

3.4.10 References

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4 Industrial processes (NFR sector 2)

4.1 Overview of the sector

The sector *"Industrial processes"* (NFR sector 2) comprises partly combustion processes combined with *"process emissions"* (combustion in manufacturing industry - processes with contact) as well as process emissions without any contact with energy-related emissions. This means that the energy source may be power from central power plants or process heat from e.g. natural gas-fired boilers, turbines or stationary engines. The chapter is outlined as follows:

- Mineral products (NFR 2A)
- Chemical industry (NFR 2B)
- Metal production (NFR 2C)
- Other production i.e. food and drink (NFR 2D)
- Other production, consumption, storage, transportation or handling of bulk products (NFR 2G)

The industrial processes included in the Danish inventory are those in large companies, e.g. cement factories, as well as a number of smaller companies e.g. iron foundries.

Table 4.1 presents an overview of sources and groups of pollutants included in the present reporting as well as pollutants and sources that will be included in the future reporting. Explanations to the abbreviations are given below the table. Table 4.1 indicates that some groups of pollutants are planned to be included in the inventory. In addition to the indicated groups of pollutants some groups do not include all relevant pollutants or the time series are not complete. Detailed information on this subject can be found in the following table.

Table 4.1 Survey of industrial sector with SNAP-code and NFR-code included in the Danish inventory.

Industrial sector	SNAP	NFR	$SO_X/NO_X/NH_3$	NMVOC/ CO	TSP/ $PM_{10/2.5}$	HM	POP
Cement	030311	2A1	IE	IE	x	x	+
Lime (incl. iron, steel and paper pulp industry)	030312	2A2	IE	IE	x	+	-
Limestone and dolomite use	040618	2A3	IE	IE	x	IE	-
Roof covering with asphalt materials	040610	2A5	-	x	-	-	+/?
Road paving with asphalt	040611	2A6	-	x	-	-	+/?
Quarrying and mining of minerals other than coal		2A7a	-	-	+	-	-
Construction and demolition		2A7b	-	-	+	-	-
Storage, handling and transport of mineral products		2A7c	-	-	+	-	-
Asphalt concrete plants	030313	2A7d	+	+	+	-	+/?
Container glass	030315	2A7d	x	x	x	x	-
Glass / Glass wool	030316	2A7d	x/+	-	x	+	-
Mineral wool	030318	2A7d	x/+	x	x	+	-
Production of bricks	040691	2A7d	x	-	+/?	-	-
Production of expanded clay products	040692	2A7d	x	-	+/?	-	-
Nitric acid	040402	2B2	x	-	x	-	-
Chemical ingredients	040500	2B5a	-	x	-	-	-
NPK-fertiliser	040407	2B5a	x	IE	x	IE	-
Other (catalysts)	040416	2B5a	x	-	x	-/?	-
Pesticide production	040525	2B5a	+	x	+	-	+/?
Sulphuric acid	040401	2B5a	x	-	-	-	-
Electric arc furnace	040207	2C1	-	-	x	x	+/?
Grey iron foundries	030303	2C1	+	+	x	x	-
Rolling mils	040208	2C1	-	-	x	x	+/?
Secondary aluminium production	030310	2C3	-	-	x	x	-
Allied metal manufacturing	040306	2C5	-	-	x	x	-
Secondary lead production	030307	2C5b	-	-	x	x	-
Secondary zinc production	030308	2C5d	-	-	x	x	-
Storage, handling and transport of metal products		2C5f	-	-	x	-	-
Paper mill industry	030321	2D1	-	+	x	-	-
Beer	040607	2D2	-	x	-	-	-
Biscuits, cakes and other bakery products	040605	2D2	-	x	-	-	-
Bread (rye and wheat)	040605	2D2	-	x	-	-	-
Coffee roasting	040699	2D2	-	x	-	-	-
Ethanol, technical	040608	2D2	-	x	-	-	-
Margarine and solid cooking fats	040698	2D2	-	x	-	-	-
Meat curing, fish and shellfish	040627	2D2	-	x	-	-	-
Meat curing, meat	040627	2D2	-	x	-	-	-
Meat curing, poultry	040627	2D2	-	x	-	-	-
Spirits, other	040608	2D2	-	x	-	-	-
Sugar production	040625	2D2	-	x	-	-	-
Other (slaughterhouse waste)	040617	2G	x/+	-	+/?	-	+/?

x Included in the present inventory.

\+ Will be included.

\- Not included/not relevant.

IE Included elsewhere.

y Included in the present inventory.

4.2 Mineral products (2A)

4.2.1 Source category description

The sub-sector *Mineral products* (NFR 2A) cover the following processes:

- 2A1 Production of cement (SNAP 030311/040612).
- 2A2 Production of lime (quicklime) (SNAP 030312/040614).
- 2A5 Roof covering with asphalt (SNAP 040610).
- 2A6 Road paving with asphalt (SNAP 040611).
- 2A7d Production of container glass/glass wool (SNAP 030315/ 030316/ 040613).
- 2A7d Production of stone wool (SNAP 030318 / 040618).
- 2A7d Production of bricks (SNAP 040691)
- 2A7d Production of expanded clay products (SNAP 040692)

The time series for emission of acidifying substances, heavy metals, NMVOC and particulate matter from *Mineral products* (NFR 2A) are presented in Table 4.2.

The emission of CO is decreasing in the period 1990-2011. In the same period of time, the activity is nearly constant. Emissions of both substances are related to combustion/process conditions and will be investigated further. Emissions of the heavy metals lead, selenium and zinc are related to the raw materials used. Recycled glass constitutes a considerable part of raw materials and, therefore, the quality/purity of the glass is a determining factor. Emission of lead shows a decreasing trend that is in accordance with the attempts to avoid lead in glass as well as in wine bottle seals.

Production of glass wool is expected to result in emission of approximately the same pollutants as production of container glass. Emission of NH_3 from production of glass wool and mineral wool shows a decreasing trend from 1990-2011 as can be verified by the decreasing emission per amount produced.

Table 4.2 Time series for pollutants from *Mineral products 2A* (process emissions; PCDD/F: grammes, metals and PAHs: kg and other pollutants: tonnes).

Pollutants	1980	1985	1990	1995	2000	2005
SO_2	+	+	1 407	1 531	1 516	1 494
NMVOC	+	567	567	568	567	573
NH_3	+	489	489	489	497	335
CO	+	10 993	10 993	10 996	11 506	8 791
TSP					212	226
PM_{10}					179	194
$PM_{2.5}$					131	143
As			19.7	20.6	3.98	3.13
Cd			24.6	22.7	1.70	1.33
Cr			394	349	12.7	9.98
Cu			98.4	100	16.5	12.9
Hg			8.20	14.5	7.63	5.98
Ni			312	278	12.3	9.60
Pb			1 164	882	456	247
Se			328	226	342	108
Zn			164	272	246	173
PCDD/F			0.014	0.010	0.025	0.071
Benzo(a)pyrene			+	0.022	0.022	0.017
Benzo(b)fluoranthene			+	0.87	0.88	0.69
Benzo(k)fluoranthene			+	0.87	0.88	0.69
Indeno(1,2,3-cd)pyrene			+	0.65	0.66	0.52
Continued	2006	2007	2008	2009	2010	2011
SO_2	1 882	2 019	1 361	731	764	823
NMVOC	572	589	581	551	591	612
NH_3	337	353	374	309	311	295
CO	8 456	9 675	8 697	6 815	239	307
TSP	235	203	192	134	123	140
PM_{10}	201	172	163	117	103	116
$PM_{2.5}$	148	125	119	87.0	74.6	85.4
As	3.46	4.00	3.63	15.4	2.90	2.80
Cd	1.49	1.74	1.57	1.18	1.25	1.20
Cr	11.2	13.0	11.8	8.85	9.37	9.02
Cu	14.5	16.9	15.3	11.5	12.1	11.7
Hg	6.67	7.74	7.02	5.27	5.59	5.39
Ni	10.8	12.5	11.4	8.52	9.02	8.68
Pb	123	145	135	106	117	115
Se	60.5	54.7	47.6	27.9	21.3	21.5
Zn	191	218	200	147	149	138
PCDD/F	0.074	0.074	0.070	0.053	0.053	0.053
Benzo(a)pyrene	0.019	0.022	0.020	0.015	0.015	0.015
Benzo(b)fluoranthene	0.77	0.90	0.81	0.59	0.60	0.60
Benzo(k)fluoranthene	0.77	0.90	0.81	0.59	0.60	0.60
Indeno(1,2,3-cd)pyrene	0.58	0.67	0.61	0.44	0.45	0.45

+ To be included.

4.2.2 Methodological issues

2A1 Production of cement

The emissions TSP from the production of cement are measured yearly from 2000 to 2011 (Aalborg Portland, 2012). PM_{10} and $PM_{2.5}$ are estimated from the distribution between TSP, PM_{10} and $PM_{2.5}$ (1/0.9/0.4) from CEPMEIP (2003). The implied EF for TSP varies between 0.02 and 0.12 kg/tonne TCE.

For the years 1990-1996, the emission has been estimated from the production of cement, expressed as TCE (total cement equivalents[1]) and emission factors from the company Aalborg Portland (Aalborg Portland, 2012). The activity has increased from 1.6 million tonne TCE in 1990 to 2.9 million tonne TCE in 2007 and thereafter decreased to 1.8 million tonne TCE in 2011 due to the financial crisis; see Table 4.3.

Table 4.3 Production of cement (tonne) (Aalborg Portland, 2012).

	1980	1985	1990	1995	2000	2005
TCE	+	+	1 619 976	2 273 775	2 612 721	2 706 371
Continued	2006	2007	2008	2009	2010	2011
TCE	2 842 282	2 946 294	2 551 346	1 663 126	1 454 043	1 766 561

+ To be included.

The emissions of heavy metals are measured in 1997 (Illerup et al., 1999) – see Table 4.4 – and estimated for the other years from emission factors (based on the measurements) and TCE.

Table 4.4 EF for heavy metals (Illerup et al., 1999).

As	g/tonne	0.02
Cd	g/tonne	0.007
Cr	g/tonne	0.01
Cu	g/tonne	0.01
Hg	g/tonne	0.06
Ni	g/tonne	0.02
Pb	g/tonne	0.01

2A2Production of lime

The activity data regarding production of lime is obtained from Statistics Denmark (2012) – See Table 4.5 – and the EF from CEPMEIP (2003) – see Table 4.6.

Table 4.5 Production of lime (tonne) (Statistics Denmark, 2012).

	1980	1985	1990	1995	2000	2005
Burnt lime			127 978	100 789	92 002	71 239
Hydralic lime			27 686	15 804	8 159	13 839
Total			155 664	116 593	100 161	85 078
Continued	2006	2007	2008	2009	2010	2011
Burnt lime	78 652	75 504	74 981	46 202	50 397	59 430
Hydralic lime	13 731	14 028	12 326	12 842	11 173	13 264
Total	92 383	89 532	87 307	59 044	61 570	72 694

Table 4.6 EF for TSP from production of lime (CEPMEIP, 2003).

TSP	g/tonne	300
PM_{10}	g/tonne	150
$PM_{2.5}$	g/tonne	30

[1] TCE (total cement equivalent) express the total amount of cement produced for sale and the theoretical amount of cement from the produced amount of clinker for sale.

2A5 and 2A6 Roof covering and road paving with asphalt

The emissions from asphalt roofing and road paving have been estimated from production statistics compiled by Statistics Denmark – see Table 4.7 – and default emission factors presented by IPCC (2007)/EMEP/EEA (2009). The applied emission factors are presented in Table 4.8.

Table 4.7 Consumption of asphalt products (tonne) (Statistics Denmark, 2012).

	1980	1985	1990	1995	2000	2005
Cut back asphalt	+	7 700	7 700	7 700	7 700	7 700
Asphalt for road covering	+	3 200 000	3 200 000	3 250 000	2 950 000	3 649 200
Asphalt roofing material	+	75 468	75 468	81 829	128 028	95 794
Continued	2006	2007	2008	2009	2010	2011
Cut back asphalt	7 700	7 700	7 700	7 700	7 700	7 700
Asphalt for road covering	3 664 690	4 640 756	4 135 232	2 500 645	3 005 146	3 883 436
Asphalt roofing material	93 899	98 814	100 509	62 127	65 753	85 942

+ To be included.

Table 4.8 Emission factors for application of asphalt products.

		Road paving with asphalt	Use of cutback asphalt	Asphalt roofing
CH_4	g per tonne	5	0	0
CO	g per tonne	75	0	10
NMVOC	g per tonne	15	64 935	80
Carbon content fraction of NMVOC	%	0.667	0.667	0.8

2A7d Other mineral products

The emission of TSP, lead, selenium, and zinc from production of container glass is measured yearly from 1997 to 2011 (TSP from 2000 to 2011) (Ardagh Glass Holmegaard, 2012). PM_{10} and $PM_{2.5}$ are estimated from the distribution between TSP, PM_{10} and $PM_{2.5}$ (1/0.9/0.8) from CEPMEIP (2003). For 1990 to 1996, emissions of arsenic, cadmium, chromium, copper, mercury and nickel are estimated from standard emission factors and activity data; see Table 4.9. Emission factors for lead, selenium, and zinc from 1990 to 1996 are estimated by interpolation from the 1990 and 1997 figures (Illerup et al., 1999); see Table 4.10.

The emission of NH_3 and TSP from the production of glass wool has been measured yearly from 1996 to 2011 (TSP from 2000 to 2011) (Saint-Gobain Isover, 2012). PM_{10} and $PM_{2.5}$ are estimated from the distribution between TSP, PM_{10} and $PM_{2.5}$ (1/0.9/0.7) from CEPMEIP (2003). The activity has varied between 33 600 and 41 318 tonnes glass wool from 1996 to 2008 and, with a significant decrease in 2011 to 29 817 tonnes due to the financial crises. During the same period, the emission decreased from approximately 300 to 108 tonne NH_3.

For production of bricks and expanded clay products the EFs for SO_2 are determined from the individual companies reporting of SO_2 emission (environmental report) for the years 2008-2010 (2009-2010 for expanded clay products) and actual activity for the corresponding years. These years were selected as the most complete data were available for these years. However, the EF will continuously be improved as a more comprehensive dataset are made available.

The SO_2 emissions has been adjusted fuel related emissions as far as possible. However, this issue will be studied further as not all the environmental reports distinguish clearly between the different emission sources.

Table 4.9 Production of other mineral products (tonne) (Statistics Denmark, 2012; Ardagh Glass Holmegaard, 2012; Saint-Gobain Isover, 2012).

	1980	1985	1990	1995	2000	2005
Glass[1]	+	+	164 000	140 000	150 000	150 000
Glass wool[2]	+	+	33 630	33 630	39 666	37 295
Stone wool[3]			ni	ni	ni	ni
Yellow bricks	+	+	291 348	362 711	414 791	407 940
Expanded clay products	+	+	331 760	340 881	316 174	310 901
Continued	2006	2007	2008	2009	2010	2011
Glass	150 000	150 000	150 000	100 000	110 000	110 000
Glass wool	42 735	40 995	41 318	33 066	24 899	29 817
Stone wool	ni	ni	ni	ni	ni	ni
Yellow bricks	465 504	348 928	322 137	226 363	212 051	222 144
Expanded clay products	411 869	504 925	303 948	140 915	157 378	172 263

+ To be included.

ni No information.

1. Production estimated from environmental reports.
2. Production in 1990 and 1995 are estimated.
3. Production confidential.

Table 4.10 Implied emission factors for *Other mineral products 2A7d.*

Process	Substance	g/tonne	EMEP/EEA (2009) g/tonne
Glass	Pb	0.1-7.1	2.9
	Se	0.3-2.3	1.5
	Zn	0.2-1.0	-
Glass wool	NH_3	2 700-7 900	1 400
Bricks	SO_2	1 300	-
Expanded clay products	SO_2	3 100	-

4.2.3 Uncertainties and time series consistency

The time series are presented in Table 4.2. The methodologies applied for the different sources within *Mineral products* are considered to be consistent either as measurements or emission factors based on the measurements. However, not all the sources are considered to be complete regarding pollutants and these are expected to be completed in the next inventory, either by use of company-specific information or by application of general emission factors.

The time series for emissions from production of cement are based on measurements combined with emissions factors based on the measurements.

4.2.4 Source specific QA/QC and verification

The emission factors have been verified and the order of magnitude confirmed by comparison with standard emission factors (EMEP/EEA, 2009; CEPMEIP, 2003). Detailed discussion of QA/QC can be found in Nielsen et al. (2012).

4.2.5 Source specific recalculations

The emissions from consumption of asphalt products and production of other mineral products have been extended to include 1985-1990.

4.2.6 Source specific planned improvements

The inventory is planned to include the sectors 2A7a-c if the necessary resources are available. The time series for production of yellow bricks and expanded clay products will be extended to include 1980-1989.

The EF for consumption of asphalt products will be reviewed and updated if found necessary.

Sector specific/process specific uncertainty assessment will be implemented.

4.3 Chemical industry (NFR 2B)

4.3.1 Source category description

The sub-sector *Chemical industry* (NFR 2B) covers the following processes:

- Production of sulphuric acid (SNAP 040401)
- Production of nitric acid/fertiliser (SNAP 040402/040407)
- Production of catalysts/fertilisers (SNAP 040416/040407)
- Production of chemical ingredients (SNAP 040500)
- Production of pesticides (SNAP 040525)

The time series for emission of acidifying substances, NMVOC and particulate matter from *Chemical industry* (NFR 2B) are presented in Table 4.11.

Table 4.11 Time series for pollutants from *Chemical industry 2B* (tonnes).

Pollutant	1980	1985	1990	1995	2000	2005
SO_2	414	414	636	406	421	402
NO_x	+	666	842	648	447	30.2
NH_3	+	23.5	25.0	75.0	27.0	79.0
NMVOC	+	390	490	157	69.0	39.7
TSP					381	23.0
PM_{10}					305	18.0
$PM_{2.5}$					228	14.0
Continued	2006	2007	2008	2009	2010	2011
SO_2	258	36.0	13.0	20.0	10.8	26.6
NO_x	37.0	18.0	19.0	18.0	21.0	26.0
NH_3	88.0	107	111	165	123	20.3
NMVOC	40.3	41.0	38.9	30.0	26.9	26.9
TSP	12.0	25.0	26.0	16.0	26.0	6.80
PM_{10}	10.0	20.0	21.0	13.0	21.0	5.40
$PM_{2.5}$	7.00	15.0	16.0	10.0	16.0	4.10

Sulphuric acid production ceased in 1997.

Nitric acid production ceased in 2004.

+ To be included.

The time series for SO_2 follows the amount of sulphuric acid produced, i.e. the fluctuation follows the activity until the activity ceased in 1997. The same is the case for NO_X from production of nitric acid; see Figure 4.1.The production of sulphuric acid and nitric acid/fertiliser ceased in 1996/7 and in the middle of 2004, respectively.

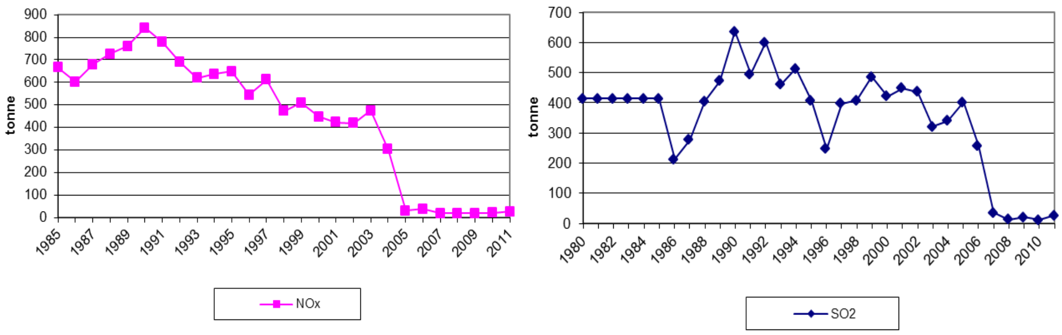

Figure 4.1 Emission of NO_x and SO_2 from Chemical industry (2B).

The emission of NO_X from production of catalysts/fertilisers decreases from 1996 to 2011, whereas the emission of NH_3 increases. Fluctuations in production, product composition and the increase in the emission factor can explain the increase in NH_3 emission.

The emission of NMVOC from production of pesticides is reduced significantly from 1990 to 2011 (Cheminova, 2012). The decrease can be explained by introduction of flue gas cleaning equipment rather than any decrease in activity. The emission of SO_2 is from the sulphur regeneration plant (Claus plant).

The time series will be explained further in the following section.

4.3.2 Methodological issues

The emission of SO_2, NO_X, NH_3 and TSP from production of sulphuric acid, nitric acid and fertiliser is measured yearly or estimated, from 1990 to 2004 (TSP from 2000 to 2004) (Kemira GrowHow, 2005). PM_{10} and $PM_{2.5}$ are estimated from the distribution between TSP, PM_{10} and $PM_{2.5}$ (1/0.8/0.6) from CEPMEIP (2003). The emission for SO_2 and NO_X for 1991 to 1993 was estimated by using interpolated emission factors and activity data. Production of sulphuric acid was stopped in 1997 and production of nitric acid was stopped in 2004. The emission factor for SO_2 fluctuated and the emission factor for NO_X decreased from 1990 to 2004. Production of sulphuric acid decreased from approximately 150 000 to 60 000 tonnes from 1990 to 1996, and production of nitric acid decreased from approximately 450 000 to 229 000 tonnes from 1990 to 2004. Overall, production of fertiliser decreased from approximately 800 000 to approximately 395 000 tonnes from 1990 to 2004.

The emission of NH_3, NO_X and TSP from production of catalysts and fertilisers is measured yearly from 1996 to 2011 (TSP from 2000 to 2011) (Haldor Topsøe, 2012). The emissions from 1990-1995 were extrapolated. PM_{10} and $PM_{2.5}$ are estimated from the distribution between TSP, PM_{10} and $PM_{2.5}$ (1/0.8/0.6) from CEPMEIP (2003). The process-related NO_X emission has been estimated as 80 % of the total NO_X emission; Haldor Topsøe reports this assumption in their environmental report. The emission of NH_3 shows an increasing trend and varies between 13 and 20 tonne from 1990 to 2011 with maximum at 165 tonne in 2009. In the same period, the production of catalysts and fertilisers increased from approximately 33 000 to 45 000 tonnes; see Table 4.12.

The emission of NMVOC from production of pesticides is measured yearly from 1990 to 2000 (Cheminova, 2012) and estimated for 2001 to 2011. An emission factor based on 2000 data – see Table 4.13 – is used for estimation of 2001 to 2011 emissions.

The emission of NMVOC from production of chemical ingredients has been measured from 1996 to 2011 (Danisco Grindsted, 2012). The emission has decreased from 100 to 12 tonnes NMVOC in this period. However, no explanation can be given on these conditions, as information on activity is not available.

The applied emission factors for the different processes in chemical industry are presented in Table 4.13.

Table 4.12 Production in chemical industry (tonne) (Statistics Denmark, 2012; Haldor Topsøe, 2012, Cheminova, 2012).

	1980	1985	1990	1995	2000	2005
Sulphuric acid	+	188 000	148 000	102 000	0	0
Nitric acid	+	350 000	450 000	390 000	433 000	0
Pesticides	+	55 800	55 800	55 800	60 284	53 504
Catalysts		ni	ni	ni	17 197	23 185
Potassium nitrate		ni	ni	ni	19 193	23 271
Catalysts+KNO_3[1]	+	32 296	32 296	32 296	36 390	46 456
Chemical ingredients[2]	ni	ni	ni	ni	ni	ni
Continued	2006	2007	2008	2009	2010	2011
Sulphuric acid	0	0	0	0	0	0
Nitric acid	0	0	0	0	0	0
Pesticides	52 575	49 796	49 747	37 484	30 977	31 000
Catalysts	20 314	20 712	28 125	22 504	ni	ni
Potassium nitrate	24 876	27 006	31 356	22 059	ni	ni
Catalysts+KNO_3[1]	45 190	47 718	59 481	44 563	44 000	44 000
Chemical ingredients[2]	ni	ni	ni	ni	ni	ni

+ To be included.

ni No information.

1. 1985-1995 and 2010-11: Production assumed.
2. Production confidential.

Table 4.13 Implied emission factors for *Chemical Industry 2B*.

Process	Substance	kg/tonne	EMEP/EEA (2009) kg/tonne
Sulphuric acid	SO_2	2.2-2.7	3.0-17
Nitric acid	NO_x	1.0-1.8	0.4-12
Pesticides, Claus process[1]	SO_2	7.0	-
	NMVOC	0.5-2.0	-
Catalysts, potassium nitrate	NO_x	0.6-1.5	-
	NH_3	0.4-1.7	-
Chemical ingredients[2]	NMVOC	no information	-

1. Average 1997-2005.
2. No activity data available.

4.3.3 Uncertainties and time series consistency

The time series are either based on specific measurements or by using company-specific emission factors and activity data. Therefore, the time series are considered to be consistent.

4.3.4 Source specific QA/QC and verification

The emission factors for production of nitric acid and sulphuric acid have been verified by comparison with standard emission factors (EMEP/EEA, 2009). Detailed discussion of QA/QC can be found in Nielsen et al. (2012).

4.3.5 Source specific recalculations

Time series have been extended to 1985.

4.3.6 Source specific planned improvements

Time series for SO_2, NO_x, NH_3 and NMVOC will be completed to 1980. Potential production of formaldehyde and unsaturated polyester will be investigated.

Sector specific/process specific uncertainty assessment will be implemented.

4.4 Metal production (NFR 2C)

4.4.1 Source category description

The sub-sector *Metal production* (NFR 2C) covers the following processes:

- Electric furnace steel plant (SNAP 040207)
- Rolling mills (SNAP 040208)
- Iron foundries (SNAP 030303)
- Secondary lead production (SNAP 030307)
- Secondary zinc production (SNAP 030308)
- Secondary aluminium production (SNAP 030310)
- Allied metal manufacturing (SNAP 040306)

The time series for emission of heavy metals and particulate matter from *Metal production* (NFR 2C) are presented in Table 4.14.

The emission inventory for metal production is based on measured emissions from steelworks and secondary aluminium manufacturing as well as average emission factors for iron foundries, secondary lead and zinc manufacturing, and allied metal manufacturing. Regarding the steelworks that use iron and steel scrap as raw material, the emissions to a large degree depend on the quality of the scrap. This fact may result in large annual variations for one or more of the heavy metals. This may also be the case for iron foundries, as they also use scrap as raw material, but they have not been subject to the same requirements to analyse emissions of heavy metals to air.

Table 4.14 Time series for pollutants from *Metal production 2C* (process emissions; PCDD/F: grammes, metals: kg and other pollutants: tonnes).

Pollutant	1980	1985	1990	1995	2000	2005
TSP					268	208
PM_{10}					128	82.4
$PM_{2.5}$					47.8	22.2
As			30.9	27.1	28.9	26.2
Cd			57.1	62.2	38.1	19.3
Cr			120	107	106	96.0
Cu			40.1	44.6	46.4	46.4
Hg			136	158	90.0	74.0
Ni			406	435	185	194
Pb			1 482	1 509	1 211	1 044
Se			515	451	482	436
Zn			6 406	7 303	2 506	2 200
PCDD/F			13.7	9.24	2.26	0.21
Continued	2006	2007	2008	2009	2010	2011
TSP	195	191	194	72.5	73.2	73.2
PM_{10}	81.6	82.6	78.3	24.2	25.1	25.2
$PM_{2.5}$	23.5	24.8	21.7	5.37	6.01	6.04
As	23.6	22.2	24.1	10.3	10.2	10.2
Cd	18.3	18.0	18.7	10.6	11.6	11.6
Cr	86.4	81.5	88.4	37.6	37.4	37.4
Cu	46.4	46.4	46.4	46.4	46.4	46.4
Hg	10.8	12.1	11.2	4.90	8.84	9.04
Ni	143	142	147	62.8	77.3	78.0
Pb	683	656	698	341	355	355
Se	393	371	402	171	170	170
Zn	1 204	1 201	1 219	885	948	951
PCDD/F	0.032	0.036	0.027	0	0	0

[1)] The electro steelwork was closed 2002-2004 and from 2006.

The steelwork was closed in the beginning of 2002 and re-opened at the end of 2004. The electro steelwork has been closed again from 2006; whereas manufacturing of steel sheets at the rolling mill has continued separated from the electro steelwork. Melting of secondary aluminium was stopped in the end of 2008.

4.4.2 Methodological issues

The emission of heavy metals and TSP from the production of steel bars and sheets from steel scrap are based on measurements from the company Stålvalseværket (Stålvalseværket, 2002). PM_{10} and $PM_{2.5}$ are estimated from the distribution between TSP, PM_{10} and $PM_{2.5}$ (1/0.95/0.6) from CEPMEIP (2003). The distribution of metals for 1995/96 (Illerup et al., 1999) is used in estimation of the different metals for the following years. The activity has varied between approximately 600 000 and 800 000 tonnes from 1990 to 2001. The production ceased in the beginning of 2002 and restarted at the end of 2004 with regard to melting of steel scrap in the electric arc furnace. The production of steel bars at the steelwork is assumed to be 1/3 of the production in 2001; the steelwork has been closed from end of 2005/beginning of 2006.

The emission of heavy metals from iron foundries is based on standard emission factors and yearly production statistics from The Association of

Danish Foundries. The emission of TSP and distribution between TSP, PM_{10} and $PM_{2.5}$ (1/0.3/0.045) is obtained from CEPMEIP (2003).

The emission of heavy metals from production of secondary lead and allied metal manufacturing is based on average emission factors for Danish producers (Illerup et al., 1999) and activity data from Statistics Denmark. The emission of TSP and distribution between TSP, PM_{10} and $PM_{2.5}$ (1/0.95/0.5) is obtained from CEPMEIP (2003).

4.4.3 Uncertainties and time series consistency

The time series are either based on specific measurements, company-specific emission factors combined with activity data or on standard emission factors combined with public statistics. The same methodology has been applied for the entire time series and, therefore, the time series are considered to be consistent.

4.4.4 Source specific recalculations

No source specific recalculations have been performed for the sector *Metal production*.

4.4.5 Source specific QA/QC and verification

Detailed discussion of QA/QC can be found in Nielsen et al. (2012).

4.4.6 Source specific planned improvements

The time series will be completed and new emission factors for the latest years will be established, if possible. Especially for secondary aluminium and zinc production, potential emissions of heavy metals will be investigated.

Potential emissions from galvanisation and electroplating will be investigated.

The chapter on metal products will be extended in the next IIR. Sector specific/process specific uncertainty assessment will be implemented.

4.5 Other production (NFR 2D)

4.5.1 Source category description

The sub-sector *Other production* (NFR 2D) covers the following process:

- Bread (SNAP 040605).
- Beer (SNAP 040607).
- Spirits (SNAP 040608).
- Sugar production (SNAP 040625).
- Meat (fish etc. frying/curing) (SNAP 040627).
- Margarine and solid cooking fats (SNAP 040698).
- Coffee roasting (SNAP 040699).

Table 4.15, 4.16 and 4.17 presents the emission of NMVOC from production of food, beverage and sugar. The emissions are presented for relevant sub-sectors.

Table 4.15 Emission of NMVOC from production of beer and spirits (tonne NMVOC).

	1980	1985	1990	1995	2000	2005
Beer	+	326	326	347	261	304
Spirits	+	32.1	32.1	31.3	23.6	22.1
Ethanol, technical	+	51.9	51.9	77.4	72.2	83.1
Sum		410	410	455	357	409
Continued	2006	2007	2008	2009	2010	2011
Beer	286	268	227	211	222	231
Spirits	20.1	16.6	11.9	10.9	12.7	24.3
Ethanol, technical	81.3	62.7	76.8	63.6	55.3	59.4
Sum	387	347	315	286	290	314

+ To be included.

Table 4.16 Emission of NMVOC from production of bread and cookies, meat curing (meat, poultry, fish, and shellfish), production of margarine and solid cooking fats, roasting of coffee (tonne NMVOC).

	1980	1985	1990	1995	2000	2005
Biscuits, cookies and other bakery products	+	100	98.6	148	138	157
Bread (rye and wheat)	+	855	853	1 038	1 098	1 158
Meat	+	414	443	528	559	603
Poultry	+	34.4	39.4	51.9	60.5	56.3
Fish and shellfish	+	495	493	708	578	405
Solid fats and oils	+	2 300	2 307	1 983	1 957	2 002
Coffee, not roasted, not decaffeinated, supply	+	27.5	28.6	26.9	30.6	20.1
Total emission		4 226	4 263	4 484	4 422	4 401
Continued	2006	2007	2008	2009	2010	2011
Biscuits, cookies and other bakery products	149	136	124	115	118	114
Bread (rye and wheat)	1 217	1 153	1 145	1 201	1 101	933
Meat	587	605	574	536	563	580
Poultry	51.3	51.7	52.9	50.6	56.0	56.1
Fish and shellfish	371	314	295	316	320	273
Solid fats and oils	1 817	1 914	1 911	1 752	1 802	1 915
Coffee, not roasted, not decaffeinated, supply	19.3	18.2	18.5	18.8	19.5	12.6
Total emission	4 211	4 192	4 120	3 990	3 980	3 884

+ To be included.

Table 4.17 Emission of NMVOC from production of sugar (tonne NMVOC).

	1980	1985	1990	1995	2000	2005
Sugar	+	+	101	88.8	88.6	101
Continued	2006	2007	2008	2009	2010	2011
Sugar	91.6	66.0	80.1	85.7	52.4	43.6

+ To be included.

The emission of NMVOC from production of food and beverage follows the activity as the same emission factors have been used for the entire period. The emission factors are presented in Table 4.9.

4.5.2 Methodological issues

The emission of NMVOC from production of food and beverage is estimated from production statistics (Statistics Denmark) and standard emission factors from the IPCC guidelines (IPCC (1997) Vol. 3, Table 2-24/2-25) combined with the EMEP/EEA Guidebook (EMEP/EEA, 2009); see Table 4.18. Regarding refining of sugar, the default EF has been revised based on company specific measurements. TOC has been measured in order to solve odour issues. The emission of TOC has been used as indicator for NMVOC assuming a conversion factor at: 0.6 kg C/kg NMVOC.

Table 4.18 Emission factors for NMVOC applied within production of food and beverage; activity is given as 1 000 l or tonne of product.

Beverage	kg NMVOC/1 000 l	Reference
Beer	0.35	EMEP/EEA (2009)
Spirits	4	EMEP/EEA (2009)
Ethanol, technical	4	EMEP/EEA (2009)
Food	kg NMVOC/tonne	
Meat, fish and poultry	0.3	EMEP/EEA (2009)
Sugar	0.2	Nielsen (2011)
Margarine and solid cooking fats	10	EMEP/EEA (2009)
Cakes, biscuits and breakfast cereals	1	EMEP/EEA (2009)
Bread	4.5	EMEP/EEA (2009)
Coffee roasting	0.55	EMEP/EEA (2009)

The activity data used for the emission estimates are presented in Table 4.19, 4.20 and 4.21.

Table 4.19 Production statistics for production of beer and spirits (tonne) (Statistics Denmark, 2012).

	1980	1985	1990	1995	2000	2005
Beer	+	930 405	930 405	990 321	745 492	868 041
Spirits	+	8 026	8 026	7 823	5 893	5 518
Ethanol, technical	+	12 977	12 977	19 338	18 059	20 780
Continued	2006	2007	2008	2009	2010	2011
Beer	816 890	765 789	647 402	603 797	633 535	658 995
Spirits	5 018	4 140	2 976	2 721	3 173	6 067
Ethanol, technical	20 336	15 663	19 195	15 896	13 827	14 846

+ To be included.

Table 4.20 Production statistics for production (or supply of) of bread and cookies, meat curing (meat, poultry, fish, and shellfish), production of margarine and solid cooking fats, roasting of coffee (tonne) (Statistics Denmark, 2012; Danish AgriFish Agency, 2012).

	1980	1985	1990	1995	2000	2005
Biscuits, cookies and other bakery products	+	100 000	98 574	148 247	138 488	157 214
Bread (rye and wheat)	+	190 000	189 562	230 762	244 060	257 444
Meat	+	1 381 400	1 477 700	1 758 800	1 864 000	2 009 400
Poultry	+	114 700	131 400	173 000	201 700	187 500
Fish and shellfish	+	1 650 000	1 643 648	2 360 076	1 926 516	1 348 424
Solid fats and oils	+	230 000	230 705	198 274	195 679	200 170
Coffee, not roasted, not decaffeinated, supply	+	50 000	52 086	48 870	55 617	36 555
Continued	2006	2007	2008	2009	2010	2011
Biscuits, cookies and other bakery products	148 683	136 397	124 170	115 496	117 500	114 486
Bread (rye and wheat)	270 493	256 265	254 373	266 886	244 753	207 316
Meat	1 958 200	2 016 100	1 912 800	1 785 300	1 877 000	1 934 400
Poultry	171 100	172 400	176 200	168 800	186 500	187 000
Fish and shellfish	1 235 158	1 046 152	984 407	1 054 914	1 066 548	911 624
Solid fats and oils	181 654	191 405	191 082	175 192	180 214	191 455
Coffee, not roasted, not decaffeinated, supply	34 549	33 121	33 643	33 933	34 190	22 847

+ To be included.

Table 4.21 Production of sugar (Statistics Denmark, 2012; Nordic Sugar, 2012).

	1980	1985	1990	1995	2000	2005
Sugar	+	+	505 709	444 143	443 189	506 471
Continued	2006	2007	2008	2009	2010	2011
Sugar	458 001	356 740	465 995	394 779	262 072	218 065

+ To be included.

4.5.3 Uncertainties and time series consistency

The time series is based on the same methodology throughout, using public statistics and standard emission factors. Therefore, the time series is considered to be consistent.

4.5.4 Source specific recalculations

The time series has been improved with 1985-1989 data spirits/ethanol, bread, meat etc., fats and coffee.

4.5.5 Source specific QA/QC and verification

No source specific QA/QC and verification has been performed for the sector *Other production*.

4.5.6 Source specific planned improvements

The time series has been improved with 1985-1989 data spirits/ethanol, bread, meat etc., fats and coffee and the time series will be prolonged to 1980 if possible. Investigation of potential country specific emission factors for production of bread is still on going. The relevance of the following sources will be investigated:

- Wood processing
- Wine
- Smokehouses
- Yeast production
- Other processes

Sector specific/process specific uncertainty assessment will be implemented.

4.6 Other production, consumption, storage, transportation or handling of bulk products (NFR 2G)

4.6.1 Source category description

The sub-sector *Other production, consumption, storage, transportation or handling of bulk products* (NFR 2G) covers the following process:

- Other (SNAP 040617; Slaughterhouse waste).

Table 4.22 presents the emission of NH_3 from treatment of slaughterhouse waste.

Table 4.22 Emission of NH_3 from treatment of slaughterhouse waste (tonne).

Year	1980	1985	1990	1995	2000	2005
NH_3	+	+	24.2	31.5	34.0	132
Continued	2006	2007	2008	2009	2010	2011
NH_3	96.4	112	112	92.5	89.0	86.2

+ To be included.

4.6.2 Methodological issues

The emission of NH_3 from treatment of slaughterhouse waste has been calculated from an average emission factor based on measurements from Danish plants (daka, 2012). Measurements of NH_3 during the years 2002/3 from three locations (Lunderskov, Løsning and Randers) with different product mix have been included in the determination of an EF:

EF_{NH3} = 0.475 kg NH_3/tonne product

Activity data are obtained from production statistics (Statistics Denmark, 2012); see Table 4.23.

Table 4.23 Products from treatment of slaughterhouse waste (tonne) (Statistics Denmark, 2012).

Year	1980	1985	1990	1995	2000	2005
Meat/bone meal[1]	+	+	128 789	197 034	198 568	177 388
Animal fat[1]	+	+	62 178	54 178	73 436	90 234
Blood meal[2]	+	+	11 000	11 000	11 400	10 230
Total			201 967	262 212	283 404	277 852
Continued	2006	2007	2008	2009	2010	2011
Meat/bone meal[1]	118 049	142 577	140 502	116 412	104 622	96 251
Animal fat[1]	75 598	82 648	84 700	70 889	75 285	77 740
Blood meal[2]	8 905	10 621	10 045	7 482	7 482	7 482
Total	202 552	235 846	235 247	194 783	187 389	181 473

+ To be included.

1. Statistics Denmark (2012).
2. daka (2012). 1990-97 and 2010-11: Produced amount of blood meal is estimated.

4.6.3 Uncertainties and time series consistency

The time series is based on the same methodology throughout, using public statistics and standard emission factors. Therefore, the time series is considered to be consistent.

4.6.4 Source specific recalculations

No source specific recalculation has been performed for the sector *Other production, consumption, storage, transportation or handling of bulk products*.

4.6.5 Source specific QA/QC and verification

No source specific QA/QC and verification has been performed for the sector *Other production, consumption, storage, transportation or handling of bulk products*.

4.6.6 Source specific planned improvements

Time series will be completed to 1980.

Sector specific/process specific uncertainty assessment will be implemented.

4.7 Uncertainty estimates

Uncertainty estimates for industrial processes (SNAP 04) are presented in Table 4.24. The uncertainty estimates are based on standard uncertainty factors (EMEP/EEA, 2009).

Table 4.24 Uncertainty estimates for industrial processes (%).

	Activity data uncertainty	Emission factor uncertainty	Overall 2011	Trend
SO_2	2	20	20.100	1.067
NO_x	2	50	50.040	0.087
NMVOC	50	50	70.711	64.879
CO	50	100	50.040	3.432
NH_3	2	1000	1000.002	6.118
TSP	50	100	50.040	0.062
Cadmium	2	1000	1000.002	0.448
Copper	2	1000	1000.002	3.291
Lead	2	1000	1000.002	0.394
Zinc	2	1000	1000.002	0.375

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5 Solvents and Other Product Use (NFR sector 3)

5.1 Introduction

This section presents the Danish methodology used for calculating emissions from use of solvents and other products in industry and households that are related to the source categories Paint application (NFR sector 3A), Degreasing and dry cleaning (NFR sector 3B), Chemical products, manufacture and processing (NFR sector 3C) and Other (NFR sector 3D). Covered pollutants are; NMVOCs, SO2, NOx, CO, NH3, particles, As, Cd, Cr, Cu, Hg, Ni, Pb, Se, Zn, dioxins/furans and PAHs.

Solvents are chemical compounds that are used on a global scale in industrial processes and as constituents in final products to dissolve e.g. paint, cosmetics, adhesives, ink, rubber, plastic, pesticides, aerosols or are used for cleaning purposes, i.e. degreasing. NMVOCs are main components in solvents - and solvent use in industries and households is typically the dominant source of anthropogenic NMVOC emissions (UNFCCC, 2008; Pärt, 2005; Karjalainen, 2005). In industrial processes where solvents are produced or used, NMVOC emissions to air and as liquid can be recaptured and either used or destroyed. Solvent containing products are used indoor and outdoor and the majority of solvent sooner or later evaporate. A small fraction of the solvent ends up in waste or as emissions to water and may finally also contribute to air pollution by evaporation from these compartments. Emission inventories for solvents are based on model estimates, as direct and continuous emissions are only measured from a limited number of sources. In addition to NMVOCs there are a number of other organic compounds and heavy metals, as listed above, that are emitted from use of fireworks, tobacco and charcoal for barbeques. These are included in the source category Other (NFR 3D).

In this section the methodology for the Danish emission inventory for Solvent and Other Product Use is presented and the results for the period 1985 – 2011 are summarised. The method is mainly based on the detailed approach and methodology described in EMEP/EEA (2009) and IPCC (1997 & 2000), and emissions are calculated for industrial sectors, households for the stated NFR sectors, as well as for individual pollutants.

5.2 Methodology

Until 2002 the Danish solvent emission inventory was based on questionnaires, which were sent to selected industries and sectors requiring information on solvent use. In 2003 it was decided to implement a method that is more complete, accurate and transparent with respect to including the total amount of used solvent, attributing emissions to industrial sectors and households and establishing a reliable model that is readily updated on a yearly basis.

Emission modelling of solvents can basically be done in two ways: 1) By estimating the amount of (pure) solvents consumed, or 2) By estimating the amount of solvent containing products consumed, taking account of their solvent content (EMEP/EEA, 2009).

In 1) all relevant solvents must be estimated, or at least those together representing more than 90 % of the total pollutant emission, and in 2) all relevant source categories must be inventoried or at least those together contributing more than 90 % of the total pollutant emission. A simple approach is to use a per capita emission for each category, whereas a detailed approach is to get all relevant consumption data (EMEP/EEA, 2009; IPCC, 1997 & 2000).

The detailed method 1) is used in the Danish emission inventory for solvent use, thus representing a chemicals approach, where each pollutant is estimated separately. The sum of emissions of all estimated pollutants used as solvents equals the pollutant emission from solvent use.

Method 2) is used for determining emissions from fireworks, tobacco and charcoal for barbeques included in 3D Other Use.

5.2.1 Pollutant list

NMVOC is the most abundant chemical group in relation to Solvent and Other Product Use. Additionally there is also some use and/or emissions of SO_2, NO_x, CO, NH_3, particles, As, Cd, Cr, Cu, Hg, Ni, Pb, Se, Zn, dioxins/furans and PAHs that are included in activities in sector 3D Other Product Use.

The definitions of solvents and VOC that are used in the Danish inventory (Nielsen et al., 2010) are as defined in the solvent directive (Directive 1999/13/EC) of the EU legislation: "Organic solvent shall mean any VOC which is used alone or in combination with other agents, and without undergoing a chemical change, to dissolve raw materials, products or waste materials, or is used as a cleaning agent to dissolve contaminants, or as a dissolver, or as a dispersion medium, or as a viscosity adjuster, or as a surface tension adjuster, or a plasticiser, or as a preservative". VOCs are defined as follows: "Volatile organic compound shall mean any organic compound having at 293.15 K a vapour pressure of 0.01 kPa or more, or having a corresponding volatility under the particular condition of use".

This implies that some NMVOCs, e.g. ethylene glycol, that have vapour pressures just around 0.01 kPa at 20 °C, may only be defined as VOCs at use conditions with higher temperature. However, use conditions under elevated temperature are typically found in industrial processes. Here the capture of solvent fumes is often efficient, thus resulting in small emissions (communication with industries).

The Danish list of NMVOCs comprises approx. 30 pollutants or pollutant groups representing more than 95 % of the total emission from solvent use, cf. Table 5.4.

5.2.2 Activity data

For each pollutant or product a mass balance is formulated:

$$\text{Consumption} = (\text{production} + \text{import}) - (\text{export} + \text{destruction/disposal} + \text{hold-up}) \quad \text{(Eq. 1)}$$

Data concerning production, import and export amounts of solvents and solvent containing products are collected from Statistics Denmark (StatBank DK, 2012), which contains detailed statistical information on the Danish society. Manufacturing and trading industries are committed to reporting production and trade figures to the Danish Customs & Tax Authorities in accordance with the Combined Nomenclature. Import and export figures are available on a monthly basis from 1990 to present and contain trade information from 272 countries world-wide. Production figures are reported quarterly as "industrial commodity statistics by commodity group and unit" from 1990 to present. Prior to 1990 the figures are assumed constant on a 1990 level.

Destruction and disposal of solvents lower the pollutant emissions. In principle this amount must be estimated for each pollutant in all industrial activities and for all uses of pollutant containing products. At present the solvent inventory only considers destruction and disposal for a limited number of pollutants. For some pollutants it is inherent in the emission factor, and for others the reduction is specifically calculated from information obtained from the industry or literature.

Hold-up is the difference in the amount in stock in the beginning and at the end of the year of the inventory. No information on solvents in stock has been obtained from industries. Furthermore, the inventory spans over several years so there will be an offset in the use and production, import and export balance over time.

In some industries the solvents are consumed in the process, e.g. in the graphics and plastic industry, whereas in the production of paints and lacquers the solvents are still present in the final product. These products can either be exported or used in the country. In order not to double count consumption amounts of pollutants it is important to keep track of total solvent use, solvents not used in products and use of solvent containing products. Furthermore some pollutants may be represented as individual pollutants and also in chemical groups, e.g. "o-xylene", "mixture of xylenes" and "xylene". Some pollutants are better inventoried as a group rather than individual pollutants, due to missing information on use or emission for the individual pollutants. The Danish inventory considers single pollutants, with a few exceptions.

Activity data for pollutants are thus primarily calculated from Equation 1 with input from Statistics Denmark (StatBank DK, 2012). When Statistics Denmark holds no information on production, import and export or when more reliable information is available from industries, scientific reports or expert judgements the data can be adjusted or even replaced.

5.2.3 Emission factors

For each pollutant the emission is calculated by multiplying the consumption with the fraction emitted (emission factor), according to:

Emission = consumption * emission factor

The present Danish method uses emission factors that represent specific industrial activities, such as processing of polystyrene, dry cleaning etc. or that represent use categories, such as paints and detergents. Some pollutants have been assigned emission factors according to their water solubility. Higher hydrophobicity yields higher emission factors, since a lower amount ends in waste water, e.g. ethanol (hydrophilic) and turpentine (hydrophobic).

Emission factors for solvents are categorised in four groups in ascending order: (1) Lowest emission factors in the chemical industry, e.g. lacquer and paint manufacturing, due to emission reducing abatement techniques and destruction of solvent containing waste, (2) Other processes in industry, e.g. graphic industry, have higher emission factors, (3) Non-industrial use, e.g. auto repair and construction, have even higher emission factors, (4) Diffuse use of solvent containing products, e.g. painting, where practically all the pollutant present in the products will be released during or after use.

For a given pollutant the consumed amount can thus be attributed with two or more emission factors; one emission factor representing the emissions occurring at a production or processing plant and one emission factor representing the emissions during use of a solvent containing product. If the chemical is used in more processes and/or is present in several products more emission factors are assigned to the respective chemical amounts.

Emission factors can be defined from surveys of specific industrial activities or as aggregated factors from industrial branches or sectors. Furthermore, emission factors may be characteristic for the use pattern of certain products. The emission factors used in the Danish inventory also rely on the work done in the joint Nordic project (Fauser et al., 2009).

5.2.4 Source allocation

The Danish Working Environment Authority (WEA) is administrating the registrations of chemicals and products to the Danish product register. All manufacturers and importers of products for occupational and commercial use are obliged to register. The following products are comprised in the registration agreement:

- Chemicals and materials that are classified as dangerous according to the regulations set up by the Danish Environmental Protection Agency (EPA).
- Chemicals and materials that are listed with a limit value on the WEA "limit value list".
- Materials, containing 1 % or more of a chemical, which is listed on the WEA "limit value list".
- Materials, containing 1 % or more of a chemical, which are classified as hazardous to humans or the environment according to the EPA rules on classification.

There are the following important exceptions for products, which does not need to be registered:

- Products exclusively for private use.
- Pharmaceuticals ready for use.
- Cosmetic products.

The Danish product register does therefore not comprise a complete account of used pollutants. Source allocations of exceptions from the duty of declaration are done based on information from trade organisations, industries, scientific reports and information from the internet.

Outputs from the inventory are

- a list where the most predominant pollutants are ranked according to emissions to air,
- specification of emissions from industrial sectors and from households,
- contribution from each pollutant to emissions from industrial sectors and households,
- yearly trend in emissions, expressed as total pollutant and single pollutant, and specified in industrial sectors and households.

5.3 Emissions, activity data and emission factors

5.3.1 NMVOC

Table 5.1 and Figure 5.1 show the emissions of NMVOC from 1985 to 2011, where the used amounts of single pollutants have been assigned to specific products and NFR sectors. From 1985 to 1990 the emission level is set constantly equal to the 1990 emission level, due to missing reliable data. A general increase is seen for all sectors from 1990 to 1996 followed by a decrease from 1997 to 2006 and stagnation in the period 2007 to 2011. Table 5.2 shows the used amounts of pollutants for the same period. Table 5.1 is derived from Table 5.2 by applying emission factors relevant to individual pollutants and production or use activities. Table 5.3 showing the used amount of products (activity data) is derived from Table 5.2, by assessing the amount of pollutants that is comprised within products belonging to each of the four source categories.

In Table 5.4 the emission for 2011 is split into individual pollutants. The most abundantly used solvents are ethanol, turpentine, or white spirit defined as a mixture of stoddard solvent and solvent naphtha and propylalcohol. Ethanol is used as solvent in the chemical industry and as windscreen washing agent. Turpentine is used as thinner for paints, lacquers and adhesives. Propylalcohol is used in cleaning agents in the manufacture of electrical equipment, flux agents for soldering, as solvent and thinner and as windscreen washing agent. Household emissions are dominated by propane and butane, which are used as aerosols in spray cans, primarily in cosmetics. For some pollutants the emission factors are precise but for others they are rough estimates. The division of emission factors into four categories implies that high emission factors are applicable for use of solvent containing products and lower emission factors are applicable for use in industrial processes.

Table 5.1 Emission of NMVOC in Gg per year.

	1985	1990	1995	2000	2001	2002	2003	2004	2005
Paint application (3A)	5.11	5.11	5.90	6.40	5.25	5.18	4.99	4.66	4.32
Degreasing and dry cleaning (3B)	7.1E-05	7.1E-05	7.7E-05	2.9E-05	1,3E-05	3.0E-05	2.9E-05	2,4E-05	1.8E-05
Chemical products, manufacturing and processing (3C)	8.14	8.14	9.32	6.96	6.28	6.58	4.96	6.06	6.25
Other (3D)	24.9	24.8	30.0	27.9	24.9	24.5	22.6	21.5	20.9
Total NMVOC	38.0	38.0	45.3	41.2	36.4	36.2	32.5	32.3	31.5

Continued

	2006	2007	2008	2009	2010	2011
Paint application (3A)	3.73	3.23	3.38	2.85	2.75	2.87
Degreasing and dry cleaning (3B)	1.5E-05	2.2E-05	1.5E-05	1.3E-05	1.2E-05	1.1E-05
Chemical products, manufacturing and processing (3C)	6.02	6.12	5.91	4.99	5.05	4.81
Other (3D)	20.9	18.1	18.5	19.8	19.5	19.3
Total NMVOC	30.7	27.5	27.8	27.6	27.3	27.0

Table 5.2 Used amounts of NMVOC in Gg per year.

	1985	1990	1995	2000	2001	2002	2003	2004	2005
Paint application (3A)	12.5	12.5	13.8	15.8	13.0	13.0	12.0	11.7	11.3
Degreasing and dry cleaning (3B)	0.705	0.705	0.767	0.293	0,125	0.298	0.289	0.240	0,183
Chemical products, manufacturing and processing (3C)	81.3	81.3	101	113	110	108	103	127	148
Other (3D)	39.4	39.4	49.5	46.1	41.2	43.6	37.1	36.5	40.9
Total NMVOC	134	134	165	175	165	165	152	175	200

Continued

	2006	2007	2008	2009	2010	2011
Paint application (3A)	9.70	8.59	8.72	7.31	6.88	6.58
Degreasing and dry cleaning (3B)	0.146	0.217	0.150	0.131	0.124	0.112
Chemical products, manufacturing and processing (3C)	150	163	15	137	128	128
Other (3D)	36.0	32.5	33.7	35.7	33.9	33.9
Total NMVOC	196	204	197	180	169	168

Table 5.3 Used amounts of products (activity data) in Gg per year.

	1985	1990	1995	2000	2001	2002	2003	2004	2005
Paint application (3A)	83.2	83.2	92.1	105	86.4	86.7	79.8	77.7	75.2
Degreasing and dry cleaning (3B)	1.41	1.41	1.53	0.586	0.251	0,597	0.578	0.481	0.366
Chemical products, manufacturing and processing (3C)	406	406	504	567	551	540	513	634	740
Other (3D)	197	197	247	230	206	218	185	182	204
Total NMVOC	688	688	845	903	844	846	779	894	1020

Continued

	2006	2007	2008	2009	2010	2011
Paint application (3A)	64.7	57.3	58.1	48.7	45.8	43.8
Degreasing and dry cleaning (3B)	0.292	0.433	0.299	0.263	0.247	0.224
Chemical products, manufacturing and processing (3C)	749	814	771	683	641	640
Other (3D)	180	162	169	179	170	169
Total products	994	1030	998	911	857	853

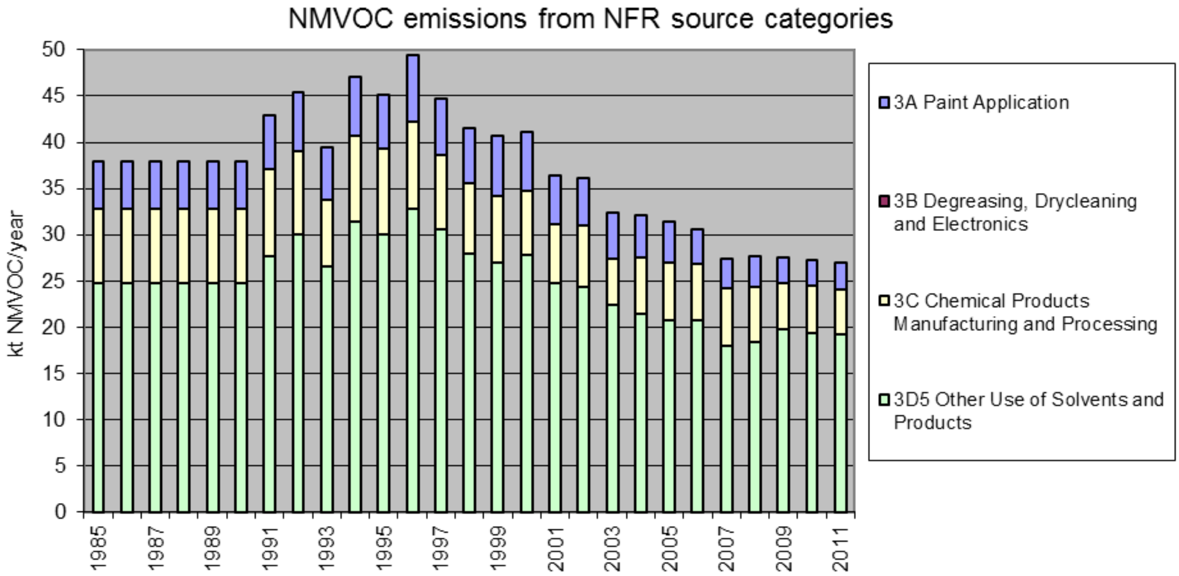

Figure 5.1 Emissions of NMVOC in Gg NMVOC per year. The methodological approach for finding emissions in the period 1985 – 2011 is described in the text. Figures can be seen in Table 5.1.

Table 5.4 NMVOCs with highest emissions 2011.

Pollutant	CAS no	Emissions 2011 (t)
ethanol	64-17-5	7,950
turpentine (white spirit: stoddard	64742-88-7	6,190
solvent and solvent naphtha)	8052-41-3	
propyl alcohol	67-63-0	2,850
cyanates	79-10-7	2,150
pentane	109-66-0	1,680
methanol	67-56-1	1,050
propylen glycol	57-55-6	922
acetone	67-64-1	783
propane	74-98-6	654
butane	106-97-8	654
butanone	78-93-3	513
xylene	1330-20-7	306
	95-47-6	
	108-38-3	
	106-42-3	
glycol ethers	110-80-5	236
	107-98-2	
	108-65-6	
	34590-94-8	
	112-34-5	
	and others	
phenol	108-95-2	163
ethylen glycol	107-21-1	143
toluene	108-88-3	135
formaldehyde	50-00-0	129
cyclohexanones	108-94-1	120
acyclic aldehydes	78-84-2	89.7
	111-30-8	
	and others	
butanoles	78-92-2	89.1
	2517-43-3	
	and others	

Continued

styrene	100-42-5	49.2
ethyl acetate	141-78-6	38.8
naphthalene	91-20-3	11.7
1-butanol	71-36-3	11.1
butyl acetate	123-86-4	10.4
tetrachloroethylene	127-18-4	1.84
acrylic acid	79-10-7	0.024
Total 2011		26,900

5.3.2 Other pollutants

This section covers emissions, activity data and emission factors for other pollutants than NMVOC from the use of fireworks, tobacco, candles and charcoal for barbeques. These are included in 3D Other Use. NMVOC emissions from the use of charcoal and tobacco are included in Table 5.1.

Regarding the national emissions from fireworks the emission factor for Pb was changed in 2000 and Hg and Pb, along with any compounds derived here from, were forbidden in 2003 and 2007, respectively. Emissions are therefore noted as not occurring for these years and forward. Full time series for emissions and activity data can be found in Annex 2E-3 – 2E-7.

Table 5.5 Emissions from use of fireworks.

	Unit	1985	1990	1995	2000	2001	2002	2003	2004	2005
SO_2	Mg	1.9	2.5	5.8	9.4	7.4	9.2	11.7	16.7	7.1
CO	Mg	6.9	8.8	20.7	33.5	26.4	32.7	41.8	59.6	25.4
TSP	Mg	39.7	50.7	118.9	192.5	151.9	187.9	240.0	342.7	146.1
PM_{10}	Mg	19.8	25.4	59.4	96.3	76.0	93.9	120.0	171.4	73.0
$PM_{2.5}$	Mg	13.9	17.8	41.6	67.4	53.2	65.8	84.0	119.9	51.1
As	kg	1.3	1.7	4.0	6.5	5.1	6.3	8.1	11.5	4.9
Cd	kg	0.7	0.9	2.0	3.2	2.6	3.2	4.0	5.8	2.5
Cr	kg	15.6	19.9	46.6	75.5	59.6	73.7	94.2	134.5	57.3
Cu	kg	444	568	1332	2157	1703	2106	2690	3840	1637
Hg	kg	0.1	0.1	0.2	0.3	0.2	0.3	NO	NO	NO
Ni	kg	30.0	38.4	89.9	145.6	114.9	142.1	181.6	259.3	110.5
Pb	kg	2200	2814	6595	3237	2554	3159	4035	5762	2456
Zn	kg	260	333	779	1262	996	1232	1574	2247	958

Continued

	Unit	2006	2007	2008	2009	2010	2011
SO_2	Mg	8.1	8.7	8.5	10.4	10.5	9.2
CO	Mg	29.0	30.9	30.1	37.1	37.4	32.7
TSP	Mg	166.9	177.4	173.2	213.4	214.9	187.7
PM_{10}	Mg	83.5	88.7	86.6	106.7	107.4	93.8
$PM_{2.5}$	Mg	58.4	62.1	60.6	74.7	75.2	65.7
As	kg	5.6	6.0	5.8	7.2	7.2	6.3
Cd	kg	2.8	3.0	2.9	3.6	3.6	3.2
Cr	kg	65.5	69.6	68.0	83.7	84.3	73.6
Cu	kg	1871	1988	1941	2392	2408	2103
Hg	kg	NO	NO	NO	NO	NO	NO
Ni	kg	126.3	134.2	131.1	161.5	162.6	142.0
Pb	kg	2807	NO	NO	NO	NO	NO
Zn	kg	1095	1163	1136	1399	1409	1230

Table 5.6 Emissions from use of cigarettes and other tobacco products.

	Unit	1985	1990	1995	2000	2001	2002	2003	2004	2005
SO_2	Mg	5.04	4.64	4.14	4.58	4.40	4.38	4.55	4.46	4.18
NO_X	Mg	22.50	20.74	18.52	20.47	19.66	19.57	20.34	19.94	18.69
CO	Mg	688.49	634.49	566.55	626.22	601.43	598.62	622.15	610.13	571.84
NH_3	Mg	51.83	47.76	42.65	47.14	45.28	45.06	46.84	45.93	43.05
TSP	Mg	170.86	157.46	140.60	155.41	149.25	148.55	154.39	151.41	141.91
PM_{10}	Mg	170.86	157.46	140.60	155.41	149.25	148.55	154.39	151.41	141.91
$PM_{2.5}$	Mg	170.86	157.46	140.60	155.41	149.25	148.55	154.39	151.41	141.91
As	kg	1.99	1.83	1.63	1.81	1.74	1.73	1.80	1.76	1.65
Cd	kg	0.20	0.18	0.16	0.18	0.17	0.17	0.18	0.18	0.17
Cr	kg	4.42	4.08	3.64	4.02	3.86	3.85	4.00	3.92	3.67
Cu	kg	1.90	1.75	1.56	1.73	1.66	1.65	1.72	1.68	1.58
Hg	kg	0.07	0.07	0.06	0.07	0.07	0.07	0.07	0.07	0.06
Ni	kg	0.40	0.37	0.33	0.36	0.35	0.35	0.36	0.35	0.33
Pb	kg	8.05	7.42	6.62	7.32	7.03	7.00	7.27	7.13	6.68
Se	kg	0.10	0.09	0.08	0.09	0.09	0.09	0.09	0.09	0.08
Zn	kg	20.12	18.54	16.55	18.30	17.57	17.49	18.18	17.83	16.71
PCDD/Fs	mg	1.25	1.15	1.03	1.14	1.09	1.09	1.13	1.11	1.04
Benzo[b]fluoranthene	kg	0.56	0.52	0.46	0.51	0.49	0.49	0.51	0.50	0.47
Benzo[k]fluoranthene	kg	0.56	0.52	0.46	0.51	0.49	0.49	0.51	0.50	0.47
Benzo[a]pyrene	kg	1.39	1.28	1.14	1.26	1.21	1.21	1.25	1.23	1.15
Indeno[1,2,3-cd]pyrene	kg	0.56	0.52	0.46	0.51	0.49	0.49	0.51	0.50	0.47

Continued

	Unit	2006	2007	2008	2009	2010	2011
SO_2	Mg	4.17	3.94	3.86	3.79	3.69	3.19
NO_X	Mg	18.63	17.62	17.27	16.93	16.48	14.27
CO	Mg	569.91	539.22	528.25	518.06	504.28	436.46
NH_3	Mg	42.90	40.59	39.77	39.00	37.96	32.86
TSP	Mg	141.43	133.81	131.09	128.56	125.14	108.31
PM_{10}	Mg	141.43	133.81	131.09	128.56	125.14	108.31
$PM_{2.5}$	Mg	141.43	133.81	131.09	128.56	125.14	108.31
As	kg	1.64	1.56	1.52	1.49	1.46	1.26
Cd	kg	0.17	0.16	0.15	0.15	0.15	0.13
Cr	kg	3.66	3.46	3.39	3.33	3.24	2.80
Cu	kg	1.57	1.49	1.46	1.43	1.39	1.20
Hg	kg	0.06	0.06	0.06	0.06	0.05	0.05
Ni	kg	0.33	0.31	0.31	0.30	0.29	0.25
Pb	kg	6.66	6.30	6.17	6.05	5.89	5.10
Se	kg	0.08	0.08	0.08	0.08	0.07	0.06
Zn	kg	16.65	15.76	15.44	15.14	14.73	12.75
PCDD/Fs	mg	1.03	0.98	0.96	0.94	0.92	0.79
Benzo[b]fluoranthene	kg	0.47	0.44	0.43	0.42	0.41	0.36
Benzo[k]fluoranthene	kg	0.47	0.44	0.43	0.42	0.41	0.36
Benzo[a]pyrene	kg	1.15	1.09	1.06	1.04	1.02	0.88
Indeno[1,2,3-cd]pyrene	kg	0.47	0.44	0.43	0.42	0.41	0.36

Table 5.7 Emissions from use of charcoal in barbeques.

	Unit	1985	1990	1995	2000	2001	2002	2003	2004	2005
SO_2	Mg	13.53	22.23	24.47	41.41	33.78	50.83	62.12	50.25	46.27
NO_X	Mg	13.09	21.52	23.69	40.07	32.69	49.19	60.11	48.63	44.77
CO	Mg	916.49	1506.2	1658.0	2805.1	2288.4	3443.4	4207.8	3404.3	3134.2
TSP	Mg	10.47	17.21	18.95	32.06	26.15	39.35	48.09	38.91	35.82
PM_{10}	Mg	10.47	17.21	18.95	32.06	26.15	39.35	48.09	38.91	35.82
$PM_{2.5}$	Mg	10.47	17.21	18.95	32.06	26.15	39.35	48.09	38.91	35.82
As	kg	0.41	0.68	0.75	1.27	1.04	1.56	1.90	1.54	1.42
Cd	kg	0.15	0.25	0.28	0.47	0.39	0.58	0.71	0.58	0.53
Cr	kg	61.10	100.41	110.53	187.01	152.56	229.56	280.52	226.95	208.95
Hg	kg	0.28	0.47	0.51	0.87	0.71	1.07	1.30	1.05	0.97
Ni	kg	0.57	0.93	1.03	1.74	1.42	2.13	2.60	2.11	1.94
Pb	kg	19.42	31.92	35.13	59.44	48.49	72.97	89.17	72.14	66.42
Se	kg	2.84	4.66	5.13	8.68	7.08	10.66	13.02	10.54	9.70
Zn	kg	60.66	99.70	109.74	185.67	151.47	227.92	278.52	225.33	207.45
PCDD/Fs	g	0.05	0.08	0.08	0.14	0.11	0.17	0.21	0.17	0.16

Continued

	Unit	2006	2007	2008	2009	2010	2011
SO_2	Mg	61.28	37.67	32.19	37.85	26.74	26.25
NO_X	Mg	59.30	36.45	31.15	36.63	25.87	25.41
CO	Mg	4151.0	2551.8	2180.5	2564.2	1811.2	1778.4
TSP	Mg	47.44	29.16	24.92	29.31	20.70	20.32
PM_{10}	Mg	47.44	29.16	24.92	29.31	20.70	20.32
$PM_{2.5}$	Mg	47.44	29.16	24.92	29.31	20.70	20.32
As	kg	1.88	1.15	0.99	1.16	0.82	0.80
Cd	kg	0.70	0.43	0.37	0.43	0.31	0.30
Cr	kg	276.73	170.12	145.37	170.95	120.74	118.56
Hg	kg	1.28	0.79	0.67	0.79	0.56	0.55
Ni	kg	2.57	1.58	1.35	1.59	1.12	1.10
Pb	kg	87.96	54.07	46.21	54.34	38.38	37.68
Se	kg	12.85	7.90	6.75	7.94	5.61	5.50
Zn	kg	274.76	168.90	144.33	169.73	119.88	117.71
PCDD/Fs	g	0.21	0.13	0.11	0.13	0.09	0.09

Table 5.8 Emissions from use of candles.

	Unit	1985	1990	1995	2000	2001	2002	2003	2004	2005
CO	Mg	88.32	74.44	90.94	169.27	163.38	243.32	244.41	254.96	344.33
TSP	Mg	11.84	9.98	12.19	22.68	21.89	32.61	32.75	34.16	46.14
PCDD/Fs	mg	0.24	0.20	0.25	0.46	0.44	0.66	0.66	0.69	0.93
Flouranthene	g	327.68	276.18	337.40	628.00	606.13	902.72	906.74	945.89	1277.48
Benzo[k]fluoranthene	g	40.98	34.54	42.20	78.54	75.81	112.90	113.40	118.30	159.77
Benzo[a]pyrene	g	32.77	27.62	33.74	62.80	60.61	90.27	90.67	94.59	127.75
Benzo[ghi]perylene	g	8.21	6.92	8.46	15.74	15.19	22.63	22.73	23.71	32.02
Indeno[1.2.3-cd]pyrene	g	8.21	6.92	8.46	15.74	15.19	22.63	22.73	23.71	32.02

Continued

		2006	2007	2008	2009	2010	2011
CO	Mg	292.41	321.12	268.48	297.91	375.78	299.51
TSP	Mg	39.18	43.03	35.98	39.92	50.35	40.13
PCDD/Fs	mg	0.79	0.87	0.72	0.80	1.01	0.81
Flouranthene	g	1084.83	1191.34	996.06	1105.25	1394.14	1111.17
Benzo[k]fluoranthene	g	135.68	149.00	124.58	138.23	174.36	138.97
Benzo[a]pyrene	g	108.48	119.13	99.61	110.53	139.41	111.12
Benzo[ghi]perylene	g	27.19	29.86	24.97	27.71	34.95	27.85
Indeno[1.2.3-cd]pyrene	g	27.19	29.86	24.97	27.71	34.95	27.85

Table 5.9 Activity data for the product use of fireworks, tobacco, charcoal for barbeques (BBQ) and use of candles.

	Unit	1985	1990	1995	2000	2001	2002	2003	2004	2005
Fireworks	Gg	1.0	1.3	3.0	4.9	3.8	4.7	6.1	8.6	3.7
Tobacco	Gg	12.5	11.5	10.3	11.4	10.9	10.9	11.3	11.1	10.4
BBQ	Gg	4.4	7.2	7.9	13.4	10.9	16.4	20.0	16.2	14.9
Candles	Gg	8.8	7.4	9.1	16.9	16.3	24.3	24.4	25.5	34.4

Continued

	Unit	2006	2007	2008	2009	2010	2011
Fireworks	Gg	4.2	4.5	4.4	5.4	5.4	4.7
Tobacco	Gg	10.3	9.8	9.6	9.4	9.2	7.9
BBQ	Gg	19.8	12.2	10.4	12.2	8.6	8.5
Candles	Gg	29.2	32.1	26.8	29.8	37.6	30.0

Emission factors for use of fireworks, tobacco, charcoal for barbeques (BBQ) and use of candles are found from literature studies and are shown in Table 5.10.

Table 5.10 Emission factors for other product use, per Gg.

Compound	Unit	Fireworks	Tobacco	BBQ	Candles
SO_2	Mg	1.935 (a)	0.40(e)	3.1 (k)	NAV
NO_X	Mg	NAV	1.80(f)	3.0 (l)	NAV
NMVOC	Mg	NAV	4.84 (g)	3.0 (l)	NAV
CO	Mg	6.9 (a)	55.10(f)	210 (l)	10.0 (n)
NH_3	Mg	NAV	4.15(f)	NAV	NAV
TSP	Mg	39.66 (b)	13.67(f)	2.4 (b)	1.34 (o)
PM_{10}	Mg	19.83 (b)	13.67(f)	2.4 (b)	NAV
$PM_{2.5}$	Mg	13.88 (b)	13.67(f)	2.4 (b)	NAV
As	kg	1.333 (c)	0.159 (h)	0.10 (k)	NAV
Cd	kg	0.667 (c)	0.016(e)	0.04 (k)	NAV
Cr	kg	15.56 (c)	0.354 (h)	14.00 (k)	NAV
Cu	kg	444.4 (c)	0.152 (h)	NAV	NAV
Hg	kg	0.064 (d)*	0.006(e)	0.065 (k)	NAV
Ni	kg	30 (d)	0.032(e)	0.13 (k)	NAV
Pb, 1980-1999	kg	2200 (d)	0.644(e)	4.45 (k)	NAV
Pb, 2000-2006	kg	666.7 (c)*			
Se	kg	NAV	0.008(e)	0.65 (k)	NAV
Zn	kg	260 (d)	1.61(e)	13.90 (k)	NAV
PCDD/Fs	mg	NAV	0.1(i)	10.50 (m)	0.04 (p)
Benzo[b]fluoranthene	kg	NAV	0.045 (j)	NAV	NAV
Benzo[k]fluoranthene	kg	NAV	0.045 (j)	NAV	0.005 (o)
Benzo[a]pyrene	kg	NAV	0.111 (j)	NAV	0.004 (o)
Indeno[1,2,3-cd]pyrene	kg	NAV	0.045 (j)	NAV	0.001 (o)

*Following the implementation of new legislation; the emission of Hg and Pb from fireworks are assumed not to be occurring from the years 2003 and 2007 respectively. (a) Netherlands National Water Board (2008), (b) Klimont, Z. et al. (2002), (c) Passant, N. et al. (2003), (d) Fyrverkeriers miljöpåverkan (1999), (e) EFs for wood (111A) in residential plants (1A4b i), SNAP 020200, the energy content used in the calculation is the average of wood pills and wood waste (16.1 GJ/Mg), (f) Martin et al. 1997, (g) Sandmo, T. 2011, (h) Finstad & Rypdal 2003, (i) Toolkit 2005, (j) Daher 2010, (k) Environment Australia (1999), (l) IPCC (1997 & 2000), (m) Hansen (2000), (n) Hamins et al. (2005), (o) Fine et al. (1999), (p) Lau et al. (1997)

5.4 Uncertainties and time series consistency

5.4.1 NMVOC

For NMVOCs an overall Tier 1 uncertainty of 23% is found for 2011. This represents a 95%-confidence interval limit relative to the calculated mean 2011 emission. The Tier 1 trend uncertainty for 1985 to 2011 is 11%.

Important uncertainty issues related to the mass-balance approach are

(i) Identification of pollutants that qualify as NMVOCs. Although a tentative list of 650 pollutants from NAEI (2000) has been used, it is possible that relevant pollutants are not included, e.g. pollutants that are not listed with their name in Statistics Denmark (StatBank DK, 2012) but as a product.

(ii) Collection of data for quantifying production, import and export of single pollutants and products where the pollutants are comprised. For some pollutants no data are available in StatBank DK (2012). This can be due to confidentiality or that the amount of pollutants must be derived from products wherein they are comprised. For other pollutants the amount is the sum of the single pollutants *and* product(s) where they are included. The data available in StatBank DK (2012) is obtained from Danish Customs & Tax Authorities and they have not been verified in this assessment.

(iii) Distribution of pollutants on products, activities, sectors and households. The present approach is based on amounts of single pollutants. To differentiate the amounts into industrial sectors it is necessary to identify and quantify the associated products and activities and assign these to the industrial sectors and households. No direct link is available between the amounts of pollutants and products or activities. From the Nordic SPIN database it is possible to make a relative quantification of products and activities used in industry, and combined with estimates and expert judgement these products and activities are differentiated into sectors. The contribution from households is also based on estimates. If the household contribution is set too low, the emission from industrial sectors will be too high and vice versa. This is due to the fact that the total amount of pollutant is constant. A change in distribution of pollutants between industrial sectors and households will, however, affect the total emissions, as different emission factors are applied in industry and households, respectively.

A number of activities are assigned as "other", i.e. activities that cannot be related to the comprised source categories. This assignment is based on expert judgement but it is possible that the assigned amount of pollutants may more correctly be included in other sectors. More detailed information from the industrial sectors is continuously being implemented.

(iv) Rough estimates and assumed emission factors are used for some pollutants. For some pollutants more reliable information has been obtained from the literature and from communication with industrial sectors. In some cases it is more appropriate to define emission factors for sector specific activities rather than for the individual pollutants.

A quantitative measure of the uncertainty has not been assessed. Single values have been used for emission factors and activity distribution ratios etc.

5.4.2 Other pollutants

The tier 1 uncertainties for other product use are shown in Table 5.11.

Table 5.11 Tier 1 uncertainties for other product use.

Pollutant	Total emission uncertainty, %	Trend 1990-2011, %	Uncertainty trend %-age points
SO_2	72.4	31.5	26.4
NO_x	64.8	-6.1	17.7
CO	71.3	14.5	16.2
NH_3	20.2	-31.2	19.5
TSP	160.6	-11.5	19.7
PM_{10}	129.9	-21.6	23.1
$PM_{2.5}$	106.8	-23.8	21.4
As	226.4	98.5	208.9
Cd	264.4	177.4	187.2
Cr	128.7	56.8	107.8
Cu	299.9	269.1	41.8
Hg	92.6	-3.1	55.2
Ni	396.3	261.3	52.8
Pb	88.6	-98.5	6.0
Se	99.4	17.1	16.4
Zn	361.8	201.9	205.9
PCDD/F	99.1	18.1	18.0
benzo[b]flouranthene	40.0	-31.2	19.5
benzo[k]flouranthene	282.0	-10.4	196.3
benzo[a]pyrene	117.1	-24.2	71.7
indeno[1,2,3-c,d]pyrene	86.1	-26.8	47.5

* Trend for particles is calculated for 2000-2011.

The main issues leading to uncertainties are:

(i) Collection of data for quantifying production, import and export of products. Some data, like private import (cross-border shopping) of fireworks, are not available in StatBank DK (2012). Other lacking data like the composition of mineral containing charcoal for barbequing are unobtainable due to confidentiality.

(ii) Reliable emission factors are not easy to obtain for other product use categories. Some chosen emission factors apply to countries that are not directly comparable to Denmark, and hereby is introduced an increased uncertainty. This is the case with e.g. some heavy metals from barbequing.

5.5 QA/QC and verification

Please refer to the Danish National Inventory Report reported to the UNFCCC (Nielsen et al., 2010).

5.6 Recalculations

Improvements and additions are continuously being implemented due to the comprehensiveness and complexity of the use and application of solvents and solvent containing products in industries and households. The main recalculations and their implications on the emissions in the 2013 reporting include the following:

- Recalculations increased the 2010 NMVOC emissions with approximately 500 t. The changes are caused by updated use category distribution keys (UCN) obtained from the Substances in Preparations In the Nordic countries (SPIN) database. Comprised chemicals are ethanol, turpentine, pro-

pyl alcohol, cyanates, xylene, butanoles and glycolethers in various use categories. Emission factors are identical to previous calculations, but since distributions of used amounts of chemicals in SNAP categories are adjusted the emissions are changed.
- There are changes in the used amount of ethanol in windscreen washing agents as a result of adjusted ethanol content in imported anti frost agents. This gives changes for all years back to 1985.
- The use of candles is included for the first time in this year's inventory.
- Cross-border shopping has been added to the activity data for tobacco smoking (2000-2011). Cross-border shopping accounts for between 4 % (2009) and 12 % (2002).

5.7 Planned improvements

Pollutants, e.g. PAH, PCB, dioxin and mercury, and product groups, e.g. cosmetics, may be implemented.

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6 Agriculture (NFR sector 4)

6.1 Overview of the sector

The emission from agricultural activities covers ammonia (NH_3) emission from animal husbandry, manure management and agricultural soils, particulate matter (PM) emission from animal production and emissions from field burning of straw of NH_3, PM, nitrogen oxides (NO_x), carbon monoxide (CO), non-methane volatile organic compounds (NMVOC), sulphur dioxide (SO_2), heavy metals (As, Cd, Cr, Cu, Hg, Ni, Pb, Se and Zn), dioxins and furanes (PCDD/F) and polycyclic aromatic hydrocarbons (PAH – benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene and indeno(1,2,3-cd)pyrene).

6.1.1 Ammonia

The majority of the Danish NH_3 emission, corresponding to 96 %, originates from the agricultural sector. The remaining 4 % originates from stationary combustion, traffic and industrial processes. Figure 6.1 shows the distribution of sources of NH_3 emission from the agricultural sector 2011. The main part of the agricultural emission is directly related to the livestock production by 84 % from manure management and 3% from grazing animals. Emissions from use of synthetic fertiliser and crops contribute with 5 % and 8 %, respectively. Emissions from NH_3-treated straw, field burning of agricultural wastes and sewage sludge used as fertiliser amount to less than 1 %.

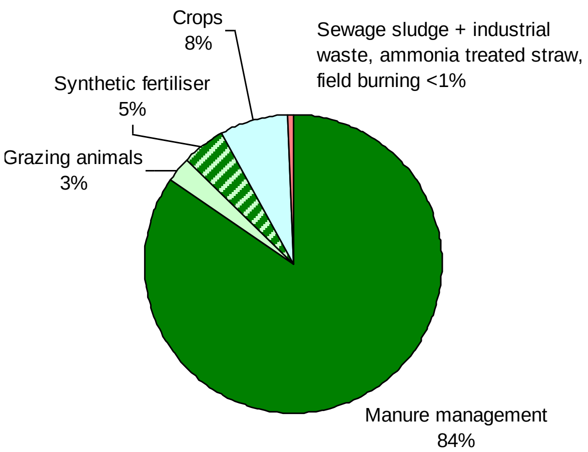

Figure 6.1 NH_3 emissions from the agricultural sector, 2011.

The NH_3 emission from the agricultural sector has decreased between 1985 and 2011 from 116.78 Gg NH_3 to 71.30 Gg NH_3, corresponding to a 39 % reduction (Table 6.1). This significant drop in NH_3 emissions should be read in a conjunction of a very active national environmental policy designed to reduce the loss of nitrogen to the aquatic environment. A string of measures have been introduced by action plans, for example the NPO (Nitrogen, phosphor, organic matter) Action Plan (1986), Action Plans for the Aquatic Environment (1987, 1998, 2004), the Action Plan for Sustainable Agriculture (1991), the Ammonia Action Plan (2001) and latest the action plan from 2009 the Agreement on Green Growth. Based on these action plans have legislative changes and actions led to an optimization of manure as a resource. Requirements to capacity of slurry storage and requirements to handling of manure during spreading has led to a decrease in animal nitrogen excretion, improvement in use of nitrogen in manure and a fall in the use of synthetic fertiliser, all of which have helped to reduce the overall NH_3 emission significantly.

Table 6.1 Total NH_3 emissions from the agricultural sector 1985 to 2011, Gg NH_3.

Year		1985	1990	1995	2000	2005	2008	2009	2010	2011
NFR						Gg NH_3				
4B	Manure management, total	93.09	87.68	76.45	72.46	68.05	62.68	60.38	60.72	59.74
	Cattle	*40.00*	*35.60*	*29.53*	*25.79*	*19.31*	*20.67*	*20.35*	*20.55*	*20.23*
	Swine	*43.88*	*41.25*	*36.45*	*35.28*	*35.15*	*28.91*	*26.93*	*26.72*	*26.49*
	Other animals	*9.21*	*10.84*	*10.46*	*11.39*	*13.58*	*13.10*	*13.10*	*13.45*	*13.02*
4D1	Synthetic N-fertiliser	6.46	6.59	5.55	3.85	3.12	3.65	3.67	3.47	3.94
4D2c	Grazing animals	3.13	2.92	3.03	2.92	2.21	1.99	1.91	1.87	1.81
4F	Field burning of agricultural Waste	1.53	0.08	0.09	0.11	0.13	0.10	0.12	0.09	0.09
4G	Crops	5.97	5.92	5.28	5.21	5.34	5.41	5.41	5.41	5.42
4G	NH_3 treated straw	6.54	10.19	6.63	2.47	0.26	0.00	0.00	0.24	0.24
4G	Sewage sludge used as fertiliser	0.05	0.07	0.11	0.08	0.05	0.05	0.07	0.06	0.06
4.	Agricultural sector - total	116.78	113.45	97.14	87.11	79.16	73.90	71.56	71.85	71.30

The management of manure has to be considered as the most important emission source. Most of the emission originates from the production of swine and cattle, which contributed, respectively with 44 % and 34 %.

It is noteworthy that the overall emission from swine has decreased by 40 % from 1985 to 2011 despite a considerable increase in swine production from 14.7 million produced fattening pigs in 1985 to 21.9 million in 2011. The most important reason for this is the improvement in feed efficiency. In 1985, the nitrogen excretion for a fattening pig was estimated to 5.09 kg N (Poulsen & Kristensen, 1998). In 2011, that figures were considerably lower at 2.82 kg N per fattening pig produced (Poulsen, 2012). Due to the large contribution from the swine production, the lower level of N-excretion has a significant influence on total agricultural emissions.

Since 1985, changes in practice of manure application to the fields have taken place, which has reduced the emission from all animal types. From the beginning of the 1990s slurry has increasingly been spread using trailing hoses. From the late 1990s the practice of slurry injection or mechanical incorporation into the soil has increased. This development is a consequence of a ban on broad spreading but it is also a consequence of the general requirement to improve the utilisation of nitrogen in the manure - e.g. requirements that a larger part of the nitrogen in manure has to be included in the farmer's nitrogen accounting. This has forced farmers to consider the manure as a fertiliser resource instead of a waste product.

Particulate matter

In the NFR, the emission of particulate matter (PM) is reported for the years 2000 to 2011. The emission from the agricultural sector includes the emission of dust from animal housing systems, which include emissions from cattle, pigs, poultry, horses, sheep and goats. Furthermore, the emission from field burning of agricultural wastes is calculated.

The Danish inventory does not yet include emission from plant production, which means activities related to field operations such as harvesting and cultivation of the soil.

TSP (total suspended particulate) emission from the agricultural sector contributes with 31 % to the national TSP emission in 2011 and the emission shares for PM_{10} and $PM_{2.5}$ are only 20 % and 6 % respectively. The majority of the emission originates from the animal production. The emission from field burning of agricultural residues, contributes with less than 1 % to the agricultural emission.

The same emission factor is used for all years. This means that changes in the PM emissions for each livestock category mainly reflects the changes in number of animals, but also reflects the changes due to the allocation of subcategories and changes in the housing type.

The PM emission from agricultural activities, given in TSP, is almost unaltered during the period from 2000 to 2011 (Figure 6.2). The emission of TSP is increased in 2010 compared to 2009 and this is mainly due to an increase in the number of swine. The emissions in 2011 are almost unaltered compared to 2010.

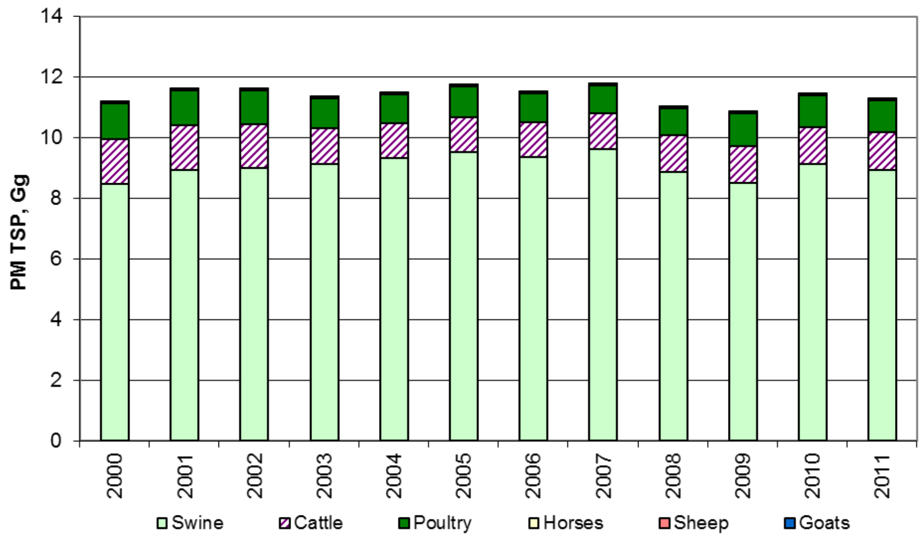

Figure 6.2 Emission of particulate matter (TSP) from the agricultural sector 2000 to 2011.

6.1.2 References – sources of information

Activity data, emissions factors (EF) and additional values are collected, evaluated and discussed in cooperation with Statistics Denmark, DCA - Danish Centre for Food and Agriculture, Aarhus University, the Danish Agricultural Advisory Service, Danish Environmental Protection Agency and the Danish AgriFish Agency. It means that both the data and the methods used are evaluated continuously according to latest knowledge and information. Table 6.2 shows the source of data input from the different institutes.

Table 6.2 List of institutes involved in the emission inventory.

References	Abbreviation	Data / information
Danish Centre for Environment and Energy, Aarhus University (http://www.dmu.dk/Luft/Emissioner)	DCE	-reporting -data collecting
Statistics Denmark - Agricultural Statistics (http://www.dst.dk/en.aspx)	DSt	-livestock production -milk yield -slaughtering data -land use -crop production -crop yield
Danish Centre for Food and Agriculture, Aarhus University	DCA	-N-excretion -feeding situation -NH_3 emissions factor -PM emissions factor
The Danish Agricultural Advisory Service (http://www.lr.dk)	DAAS	-housing type (until 2004) -grazing situation -manure application time and methods -field burning of agricultural residue
Danish Environmental Protection Agency (http://www.mst.dk)	EPA	-sewage sludge used as fertiliser (until 2004)
The Danish AgriFish Agency (http://naturerhverv.fvm.dk)	DAFA	-synthetic fertiliser -number of animals from CHR -housing type (from 2005) -sewage sludge used as fertiliser (from 2005)

Methods

The emission calculation is based on the methodologies provided in the EMEP/EEA air pollutant emission inventory guidebook (EMEP/EEA, 2009).

The emissions from agricultural activities include Animal Husbandry and Manure Management, Crop Production and Agricultural Soils, Field Burning of Agricultural Wastes and Agriculture Other. In general the field burning of agricultural wastes has been prohibited since 1989. However, burning of straw may take place in connection with fields continuously cultivating seed grass or in cases where weather conditions result in surplus of straw in form of wet or broken bales.

The emissions from the agricultural sector are calculated in a comprehensive agricultural model complex called IDA (Integrated Database model for Agricultural emissions). The model complex is designed in a relational database system (MS Access). Input data are stored in tables in one database called IDA_Backend and the calculations are carried out as queries in another linked database called IDA. The model, as shown in Figure 6.3, is implemented and it is used to calculate emissions of NH_3, PM, NO_x, CO, NMVOC, SO_2, heavy metals, dioxin, PAH and greenhouse gases (N_2O and CH_4). Thus, there is direct link between the NH_3 emission and the emission estimation of N_2O.

DCE – the Danish Centre for Environment and Energy, Aarhus University, which is responsible for the emission inventory, has established data agreements with the institutes and organisations to assure that the necessary data are available for timely completion of the emission inventory. The main part of the emission is related to livestock production and most of the data are based on Danish standards. DCA, Danish Centre for Food and Agriculture, Aarhus University delivers Danish standards relating to feeding consumption, manure type in different housing types, nitrogen content in manure, etc. Previously, the standards were updated and published every third or fourth year – the last one is Poulsen et al. from 2001. From year 2001, DCE receives updated data annually directly from DCA in the form of spread sheets. These standards have been described and published in English in Poulsen & Kristensen (1998). From 2004 the standards are uploaded every year at http://anis.au.dk/forskning/sektioner/husdyrernaering-og-miljoe/normtal/.

IDA - Integrated Database model for Agricultural emissions

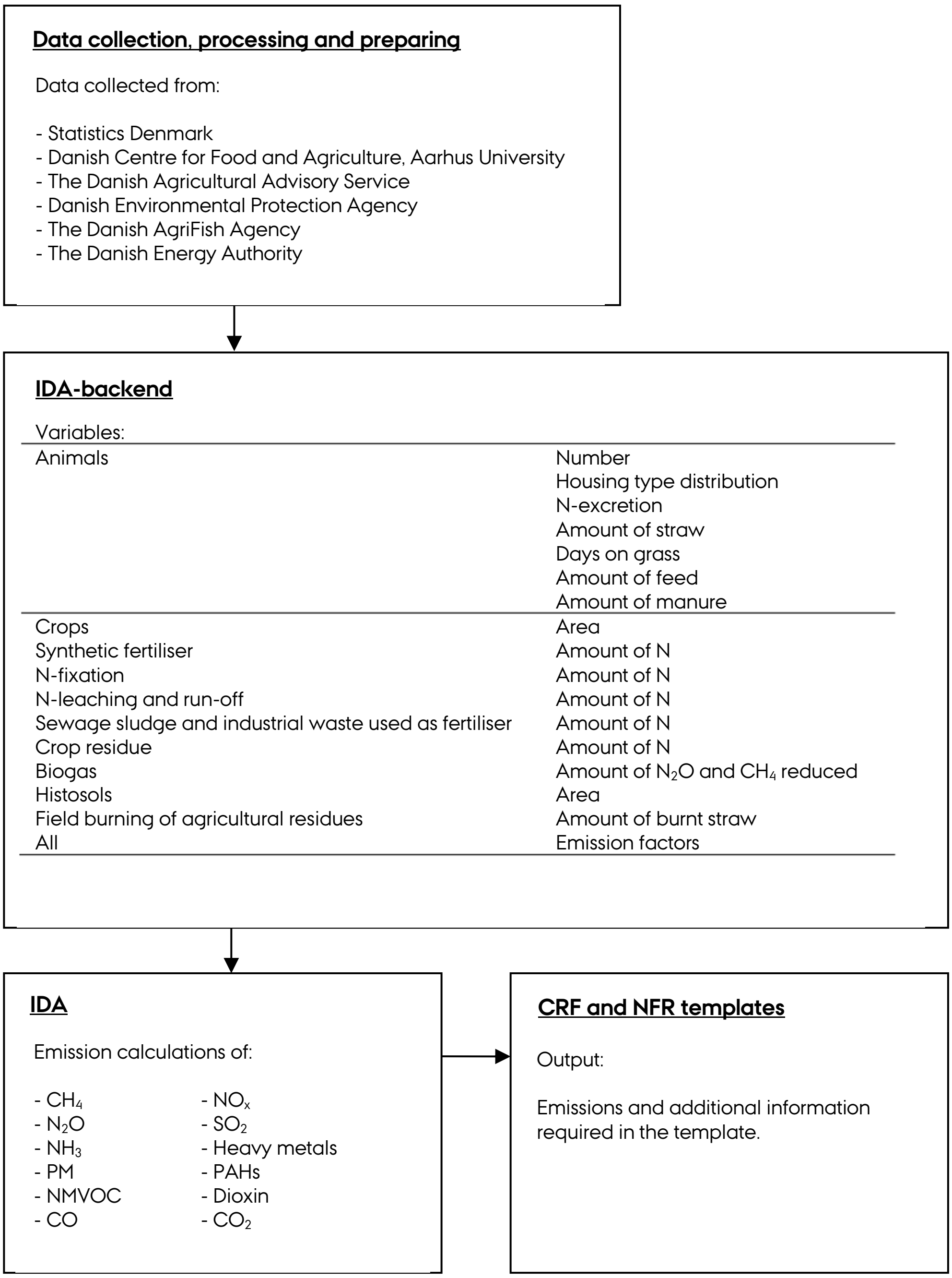

Figure 6.3 Overview of the data process for calculation of agricultural emissions.

IDA includes 38 different livestock categories, divided on weight class and age. Each of these subcategories is subdivided according to housing system and manure type, which results in 247 different combinations of subcategories and housing type (Table 6.3). The emissions are calculated from each of these subcategories and then aggregated in accordance with the livestock categories given in the NFR. It is important to point out that changes in the emission and the implied emission factor over the years are not only a result of changes in the number of animals, but also depend on changes in the allocation of subcategories, changes in feed consumption, changes in housing type and changed practices with regard to the handling of livestock manure in relation to storage and application.

Table 6.3 Livestock categories and subcategories.

NFR 4B	Animal categories	Includes	No. of subcategories in IDA, animal type/housing system/manure type
4B 1a	Dairy Cattle[1]	Dairy Cattle	34
4B 1b	Non-dairy Cattle[1]	Calves (<½ year), heifers, bulls, suckling cattle	120
4B 3	Sheep	including lambs	1
4B 4	Goats	Including kids (meet, dairy and mohair)	3
4B 6	Horses	<300 kg, 300 - 499 kg, 500 - 700 kg, >700 kg	4
4B 8	Swine	Sows, weaners, fattening pigs	36
4B 9	Poultry	Hens, pullet, broilers, turkey, geese, ducks, ostrich, pheasant	41
4B 13	Other	Fur farming, deer	8

1) For all cattle categories, large breed and jersey cattle are distinguished from each other.

6.2 NH_3 emission from Manure Management – NFR 4.B

6.2.1 Description

The main part of the NH_3 emission (84%) is related to manure management. Figure 6.4 shows the emission from manure management (NFR category 4.B) distributed according to the different livestock categories in 2011. The main part of the emission is related to cattle and pig production, corresponding to 78 %. The fall in the emission from pigs and cattle during 1985 to 2011 is mainly due to an active environmental policy in combination with improvements within the genetic development. The emission has increased slightly from poultry and “other”, which is mainly due to an increase in number of produced animals.

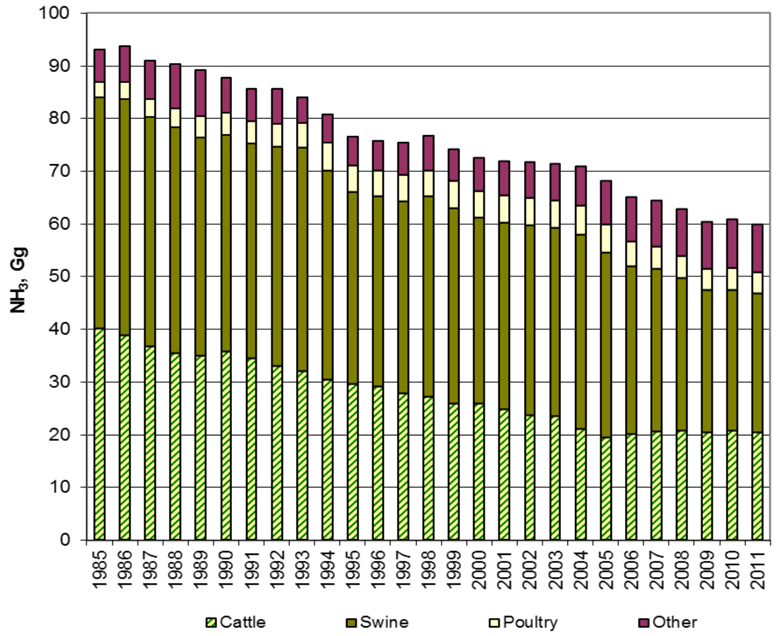

Figure 6.4 NH_3 emission from manure management 1985 to 2011.

6.2.2 Methodological issues

Activity data – livestock production

Table 6.4 shows the development in livestock production from 1985 to 2011 based on the Agricultural Statistics (Statistics Denmark). The number of animal corresponds to average annual production (AAP), which means the number of animal that are present on average within the year (EMEP/EEA, 2009). For many animal categories the number given in the annual Agricultural Statistics can be used directly. However, for weaners, fattening pigs, bulls and poultry the number is based on slaughter data also collected from the Agricultural Statistics. This is because the production cycle for these animals is under one year and the normative figures are based on produced animals.

Only farms larger than five hectares are included in the annual census. Especially horses, goats and sheep are placed on small farms, which mean that the number of animals given in the Agricultural Statistics is not representative. Therefore, the number of sheep and goats is based on the Central Husbandry Register (CHR) which is the central register of farms and animals managed by the Ministry of Food, Agriculture and Fisheries. The number of deer and ostriches is also based on CHR because these are not included in the Agricultural Statistics published by Statistics Denmark. The number of horses is based on data from The Danish Agricultural Advisory Service. The number of pheasants is based on expert judgement from Department of Bioscience, Aarhus University and the Danish pheasant breeding association.

Since 1985, the production of swine, poultry and fur has increased significantly. This is contrary to the production of cattle, which has decreased as a result of increasing milk yields. Buffalos, camels, lamas, mules and donkeys are not farmed in Denmark.

Table 6.4 Livestock production 1985 to 2011 given in AAP, 1000 head - NFR category 4B.

NFR	Animal category	1985	1990	1995	2000	2005	2008	2009	2010	2011
4B 1a	Dairy Cattle	896	753	702	636	564	558	563	568	565
4B 1b	Non-dairy cattle	1 721	1 486	1 388	1 232	1 006	1 006	977	1 003	1 003
4B 3	Sheep*	40	92	81	112	126	117	116	111	94
4B 4	Goats*	8	7	7	8	11	14	16	16	13
4B 6	Horses*	140	135	143	150	175	190	178	165	155
4B 8	Swine	9 089	9 497	11 084	11 922	13 534	12 738	12 369	13 173	12 932
4B 9a	Laying hens	5 577	5 696	6 088	4 935	5 168	4 973	4 437	5 248	5 679
4B 9b	Broilers	8 490	9 802	12 585	16 047	11 905	9 737	14 787	12 836	12 528
4B 9c	Turkeys	308	238	456	456	516	446	490	494	400
4B 9d	Other poultry	1 822	1 600	1 563	1 374	1 509	1 590	1 350	1 510	1 963
4B 13	Other;									
4B 13	Fur farming	1 906	2 264	1 850	2 199	2 552	2 810	2 721	2 699	2 757
4B 13	Deer	9	10	10	10	10	10	9	10	8

*Includes animals on small farms (less than 5 ha), which are not included in the Agricultural Statistics published by Statistics Denmark.

N-excretion

The normative figures for both total nitrogen excretion and the content of TAN are provided by DCA, Aarhus University.

The emission of NH_3 from manure management is calculated on the basis on nitrogen excreted from livestock. Most of the N excreted that is readily degradable and broken down to NH_4-N is found in the urine. The relationship between NH_4-N and total N will not remain constant over time due to changes in feed composition and feed use efficiency. In order to be able to implement the effect of NH_3 reducing measures as improvements in feed intake and composition in the emission inventory, it is necessary to calculate the emission based on the Total Ammoniacal Nitrogen (TAN) content. Since 2007, DCA has established Danish standards based on TAN for liquid manure, which is incorporated in the inventory. The emission for solid manure and deep litter is based on the total N excreted because DCE's estimate of TAN follows urine-N.

In Annex 2C Table 2C.1 is given the average N-excretion based on Total-N for each NFR livestock category from 1985 to 2006 (Table 2C.1a) and N-excretion based on TAN for 2007-2011 (Table 2C.1b). These values include N excretion from grazing animals. Notice that each livestock category is an aggregated average of different subcategories (see Table 6.3).

Housing system

A systematic registration of the housing of husbandry for all farms does not exist from 1985 to 2004 and the housing type distribution is therefore based on estimates from the Danish Agricultural Advisory Services (Rasmussen, 2006) and Lundgaard (2006). From 2005 the distribution of housing system is based on information from the Danish AgriFish Agency, which is based on information from the farmers.

The structural development in the agricultural sector has an influence on the changes in housing type distribution. The trend in housing system for dairy cattle goes from older tied-up housings, which is replaced by bigger housings with loose-holding. In 1985 85 % of the dairy cattle were kept in tied-up housings and in 2011 the share is reduced to 9 %. In loose-holding systems the cattle have more space and more straw bedding and this will in general increase the NH_3 emission per animal compared to the tied-up housings. In

Annex 2C Table 2C.2 the distribution of housing type for dairy cattle and fattening pigs from 1985-2011 is listed.

Emission factors - Housing

The emission from housings is thus determined by a number of different conditions that depends on housing type and the different kinds of manure disposal systems placed in these housings. Danish Centre for Food and Agriculture, Aarhus University has carried out a number of emission surveys and estimated emission coefficients for each type of housings (Poulsen et al., 2001 and Poulsen, 2012). In Table 6.5 is shown the emission factors for the most important animal categories; dairy cattle and fattening pigs in different housing systems. For the slurry and liquid manure is given TAN emission factors (TAN ex animal) and for solid and deep litter manure is given N ex animal.

Table 6.5 NH_3 emission factors in different housing systems 2011 – dairy cattle and fattening pigs.

Manure system	Manure type	NH_3 emission	NH_3 emission
		Pct. NH_3-N of N ex Animal	Pct. NH_3-N of TAN ex Animal
Dairy cattle			
Tied-up	Solid manure	6.0	
	+ Liquid		10.0
Tied-up	Slurry		6.0
Loose-holding with beds, slatted floor	Slurry		16.0
Loose-holding with beds, slatted floor, scrapes	Slurry		12.0
Loose-holding with beds, solid floor	Slurry		20.0
Loose-holding with beds, drained floor	Slurry		8.0
Deep litter (all)	Deep litter	6.0	
Deep litter, slatted floor	Deep litter	6.0	
	+ Slurry		16.0
Deep litter, slatted floor, scrapes	Deep litter	6.0	
	+ Slurry		12.0
Deep litter, solid floor, scrapes	Deep litter	6.0	
	+ Slurry		20.0
Fattening pigs			
Full slatted floor	Slurry		24.0
Partly slatted floor (50-75% solid floor)	Slurry		13.0
Partly slatted floor (25-49% solid floor)	Slurry		17.0
Solid floor	Solid manure	25.0	
	+ Liquid		27.0
Deep litter	Deep litter	25.0	
Partly slatted floor and partly deep litter	Deep litter	25.0	
	+ Slurry		18.0

Emission factors - Storage

Livestock manure is collected either as solid manure or as slurry depending on housing type. In Table 6.6 are shown the emission factors used for storage. It is assumed that the part of solid manure taken directly from the housing into the field is 65% from cattle, 25% from pigs, 50% from sows, 15% from poultry and 5% from hens (Poulsen, 2012). The remaining part of the solid manure is deposited in stock piles in the field before field application.

By law all slurry tanks have to be covered by a crust in order to reduce NH_3 emission. However, investigations show that slurry tanks were incompletely covered earlier (COWI, 2000), which results in a higher NH_3 emission. In 2011 it is assumed that 5% of the tanks with pig slurry and 2% of tanks with cattle slurry are incompletely covered (Annex 2C Table 2C.3). This information has been incorporated in the emission inventory.

Table 6.6 NH_3 emission factors for storage 2011.

		Liquid manure	Slurry	Solid manure	Deep litter
		Loss of NH_3-N in %			
Animal category		of TAN ex housing	of TAN ex housing	of N ex housing	of N ex housing
Cattle		2.2	3.5	4.0	1.05
Swine	Fattening pigs	2.2	2.9	19.0	9.75
	Sows		2.9	19.0	6.50
Poultry	Hens and pullet		2.0[a]	7.5	4.75
	Broilers, geese and ducks			7.5	6.80
	Turkeys			7.5	8.00
Fur farming			3.1	11.5	
Sheep/goats					3.0
Horses					3.0

[a] Loss of NH_3-N in % of N ex housing.

Application in fields

There exists no annual statistical information on how the farmers are handling the manure in practice. In the calculation of emissions from application of manure on the fields distinguish between solid manure and liquid manure and also between manure from cattle and pigs. For all other animals same emission factor as for cattle is used. In 2011 the emission factor for solid manure is estimated to 6 % of N ex storage and liquid manure is estimated to 13 % for cattle and 11% for swine of TAN ex storage.

The weighted emission factors will vary from year to year depending on changes in the practice of application. The emission factor is based on background estimates of time of application, application methods, application in growing crops or on bare soil and the time from application to ploughing in soil. In Table 6.7 background information for 2011 are given.

Table 6.7 Estimate for application method, time of application and time before the manure is incorporated in the soil for 2011.

Liquid manure				Length of time before incorporation into soil, hours							
Application methods	Application time	Percentage distribution of manure		0		4, and then harrowed		4, and then Ploughed		Not incorporated	
		Cattle	Pigs	Cattle	Pigs	Cattle	Pigs	Cattle	Pigs	Cattle	Pigs
Incorporated	winter-spring	63	24	63	24	-	-	-	-	-	-
Incorporated	summer-autumn	13	4	13	4	-	-	-	-	-	-
Trailing horses	winter-spring	20	64	-	-	-	3	-	2	20	59
Trailing horses	spring-summer	2	2	-	-	-	-	-	-	2	2
Trailing horses	late summer-autumn	2	6	-	-	-	2	-	1	2	3
Total		100	100	76	28	-	5	-	3	24	64
Solid manure				Length of time before incorporation into soil, hours							
Application methods	Application time	Percentage distribution of manure		0		4		6		Not incorporated	
		Cattle	Pigs	Cattle	Pigs	Cattle	Pigs	Cattle	Pigs	Cattle	Pigs
Broad spreading	winter-spring	90	76	-	-	70	60	20	16	-	-
Broad spreading	spring-summer	5	5	5	5	-	-	-	-	-	-
Broad spreading	late summer-autumn	5	19	-	-	5	19		-	-	-
Total		100	100	5	5	75	79	20	16	-	-

Implied emission factor

Table 6.8 shows the implied emission factors for each NFR livestock category from 1985 to 2011. The implied emission factors express the average emission of NH_3 per AAP (annual average population) per year. The implied emission factors are changing from year to year depending on a combination of several factors, such as:

- change in number of animals or change in the share of different subcategories,
- change in feed intake and N-excretion,
- change in housing type,
- change in handling of manure in relation to storage and application.

It should be mentioned that the emission from manure deposited by grazing animals is included in the emission from agricultural soils (NFR – 4.D2c).

For most of the animal categories are the implied emission factor decreased from 1985 to 2011, which is the result of measures in relation to implementation of the Action plans for the Aquatic Environment and the Ammonia Action Plan. Strict requirements to obtain improvements in utilisation of nitrogen in manure have resulted in reduction of N-excretion and especially for fattening pigs. Changes in the way manure is handled during application are another important factor, which has reduced the emission. Based on the action plans various initiatives has been implemented and include for example requirement for a minimum 9-month manure storage capacity, requirement that manure applied to soil be ploughed down within six hours, a ban on the application of manure in winter and broad spreading is no longer allowed. The slurry tanks have to be covered with a floating cover or safety access cover.

Table 6.8 Implied emission factor, manure management 1985 to 2011, kg NH_3 per AAP per year.

NFR	Animal category	1985	1990	1995	2000	2005	2008	2009	2010	2011
4B1a	Dairy cattle	30.94	33.36	29.87	28.46	24.98	25.55	24.77	25.54	24.88
4B1b	Non-dairy cattle	7.13	7.05	6.16	6.25	5.19	6.37	6.55	6.02	6.16
4B3	Sheep	1.93	1.85	1.88	1.45	1.44	1.32	1.32	1.32	1.34
4B4	Goats	1.93	1.85	1.88	1.45	1.35	1.28	1.28	1.28	1.30
4B6	Horses	7.62	7.10	6.32	6.27	6.23	5.71	5.71	5.71	5.77
4B8	Swine	4.83	4.34	3.29	2.96	2.60	2.27	2.18	2.03	2.05
4B9a	Laying hens	0.21	0.26	0.30	0.32	0.39	0.35	0.36	0.31	0.31
4B9b	Broilers	0.18	0.24	0.21	0.19	0.24	0.23	0.15	0.17	0.16
4B9c	Turkeys	0.57	0.59	0.74	0.72	0.71	0.61	0.61	0.61	0.61
4B9d	Other poultry	0.12	0.11	0.16	0.12	0.09	0.04	0.04	0.03	0.02
4B13	Other	2.62	2.44	2.32	2.34	2.69	2.67	2.87	3.00	2.87

Emissions

The NH_3 emission from manure management is estimated to 59.74 Gg NH_3 in 2011 (Table 6.9). From 1985 to 2011, the emission is reduced by 36 %. As mentioned in Chapter 6.1.1 this development is mainly due to implementation of a number of action plans to reduce nitrogen losses from the agricultural production.

In 2011, cattle production contributes with 34 % of the total emission from manure management. The pig production contributes in 2011 with 44 % of the total emission from manure management. The number of cattle has decreased as a result of a growth in milk yield and the milk quota which limits the production. The production of fattening pigs has increased by more than 50 % compared with 1985. However, despite this development the emission from pigs is still decreasing. This is due to a breeding of pigs with focus on a biological development and improvement in fodder efficiency. Thus the N-excretion for fattening pigs has decreased from 5.09 kg per pig per year in 1985 to 2.82 in 2011.

Table 6.9 Emission of NH_3 from manure management 1985 to 2011, Gg NH_3.

NFR	Animal category	1985	1990	1995	2000	2005	2008	2009	2010	2011
4B1a	Dairy cattle	27.73	25.13	20.98	18.09	14.10	14.26	13.95	14.51	14.06
4B1b	Non-dairy cattle	12.27	10.47	8.55	7.70	5.22	6.41	6.40	6.04	6.17
4B3	Sheep	0.08	0.17	0.15	0.16	0.18	0.16	0.15	0.15	0.12
4B4	Goats	0.02	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.02
4B6	Horses	1.07	0.96	0.90	0.94	1.09	1.08	1.01	0.94	0.89
4B8	Swine	43.88	41.25	36.45	35.28	35.15	28.91	26.93	26.72	26.49
4B9a	Laying hens	1.15	1.49	1.82	1.56	2.02	1.75	1.59	1.65	1.75
4B9b	Broilers	1.49	2.32	2.67	3.07	2.87	2.22	2.15	2.21	2.01
4B9c	Turkeys	0.18	0.14	0.34	0.33	0.37	0.27	0.30	0.30	0.24
4B9d	Other poultry	0.22	0.18	0.25	0.16	0.14	0.06	0.05	0.05	0.05
4B13	Other	5.02	5.56	4.32	5.17	6.90	7.53	7.83	8.13	7.93
4B	Total	93.09	87.68	76.45	72.46	68.05	62.68	60.38	60.72	59.74

Figure 6.5 shows the percentage distribution of the NH_3 emission from housing, storage and application of manure. The main part of the reduction in NH_3 emission has taken place in connection with the application of manure in fields, due to changes in manure application practice. There has been a reduction in emissions associated with storage of manure, which is a result of improvement in coverage of slurry tanks. Because of the reduced emission from manure storage and spreading, emission from manure management in house in percentage increased from 38 % in 1985 to 57 % in 2011. In

future, the possibilities for NH_3 reduction will likely be focused on measures in housings by implementation various technological solutions.

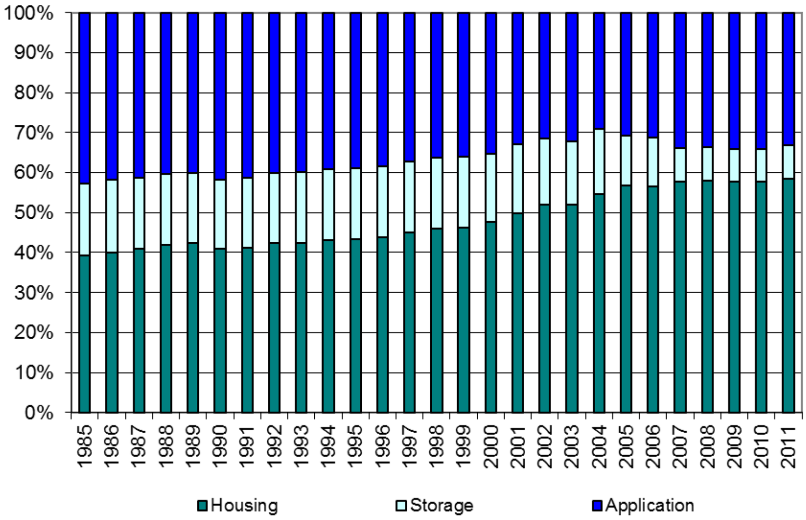

Figure 6.5 The percentage distribution of the NH_3 emission in manure management 1985-2011.

6.3 NH_3 emission from agricultural soils – NFR 4.D

6.3.1 Description

NH_3 emission from agricultural soils contributes with 9 % of the total emission from the agricultural sector and includes the emission from use of synthetic fertiliser and the emission from nitrogen deposited by grazing animals. In 2011 approximately 65 % of the emission from agricultural soils originates from synthetic fertiliser.

6.3.2 Methodological issues

Synthetic fertiliser

Since 1985 there has been a significant decrease in use of synthetic fertiliser. This is due to requirements to utilising of nitrogen in manure as outlined in various environmental action plans. Another explanation for a reduction of emission is a decrease in use of urea as currently accounting for less than 1 % of the total nitrogen (Table 6.10). Based on the Danish use and composition of synthetic fertiliser in 2011, the emission in average is estimated to 1.6 % NH_3 of the total nitrogen.

Data on the use of synthetic fertiliser is based on the annual sale estimations collected by the Danish AgriFish Agency (2012). Emission factors are based on the values given in EMEP/EEA guidebook (EMEP/EEA, 2009).

The use of synthetic fertiliser includes fertiliser used in parks, golf courses and private gardens. Approximately 1 % of the synthetic fertiliser can be related to use outside the agricultural area.

Table 6.10 Synthetic fertiliser consumption 2011 and emission factors.

	NH_3 Emission factor[1], Kg NH_3-N pr kg N	Consumption[2], t N
Fertiliser type		
Calcium and boron calcium nitrate	0.01	0.4
Ammonium sulphate	0.01	6.2
Calcium ammonium nitrate and other nitrate types	0.01	94.9
Ammonium nitrate	0.01	8.6
Liquid ammonia	0.02	6.0
Urea	0.13	0.4
Other nitrogen fertiliser	0.06	25.2
Magnesium fertiliser	0.01	0.0
NPK-fertiliser	0.01	48.1
Diammonphosphate	0.01	1.1
Other NP fertiliser types	0.01	4.0
NK fertiliser	0.01	2.3
Total consumption of N in synthetic fertiliser		197.0
Total emission of NH_3-N, Gg	3.24	
Average NH_3-N emission, FracGASF	0.02	

[1] EMEP/EEA (2009), Mean spring temperature in DK is 6 °C, see Annex 2C Table 2C.4 for assumptions for fertiliser type

[2] The Danish AgriFish Agency.

Grazing

It is assumed that 5% of the manure from dairy cattle is deposited in the field, which corresponding to 18 days per year (Aaes, 2008). For heifers 36% of the nitrogen in the manure is estimated deposited during grazing (Aaes, 2008), 61% for suckling cows (Poulsen et al, 2001), 50% for horses (Clausen, 2008) and 73% for sheep and goats (Poulsen et al, 2001).

Study of grazing cattle indicates that seven per cent of the total nitrogen content is assumed to evaporate as NH_3 (Jarvis *et al*. 1998a, Jarvis *et al*. 1989b and Bussink 1994). This emission factor is used for all animal categories.

Activity data

At present, farmed area covers about 60 % of the total land area in Denmark. In recent decades, farmed area has decreased, being replaced by built-up areas, roads, forest and nature habitats. Table 6.11 shows the activity data used in calculation of the NH_3 emission from agricultural soils. The use of fertiliser has decreased considerably. The consumption in 2011 is almost half than in 1985. The increase of fertiliser from 2007 to 2008 can be explained by expectations of rising taxes but also cultivation of 80.000 ha fallow fields. This is also the reason for the decline in 2009.

Table 6.11 Activity data used to estimate the NH_3 emission from agricultural soils 1985 to 2011.

NFR 4.D										
Activity data	Unit	1985	1990	1995	2000	2005	2008	2009	2010	2011
N in synthetic fertiliser	M kg N	398	400	316	251	206	220	200	190	197
N deposited on grass	M kg N	37	34	36	34	26	23	22	22	21

Implied emission factor

Table 6.12 shows the implied emission factors, 1985-2011 for use of synthetic fertiliser and grazing animals.

The IEF for synthetic fertiliser depend on consumption and type of fertiliser. The increase of IEF is due to an increase in the amount of the fertilisers "other nitrogen fertiliser" which has a relatively high EF.

Table 6.12 Implied emission factors for NH_3 emission from agricultural soils.

NFR 4.D										
Source	Unit	1985	1990	1995	2000	2005	2008	2009	2010	2011
Fertiliser	% of total N	1.3	1.4	1.4	1.3	1.2	1.4	1.5	1.5	1.6
N grass	% of total N	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0

6.3.3 Emissions

From 1985 to 2011 the NH_3 emission from agricultural soils decreased from 9.59 Gg NH_3 to 5.75 Gg NH_3, which corresponds to a 40 % reduction (Table 6.13). A considerable decrease in the use of synthetic fertiliser has, in particular, been important for this development. The lower emissions from grazing animals reflect the trend towards larger farms where the animals are kept in housings throughout the year.

Table 6.13 Emission of NH_3 from Agricultural Soils from 1985 to 2011, Gg NH_3.

NFR 4.D									
Agricultural Soils	1985	1990	1995	2000	2005	2008	2009	2010	2011
Synthetic fertiliser	6.46	6.59	5.55	3.85	3.12	3.65	3.67	3.47	3.94
N excretion on pasture	3.13	2.92	3.03	2.92	2.21	1.99	1.91	1.87	1.81
Emission - total	9.59	9.51	8.58	6.77	5.34	5.64	5.57	5.34	5.75

6.4 NH_3 emission from agriculture other – NFR 4.G

6.4.1 Description

Emissions reported under NFR category 4G include three emissions sources; emissions from growing crops, sewage sludge used as fertilizer and NH_3 treated straw. NH_3 emission from these sources contributes in 2011 with 8 % of the total emission from the agricultural sector. The most important contributor is the emission from growing crops.

6.4.2 Methodological issues

Crops

The Danish emission inventory includes NH_3 emission from crops, despite the uncertainties related to this emission source. Literature research shows that the volatilisation from crop types differs considerably. EF´s for crops are estimated to 2 % for crops and 0.5 % for grass based on a literary survey (Gyldenkærne and Albrektsen, 2009). However, as for the emission ceiling given in the Gothenburg-Protocol and the EU NEC Directive the emission from crops is not taken into account.

Table 6.14 EF used to estimate the emission of NH_3 from crops.

Crops	kg NH_3-N per ha
Cash crops, beets and silage maize	2
Grass/clover in rotation	0.5
Permanent grass	0.5
Set-a side	0

NH_3 treated straw

NH_3 is used for conservation of straw for feeding. Investigations show that up to 80-90% of the supplied NH_3 (given in NH_3-N) can emit (Andersen *et al.* 1999). However, the emissions can be reduced particularly if the right dose is used. It is assumed that the emission factor is 65 % of the applied NH_3-N. Information on NH_3 used for treatment of straw is collected from the suppliers. NH_3 treated straw has been prohibited from 2006, but in 2010 and 2011 an exemption were given due to wet weather.

As for the emission ceiling given in the Gothenburg-Protocol and the EU NEC Directive the emission from NH_3 treated straw is not taken into account.

Activity data

Information on farmed area and cultivation of different crop types is collected by Statistics Denmark. Information on amount of sewage sludge, N-content and NH_3 emission factor is obtained from reports prepared by the Danish Environmental Protection Agency and based on data from the fertiliser accounts controlled by The Danish AgriFish Agency. Farmers with more than 10 animal units have to be registered and keep accounts of the use of N content in manure, received manure or other organic fertilizer.

The activity data are given in Table 6.15. The amount of sewage sludge has increased from 1985 until 1995. In the following years to 2011 the trend is a fall, which probably is a result of increasing demand from the industrial sector. The sludge is used in industrial processes, e.g. in the cement production and production of sandblasting material.

Table 6.15 Activity data used to estimate the NH_3 emission from agriculture other 1985 to 2011.

NFR 4.G										
Activity data	Unit	1985	1990	1995	2000	2005	2008	2009	2010	2011
Cultivated area	1000 ha	2 834	2 788	2 726	2 647	2 707	2 668	2 607	2 626	2 623
Amount of sludge applied on soil	Tonnes of dry matter	50 000	77 883	112 235	83 727	45 738	50 401	62 709	56 665	54 564
N-content	%	4.00	4.00	4.13	4.33	4.75	4.75	4.75	4.75	4.75
N applied on soil	Tonnes N	2 000	3 115	4 635	3 625	2 173	2 394	2 979	2 692	2 592
NH_3 treated straw	Tonnes NH_3-N	8 285	12 912	8 406	3 125	329	0	0	300	300

Implied emission factor

The implied emission factor for crops is expressed as total emission divided by total area under cultivation. The IEF is at the same level for all years. Same IEF for sewage sludge and NH_3 used for straw are used for all years.

Table 6.16 Implied emission factors used to estimate the NH_3 emission from 4.G Agriculture Other.

NFR 4.G										
Source	Unit	1985	1990	1995	2000	2005	2008	2009	2010	2011
Crops	kg NH_3-N per hectare	1.7	1.7	1.6	1.6	1.6	1.7	1.7	1.7	1.7
Sewage sludge[1]	kg NH_3-N per kg N	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019
NH_3 treated straw	% of total NH_3-N	65	65	65	65	65	65	65	65	65

[1] Emission factor is based on information from the Danish Environmental Protection Agency

6.4.3 Emissions

From 1985 to 2011 the NH_3 emission from Agriculture Other decreases from 12.56 Gg NH_3 to 4.71 Gg NH_3, which corresponds to a 55 % reduction (Table 6.17). The decrease is mainly due to a decrease in NH_3 used for treatment of straw. NH_3 treatment was prohibited by law in 2006 but a small emission is seen for 2010 and 2011 caused by an exemption due to wet weather.

Table 6.17 Emission of NH_3 from 4.G Agriculture Other 1985 to 2011, Gg NH_3.

NFR 4.G	1985	1990	1995	2000	2005	2008	2009	2010	2011
Crops	5.97	5.92	5.28	5.21	5.34	5.41	5.41	5.41	5.42
Sewage sludge	0.05	0.07	0.11	0.08	0.05	0.05	0.07	0.06	0.06
NH_3 treated straw	6.54	10.19	6.63	2.47	0.26	0.00	0.00	0.24	0.24
Emission - total	12.56	16.18	12.02	7.76	5.65	5.47	5.48	5.71	4.71

6.5 PM emission from housings – NFR 4.B

This chapter describes the PM emission related to the animal production. The calculation of PM emission in connection to field burning of agricultural wastes is included in Chapter 6.6.

6.5.1 Description

Investigations have shown that farmers, as well as livestock, are subject to an increased risk of developing lung and respiratory related diseases due to the particulate emissions (Hartung and Seedorf, 1999). This is because the particles are able to carry bacteria, viruses and other organic compounds.

In 2011 the PM emission from housings, given as TSP, is estimated to 11.29 Gg. Of this, 79 % relates to swine production. The emission from cattle and poultry contributes with 11 % and 10 %, respectively and the remainder animals contribute with less than 1 %.

6.5.2 Methodological issues

The estimation of PM emission is based on the EMEP/EEA guidebook (2009) where the scientific data mainly are based on an investigation of PM emission in North European housings (Takai et al., 1998).

The PM emission includes primary particles in the form of dust from housings. The inventory includes PM emission from cattle, swine, poultry, horses, sheep and goats (Table 6.18). The number of grazing days is taken into account. Some animal categories are divided into subcategories and for some categories (if applicable) distinction is made between solid and slurry based housing systems.

The PM emission is related to the annual average population (AAP) and to the time the animal is housed. The PM emission from grazing animals is considered as negligible.

Table 6.18 Livestock categories used in the PM emission inventory.

Livestock categories as given in NFR	Subcategories as given in the EMEP/EEA guidebook	Danish inventory	Grazing days
Cattle			
Dairy Cattle	Dairy cattle	Dairy cattle	18
Non-Dairy Cattle	Calves	Calves < ½ yr	0
	Beef cattle	Bulls	0
		Heifers	132
		Suckling cattle	224
Swine	Sows	Sows (incl. weaners until 7 kg)	0
	Weaners	Weaners (7-32 kg)	0
	Fattening pigs	Fattening pigs (32-107 kg)	0
Poultry	Laying hens	Laying hens	0
	Broilers	Broilers	0
	Turkeys	Turkeys	0
	Other poultry	Ducks	0
		Geese	365
Horses	Horses	Horses	183
Sheep	Sheep	Sheep	265
Goats	Goats	Goats	265

Activity data

Livestock production data are based on Statistics Denmark, Agricultural Statistics (http://www.dst.dk/en.aspx) – Table 6.4.

Emission factor

Emission factors for TSP, PM_{10} and $PM_{2.5}$ are based on the EMEP/EEA guidebook (EMEP/EEA, 2009). However, calves and weaners are not included and therefore guidebook 2007 (EMEP/CORINAIR, 2007) is used. Emission factors for sheep and goats are based on Fontelle et al. (2011). The same emissions factors are used for all years.

In Takai et al. (1998), dust emissions from housings are estimated as ”inhalable dust”. This is defined as particles that can be transported into the body via the respiratory system. Approximately, “inhalable dust” equates to TSP (Hinz, 2002). Estimation of TSP is based on the transformation factors between TSP and PM_{10} as given in the EMEP/EEA emission inventory guidebook (2009).

Table 6.19 Emission factors for particle emission from animal housing system.

Livestock category	Housing system	Emission factor PM$_{10}$	PM$_{2.5}$	TSP	Transformation factor PM$_{10}$ to TSP
		kg per AAP per year			
Cattle:					
Dairy cattle	Solid	0.36	0.23	0.29	0.46
	Slurry	0.70	0.45	0.30	0.46
Calves < ½ yr	Solid	0.16	0.10	0.29	0.46
	Slurry	0.15	0.10	0.31	0.46
Beef cattle	Solid	0.24	0.16	0.31	0.46
	Slurry	0.32	0.21	0.30	0.46
Heifer[1)]	Solid	0.26	0.17	0.30	0.46
	Slurry	0.43	0.28	0.30	0.46
Suckling cattle[2)]	Solid	0.24	0.16	0.31	0.46
	Slurry	0.32	0.21	0.30	0.46
Swine:					
Sows	Solid	0.58	0.09	0.07	0.45
	Slurry	0.45	0.07	0.07	0.45
Weaners	Solid[3)]	0.18	0.03	0.07	0.45
	Slurry	0.18	0.03	0.07	0.45
Fattening pigs	Solid	0.50	0.08	0.07	0.45
	Slurry	0.42	0.07	0.07	0.45
Poultry:					
Laying hens, cages	Solid	0.017	0.002	0.12	1.00
Laying hens, perchery	Solid	0.084	0.016	0.19	1.00
Broilers	Solid	0.052	0.007	0.13	1.00
Turkeys, ducks and gees	Solid	0.032	0.004	0.13	1.00
Horses	Solid	0.18	0.12	0.31	0.46
Sheep	Solid	0.06	0.02	0.14	0.46
Goats	Solid	0.06	0.02	0.14	0.46

1) Average of “calves” and “dairy cattle”.

2) Assumed the same value as for “Beef cattle”.

3) Same as slurry based systems.

6.5.3 Emissions

Table 6.20 shows the PM emission, given in TSP, PM$_{10}$ and PM$_{2.5}$ for each animal category in the period 2000 to 2011. It is seen that the main part of the emission originates from swine housings. In the period 2000 to 2011, the total agricultural emission of TSP from housings is almost unaltered, but from 2009 to 2010 the emission is increased 5 %, mainly due to an increase in the number of swine.

Table 6.20 PM emission from housings 2000 – 2011, Gg PM_{10}, $PM_{2.5}$ and TSP.

	Gg TSP	2000	2005	2006	2007	2008	2009	2010	2011
NFR	Animal Category								
4B 1a	Dairy	0.72	0.73	0.73	0.74	0.76	0.77	0.78	0.78
4B 1b	Non-dairy	0.76	0.42	0.43	0.46	0.45	0.44	0.45	0.45
4B 3	Sheep	<0.005	0.005	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
4B 4	Goats	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
4B 6	Horses	0.03	0.03	0.04	0.04	0.04	0.03	0.03	0.03
4B 8	Swine	8.47	9.53	9.37	9.64	8.88	8.52	9.13	8.95
4B 9a	Laying hens	0.33	0.38	0.26	0.28	0.35	0.29	0.36	0.40
4B 9b	Broilers	0.83	0.62	0.67	0.61	0.51	0.77	0.67	0.65
4B 9c	Turkeys	0.01	0.02	0.01	0.01	0.01	0.02	0.02	0.01
4B 9d	Other poultry	0.008	0.008	0.009	0.005	0.005	<0.005	<0.005	<0.005
4B 13	Other	NE	NE	NE	NE	NE	NE	NE	NE
	TSP total	11.18	11.74	11.52	11.78	11.01	10.86	11.43	11.29
	Gg PM_{10}	2000	2005	2006	2007	2008	2009	2010	2011
NFR	Animal Category								
4B 1a	Dairy	0.33	0.34	0.34	0.34	0.35	0.36	0.36	0.36
4B 1b	Non-dairy	0.35	0.19	0.20	0.21	0.21	0.20	0.20	0.21
4B 3	Sheep	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
4B 4	Goats	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
4B 6	Horses	0.01	0.02	0.02	0.02	0.02	0.02	0.01	0.01
4B 8	Swine	3.81	4.29	4.22	4.34	4.00	3.84	4.11	4.03
4B 9a	Laying hens	0.33	0.38	0.26	0.28	0.35	0.29	0.36	0.40
4B 9b	Broilers	0.83	0.62	0.67	0.61	0.51	0.77	0.67	0.65
4B 9c	Turkeys	0.01	0.02	0.01	0.01	0.01	0.02	0.02	0.01
4B 9d	Other poultry	0.008	0.008	0.009	0.005	0.005	<0.005	<0.005	<0.005
4B 13	Other	NE	NE	NE	NE	NE	NE	NE	NE
	PM_{10} total	5.70	5.86	5.72	5.81	5.44	5.50	5.73	5.68
	Gg $PM_{2.5}$	2000	2005	2006	2007	2008	2009	2010	2011
NFR	Animal Category								
4B 1a	Dairy	0.21	0.22	0.22	0.22	0.22	0.23	0.23	0.23
4B 1b	Non-dairy	0.22	0.12	0.13	0.14	0.13	0.13	0.13	0.13
4B 3	Sheep	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.000
4B 4	Goats	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4B 6	Horses	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
4B 8	Swine	0.62	0.70	0.69	0.71	0.65	0.63	0.67	0.66
4B 9a	Laying hens	0.06	0.07	0.05	0.05	0.07	0.06	0.07	0.08
4B 9b	Broilers	0.11	0.08	0.09	0.08	0.07	0.10	0.09	0.09
4B 9c	Turkeys	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
4B 9d	Other poultry	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
4B 13	Other	NE	NE	NE	NE	NE	NE	NE	NE
	$PM_{2.5}$ total	1.24	1.21	1.18	1.21	1.16	1.16	1.20	1.20

6.6 Field burning of agricultural wastes – NFR 4F

Field burning of agricultural wastes has been prohibited in Denmark since 1990 and may only take place in connection with production of grass seeds on fields with repeated production and in cases of wet or broken bales of straw. The amount of burnt straw from the grass seed production is estimated as 15-20 % of the total amount produced. The amount of burnt bales of wet straw is estimated as 0.1 % of total amount of straw. Both estimates are based on expert judgement by the Danish Agricultural Advisory Service. The total amounts are based on data from Statistics Denmark. EMEP/EEA guidebook (EMEP/EEA, 2009) default values for the emission factors for field burning of agricultural wastes are used (Table 6.21).

Emissions of NH_3, NO_x, CO, NMVOC, SO_2, PM, heavy metals, dioxin and PAHs are included under the NFR category 4F. The emission of NH_3 from field burning contributes in 2011 with less than 1 % of the agricultural emission. Emissions of PM and NMVOC from field burning contributes with 2 % TSP, 4 % PM_{10}, 15 % $PM_{2.5}$ and 11 % NMVOC of the agricultural emission. The emission of NO_x, CO, SO_2, heavy metals and dioxin from field burning contribute with less than 1 % of the total national emission, while the emission of PAHs contribute with around 2 % of the national emission. From 1989 to 1990 all emissions decrease significantly due to the ban on field burning, see Annex 2C Table 2C.5 and 2C.6 for emissions and activity data.

Table 6.21 EF for field burning of agricultural waste.

Pollutant	EF	Unit
NO_x[1]	2.4	g/kg DM
CO[1]	58.9	g/kg DM
NMVOC[1]	6.3	g/kg DM
SO_x[1]	0.3	g/kg DM
NH_3[1]	2.4	g/kg DM
TSP[1]	5.8	g/kg DM
PM_{10}[1]	5.8	g/kg DM
$PM_{2.5}$[1]	5.5	g/kg DM
PCDD/F[1]	500	ng TEQ/t
Pb[1]	0.865	mg/kg DM
Cd[1]	0.049	mg/kg DM
Hg[1]	0.008	mg/kg DM
As[1]	0.058	mg/kg DM
Cr[1]	0.22	mg/kg DM
Ni[1]	0.177	mg/kg DM
Se[1]	0.036	mg/kg DM
Zn[1]	0.028	mg/kg DM
Cu[2]	0.0003	mg/kg DM
Benzo(a)pyrene[2]	2 787	mg/kg DM
benzo(b)fluoranthene[2]	2 735	mg/kg DM
benzo(k)fluoranthene[2]	1 073	mg/kg DM
Indeno(1,2,3-cd)pyrene[2]	1 017	mg/kg DM

[1] EMEP/EEA, 2009

[2] Jenkins, 1996

6.7 NMVOC emissions from agriculture other – NFR 4G

Around 3 % of the NMVOC emission originates from the agricultural sector, which, in the Danish emission inventory, includes emission from arable land crops and grassland, and field burning of agricultural wastes (refer to Chapter 6.6.) Activity data are obtained from Statistics Denmark. The emission factors for crops and grassland are for land with arable crops estimated to 393 g NMVOC per ha and for grassland 2 120 g NMVOC per ha (Fenhann & Kilde 1994; Priemé & Christensen 1991).

Table 6.22 Areas and NMVOC emission from agricultural soils 1985 – 2011.

	1985	1990	1995	2000	2005	2008	2009	2010	2011
Arable crops, 1000 ha	2 336	2 322	2 064	2 043	2 086	2 107	2 103	2 096	2 102
Grassland, 1000 ha	498	466	446	413	446	490	498	521	516
NMVOC emission, Gg	1.97	1.90	1.76	1.68	1.77	1.87	1.88	1.93	1.92

6.8 Uncertainties

Table 6.23 shows the estimated uncertainties for the pollutants.

6.8.1 NH_3

4B Manure management

The total uncertainty regarding emission from manure management depends on uncertainty values for activity data and emission factor. In the Danish inventory it is chosen to consider activity data as more than just the number of animals. Also N-excretion, type of housing and thus type of manure is taken into account as a part of the activity data. The uncertainty of the emission factor includes only the uncertainty that specifically has to do with measurements and calculations of the emission from housing.

Uncertainties regarding animal production, such as number of animals, feeding consumption, normative figures etc. are low. The number of animals for the most important categories is estimated by Statistic Denmark and for each animal category an uncertainty estimate is given. For the large animal groups such as cattle and swine the uncertainty is very low, while it for the smaller groups, e.g. poultry, horses, sheep and goats is a little higher. The uncertainty for animals overall is estimated to 2 %.

The Danish Normative System for animal excretions is based on data from the Danish Agricultural Advisory Service (DAAS), which is the central office for all local Danish agricultural advisory services. DAAS engages in a great deal of research as well as the collection of efficacy reports from Danish farmers for dairy production, meat production, swine production, etc. to optimise productivity in Danish agriculture. In total, feeding plans from 15-18 % of Danish dairy production, 25-30 % of pig production, 80-90 % of poultry production and approximately 100 % of fur production are collected annually. These basic feeding plans are used to develop the standard values of the "Danish Normative System".

The normative figures (Poulsen et al. 2001, Poulsen, 2012) are comprised of arithmetic means. Based on feeding plans, the standard deviation in N-excretion rates between farms can be estimated to ±20 % for all animal types (Hanne D. Poulsen, pers. comm.). However, due to the large number of farms included in the norm figures the arithmetic mean, it can be assumed as a very good estimate with a low uncertainty.

The combined effect of low uncertainty in actual animal numbers, the relatively low uncertainty for feed consumption and excretion rates gives a low uncertainty in the activity data as a whole and is estimated to 10 %. The major uncertainty for the manure management, therefore relates to the emission factors which is estimated to 20 %.

4D1a Synthetic N-fertilizers

The activity data for the emission from synthetic fertiliser are the amount of sold fertiliser given by the Danish AgriFish Agency. Uncertainty for this is considered to be low; 3 % based on expert judgement. No uncertainty values for the emission factor are given in the EEA/EMEP guidebook. The Danish inventory assume an uncertainty value at 25 %, which indicated a uncertainty in the translation of the Danish fertiliser types to types specified in the guide book but also indicate an uncertainty of the emission factors specified in the guidebook.

4D2c N-excretion on pasture range and paddock

The number of days and the N-excretion on grass is estimated by DAAS and DCA, Aarhus University. The overall uncertainty for the activity is estimated to 5 %, while the uncertainty for the emission factor is considered higher, 25 %.

4F Field burning of agricultural waste

An uncertainty of 25 % for the activity for field burning of agricultural wastes is used. The uncertainty is a combination of the uncertainty for area of grass for seed production, which has a low uncertainty, amount of burnt straw and yield, which have a high uncertainty. For the emission factors uncertainty given in the references is used.

4G Other

Under Table 4G emissions from three sources are reported, crops, sewage sludge and NH_3 treated straw. The uncertainty of activity data for crops is very low, while it for sewage sludge and NH_3 treated straw is higher. The total uncertainty value is assumed to be 20 %.The uncertainty level for the emission factor for crops and NH_3 treated straw is high uncertainty, while it for sewage sludge is lower. The uncertainty value for the emission factor in overall is assumed to be 50 %.

6.8.2 PM

Previously the uncertainties for the PM emission factors have been considered to be very high and especially for animal husbandry and manure management. The uncertainty estimates regarding the PM emission factors are based on the EMEP/EEA guidebook.

6.8.3 Other pollutants

For the NMVOC emission from 4G Other the activity data is hectares of arable crops and grassland. Data for hectares under cultivation is estimated by Statistic Denmark and the uncertainties are based on the calculations and they are very low; 2 %. The uncertainty for the emission factor is based on expert judgment and is considered to be very high; 500 %. For the NMVOC emission from field burning the uncertainty of the emission factor is based on EMEP/EEA guidebook.

Emission of NO_x, CO, SO_2, heavy metals, dioxin and PAHs from the agricultural sector originates from field burning of agricultural wastes. The uncertainty for activity data for these emissions is a combination of the uncertainty for crop production which is low and the uncertainty of the amount of burned straw which is high. The uncertainties for the emission factors are based on EMEP/EEA guidebook. All uncertainties for field burning are relatively high.

Table 6.23 Estimated uncertainty associated with activities and emission factors for the agricultural sector.

	Sector	Emission	Activity data, %	Emission factor, %	Combined Uncertainty, %	Total Uncertainty, %
NO_x, Gg	4.F Field burning	0.09	25	25	35	35
CO, Gg	4.F Field burning	2.15	25	100	103	103
NMVOC, Gg	4.F Field burning	0.23	25	100	103	446
NMVOC, Gg	4 G Agriculture other	1.92	2	500	500	
SO_2, Gg	4.F Field burning	0.01	25	100	103	103
NH3, Gg	4.B Animal husbandry and manure management	59.74	10	20	22	19
NH_3, Gg	4 D 1 a Synthetic N-fertilizers	3.94	3	25	25	
NH_3, Gg	4 D 2 c N-excretion on pasture range and paddock	1.81	5	25	25	
NH_3, Gg	4.F Field burning	0.09	25	50	56	
NH_3, Gg	4 G Agriculture other	5.71	20	50	54	
TSP, Gg	4.B Animal husbandry and manure management	11.21	2	300	300	294
TSP, Gg	4.F Field burning	0.21	25	50	56	
PM_{10}, Gg	4.B Animal husbandry and manure management	5.60	2	300	300	289
PM_{10}, Gg	4.F Field burning	0.21	25	50	0	
$PM_{2.5}$, Gg	4.B Animal husbandry and manure management	1.18	2	300	300	256
$PM_{2.5}$, Gg	4.F Field burning	0.20	25	50	56	
Pb, Mg	4.F Field burning	0.03	25	50	56	56
Cd, Mg	4.F Field burning	0.00	25	100	103	103
Hg, Mg	4.F Field burning	0.00	25	200	202	202
As, Mg	4.F Field burning	0.00	25	100	103	103
Cr, Mg	4.F Field burning	0.01	25	200	202	202
Cu, Mg	4.F Field burning	0.00	25	200	202	202
Ni, Mg	4.F Field burning	0.01	25	200	202	202
Se, Mg	4.F Field burning	0.00	25	100	103	103
Zn, Mg	4.F Field burning	0.00	25	200	202	202
Dioxin, g I-Teq	4.F Field burning	0.02	25	500	501	501
Benzo(a)pyrene, Mg	4.F Field burning	0.10	25	500	501	501
Benzo(b)fluoranthen, Mg	4.F Field burning	0.10	25	500	501	501
Benzo(k)fluoranthen, Mg	4.F Field burning	0.04	25	500	501	501
Indeno(1,2,3 cd)pyrene, Mg	4.F Field burning	0.04	25	500	501	501

6.9 Quality assurance and quality control (QA/QC)

A general QA/QC and verification plan for the agricultural sector is continuously under development and will be improved and developed in line with the deficiencies are identified and corrected. The objectives for the quality planning, as given in the CLRTAP Emission Inventory Guidebook, which is closely related to the IPCC Good Practice Guidance, are to improve the transparency, consistency, comparability, completeness and confidence.

To ensure consistency a procedure for internal quality check are provided. Input of external data is checked and certain time series have been prepared for both the activity data, the emission factors and implied emission factors, 1985 - 2011. The annual change for each emission source on activity will be checked for significant differences and if necessary explained. Considerable variation between years can reveal miscalculations or changes in methods. All checks of all activity data, emission factor, implied emission factor and other important key parameters are provided and achieved in excel spread sheet.

Activity data and emission factors are collected and discussed in cooperation with specialists and researchers at different institutes and research departments. As a consequence, both data and methods are evaluated continuously according to latest knowledge and information. A more detailed description of quality assurance and quality control is given in the Denmark´s National Inventory Report 2012 - submitted under the United Nations Framework Convention on Climate Change (http://www2.dmu.dk/pub/sr19.pdf).

6.10 Recalculations

Compared with the previous NH_3 and PM emissions inventory (submission 2012), some changes and updates have been made. These changes cause a decrease in the NH_3 emission (2007 – 2009), an increase in the NH_3 emission in 2010 and an increase in the PM emission in 2000-2010, see Table 6.24.

Table 6.24 Changes in NH_3 and PM emission in the agricultural sector compared to NFR reported last year.

NH_3 emission, Gg NH_3	1985	1990	1995	2000	2005	2008	2009	2010
2011 submission	116.78	113.45	97.14	87.11	79.16	74.78	72.16	71.76
2012 submission	116.78	113.45	97.14	87.11	79.16	73.90	71.56	71.85
Difference, %	0.00	0.00	0.00	0.00	0.00	-1.17	-0.84	0.13

PM emission, Gg TSP	2000	2005	2008	2009	2010
2011 submission	11.41	12.00	11.18	11.09	11.57
2012 submission	11.45	12.05	11.26	11.15	11.65
Difference, %	0.38	0.45	0.67	0.62	0.70

There have been no changes in the methodology.

Emission of NH_3 has decreased 1-2 % in the period 2007-2009 and increased 0.1 %in 2010 compared to the submission 2011. The main reason for the decrease is an adjustment of normative figures for the period 2007-2010. For 2010 a change of the number of animals for some categories is made and this influences the emission to increase. The number of animals is changed for fur animals due to updated numbers from DSt and for weaners, fattening pigs and hens due to and error in the calculations.

Activity data for sewage sludge have been changed for 2010 due to updated data from the Danish AgriFish Agency.

Emission of PM increased all years due to correction of some data for non-dairy cattle and laying hens. Furthermore is the production cycle in 2010 changed for weaners, fattening pigs and hens due to changes in the number of animals.

6.11 Planned improvements

In recent years, there has been focus on reduction of the NH_3 emission and especially the possibilities for emission reduction in housings. A number of investigations to estimate the effects from technical measures on the emission have been initiated. Until now, still relatively few housings have implemented NH_3 reduction technologies, but there is no doubt, that the ammonia reducing technology will play an important role in the future. When data are available, it is planned to implement the effect of the reducing technology in the emission inventory.

It is planned to include the dust emission from arable farming – i.e. harvesting and field preparation by machines. At the moment there are no resources to implement this, but Denmark has noticed that the ERT strongly encourage making further efforts to include it.

At present no PM emission from fur animals and no NMVOC emission from all animals (NFR 4B) is included in the inventory due to lack of resources.

The QA/QC plan for the agricultural sector is still under development. Until now, the main focus has been on the internal procedure check as described in Section 6.9. There is still a need to provide the procedure for control of the inventory data calculations. This mean to identify the possibility to compare the calculations made by other institutions or organisations e.g. calculation of total N-excretion made by the DCA-Danish Centre for Food and Agriculture, Aarhus University. Furthermore, it is a need to consider how to ensure a quality assurance procedure for the entire inventory. To implement these activities there is a need for more resources than are currently allocated to the emission inventory

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7 Waste (NFR sector 6)

The waste sector consists of the four main NFR categories 6A Solid waste disposal on land, 6B Waste-Water handling, 6C Waste incineration and 6D Other waste. Table 7.1 below shows the relevant SNAP codes for the waste sector.

Table 7.1 Link between SNAP codes and NFR sectors.

SNAP code	SNAP name	NFR code
090401	Managed Waste Disposal on Land	6A
090402	Unmanaged Waste Disposal Sites	6A
090403	Other	6A
091001	Waste water treatment in industry	6B
091007	Latrines	6B
091002	Waste water treatment in residential/commercial sect.	6B
090201	Incineration of domestic or municipal wastes	6C
090202	Incineration of industrial wastes (except flaring)	6C
090204	Flaring in chemical industries	6C
090205	Incineration of sludge from waste water treatment	6C
090207	Incineration of hospital wastes	6C
090208	Incineration of waste oil	6C
090901	Incineration of corpses	6C
090902	Incineration of carcasses	6C
090700	Open burning of agricultural wastes	6C
091003	Sludge spreading	6D
091005	Compost production	6D
091006	Biogas production	6D
091008	Other production of fuel (refuse derived fuel)	6D
091009	Accidental fires	6D

Incineration of waste (municipal, industrial, clinical and hazardous) in Denmark is done with energy recovery and therefore the emissions are included under the relevant sectors under NFR sector 1A. The documentation for waste incineration is included in Chapter 3.2.

7.1 Solid waste disposal on land

Major emissions from landfilling are emissions of greenhouse gases, i.e. CH_4. It is assumed that landfilling also leads to emission of small quantities of NMVOC, CO, NH_3 and NO_x. PM emissions are emitted from waste handling as well, but these have not been included in the current submission.

For the 2013 submission Denmark has not estimated emissions of air pollutants from solid waste disposal. The draft EMEP/EEA Guidebook contains a default NMVOC emission factor, however due to limited resources it has not been possible to estimate the emissions.

7.2 Wastewater handling

According to the EMEP/EEA Guidebook wastewater handling can be a source for emissions of POPs, NMVOC, NH_3 and CO. Of these pollutants only NMVOC is thought to be significant.

For the current submission Denmark has not estimated emissions of air pollutants from wastewater handling. The EMEP/EEA Guidebook contains a default NMVOC emission factor for latrines and wastewater handling, however due to limited resources it has not been possible to estimate the emissions.

7.3 Waste incineration

Incineration of municipal, industrial, clinical and hazardous waste takes place with energy recovery, therefore the emissions are included in the relevant subsectors under NFR sector 1A. For documentation please refer to Chapter 3.2. Flaring off-shore and in refineries are included under NFR sector 1B2c, for documentation please refer to Chapter 3.4. No flaring in chemical industry occurs in Denmark.

7.3.1 Human cremation

The incineration of human bodies is a common practice that is performed on an increasing part of the yearly deceased. All Danish incineration facilities use optimised and controlled incineration, with temperatures reaching 800-850 °C, secondary combustion chambers, controlled combustion air flow and regulations for coffin materials.

However, the emissions of especially Hg caused by cremations can still contribute to a considerable part of the total national emissions. In addition to the most frequently discussed emissions of Hg and PCDD/Fs (dioxins and furans), are the emissions of compounds like SO_2, NO_x, NMVOC, CO, other heavy metals (As, Cd, Cr, Cu, Ni, Pb, Se, Zn), particulate matter, HCB, PAHs and PCBs.

Crematoria are usually located within cities, close to residential areas and normally, their stacks are relatively low. Therefore environmental and human exposure is likely to occur as a result of emissions from cremation facilities.

Methodology

During the 1990es all Danish crematoria were rebuilt to meet new standards. This included installation of secondary combustion chambers and in most cases, replacement of old primary incineration chambers (Schleicher et al., 2001). All Danish crematoria are therefore performing controlled incinerations with a good burn-out of the gases, and a low emission of pollutants.

Following the development of new technology, the emission limits for crematoria were lowered again in January 2011. These new standard terms were originally expected from January 2009 but were postponed two years for existing crematoria. Table 7.2 shows a comparison of the emission limits from February 1993 and the new standard limits.

Table 7.2 Emission limit values mg per Nm^3 at 11 % O_2 (Schleicher & Gram, 2008).

Component	Report 2/1993	Standard terms (1/2011)
	Emission limit value mg/normal m^3 at 11 % O_2	
Total dust	80	10
CO	50	50
Hg	No demands	0.1
Other demands:		
Stack height	3 m above rooftop	3 m above rooftop
Temperature in stack	Minimum 150 °C	Minimum 110 °C
Flue gas flow in stack	8 – 20 m/s	No demands
Temperature in after burner	850 °C	800 °C
Residence time in after burner	2 seconds	2 seconds
Odour	The crematory must not cause noticeable odour in the surroundings	The crematory must not cause odour nuisance outside the crematory perimeter, that is significant according to the supervisory authority

To meet the new terms, some crematoria are rebuilt to larger capacity while others are closed (MILIKI, 2006). In 2011, there were 28 operating crematoria in Denmark, some with multiple furnaces (DKL, 2012).

Crematoria that are not closed are equipped with flue gas cleaning (bag filters with activated carbon). The use of air pollution control devices, and activated carbon, for the removal of Hg will also reduce the flue gas concentration of dioxins, PAHs and odour. Existing knowledge on the reduction efficiencies justifies that no emission limits are necessary (Schleicher & Gram, 2008).

Activity data

Table 7.3 shows the development in total number of deceased persons (Statistics Denmark, 2012), number of cremations and the development in the fraction of cremated corpses from the total number of deceased (DKL, 2012). Annex 2D Table 2D-1 presents data for the entire time series.

Table 7.3 Data human cremations (DKL 2012, Statistics Denmark 2012).

	1980	1985	1990	1995	2000
Nationally deceased	55939	58378	60926	63127	57998
Cremations	33986	36705	40991	43847	41651
Cremation fraction, %	60.8	62.8	67.3	69.5	71.8
Continued	2001	2002	2003	2004	2005
Nationally deceased	58355	58610	57574	55806	54962
Cremations	41707	42539	41997	41555	40758
Cremation fraction, %	71.5	72.6	72.9	74.5	74.2
Continued	2006	2007	2008	2009	2010
Nationally deceased	55477	55604	54591	54872	54368
Cremations	41233	41766	41788	42408	42050
Cremation fraction, %	74.3	75.1	76.6	77.3	77.3
Continued	2011				
Nationally deceased	52516				
Cremations	41248				
Cremation fraction, %	78.6				

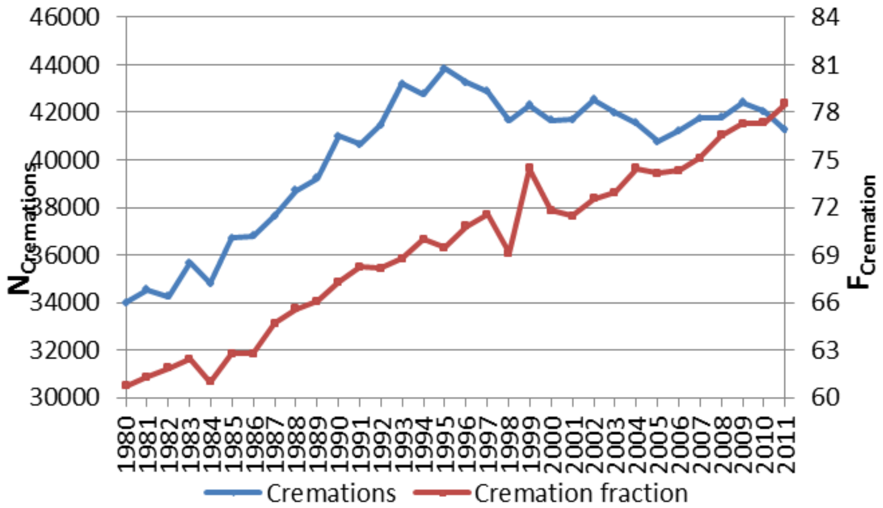

Figure 7.1 Illustration of the development in cremations (DKL 2012), where the number of cremations, $N_{cremations}$, is shown at the left Y-axis. The cremation percentage, $F_{cremations}$, shows the percentage of cremated deceased of the total number of deceased for the years 1984 to 2011. Data for 1980-1983 are estimated values, for details on the estimation, see Annex 2D-1.

Even though the total number of annual cremations is fluctuating, the cremation percentage has been steadily increasing since 1984, and is likely to continue to increase.

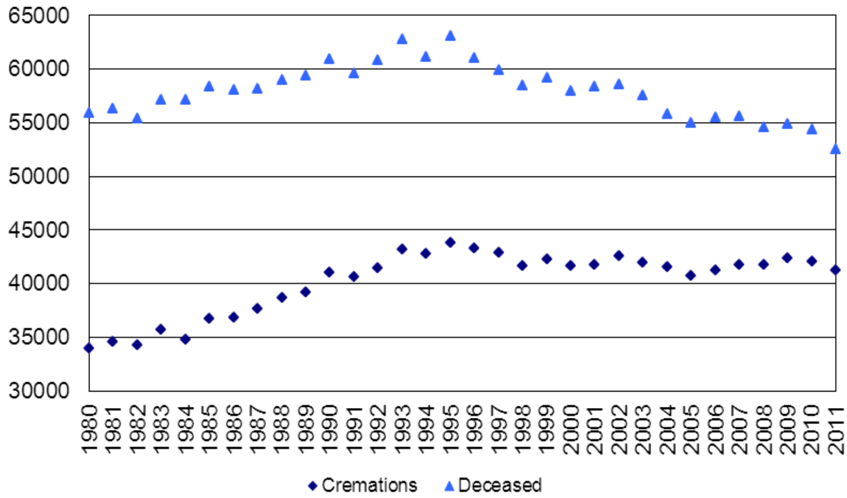

Figure 7.2 Trends of the activity data for cremation of human bodies and the national number of deceased persons.

Figure 7.2 presents the trend of the number of deceased persons together with the activity data for human cremation. The figure shows a direct connection between the number of deceased and the activity of human cremation as the two trends are quite similar. Figure 7.2 also shows the effect of the increasing fraction of cremated bodies, as the number of cremations is not decreasing along with the number of deceased. The cremation fraction has increased from 67 % in 1990 to 79 % in 2011; the trend of this fraction is shown in Figure 7.1, Table 7.3 and Annex 2D Table 2D-1.

Emission factors

For crematoria, emissions are calculated by multiplying the total number of cremations by the emission factors. Since there are no continuous measurements available of the annual emission from Danish crematoria, the estimation of emissions is based on emission factors from literature. The estimation is based on the measurements performed in countries that are comparable with Denmark. By comparable is meant countries that use similar incineration processes, similar cremation techniques including support fuel and have a similar composition of sources to lifetime exposure, lifetimes and coffins.

Table 7.4 Emission factors for human cremation with references.

Pollutant name	Unit	Emission factor*	Reference
SO_2	kg/body	0.113	Santarsiero et al., 2005
NO_X	kg/body	0.825	Santarsiero et al., 2005
NMVOC	kg/body	0.013	EEA, 1996
CO	kg/body	0.010	Schleicher et al., 2001
NH_3		NA	
TSP	kg/body	0.039	Webfire, 2012
PM_{10}	kg/body	0.035	Webfire, 2012
$PM_{2.5}$	kg/body	0.035	Webfire, 2012
As	g/body	0.014	Webfire, 2012
Cd	g/body	0.005	Webfire, 2012
Cr	g/body	0.014	Webfire, 2012
Cu	g/body	0.012	Webfire, 2012
Hg	g/body	1.12	Kriegbaum et al., 2005
Ni	g/body	0.017	Webfire, 2012
Pb	g/body	0.030	Webfire, 2012
Se	g/body	0.020	Webfire, 2012
Zn	g/body	0.160	Webfire, 2012
HCB	mg/body	0.152	Toda, 2006
PCDD/F	µg I-TEQ/body**	0.350	Schleicher et al., 2001
Benzo(b)flouranthene	µg/body	7.21	Webfire, 2012
Benzo(k)flouranthene	µg/body	6.44	Webfire, 2012
Benzo(a)pyrene	µg/body	13.20	Webfire, 2012
Indeno(1,2,3-c-d)pyrene	µg/body	6.99	Webfire, 2012
PCBs	mg/body	0.414	Toda, 2006

*NA = not applicable. ** I-TEQ: International Toxicity Equivalents.

The average body weight of cremated corpses is assumed to be 65 kg.

Fluegas cleaning efficiencies are based on measurements performed at Danish crematoria and expert judgements, and are 75 % for PCDD/Fs, 99 % for particles and Hg and 98 % for other metals. These abatement efficiencies are implemented from 2011.

It has not been possible to find data for ammonia. Ammonia might appear in lesser amounts, but will most likely be converted to NO_X at the high incineration temperatures.

There might for some emission factors be included a small part of the support fuel (natural gas) if the measurements were taken early in the burning process. This would then be a double counting since fuel for cremation is reported under NFR code 1A4a, commercial and institutional. However, this double counting is considered miniscule.

Emissions

Table 7.5 shows the total emissions from selected years. To view the entire time series 1980-2011, see Annex 2D-3. The dioxin emission is given in I-TEQ; i.e. International Toxicity Equivalents which is a weighted addition of congener toxicity with reference to 2,3,7,8-TCDD (Seveso-dioxin).

Table 7.5 Total national emissions from incineration of corpses.

	Unit	1980	1985	1990	1995	2000	2001	2002	2003	2004	2005
SO_2	Mg	3.83	4.14	4.62	4.94	4.70	4.70	4.80	4.74	4.69	4.60
NO_X	Mg	28.04	30.28	33.82	36.17	34.36	34.41	35.09	34.65	34.28	33.63
NMVOC	Mg	0.442	0.477	0.533	0.570	0.541	0.542	0.553	0.546	0.540	0.530
CO	Mg	0.340	0.367	0.410	0.438	0.417	0.417	0.425	0.420	0.416	0.408
TSP	Mg	1.31	1.42	1.58	1.69	1.61	1.61	1.64	1.62	1.60	1.57
PM_{10}	Mg	1.18	1.27	1.42	1.52	1.45	1.45	1.48	1.46	1.44	1.41
$PM_{2.5}$	Mg	1.18	1.27	1.42	1.52	1.45	1.45	1.48	1.46	1.44	1.41
As	kg	0.46	0.50	0.56	0.60	0.57	0.57	0.58	0.57	0.57	0.55
Cd	kg	0.17	0.18	0.21	0.22	0.21	0.21	0.21	0.21	0.21	0.21
Cr	kg	0.46	0.50	0.56	0.59	0.56	0.57	0.58	0.57	0.56	0.55
Cu	kg	0.42	0.46	0.51	0.55	0.52	0.52	0.53	0.52	0.52	0.51
Hg	kg	38.03	41.07	45.87	49.06	46.61	46.67	47.60	46.99	46.50	45.61
Ni	kg	0.59	0.64	0.71	0.76	0.72	0.72	0.74	0.73	0.72	0.71
Pb	kg	1.02	1.10	1.23	1.32	1.25	1.25	1.28	1.26	1.25	1.22
Se	kg	0.67	0.73	0.81	0.87	0.82	0.82	0.84	0.83	0.82	0.81
Zn	kg	5.44	5.88	6.56	7.02	6.67	6.68	6.81	6.72	6.65	6.53
HCB	g	5.15	5.56	6.21	6.65	6.31	6.32	6.45	6.37	6.30	6.18
PCDD/F	mg	11.90	12.85	14.35	15.35	14.58	14.60	14.89	14.70	14.54	14.27
benzo(b)flouranthene	g	0.25	0.26	0.30	0.32	0.30	0.30	0.31	0.30	0.30	0.29
benzo(k)flouranthene	g	0.22	0.24	0.26	0.28	0.27	0.27	0.27	0.27	0.27	0.26
benzo(a)pyrene	g	0.45	0.48	0.54	0.58	0.55	0.55	0.56	0.55	0.55	0.54
indeno(1,2,3-c-d)pyrene	g	0.24	0.26	0.29	0.31	0.29	0.29	0.30	0.29	0.29	0.28
PCB	g	14.05	15.18	16.95	18.13	17.22	17.25	17.59	17.37	17.18	16.86

Continued	Unit	2006	2007	2008	2009	2010	2011
O_2	Mg	4.65	4.71	4.71	4.78	4.74	4.65
NO_X	Mg	34.02	34.46	34.48	34.99	34.69	34.03
NMVOC	Mg	0.536	0.543	0.543	0.551	0.547	0.536
CO	Mg	0.412	0.418	0.418	0.424	0.421	0.412
TSP	Mg	1.59	1.61	1.61	1.64	1.62	0.02
PM_{10}	Mg	1.43	1.45	1.45	1.47	1.46	0.01
$PM_{2.5}$	Mg	1.43	1.45	1.45	1.47	1.46	0.01
As	kg	0.56	0.57	0.57	0.58	0.57	0.01
Cd	kg	0.21	0.21	0.21	0.21	0.21	0.004
Cr	kg	0.56	0.57	0.57	0.58	0.57	0.01
Cu	kg	0.51	0.52	0.52	0.53	0.52	0.01
Hg	kg	46.14	46.74	46.76	47.45	47.05	0.46
Ni	kg	0.71	0.72	0.72	0.73	0.73	0.01
Pb	kg	1.24	1.25	1.25	1.27	1.26	0.02
Se	kg	0.82	0.83	0.83	0.84	0.83	0.02
Zn	kg	6.60	6.69	6.69	6.79	6.73	0.13
HCB	g	6.25	6.33	6.33	6.43	6.37	6.25
PCDD/F	mg	14.43	14.62	14.63	14.84	14.72	3.61
benzo(b)flouranthene	g	0.30	0.30	0.30	0.31	0.30	0.30
benzo(k)flouranthene	g	0.27	0.27	0.27	0.27	0.27	0.27
benzo(a)pyrene	g	0.54	0.55	0.55	0.56	0.56	0.54
indeno(1,2,3-c-d)pyrene	g	0.29	0.29	0.29	0.30	0.29	0.29
PCB	g	17.05	17.27	17.28	17.54	17.39	17.06

7.3.2 Animal cremation

The burning of animal carcasses in animal crematoria follows much the same procedure as human cremation. Animal cremation facilities use similar two chambered furnaces and controlled combustion. However, animals are burned in special designed plastic (PE) bags rather than coffins.

Emissions from animal cremation are also similar to that of human cremation, with the exception of heavy metals which is in general lower for carcasses.

Animal cremations are performed in two ways, individually where the owner often pays for receiving the ashes in an urn or collectively which is most often the case with animal carcasses that are left at the veterinarian.

Methodology

Open burning of animal carcasses is illegal in Denmark and is not occurring and small-scale incinerators are not known to be used at Danish farms. Livestock that is diseased or in other ways unfit for consumption is disposed of through rendering plants, incineration of livestock carcasses is illegal and these carcasses are therefore commonly used in the production of fat and soap at Daka Bio-industries.

The only animal carcasses that are approved for cremation in Denmark are deceased pets and animals used for experimental purposes, where the burning must take place at a specialised animal crematorium. There are four animal crematoria in Denmark but one of these is situated at the AVV waste incineration site. The special designed cremation furnaces are at this location connected to the flue gas cleaning equipment of the municipal waste incineration plant and the emission from the cremations are included in the yearly inventory from AVV and consequently included under waste incineration with energy recovery in this report. Therefore, only three animal crematoria are discussed in this section.

Animal by-products are considered as waste, and animal crematoria must therefore comply with the EU requirements for waste incineration. The EU directive (2000/76/EF) on waste incineration has been transferred into Danish law (Statutory order nr.162[1]).

The incineration of animal carcasses is, as the incineration of human corpses, performed in special furnaces. All furnaces at Danish pet crematoria have primary incineration chambers with temperatures around 850 ºC and secondary combustion chambers with temperatures around 1100 ºC. The fuel used at the Danish facilities is natural gas.

Emissions from pet cremations are calculated for SO_2, NO_x, NMVOC, CO, NH_3, particles, heavy metals (As, Cd, Cr, Cu, Ni, Pb, Se, Zn), HCB, dioxins/furans, PAHs and PCBs. For the pollutants SO_2, NO_x, CO, As, Se, HCB, PAHs and PCBs, emissions are estimated by using the same emission factors as for human cremation.

Activity data

Activity data for the incineration of animal carcasses are gathered directly from the pet crematoria. There is no national statistics available on the activi-

[1] Bekendtgørelse no. 162 of March 11 2003 on waste incineration plants.

ty from these facilities. The precision of activity data therefore depends on the information provided by the crematoria.

The following Table 7.6 lists the four Danish pet crematoria, their foundation year and provides each crematorium with an id letter.

Table 7.6 Animal crematoria I Denmark.

Id	Name of crematorium	Founded in
A	Dansk Dyrekremering ApS	May 2006
B	Ada's Kæledyrskrematorium ApS	Unknown, existed in more than 30 years, assumed 1980
C	Kæledyrskrematoriet	2006
D	Kæledyrskrematoriet v. Modtagestation Vendsyssel I/S	-

Crematoria D is situated at the AVV municipal waste incineration site and the emissions from this site are, as previously mentioned, included in the yearly inventory from AVV and consequently included under waste incineration with energy recovery in this report. Therefore, only crematoria A-C are considered in this chapter.

Table 7.7 lists the activity data for crematoria A, B, C and the total amount of incinerated carcasses. The complete time series can be found in Annex 2D-2.

Table 7.7 Activity data. Source: direct contact with all Danish crematoria.

	1980	1985	1990	1995	2000	2001
Crematorium A, Mg	-	-	-	-	-	-
Crematorium B, Mg	50	100	150	200	443	452
Crematorium C, Mg	-	-	-	-	-	-
Total, Mg	50	100	150	200	443	452
	2002	2003	2004	2005	2006	2007
Crematorium A, Mg	-	-	-	-	300	450
Crematorium B, Mg	451	462	571	762	798	802
Crematorium C, Mg	-	-	-	-	18	32
Total, Mg	451	462	571	762	1116	1284
	2008	2009	2010	2011		
Crematorium A, Mg	450	450	475	220		
Crematorium B, Mg	848	853	934	959		
Crematorium C, Mg	40	36	40	40		
Total, Mg	1338	1339	1449	1219		

Crematorium B delivered exact yearly activity data for the years 1998-2011. They are not certain about the founding year but have existed for more than 30 years. It is assumed that crematorium B was founded in January 1980. The estimated activity data for 1980-1997 are shown as the thick line in Figure 7.3.

It is not possible to extrapolate data back to 1980 because the activity, due to the steep increase, in this case would become negative from 1993 and back in time.

Statistical data describing the national consumption for pets including food and equipment for pets were evaluated as surrogate data. These statistical data show an increase of consumption of 6 % from 1998 to 2000, in the same period the national amount of cremated animal carcasses increased with 89 % and no correlation seems to be present. Since there are no other available data on the subject of pets, it is concluded that there are no surrogate data available. The activity data for the period of 1980-1997 are estimated by an expert judgement. The estimated data are shown in Table 7.7, Figure 7.3 and Annex 2D Table 2D-2.

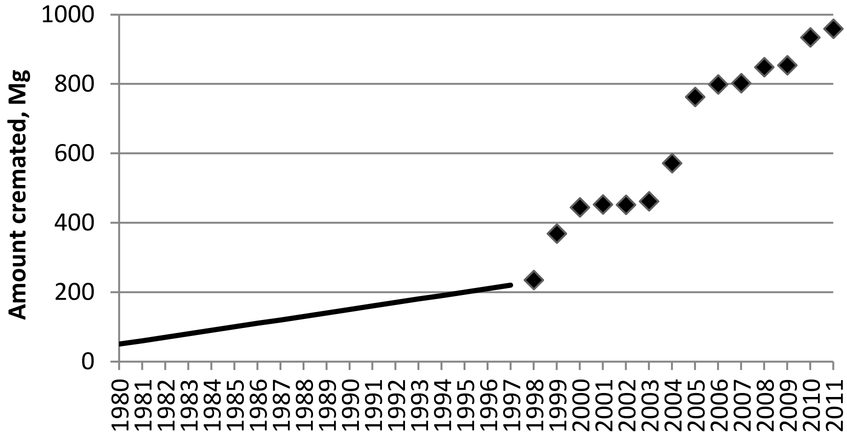

Figure 7.3 The amount of cremated carcasses in Mg at crematorium B, which is the oldest and largest crematorium in Denmark. Data from 1998-2011 are delivered by the crematorium and is considered to be exact; these data are marked as points. Data from 1980-1997 are estimated and are shown as the thick line in the figure.

Emission factors

The EMEP/EEA Guidebook (EEA, 2009) is the only available source to emission factors for NMVOC, NH_3, TSP, PM_{10}, $PM_{2.5}$ and PCDD/F. It also provides an emission factor for PAHs but does not specify on the single congeners.

Chen et al. (2004) is the only available source to emission factors for the heavy metals Cd, Cr, Cu, Ni, Pb and Zn.

The emission factors of the remaining pollutants SO_2, NO_x, CO, As, Se, HCB, PAHs and PCB are collected from the section on human cremation, and it is assumed that humans and animals are similar in composition for this purpose.

There is a good agreement between the emission factors for animal and human cremation for PCDD/F and a relatively good agreement for NMVOC, TSP, PM_{10}, $PM_{2.5}$ and heavy metals.

No data was available for the emission of Hg in animal cremations. The emission factor accepted for human incineration is not accepted in the case of Hg, because the Hg emission from human cremations primarily stems from tooth fillings.

Table 7.8 Emission factors for animal cremation with references, per Mg.

Pollutant	Unit	Emission factor	Source
SO_2	kg	1.73*	Santarsiero et al, 2005
NO_X	kg	12.69*	Santarsiero et al, 2005
NMVOC	kg	2 00	EEA, 2009
CO	kg	0.15*	Schleicher et al., 2001
NH_3	kg	1.90	EEA, 2009
TSP	kg	2.18	EEA, 2009
PM_{10}	kg	1.53	EEA, 2009
$PM_{2.5}$	kg	1.31	EEA, 2009
As	g	0.21*	Webfire, 2012
Cd	g	0.01	Chen et al., 2004
Cr	g	0.07	Chen et al., 2004
Cu	g	0.02	Chen et al., 2004
Hg	-	NAV	-
Ni	g	0.06	Chen et al., 2004
Pb	g	0.18	Chen et al., 2004
Se	g	0.30*	Webfire, 2012
Zn	g	0.19	Chen et al., 2004
HCB	mg	2.33*	Toda, 2006
PCDD/F	µg I-TEQ	10.00	EEA, 2009
Benzo(b)flouranthene	mg	0.11*	Webfire, 2012
Benzo(k)flouranthene	mg	0.10*	Webfire, 2012
Benzo(a)pyrene	mg	0.20*	Webfire, 2012
Indeno(1,2,3-c-d)pyrene	mg	0.11*	Webfire, 2012
PCB	mg	6.36*	Toda, 2006

* Emission factors from human cremations.

Emissions

For the incineration of animal carcasses, emissions are calculated by multiplying the amount of incinerated animals by the emission factors.

Emissions are shown in the following Table 7.9. Emissions for the full time series are shown in Annex 2D Table 2D-4.

Table 7.9 Total national emissions from incineration of carcasses.

	unit	1980	1985	1990	1995	2000	2001	2002	2003	2004	2005
SO_2	Mg	0.09	0.17	0.26	0.35	0.77	0.78	0.78	0.80	0.99	1.32
NO_X	Mg	0.63	1.27	1.90	2.54	5.63	5.74	5.73	5.86	7.25	9.68
NMVOC	Mg	0.10	0.20	0.30	0.40	0.89	0.90	0.90	0.92	1.14	1.52
CO	Mg	0.01	0.02	0.02	0.03	0.07	0.07	0.07	0.07	0.09	0.12
NH_3	Mg	0.10	0.19	0.29	0.38	0.84	0.86	0.86	0.88	1.09	1.45
TSP	Mg	0.11	0.22	0.33	0.44	0.97	0.99	0.98	1.01	1.25	1.66
PM_{10}	Mg	0.08	0.15	0.23	0.31	0.68	0.69	0.69	0.71	0.87	1.17
$PM_{2.5}$	Mg	0.07	0.13	0.20	0.26	0.58	0.59	0.59	0.60	0.75	1.00
As	kg	0.01	0.02	0.03	0.04	0.09	0.09	0.09	0.10	0.12	0.16
Cd	kg	0.001	0.001	0.002	0.002	0.004	0.005	0.005	0.005	0.01	0.01
Cr	kg	0.004	0.01	0.01	0.01	0.03	0.03	0.03	0.03	0.04	0.05
Cu	kg	0.001	0.002	0.003	0.004	0.01	0.01	0.01	0.01	0.01	0.02
Ni	kg	0.003	0.01	0.01	0.01	0.03	0.03	0.03	0.03	0.03	0.05
Pb	kg	0.01	0.02	0.03	0.04	0.08	0.08	0.08	0.08	0.10	0.14
Se	kg	0.02	0.03	0.05	0.06	0.13	0.14	0.14	0.14	0.17	0.23
Zn	kg	0.01	0.02	0.03	0.04	0.08	0.09	0.09	0.09	0.11	0.14
HCB	g	0.12	0.23	0.35	0.47	1.03	1.05	1.05	1.08	1.33	1.78
PCDD/F	mg	0.50	1.00	1.50	2.00	4.43	4.52	4.51	4.62	5.71	7.62
benzo(b)flouranthene	g	0.01	0.01	0.02	0.02	0.05	0.05	0.05	0.05	0.06	0.08
benzo(k)flouranthene	g	0.005	0.01	0.01	0.02	0.04	0.04	0.04	0.05	0.06	0.08
benzo(a)pyrene	g	0.01	0.02	0.03	0.04	0.09	0.09	0.09	0.09	0.12	0.15
indeno(1,2,3-c-d)pyrene	g	0.01	0.01	0.02	0.02	0.05	0.05	0.05	0.05	0.06	0.08
PCB	g	0.32	0.64	0.95	1.27	2.82	2.88	2.87	2.94	3.63	4.85
Continued	unit	2006	2007	2008	2009	2010	2011				
SO_2	Mg	1.94	2.23	2.32	2.32	2.51	2.11				
NO_X	Mg	14.17	16.30	16.99	16.99	18.39	15.47				
NMVOC	Mg	2.23	2.57	2.68	2.68	2.90	2.44				
CO	Mg	0.17	0.20	0.21	0.21	0.22	0.19				
NH_3	Mg	2.12	2.44	2.54	2.54	2.75	2.32				
TSP	Mg	2.43	2.80	2.92	2.92	3.16	2.66				
PM_{10}	Mg	1.71	1.96	2.05	2.05	2.22	1.86				
$PM_{2.5}$	Mg	1.46	1.68	1.75	1.75	1.90	1.60				
As	kg	0.23	0.27	0.28	0.28	0.30	0.25				
Cd	kg	0.01	0.01	0.01	0.01	0.01	0.01				
Cr	kg	0.08	0.09	0.09	0.09	0.10	0.09				
Cu	kg	0.02	0.03	0.03	0.03	0.03	0.02				
Ni	kg	0.07	0.08	0.08	0.08	0.09	0.07				
Pb	kg	0.20	0.23	0.24	0.24	0.26	0.22				
Se	kg	0.34	0.39	0.41	0.41	0.44	0.37				
Zn	kg	0.21	0.24	0.25	0.25	0.28	0.23				
HCB	g	2.60	2.99	3.12	3.12	3.38	2.84				
PCDD/F	mg	11.16	12.84	13.38	13.39	14.49	12.19				
benzo(b)flouranthene	g	0.12	0.14	0.15	0.15	0.16	0.14				
benzo(k)flouranthene	g	0.11	0.13	0.13	0.13	0.14	0.12				
benzo(a)pyrene	g	0.23	0.26	0.27	0.27	0.29	0.25				
indeno(1,2,3-c-d)pyrene	g	0.12	0.14	0.14	0.14	0.16	0.13				
PCB	g	7.10	8.17	8.51	8.52	9.22	7.75				

7.4 Other waste

This category is a catch all for the waste sector. Emissions in this category could stem from sludge spreading, compost production, accidental fires, biogas production and other combustion without energy recovery.

7.4.1 Sludge spreading

Sludge from wastewater treatment plants is only spread out in the open with the purpose of fertilising crop fields. Emissions that derive from this activity are covered in Chapter 6.

7.4.2 Compost production

This section covers the biological treatment of solid waste called composting. Pollutants that are emitted from this process are ammonia (NH_3) and carbon monoxide (CO).

Methodology

Emissions from composting have been calculated according to a country specific method.

In Denmark, composting of solid biological waste includes composting of:

- garden and park waste (GPW),
- organic waste from households and other sources,
- sludge and,
- home composting of garden and vegetable food waste.

In 2001, 123 composting facilities treated only garden and park waste (type 2 facilities), nine facilities treated organic waste mixed with GPW or other organic waste (type 1 facilities) and 10 facilities treated GPW mixed with sludge and/or “other organic waste” (type 3 facilities). 92 % of these facilities consisted entirely of windrow composting which is a primitive technology composting method with natural access to air. It is assumed that all facilities can be considered as using windrow composting.

Composting is performed with primitive technology in Denmark; this means that temperature, moisture and aeration are not consistently controlled or regulated. Temperature is measured but not controlled, moisture is regulated by watering the windrows in respect to weather conditions and aeration is assisted by turning the windrows (Petersen & Hansen, 2003).

During composting a fraction of the degradable organic carbon (DOC) in the waste material is converted into CO. Even though the windrows are regularly turned to support aeration, anaerobic sections are inevitable and will probably cause a small emission of CH_4. In the same manner, aerobic biological digestion of N leads to an emission of NO_X, while the anaerobic decomposition leads to the emission of NH_3 (IPCC, 2006).

Activity data

All Danish waste treatment plants are obligated to statutory registration and reporting of all wastes entering and leaving the plants. All waste streams are weighed, categorised with a waste type and a type of treatment and registered to the ISAG waste information system, which contain data for 1995-2009 (Affaldsstatistik, 2006). The new waste data system that was supposed to replace ISAG as of 2010 is not yet functioning, activity data for 2010-2011 has therefor been estimated by extrapolation.

Figure 7.4 illustrates the nationally composted amount of waste divided in the four categories mentioned earlier.

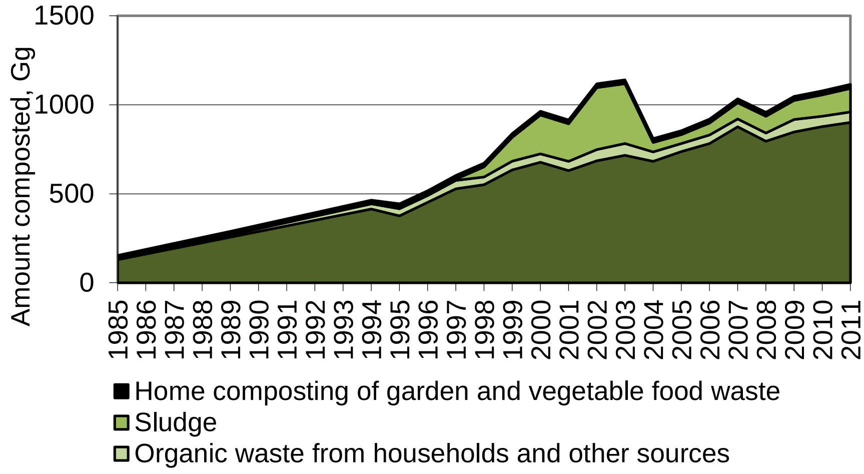

Figure 7.4 National amount of composted waste, these data are also shown in Table 7.11.

Activity data for the years 1995-2009 stems from ISAG data for the categories: “sludge”, “organic waste from households and other sources” and “garden and park waste”. Activities for 2010-2011 are extrapolated using the trend from earlier years.

The Danish legislation on sludge (Slambekendtgørelsen) was implemented in the summer of 2003. This stated that composted sludge may only be used as a fertilizer on areas not intended for growing foods of any kind in at least 2-3 years. This restriction caused the amount of composted sludge to drop drastically from 2003 to 2004.

The trend in composting of sludge does not demonstrate a convincing trend that can be used for estimation of activity data for previous years. Since this activity is insignificant for 1995-1997 (1-2 %) it is assumed to be “not occurring” for 1985-1994.

The amounts of organic waste from households composted in the years 1985-1994 are estimated by multiplying the number of facilities treating this type of waste with the average amount composted per facility in the years 1995-2001 (2.6-3.8 Gg per facility per year). The following Table 7.10 shows the number of composting sites divided in the three types described previously. (Petersen, 2001 and Petersen & Hansen, 2003)

Table 7.10 Number of composting facilities in the years 1985-2001.

Facility type	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Type 1	2	2	3	3	4	5	6	7	8	9
Type 2	6	10	14	18	22	38	54	70	86	102
Type 3	0	0	0	0	0	1	2	2	3	4
Total	8	12	17	21	26	44	62	79	97	115

Continued

Facility type	1995	1996	1997	1998	1999	2000	2001
Type 1	13	14	13	14	13	11	9
Type 2	113	108	99	102	111	115	123
Type 3	9	9	11	10	10	7	10
Total	136	133	126	130	139	138	149

Type 1 waste treatment sites normally includes biogas producing facilities, but these are not included in Table 7.10.

Activity data for composting of garden and park waste (GPW) includes wood chipping. Compost data for GPW provided by Petersen (2001) and Petersen & Hansen (2003) indicates that for 1997-2001, wood chipping accounts for about 3 % of the total chosen activity data for GPW provided by the ISAG database. Activity data for GPW for the years 1985-1994 and 2010-2011 are estimated by extrapolating the trend.

The last waste category involved in composting is home composting of garden waste and vegetable waste. The activity data for this category is known from Petersen & Kielland (2003) to be 21.4 Gg in 2001. It is assumed that the following estimates made by Petersen & Kielland (2003) are valid for all years 1985-2011.

- 28 % of all residential buildings with private gardens (including summer cottages) are actively contributing to home composting.
- 14 % of all multi-dwelling houses are actively contributing to home composting.
- 50 kg waste per year will in average be composted at every contributing residential building.
- 10 kg waste per year will in average be composted at every contributing multi-dwelling house.

The total number of occupied residential buildings, summer cottages and multi-dwelling houses are found at the Statistics Denmark website. The calculated activity data for home composting of garden and vegetable waste are shown in Table 7.11 and Annex 2D Table 2D-5.

Table 7.11 Activity data composting, Gg.

	1985	1990	1995	2000	2001	2002	2003	2004	2005
Composting of garden and park waste	130	288	376	677	630	685	716	682	737
Composting of organic waste from households and other sources	5	16	40	47	52	63	66	53	45
Composting of sludge	NAV	NAV	7	218	211	348	336	53	50
Home composting of garden and vegetable food waste	19	20	21	21	21	22	22	22	22
Total	154	324	444	963	914	1118	1140	810	854

Continued	2006	2007	2008	2009	2010	2011
Composting of garden and park waste	782	876	795	847	877	901
Composting of organic waste from households and other sources	48	44	46	70	58	59
Composting of sludge	67	91	94	107	120	132
Home composting of garden and vegetable food waste	22	22	22	23	23	23
Total	919	1033	957	1047	1078	1115

NAV = Not available.

Emission factors

The emission from composting strongly depends on both the composition of the treated waste and on process conditions such as aeration, mechanical agitation, moisture control and temperature pattern. (Amlinger et al., 2008).

The emission factors stated in Table 7.12 are considered the best available for the calculation of Danish national emissions from composting.

Table 7.12 Composting emission factors, per Mg.

	Composting of garden and park waste (GPW)	Composting of organic waste	Composting of sludge	Home composting of garden and vegetable food waste
Unit	kg	kg	kg	kg
NO_x	NAV	NAV	NAV	NAV
CO	0.56	NAV	NAV	0.08
NH_3	0.66	0.31	0.02	0.63
Source	Boldrin et al., 2009	Amlinger et al., 2008	Amlinger et al., 2008	Boldrin et al., 2009

Emission factors for composting of GPW and for home composting of garden and vegetable food waste are derived from Boldrin et al. (2009). No other sources were found that describe the emission from home composting.

Two other sources provide emission factors for composting of GPW; Amlinger et al. (2008) and Hellebrand (1998). All three sources give very similar data. Boldrin et al. (2009) is the chosen source since this is a Danish report based on experiments from Danish waste and composting methods.

Emissions from Boldrin et al. (2009) are given in percentage of total degraded carbon or nitrogen respectively. The factors shown in Table 7.12 are calculated by assuming 37.5 % DOC in dry matter, 2 % N in dry matter and 50 % moisture in the waste (Boldrin et al., 2009).

Emission factors for composting of organic municipal waste and sludge are given by Amlinger et al. (2008). Pagans et al. (2006) delivers similar emissions for NH_3 from these waste categories but do not consider any other pollutants. Amlinger et al. (2008) is chosen as the most recent and thorough source to these data.

Emissions

Table 7.13 show the total national emissions from composting. The full time series is shown in Annex 2D Table 2D-6.

Table 7.13 National emissions from composting, Mg.

	1985	1990	1995	2000	2001	2002	2003	2004	2005
CO	74.6	163.5	213.1	382.4	356.0	387.0	404.4	385.3	416.2
NH_3	99.3	207.7	274.1	479.6	450.0	493.4	514.5	481.8	515.5
Continued	2006	2007	2008	2009	2010				
CO	441.5	494.4	448.8	478.2	495.0				
NH_3	546.5	607.8	555.1	597.8	614.2				

7.4.3 Biogas production

Emissions from biogas production are divided and reported in different sections of this inventory according to use.

For the biogas production from organic waste with the purpose of energy production, the fuel consumption rate of the biogas production plants refers to the Danish energy statistics. The applied emission factors are the same as for biogas boilers. See this IIR Chapter 3, Energy.

Biogas production from manure should be included in Chapter 6, Agriculture.

The fugitive emissions of NMVOC and NH_3 from the production of biogas from sludge from waste water treatment should be investigated and possibly added to the IIR Chapter 7.2.

Biogas production in this section only covers fugitive emissions from the handling of biological waste, sludge and manure. This includes activities like storage, pre- and after-treatment and fugitive emissions from the anaerobic digestion that is the actual production. However, emissions on these activities are considered negligible.

7.4.4 Accidental building fires

Emissions from accidental fires are categorised under 6D Other Waste. Pollutants that are emitted from building fires include SO_2, NO_x, NMVOC, CO, heavy metals (As, Cd, Cr, Cu, Hg, Pb), particulate matter, dioxins/furans and PAHs.

Methodology

Emissions from building fires are calculated by multiplying the number of building fires with selected emission factors. Six types of buildings are distinguished with different emission factors: detached houses, undetached houses, apartment buildings, industrial buildings, additional buildings and containers.

Activity data

In January 2005 it became mandatory for the local authorities to register every rescue assignment in the *online data registration- and reporting system* called ODIN, ODIN is developed and run by the Danish Emergency Management Agency (DEMA, 2007).

Activity data for accidental building fires is given by The Danish Emergency Management Agency (DEMA). Fires are classified in four categories: full, large, medium and small. The emission factors comply for full scale fires and the activity data are therefore recalculated as a full scale equivalent where it is assumed that a full, large, medium and a small fire leads to 100 %, 75 %, 30 % and 5 % of a full scale fire respectively.

In practice, a full scale fire is defined as a fire where more than three fire hoses were needed for extinguishing the fire, a full scale fire is considered as a complete burnout. A large fire is in this context defined as a fire that involves the use of two or three fire hoses for fire extinguishing and is assumed to typically involve the majority of a house, an apartment, or at least part of an industrial complex. A medium size fire is in this context defined as a fire involving the use of only 1 fire hose for fire-fighting and will typically involve a part of a single room in an apartment or house. And a small size fire is in this context defined as a fire that was extinguished before the arrival of the fire service, extinguished by small tools or a chimney fire.

The total number of registered fires is known for the years 1989-2011. For the years 2007-2011 the total number of registered building fires is known with a very high degree of detail.

Table 7.14 shows the occurrence of all types of fires (registered for 1989-2011) and the occurrence of building fires (2007-2011) registered at DEMA. The 1980-1988 data for all fires are estimated to be the average of 1989-2010 data. In 2007-2010 the average percentage of building fires, in relation to all fires, was 60 %. The total numbers of building fires 1980-2006 are calculated using this percentage. The full time series is presented in Annex 2D Table 2D-7.

Table 7.14 Occurrence of all fires and building fires.

Year	All fires	Building fires
1980	17751	10621
1985	17751	10621
1990	17025	10187
1995	19543	11694
2000	17174	10276
2001	16894	10108
2002	16362	9790
2003	18443	11035
2004	15927	9530
2005	16551	9903
2006	16965	10151
2007	18263	12527
2008	20643	12124
2009	18930	10652
2010	16728	9325
2011	16157	11447

The building fires that occurred in the years 2007-2011 are subcategorised into six building types; detached houses, undetached houses, apartment buildings, industrial buildings, additional buildings and container fires.

Table 7.15 states the average registered activity data for building fires for the years 2007-2010, divided in both size and building type. The calculated averages describes the average share of building fires from 2007-2010 of a certain type and size, in relation to all building fires in the same four years period.

Table 7.15 Registered occurrence of building fires. (DEMA).

	Size	Detached	Undetached	Apartment	Industry	Additional	Container	All building fires
	full	263	32	24	65	35	11	430
	large	446	112	107	155	358	162	1340
	medium	553	193	601	255	373	1484	3459
	small	1385	394	1260	464	277	316	4096
2010	all	2647	731	1992	939	1043	1973	9325
	full	270	47	35	81	52	8	493
	large	497	111	145	191	355	203	1502
	medium	574	193	654	299	447	2046	4213
	small	1212	393	1464	610	276	489	4444
2009	all	2553	744	2298	1181	1130	2746	10652
	full	312	71	34	82	73	18	590
	large	419	130	119	190	329	239	1426
	medium	638	294	783	312	557	2469	5053
	small	1375	419	1500	566	713	482	5055
2008	all	2744	914	2436	1150	1672	3208	12124
	full	239	77	47	100	39	43	545
	large	391	156	108	218	307	257	1437
	medium	550	379	697	445	550	2300	4921
	small	1189	700	1367	758	967	643	5624
2007	all	2369	1312	2219	1521	1863	3243	12527
	full	2.46	0.50	0.31	0.73	0.44	0.17	4.61
	large	4.01	1.14	1.09	1.69	3.08	1.92	12.93
	medium	5.24	2.33	6.15	2.92	4.30	18.46	39.40
	small	11.77	4.24	12.64	5.36	4.79	4.27	43.06
Average, %	all	23.47	8.21	20.19	10.70	12.61	24.82	100.00

It is assumed that the average percentages provided by the years 2007-2010 shown in Table 7.15 are compliable for the years 1980-2006. Hereby, similar activity data for building fires can be estimated back to 1980.

By applying the damage rates of 100 %, 75 %, 30 % and 5 % corresponding to the damage sizes full, large, medium and small, a full scale equivalent can be determined. Table 7.16 shows the calculated full scale equivalents (FSE). The full time series is shown in Annex 2D-8.

Table 7.16 Accidental building fires full scale equivalent activity data.

	1980	1985	1990	1995	2000	2001	2002	2003	2004	2005
Container fires	782	782	750	861	756	744	721	812	701	729
Detached house fires	810	810	777	892	784	771	747	841	727	755
Undetached house fires	240	240	231	265	233	229	222	250	216	224
Apartment building fires	383	383	367	421	370	364	353	398	343	357
Industry building fire	334	334	320	368	323	318	308	347	300	311
Additional building fires	455	455	437	501	440	433	420	473	408	424

Continued	2006	2007	2008	2009	2010	2011
Container fires	747	958	962	799	594	729
Detached house fires	774	757	886	876	833	818
Undetached house fires	230	343	278	208	194	206
Apartment building fires	366	405	433	413	348	362
Industry building fire	319	435	346	344	281	334
Additional building fires	435	483	523	466	429	740

Emission factors

For building fires, emissions are calculated by multiplying the number of full scale equivalent fires with the emission factors. The emission factors are produced from different measurements and assumptions from literature and expert judgements. When possible, emission factors are chosen that represent conditions that are comparable to Denmark. By comparable is meant countries that have similar building traditions, in relation to the material used in building structure and interior.

In the process of selecting the best available emission factors for the calculation of the emissions from Danish accidental building fires, a range of different sources have been studied. Unfortunately, it is difficult to do an interrelated comparison of the different sources because they all establish emission factors on different assumptions and many of these assumptions are not fully accounted for. Table 7.17 lists the emission factors that were chosen for 2011 as the best available and their respective references.

Table 7.17 Emission factors building fires, 2011.

Compound	Unit /fire	Detached house	Undetached house	Apartment building	Industrial building	Additional building	Container	Source
SO_2	kg	263.9	212.5	124.5	802.9	32.1	2.4	Blomqvist et.al. 2002
NO_x	kg	19.7	15.9	9.3	24.0	1.0	3.0	NAEI, 2009
NMVOC*	kg	98.6	79.4	46.5	120.0	4.8	0.7	NAEI, 2009
CO	kg	276.1	222.3	130.2	336.0	13.4	42.0	NAEI, 2009
TSP	kg	143.8	61.62	43.78	27.2	1.1	23.2	Aasestad, 2007**
PM_{10}	kg	143.8	61.62	43.78	27.2	1.1	23.2	Aasestad, 2007**
$PM_{2.5}$	kg	143.8	61.62	43.78	27.2	1.1	23.2	Aasestad, 2007**
As	g	1.35	0.58	0.41	0.25	0.01	0.22	Aasestad, 2007**
Cd	g	0.85	0.36	0.26	0.16	0.01	0.14	Aasestad, 2007**
Cr	g	1.29	0.55	0.39	0.24	0.01	0.21	Aasestad, 2007**
Cu	g	2.99	1.28	0.91	0.57	0.02	0.48	Aasestad, 2007**
Hg	g	0.85	0.36	0.26	0.16	0.01	0.14	Aasestad, 2007**
Pb	g	0.42	0.18	0.13	0.08	0.003	0.07	Aasestad, 2007**
PCDD/F*	mg	3.5	2.8	1.6	4.2	0.2	1.1	Hansen, 2000
Benzo[b]fluoranthene	g	12.5	10.1	5.9	15.2	0.6	1.9	NAEI, 2009
Benzo[k]fluoranthene	g	4.4	3.5	2.1	5.4	0.2	0.7	NAEI, 2009
Benzo[a]pyrene	g	7.9	6.4	3.7	9.6	0.4	1.2	NAEI, 2009
Indeno[1,2,3-cd]pyrene	g	8.5	6.9	4.0	10.4	0.4	1.3	NAEI, 2009

*Container fires have a different source than the other five categories; Blomqvist et.al. 2002, ** Personal contact with Kristin Aasestad has provided a correction of the units which are inaccurate in the text of Aasestad (2007)

Emission factors for detached, undetached and apartment fires depend on the annual average floor space; see Table 7.18. Industrial, additional and container fires on the other hand are assumed to have a constant size/volume throughout the time series. Emission factors for detached, undetached and apartment fires for 1980-2010 are shown in Annex 2D Table 2D-9, 2D-10 and 2D-11.

Emission factors from Aasestad (2007) are already specified for four of the six building types; detached houses, undetached houses, apartment buildings and industrial buildings. Aasestad (2007) and all other considered sources were converted to match the six building types.

This conversion was performed simply by adjusting the average floor space for each of the building types respectively, whereas factors like loss rate and mass of combustible content per area are not altered.

The average floor space in Danish buildings is stated in Table 7.18. The data are collected from Statistics Denmark and takes into account possible multiple building floors but not attics and basements. For the full time series see Annex 2D Table 2D-12. The average floor space in industrial buildings, schools etc. is estimated to 500 square meters for all years and the average floor space for additional buildings, sheds etc. is estimated to 20 square meters for all years.

Table 7.18 Average floor space in building types.

Year	Detached	Undetached	Apartment
1980	154	130	74
1985	154	130	75
1990	156	129	75
1995	155	129	75
2000	156	131	75
2001	160	131	75
2002	161	131	75
2003	162	131	75
2004	163	132	75
2005	162	131	76
2006	163	132	76
2007	160	132	76
2008	161	133	77
2009	162	133	77
2010	163	134	77
2011	164	132	78

Statistics Denmark (2012).

Emission factors for container fires cannot be calculated based on an average floor space but on an average mass. The average mass of a container is set to 1 Mg and covers all types of containers, from small residential garbage containers to large shipping containers and some types of stocks.

The Swedish source Persson et al. (1998) gives emission factors for NO_x and CO expressed as kg per Mg of object burned and divided in three different objects; house, apartment and schools of average Swedish sizes. The data is based on the distribution of combustible material in the interior of the different building types, and does not take into account the combustible material in the structure itself. These emission factors are recalculated using Danish data for average building sizes, resulting in the subdivision of building types in detached, undetached, apartment, industrial buildings and additional buildings.

Persson et al. (1998) sets a rate of weight loss at 12.4 %, but does not specify any further on different building types. It seems quite unrealistic that the same rate of weight loss applies for houses and industrial buildings, resulting in the conclusion that there is most likely an overestimation on the emission factors for industrial buildings.

In 2002 a report on the further development of this data was published in Blomqvist et al. (2002), this report added data for the amount of combustible material in the building structure. The emission factors from this source is calculated by combining the estimated amount of combustible material in the building structure itself, with the amount of combustible interior estimated in Persson et al. (1998) for the different building types. Again, Danish data for the average floor space in different building types is used to divided the emission factors into the six categories; detached houses, undetached houses, apartment buildings, industrial buildings, additional buildings and container fires.

The emission factors from both Persson et al. (1998) and Blomqvist et al. (2002) are probably overestimated due to building traditions, because wood is used to a further extent in Sweden and Norway contra Denmark where bricks are more common.

The last three sources that were considered are all presented in mass emission per mass burned. For the calculation of these emission factors to a unit that matches the activity data, the building masses are estimated using the same methodology as Hansen (2000) and stated in Table 7.19 for 2011.

Table 7.19 Building mass per building type.

	Unit	Detached house	Undetached house	Apartment building	Industry building	Additional building	Container
Average floor area*	m^2	164	132	78	500	20	-
Building mass per floor area	kg/m^2	40	40	35	30	30	-
Total building mass*	Mg/fire	6.6	5.3	2.7	15.0	0.6	1

* 2011 numbers

Emission factors for particulate matter are available from Aasestad (2007), EIIP (2001), Claire (1999) and NAEI (2009), giving four emission factors that vary from 9.6-143.8 kg PM per full scale fire of a detached house. The best reliable source in this case is believed to be Aasestad (2007) which states both the PM_{10} and the $PM_{2.5}$ to be equal to the TSP. There is however the quite questionable relationship between the different building types that is claimed by Aasestad (2007). Comparing with the Danish average floor areas shown in Table 7.18 and 7.19, it seems illogical that a fire in a detached house will cause more than twice the emission of a fire in an undetached house. That a full scale fire in an apartment building is expected to cause less than a third of the emission of that in a detached house, and that a large fire in an industrial building should cause less than a fifth of the emission from a detached house, even keeping in mind an expected difference in the composition of the interior. Still, Aasestad (2007) is considered the best available.

Aasestad (2007) is the only found source of emission factors for the heavy metals arsenic, cadmium, cobber, chrome, lead and mercury, no emission factors were found for Ni, Se and Zn.

For the emission factor of dioxins and furans there are three sources. Hansen (2000) and UNEP toolkit provides data that are very similar with 50-1000 and 400 µg per Mg respectively. In addition Aasestad (2007) gives an emission factor of 0.0014 mg per fire. Hansen (2000) is chosen as the best reliable source with an average of 475 µg per Mg, translating to 1.44 mg per fire for full scale detached house fires.

NAEI (2009) is the only source that provides data for PAHs, and that gives an emission factor for NMVOC.

Being that Persson et al. (1998) and Blomqvist et al. (2002) are the only sources to a SO_2 emission factor, Blomqvist et al. (2002) is the best available source as this provides a more recent and more detailed method.

Emission factors for NO_x and CO are provided by several sources EIIP (2001), Persson et al. (1998), Blomqvist et al. (2002), Claire (1999) and NAEI (2009). In the case of both pollutants there is a good agreement between the emission factors provided by EIIP (2001), Claire (1999) and NAEI (2009). And in both cases the more recent factors of NAEI (2009) are selected.

No data was available for HCB and PCB. NH_3 is assumed not to be emitted.

Emissions

Table 7.20 shows the total emissions from building fires. The entire time series 1980-2011 is shown in Annex 2D Table 2D-13.

Table 7.20 Emissions from building fires.

	unit	1980	1985	1990	1995	2000	2001	2002	2003	2004	2005
SO_2	Mg	580.42	581.31	559.3	640.2	565.2	560.2	544.4	615.2	532.1	552.4
NO_x	Mg	32.91	32.97	31.8	36.3	32.1	31.9	31.0	35.1	30.4	31.5
NMVOC	Mg	153.34	153.68	148.0	169.3	149.7	148.9	144.8	163.8	141.8	147.2
CO	Mg	460.67	461.60	444.5	508.4	449.5	446.6	434.4	491.3	425.2	441.2
TSP	Mg	175.77	175.77	168.6	193.5	170.1	167.3	162.0	182.6	157.7	163.9
PM_{10}	Mg	175.77	175.77	168.6	193.5	170.1	167.3	162.0	182.6	157.7	163.9
$PM_{2.5}$	Mg	175.77	175.77	168.6	193.5	170.1	167.3	162.0	182.6	157.7	163.9
As	kg	1.65	1.65	1.58	1.81	1.59	1.57	1.52	1.71	1.48	1.54
Cd	kg	1.04	1.04	1.00	1.14	1.00	0.99	0.96	1.08	0.93	0.97
Cr	kg	1.57	1.57	1.51	1.73	1.52	1.50	1.45	1.63	1.41	1.47
Cu	kg	3.66	3.66	3.51	4.02	3.54	3.48	3.37	3.80	3.28	3.41
Hg	kg	1.04	1.04	1.00	1.14	1.00	0.99	0.96	1.08	0.93	0.97
Pb	kg	0.51	0.51	0.49	0.57	0.50	0.49	0.47	0.53	0.46	0.48
PCDD/F	g I-TEQ	6.21	6.22	6.0	6.9	6.1	6.0	5.8	6.6	5.7	5.9
Benzo(b)fluoranthene	kg	20.84	20.88	20.1	23.0	20.3	20.2	19.7	22.2	19.2	20.0
Benzo(k)fluoranthene	kg	7.35	7.36	7.1	8.1	7.2	7.1	6.9	7.8	6.8	7.0
Benzo(a)pyrene	kg	13.16	13.19	12.7	14.5	12.8	12.8	12.4	14.0	12.1	12.6
Indeno(1,2,3-cd)pyrene	kg	14.26	14.29	13.8	15.7	13.9	13.8	13.4	15.2	13.2	13.7

Continued	unit	2006	2007	2008	2009	2010	2011
SO_2	Mg	567.8	683.6	638.3	615.9	543.0	598.2
NO_x	Mg	32.4	37.4	37.2	35.2	31.5	33.7
NMVOC	Mg	151.4	173.5	172.2	164.6	149.1	158.0
CO	Mg	453.9	524.1	520.8	493.0	441.3	471.6
TSP	Mg	168.0	182.3	195.9	185.2	168.8	173.0
PM_{10}	Mg	168.0	182.3	195.9	185.2	168.8	173.0
$PM_{2.5}$	Mg	168.0	182.3	195.9	185.2	168.8	173.0
As	kg	1.57	1.71	1.84	1.74	1.58	1.62
Cd	kg	0.99	1.08	1.16	1.09	1.00	1.02
Cr	kg	1.50	1.63	1.75	1.66	1.51	1.55
Cu	kg	3.49	3.79	4.07	3.85	3.51	3.60
Hg	kg	0.99	1.08	1.16	1.09	1.00	1.02
Pb	kg	0.49	0.53	0.57	0.54	0.49	0.51
PCDD/F	g I-TEQ	6.1	7.1	7.1	6.6	5.9	6.3
Benzo(b)fluoranthene	kg	20.5	23.7	23.6	22.3	20.0	21.3
Benzo(k)fluoranthene	kg	7.2	8.4	8.3	7.9	7.0	7.5
Benzo(a)pyrene	kg	13.0	15.0	14.9	14.1	12.6	13.5
Indeno(1,2,3-cd)pyrene	kg	14.0	16.2	16.1	15.3	13.7	14.6

7.4.5 Accidental vehicle fires

Pollutants that are emitted from accidental vehicle fires include SO_2, NO_x, NMVOC, CO, particulate matter, heavy metals (As, Cd, Cr, Cu, Ni, Pb, Zn), dioxins/furans and PAHs.

Methodology

Emissions from vehicle fires are calculated by multiplying the mass of vehicle fires with selected emission factors. Emission factors are not available for different vehicle types, whereas it is assumed that all the different vehicle types leads to similar emissions. The activity data are calculated as a yearly combusted mass by multiplying the number of different full scale vehicles fires with the Danish registered average weight of the given vehicle type.

Activity data

As with accidental building fires, data for vehicle fires are available through the Danish Emergency Management Agency (DEMA). DEMA provides very detailed data for 2007-2011; the remaining years back to 1980 are estimated by using surrogate data.

Table 7.21 shows the occurrence of fires in general and vehicle fires registered at DEMA. The 1980-1988 data for all fires are estimated to be the average of 1989-2010 data. In 2007-2010 the average percentage of vehicle fires, in relation to all fires, was 20 %. The total numbers of vehicle fires in 1980-2006 are calculated using this percentage. The full time series is presented in Annex 2D Table 2D-7.

Table 7.21 Occurrence of all fires and vehicle fires.

Year	All fires	Vehicle fires
1980	17751	3497
1985	17751	3497
1990	17025	3354
1995	19543	3850
2000	17174	3383
2001	16894	3328
2002	16362	3223
2003	18443	3633
2004	15927	3137
2005	16551	3260
2006	16965	3342
2007	18263	3223
2008	20643	4068
2009	18930	3930
2010	16728	3459
2011	16157	3255

There are fourteen different vehicle categories. The activity data are categorised in passenger cars (lighter than 3500 kg), buses, light duty vehicles (vans and motor homes), heavy duty vehicles (trucks and tankers), motorcycles/mopeds, other transport, caravans, trains, ships, airplanes, bicycles, tractors, combined harvesters and machines.

In the same manner as accidental building fires, the 2007-2011 data from DEMA can be divided in four categories according to damage size. It is assumed that a full scale fire is a complete burnout of the given vehicle, and that a large, medium and small scale fire corresponds to 75, 30 and 5 % of a full scale fire respectively. The total number of full scale equivalent fires (FSE) can be calculated for each of the fourteen vehicle categories for 2007-2011.

The total number of registered vehicles is known from Jensen et al. (2012) and Statistics Denmark (2012). By assuming that the share of vehicle fires in relation to the total number of registered vehicles, of every category respectively, can be counted as constant, the number of vehicle fires is estimated for the years 1980-2006. The numbers of registered vehicles from 1980 to 1984 are extrapolated based on the years 1985 to 1989, where a clear trend has been visible this trend has been extrapolated (e.g. passenger cars), otherwise the average value of 1985 to 1989 has been used (e.g. buses). Table 7.22a, b and c states the total number of national registered vehicles and the number of full scale equivalent vehicle fires. The full time series 1980-2011 is shown in Annex 2D Table 2D-14.

Table 7.22a Number of nationally registered vehicles and full scale equivalent vehicle fires.

	Passenger Cars		Buses		Light Duty Vehicles		Heavy Duty Vehicles	
	Registered	FSE fires	Registered	FSE fires	Registered	FSE fires	Registered	FSE fires
1980	1475109	429	8070	12	99168	10	47428	60
1985	1564449	455	8010	12	147877	14	46962	60
1990	1645587	479	8109	12	192321	19	45664	58
1995	1733405	504	14371	21	228076	22	48077	61
2000	1916686	558	15051	22	272387	27	50227	64
2001	1932741	562	15005	22	283031	28	49885	63
2002	1946353	566	14971	21	295581	29	49208	62
2003	1948967	567	14989	22	309614	30	48653	62
2004	1967643	573	14997	22	336038	33	48318	61
2005	2012399	586	15131	22	372674	36	49311	63
2006	2064005	601	15180	22	414454	40	50691	64
2007	2151344	518	15013	16	402464	19	51758	46
2008	2187294	666	14854	24	398718	44	50606	71
2009	2201821	729	14794	23	373694	48	46585	67
2010	2247021	646	14577	23	362389	38	44812	60
2011	2282304	584	13915	13	343372	43	43639	54

Table 7.22b Number of nationally registered vehicles and full scale equivalent vehicle fires.

	Motorcycles/Mopeds		Caravans		Train		Ship	
	Registered	FSE fires	Registered	FSE fires	Registered	FSE fires	Registered	FSE fires
1980	220273	78			7284	9	2222	25
1985	191478	68			7284	9	2222	25
1990	163133	58	86257	24	7156	9	2324	26
1995	165272	58	95831	26	6854	8	1911	21
2000	233309	82	106935	29	4907	6	1759	19
2001	243020	86	108924	30	4561	5	1797	20
2002	253375	90	110995	30	4169	5	1878	21
2003	256438	91	113338	31	4048	5	1838	20
2004	263472	93	116930	32	3273	4	1783	20
2005	273904	97	121350	33	3195	4	1792	20
2006	287366	102	126011	35	3002	4	1789	20
2007	302475	99	131708	36	2617	2	1755	20
2008	308538	122	136905	45	2588	3	1728	20
2009	307335	128	140366	34	2489	5	1742	22
2010	301562	83	142354	37	2740	2	1773	16
2011	295488	91	142764	34	2943	3	1768	21

Table 7.22c Number of nationally registered vehicles and full scale equivalent vehicle fires.

	Airplane		Tractor		Combined Harvester		Bicycle	Other	Machine
	Registered	FSE	Regis-	FSE fires	Registered	FSE fires	FSE fires	FSE fires	FSE fires
1980	1060	1	143927	87	40557	66			
1985	1060	1	133027	80	37484	61			
1990	1055	1	135980	82	35118	57			
1995	1058	1	134277	81	29291	47			
2000	1070	1	115692	70	24128	39			
2001	1089	1	114369	69	23589	38			
2002	1149	1	112742	68	23065	37			
2003	1083	1	111023	67	22537	37			
2004	1055	1	109610	66	22076	36			
2005	1073	1	107867	65	21436	35			
2006	1039	1	105865	64	20976	34			
2007	1058	1	106025	52	20507	19	2	85	75
2008	1077	1	106025	62	20046	34	4	97	135
2009	1122	1	106025	64	19584	43	3	93	111
2010	1152	1	106025	77	19354	32	4	58	94
2011	1132	0	106025	59	19354	21	3	50	111

The average weight of a passenger car, bus, light commercial vehicle, truck and motorcycle/moped is known for every year back to 1993 (Statistics Denmark 2012). The corresponding weights from 1980 to 1992 and the average weight of the units from the remaining categories are estimated by expert judgment, see Table 7.23 and Annex 2D Table 2D-15.

Table 7.23 Average weight of different vehicle categories, kg.

	Cars	Buses	Vans	Trucks	Motorcycles/ Mopeds
1980	850	10000	2000	15000	80
1985	850	10000	2000	15000	80
1990	850	10000	2000	15000	80
1995	923	10807	2492	14801	107
2000	999	11195	3103	15214	107
2001	1012	11312	3238	14888	108
2002	1024	11387	3333	14486	108
2003	1039	11479	3442	14026	109
2004	1052	11572	3561	13599	110
2005	1068	11560	3793	13258	111
2006	1086	11684	4120	13179	113
2007	1105	11753	4505	13268	114
2008	1122	11700	4710	13246	116
2009	1134	11642	4682	12802	116
2010	1144	11804	4498	11883	117
2011	1154	11907	4296	11291	118

It is assumed that the average weight of a ship equals that of a bus. That tractors and vans weigh the same and that trains, airplanes and combined harvesters have the same average weight as trucks.

Bicycles, machines and other transport can only be calculated for the years 2007-2011 due to the lack of surrogate data (number of nationally registered vehicles). The average weight of a bicycle, machine and other transport is set as 12 kg, 50 % of a car and 40 % of a car respectively. Caravan fires are only calculated for 1990-2011, and the average weight of a caravan is set as 90 % of that of a passenger car.

By multiplying the number of full scale fires with the average weight of the vehicles respectively, the total amount of combusted vehicle mass can be calculated. The result is shown in Table 7.24 and in Annex 2D Table 2D-16.

Table 7.24 Burnt mass of different vehicle categories, Mg

	1980	1985	1990	1995	2000	2001	2002	2003	2004	2005
Passenger cars	365	387	407	466	557	569	580	589	602	626
Buses	116	115	116	223	242	244	245	247	249	251
Light duty vehicles	19	29	37	55	82	89	96	104	117	138
Heavy duty vehicles	902	893	869	903	969	942	904	865	833	829
Motorcycle, moped	6	5	5	6	9	9	10	10	10	11
Other transport	-	-	-	-	-	-	-	-	-	-
Caravan	-	-	18	22	26	27	28	29	30	32
Train	130	130	128	121	89	81	72	68	53	51
Ship	246	246	257	228	218	225	236	233	228	229
Airplane	12	12	12	11	12	12	12	11	10	10
Bicycle	-	-	-	-	-	-	-	-	-	-
Tractor	173	160	164	201	216	223	226	230	235	246
Combine harvester	986	911	854	702	595	569	541	512	486	460
Machine	-	-	-	-	-	-	-	-	-	-
Total	2955	2888	2866	2939	3015	2990	2951	2899	2855	2883

Continued

	2006	2007	2008	2009	2010	2011
Passenger cars	652	572	748	827	739	674
Buses	255	182	283	264	266	160
Light duty vehicles	166	86	207	223	171	185
Heavy duty vehicles	847	608	936	863	715	606
Motorcycle, moped	11	11	14	15	10	11
Other transport	-	47	54	53	33	29
Caravan	34	36	45	34	38	35
Train	47	33	39	63	24	28
Ship	231	234	230	253	189	249
Airplane	10	8	13	13	7	3
Bicycle	-	0	0	0	0	0
Tractor	263	235	290	301	347	254
Combine harvester	448	255	450	552	378	242
Machine	-	33	61	50	43	51
Total	2965	2339	3371	3512	2960	2526

Emission factors

In the process of selecting the best emission factors for the calculation of the emissions from Danish vehicle fires, a range of different sources have been studied. Unfortunately, it is difficult to do an interrelated comparison of the different sources because they all establish emission factors on different assumptions and many of these assumptions are not fully accounted for. Table 7.25 lists the accessible emission factors and their respective references.

Table 7.25 Emission factors vehicle fires.

	Unit, per Mg	Emission factor	Source
SO_2	kg	5	Lönnermark et al., 2004
NO_x	kg	2	Lemieux et al., 2004
NMVOC	kg	8.5	Lönnermark et al., 2004
CO	kg	63	Lönnermark et al., 2004
TSP	kg	2.05	EEA, 2009
PM_{10}	kg	2.05	EEA, 2009
$PM_{2.5}$	kg	2.05	EEA, 2009
As	g	0.01	Lönnermark et al., 2004
Cd	g	0.09	Lönnermark et al., 2004
Cr	g	0.2	Lönnermark et al., 2004
Cu	g	1.5	Lönnermark et al., 2004
Ni	g	0.15	Lönnermark et al., 2004
Pb	g	44.0	Lönnermark et al., 2004
Zn	g	173.0	Lönnermark et al., 2004
PCDD/F	mg	0.04	Hansen, 2000
Benzo(b)fluoranthene	g	32.3	Lemieux et al., 2004
Benzo(k)fluoranthene	g		Lemieux et al., 2004
Benzo(a)pyrene	g	14.7	Lemieux et al., 2004
Indeno(1,2,3-cd)pyrene	g	23.3	Lemieux et al., 2004

PCDD/F has the best documented emission factor as eight sources were found for this group of compounds. There is a very good agreement between the five sources; Hansen (2000), UNEP toolkit (2005), NAEI (2009), Blomqvist et al. (2002) and Schleicher et al. (2004). Hansen (2000) is chosen as the source for the calculation of the PCDD/F emission from vehicle fires.

Lönnermark et al. (2004) is the only available source of emission factors for heavy metals (As, Cd, Cr, Cu, Hg, Ni, Pb, Se, Zn). Lönnermark et al. (2004) is also found to be the best available source to SO_2 and NMVOC. Emission factors from this source were derived by both small-scale and full-scale tests.

There are three sources to particle matter emission factors; EEA (2009), Lönnermark et al. (2004) and Lemieux et al. (2004). The two latter provides data of 38 and 50 kg per Mg combusted vehicle respectively. The emission factor supplied by the Guidebook is given in kg per fire and is therefore divided by the average weight of a passenger car in 2009, to give a factor that is better comparable; the resulting emission factor is of 2.0 kg per Mg.

Persson et al. (1998) and Lemieux et al. (2004) delivers very similar emission factors for NO_x, the more recent Lemieux et al. (2004) is chosen as the most reliable. Lemieux et al. (2004) is also considered the best available in the case of PAHs.

Emission factors for CO are available from the same two sources and from Lönnermark et al. (2004); in this case Lönnermark et al. (2004) and Lemieux et al. (2004) deliver the same factor. Lönnermark et al. (2004) is chosen as the best available source since it is based on experimental data.

No data was available for Hg, Se, HCB and PCBs. NH_3 is assumed not to be emitted.

Emissions

Table 7.26 shows the total national emissions from vehicle.

Table 7.26 National emissions from vehicle fires.

	unit	1980	1985	1990	1995	2000	2001	2002	2003	2004	2005
SO_2	Mg	14.78	14.44	14.33	14.70	15.08	14.95	14.75	14.49	14.28	14.42
NO_X	Mg	5.91	5.78	5.73	5.88	6.03	5.98	5.90	5.80	5.71	5.77
NMVOC	Mg	25.12	24.55	24.36	24.98	25.63	25.42	25.08	24.64	24.27	24.51
CO	Mg	186.18	181.97	180.57	185.18	189.95	188.37	185.90	182.61	179.87	181.64
TSP	Mg	6.06	5.92	5.88	6.03	6.18	6.13	6.05	5.94	5.85	5.91
PM_{10}	Mg	6.06	5.92	5.88	6.03	6.18	6.13	6.05	5.94	5.85	5.91
$PM_{2.5}$	Mg	6.06	5.92	5.88	6.03	6.18	6.13	6.05	5.94	5.85	5.91
As	kg	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Cd	kg	0.27	0.27	0.26	0.27	0.28	0.28	0.27	0.27	0.26	0.27
Cr	kg	0.59	0.58	0.57	0.59	0.60	0.60	0.59	0.58	0.57	0.58
Cu	kg	4.43	4.33	4.30	4.41	4.52	4.49	4.43	4.35	4.28	4.32
Ni	kg	0.44	0.43	0.43	0.44	0.45	0.45	0.44	0.43	0.43	0.43
Pb	kg	130.03	127.09	126.11	129.33	132.67	131.56	129.83	127.54	125.62	126.86
Zn	kg	511.24	499.69	495.84	508.51	521.62	517.28	510.48	501.45	493.93	498.79
PCDD/F	g I-TEQ	0.12	0.12	0.11	0.12	0.12	0.12	0.12	0.12	0.11	0.12
Benzo(b)fluoranthene	kg	47.73	46.65	46.29	47.47	48.69	48.29	47.65	46.81	46.11	46.56
Benzo(k)fluoranthene	kg	47.73	46.65	46.29	47.47	48.69	48.29	47.65	46.81	46.11	46.56
Benzo(a)pyrene	kg	43.44	42.46	42.13	43.21	44.32	43.95	43.38	42.61	41.97	42.38
Indeno(1,2,3-cd)pyrene	kg	68.86	67.30	66.78	68.49	70.25	69.67	68.75	67.54	66.52	67.18

Continued	unit	2006	2007	2008	2009	2010	2011
SO_2	Mg	14.82	11.70	16.85	17.56	14.80	12.63
NO_X	Mg	5.93	4.68	6.74	7.02	5.92	5.05
NMVOC	Mg	25.20	19.88	28.65	29.85	25.16	21.47
CO	Mg	186.77	147.38	212.37	221.24	186.51	159.15
TSP	Mg	6.08	4.80	6.91	7.20	6.07	5.18
PM_{10}	Mg	6.08	4.80	6.91	7.20	6.07	5.18
$PM_{2.5}$	Mg	6.08	4.80	6.91	7.20	6.07	5.18
As	kg	0.04	0.03	0.05	0.05	0.04	0.04
Cd	kg	0.27	0.22	0.31	0.32	0.27	0.23
Cr	kg	0.59	0.47	0.67	0.70	0.59	0.51
Cu	kg	4.45	3.51	5.06	5.27	4.44	3.79
Ni	kg	0.44	0.35	0.51	0.53	0.44	0.38
Pb	kg	130.44	102.93	148.32	154.52	130.26	111.15
Zn	kg	512.88	404.70	583.18	607.54	512.16	437.03
PCDD/F	g I-TEQ	0.12	0.09	0.13	0.14	0.12	0.10
Benzo(b)fluoranthene	kg	47.88	37.78	54.44	56.72	47.81	40.80
Benzo(k)fluoranthene	kg	47.88	37.78	54.44	56.72	47.81	40.80
Benzo(a)pyrene	kg	43.58	34.39	49.55	51.62	43.52	37.13
Indeno(1,2,3-cd)pyrene	kg	69.08	54.51	78.54	81.83	68.98	58.86

7.4.6 Other

Other combustion sources include open burning of yard waste and bonfires.

In Denmark, the open burning of private yard waste is under different restrictions according to the respective municipality. These restrictions involve what can be burned but also the quantity, how, when and where or in some cases a complete ban. The burning of yard waste is not allowed within residential areas. There is no registration of private waste burning and the activity data on this subject are very difficult to estimate. People are generally encouraged to compost their yard waste or to dispose of it through one of the many waste disposal/recycling sites.

The occurrence of bonfires at midsummer night and in general are also not registered, therefore it has not been possible to obtain activity data.

Due to the cold and wet climatic conditions in Denmark wild fires very seldom occur. Controlled field burnings are included under Chapter 6, Agriculture, and the occasional wild fires should be included under Chapter 8, Other and natural emissions.

7.5 Uncertainties and time series consistency

The uncertainty of the number of human cremations is miniscule, however for the purpose of the calculation it has been set to 1 %.

The uncertainty of the activity data from animal cremations is also minimal for the most recent years (1998-2011) but is increasing back in time (to 200 % in 1980). The uncertainty is set to 80 % for all years.

The uncertainty of the total number of accidental fires is very small, but the division into building and vehicle types and also the calculation of full scale equivalents might lead to a small uncertainty, partly caused by the category "other". The uncertainty for both building and vehicle activity data is therefore set to 10 %. The uncertainty is lowest for the most recent years. The following Tables 7.27 lists the uncertainties for activity data in the waste sector.

Table 7.27 Estimated uncertainty rates for activity data.

	Human cremation	Animal cremation	Composting	Accidental building fires	Accidental vehicle fires
Activity data uncertainty, %	1	80	50	10	10

The uncertainties for emission factors in the waste sector, and at the present level of available information, are listed in Table 7.28.

Table 7.28 Estimated uncertainty rates for emission factors, %.

Pollutant	Human cremation	Animal cremation	Composting	Accidental building fires	Accidental vehicle fires
SO_2	100	100		300	500
NO_x	150	150		500	500
NMVOC	100	300		500	500
CO	150	150	100	500	500
NH_3		300	100		
TSP	500	300		500	700
PM_{10}	500	300		500	700
$PM_{2.5}$	500	300		500	700
As	700	700		500	500
Cd	700	500		500	500
Cr	700	500		500	500
Cu	700	500		500	500
Hg	150			500	
Ni	700	500			500
Pb	600	500		500	500
Se	700	700			
Zn	700	500			500
HCB	500	500			
PCDD/F	300	300		100	100
Benzo(b)flouranthene	1000	1000		500	500
Benzo(k)flouranthene	1000	1000		500	500
Benzo(a)pyrene	1000	1000		500	500
Indeno(1,2,3-c,d)pyrene	1000	1000		500	500
PCB	1000	1 000			

7.5.1 Uncertainty results

The Tier 1 uncertainty estimates for the waste sector are calculated from 95 % confidence interval uncertainties, results are shown in Table 7.29.

Table 7.29 National tier 1 uncertainty results for waste.

Pollutant	Total emission uncertainty, %	Trend 1990-2011, %	Trend Uncertainty, %-age points
SO_2	±290.9	6.8	±14.8
NO_x	±203.4	20.5	±47.3
NMVOC	±437.1	5.3	±19.1
CO	±223.6	44.5	±135.2
NH_3	±107.3	204.3	±171.5
TSP	±478.8	1.2	±15.5
PM_{10}	±480.9	1.0	±15.5
$PM_{2.5}$	±481.6	0.9	±15.6
As	±432.0	-13.0	±175.7
Cd	±412.5	-13.4	±99.7
Cr	±379.4	-18.8	±132.3
Cu	±352.1	-10.8	±47.7
Hg	±347.6	-96.8	±11.0
Ni	±414.4	-59.4	±190.5
Pb	±496.8	-12.5	±13.6
Se	±672.2	-54.8	±403.2
Zn	±499.7	-12.9	±15.5
HCB	±377.8	38.6	±253.9
PCDD/F	±98.7	5.1	±14.6
Benzo(b)flouranthene	±370.6	-6.4	±28.4
Benzo(k)flouranthene	±429.4	-9.5	±18.2
Benzo(a)pyrene	±390.4	-7.7	±24.7
Indeno(1,2,3-c,d)pyrene	±412.9	-8.8	±20.8
PCB	±755.3	38.6	±506.0

*Trend 2000-2011, %

7.6 QA/QC and verification

A list of QA/QC tasks are performed directly in relation to the emissions from the waste sector part of the Danish emission inventories. The following procedures are carried out to ensure the data quality:

- Checking of time series in the NFR and SNAP source categories. Considerable changes are controlled and explained.
- Comparison with the inventory of the previous year. Any major changes are verified.
- A manual log table is applied to collect information about recalculations.
- Some automated checks have been prepared for the emission databases:
- Check of units for fuel rate and emission factors
- Additional checks on database consistency

The QC work will continue in future years.

7.6.1 Data deliveries

Table 7.30 lists the external data deliveries used for the waste emission inventory. Further the table holds information on the contacts at the data delivery companies.

Table 7.30 List of external data sources.

Category	Data description	Activity data, emission factors or emissions	Reference	Contact(s)	Data agreement/ Comment	http, file or folder name
Human cremation	Annual number of cremated persons	Activity data	Association of Danish Crematories	Hanne Ring	Public access	http://www.dkl.dk
Human cremation	Population statistics	Activity data	Statistics Denmark		Public access	http://www.statistikbanken.dk/BEF5
Animal cremation	Annual number of cremated carcasses	Activity data	Dansk Dyre-kremering ApS	Knud Ribergaard	Personal contact	
Animal cremation	Annual number of cremated carcasses	Activity data	Ada's Kæle-dyrskrematorium ApS	Frederik Møller	Personal contact	
Animal cremation	Annual number of cremated carcasses	Activity data	Kæledyrs-krematoriet	Annette Laursen	Personal contact	
Accidental building fires	Average floor space in buildings	Activity data	Statistics Denmark		Public access	http://www.statistikbanken.dk/BOL511
Accidental fires	Categorised fires	Activity data	The Danish Emergency Management Agency	Steen Hjere Nonnemann	Public access	https://statistikbank.brs.dk
Accidental building fires	Building type statistics	Activity data	Statistics Denmark		Public access	http://www.statistikbanken.dk/ BOL11, BOL3, BOL33 and BYGB11
Accidental vehicle fires	Weight categorisation of vehicles (passenger cars, busses, vans and trucks)	Activity data	Statistics Denmark		Public access	http://www.statistikbanken.dk BIL10, BIL12, BIL15 and BIL18
Composting	Waste categories for composting	Activity data	Waste Statistics (Affaldsstatistik)		Public access	http://www2.mst.dk/udgiv/publikationer/2010/978-87-92668-21-9/pdf/978-87-92668-22-6.pdf

7.7 Source-specific recalculations and improvements

No recalculations were made for sector 6.C. Waste Incineration.

For sector 6.D. Waste Other several recalculations were made. Activity data for composting of garden and park waste from the waste statistics includes wood chipping, in previous submissions this relatively small part of the activity was subtracted in the whole time series with help from surrogate data (available for 1997-2000). The influence that this exclusion of wood chipping had on the activity data (3-6 %) could not justify the increase in uncertainty that it caused. Therefore, wood chipping is now included, adding in average 4 % to the total composting activity data.

For accidental building fires, emission factors for particles and heavy metals have been increased with a factor 1000 after personal contact with the author of the source Aasestad (2007). Furthermore, a small mistake in the calculation of FSE activity data for container fires has been corrected, giving a decrease for 1981-2010 between 2 % (2007) and 5 % (2009). Since container fires are just a small part of the fires contributing to emissions from accidental building fires, this recalculation is miniscule.

For accidental vehicle fires, an update in vehicle population data from Jensen et al. (2012) has given a very small decrease in the FSE activity data for accidental truck and passenger car fires.

7.8 Source-specific planned improvements

There are currently no planned improvements for this sector.

7.9 References

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8 Other and natural emissions

Denmark does not report emissions in the NFR category "Other" (NFR 7). Regarding natural emissions volcanoes do not occur in Denmark and hence the category is reported as NO (Not Occurring).

Emissions from forest fires are for most years negligible but have not been estimated. Any other natural emissions to be reported under NFR category 11C have also not been estimated.

9 Reporting spatially distributed emissions on grid

This chapter include descriptions on input data, methodology and results of the Danish gridded emissions for the years 2005 and 2010. A detailed methodological description is given in Plejdrup & Gyldenkærne (2011).

9.1 Background for reporting

According to the UNECE Convention on Long-Range Transboundary Air Pollution parties are obligated to report gridded emissions every fifth year. In the 2012 reporting Denmark reported gridded emissions for the years 2005 and 2010. The mandatory reporting of gridded emissions includes the following 13 pollutants: SO_x, NO_x, NH_3, NMVOC, CO, PM_{10}, $PM_{2.5}$, Pb, Cd, Hg, benzo(b)flouranthene, benzo(k)flouranthene, benzo(a)pyrene, indeno(1,2,3-c,d)pyrene, HCB, and dioxins and furans. The reporting includes GNFR sectoral emissions as well as national total emissions disaggregated to the standard EMEP grid with a resolution of 50 km x 50 km. Table 9.1 lists the categories (sectors) used for reporting gridded emission data based on the Danish inventories.

Table 9.1 GNFR categories and corresponding NFR categories and SNAP IDs in the Danish gridded emission inventory

GNFR ID	GNFR (long name)	NFR	SNAP	Note
A_PublicPower	PublicPower	1A1a	0101, 0102	
B_IndustrialComb	IndustrialCombustion	1A1c, 1A2a, 1A2b, 1A2c, 1A2d, 1A2e, 1A2f i	0103, 0105, 0301, 0302, 0304, 0305, 0306, 0307, 0308, 0309, 0310 , 0311, 0312, 0313, 0314, 0315, 0316, 0320	
C_SmallComb	SmallCombustion	1A4a i, 1A4b i, 1A4c i	0201, 0202, 0203	
D_IndProcess	IndustrialProcesses	2	0303, 0402, 0404, 0405, 0406	
E_Fugitive	Fugitive emissions from fuels	1B1, 1B2	0401, 0501, 0502, 0505, 0506, 0902	
F_Solvents	Solvent and other product use	3	06	
G_RoadRail	RoadRailway	1A3b, 1A3c	07, 0802	
H_Shipping	Shipping	1A3d ii, 1A4c iii	0803, 080402, 080403	
I_OffRoadMob	OffRoadMobile	1A2f ii, 1A4a ii1A4b ii, 1A4c ii, 1A5b	0801, 0806, 0807, 0808, 0809, 0811	
J_AviationLTO	AviationLTO	1A3 a i (i), 1A3 a ii (i)	080501, 080502	
L_OtherWasteDisp	OtherWasteDisposal	6D	0910	
M_WasteWater	WasteWater			NE
N_WasteIncin	WasteIncineration	6C	0909	
O_AgriLivestock	AgricultureLivestock	4B	*	
P_AgriOther	AgricultureOther	4D, 4G	*	
Q_AgriWaste	AgricultureWaste	4F	*	
R_Other	Other			NO
S_Natural	Natural			NO
K_CivilAviCruise	CivilAviationCruise	1A3a ii (ii)	080503	
T_IntAviCruise	IntAviationCruise	1A3a i (ii)	080504	
Z_memo	memo	1A3d i (i)	080404	

* The Danish national emission inventory system for agriculture builds on NFR categories and not SNAP categories as is the case for the remaining sectors in the Danish emission inventory system

Guidelines for reporting emissions of air pollutants on grid are included in UNECE (2009). The methodology in the Danish emission gridding model SPREAD follows the EMEP/EEA Guidebook (2009). The gridded emission data in the 2012 reporting are available at the EIONET Central Data Repository homepage:

http://cdr.eionet.europa.eu/dk/Air_Emission_Inventories/Submission_EMEP_UNECE

Further, a detailed methodological description is given in Plejdrup & Gyldenkærne (2011).

9.2 Methods and data for disaggregation of emission data

A national model for high resolution spatial distribution of emissions to air, the SPREAD model, has been developed at Department of Environmental Science, Aarhus University. SPREAD includes all sources and pollutants in the Danish emission inventory system, and generates emissions on a resolution of 1 km x 1 km.

SPREAD covers the area defined by the Exclusive Economic Zone (EEZ) and the national boarder. Denmark is geographically the peninsula of Jutland and 443 named islands and islets, of which approximately 72 are inhabited. The country is located in Scandinavia neighbouring the sea (the Baltic Sea, Skagerrak, Kattegat and the North Sea) as well as Germany, which Jutland are adjacent to the south (Figure 9.1).

The spatial emission distribution is carried out on the most disaggregated level possible and therefore SPREAD includes a large number of distribution keys related to single sources, sub categories and in a single case to a whole sector. Gridded emissions reported to UNECE LRTAP are based on the results from SPREAD, aggregated on the 50 km x 50 km EMEP grid.

The spatial distribution in SPREAD is based on a number of national geographical data sets. As the model is very complex and include many spatial data, only the most important input data and methodology descriptions are included in the IIR report. For a more detailed description, please refer to Plejdrup & Gyldenkærne (2011).

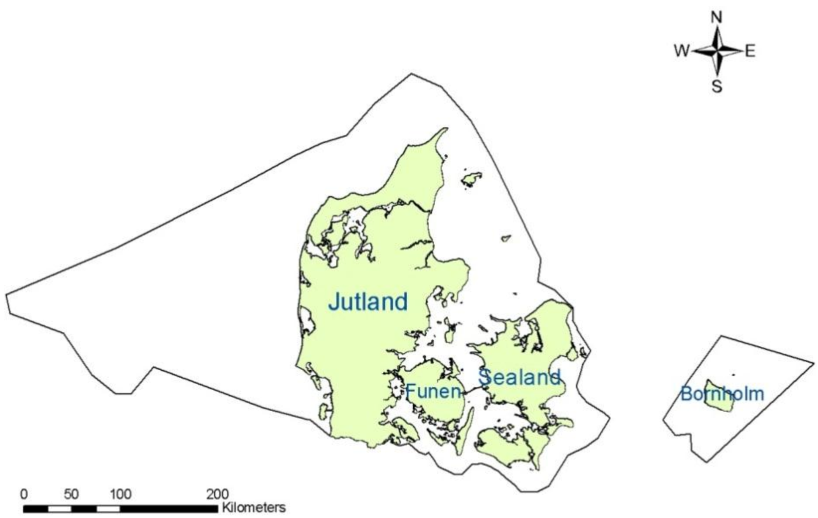

Figure 9.1 Map of Denmark including names of regions and the Exclusive Economic Zone.

9.2.1 The SPREAD model

The distribution in SPREAD is made on SNAP category level to assure the most accurate distribution of the emissions. It has been aimed to use the most disaggregated SNAP level (SNAP 3 level) but for some categories and sectors SNAP 2 or SNAP 1 level has been applied in the distribution model, due to a lack of detailed geographical information. An exception is the agricultural sector, as this sector is not treated on SNAP level in the Danish inventory system. Instead the agricultural data processing is carried out for the relevant NFR categories, and the same approach is applied in SPREAD. The SPREAD model is prepared in order to be applicable for the mandatory reporting of gridded emissions under CLRTAP.

SPREAD includes a number of sub-models covering separate sources or groups of sources in the emission inventory; Large Point Sources, Stationary combustion for point sources, Stationary combustion for area sources, Mobile sources, Aviation, Fugitive emissions from fuels, Industrial Processes, F-gases, Solvent and other product use, Waste, and a number of sub-models for the agricultural sector. All sub-models correspond to the methodology and groupings in the Danish inventory system. A number of sub-models include a higher disaggregation level compared to the NFR tables. Both SNAP and NFR categories are included in all SPREAD sub-models to enable a distribution in agreement with the international guidelines.

Emissions from all Large Point Sources (LPS) are treated in the LPS sub-model in SPREAD. LPSs represent emissions at all SNAP 1 categories except solvents (SNAP 06) and road traffic (SNAP 07). Further, LPSs in agriculture are included in a separate part of the emission database system covering agriculture and are not included in the LPS sub-model in SPREAD. The Point Sources sub-model covers emissions from stationary combustion from point sources, which refer to the large number of plants, for which the fuel consumption is known at plant level but emissions are calculated using standard emission factors.

General methodology

The distribution of emissions in the Danish emission inventory is carried out in databases and in a geographical information system, GIS.

The methodology applied in the part of the distribution carried out in GIS is shortly described in this chapter. The description is made for the Industrial Processes sector as a case, as this distribution is rather simple.

The emission inventory for Industrial Processes covers both point sources and area sources. Emissions from point sources are allocated to the coordinates for the individual plants included in the Danish inventory system and are not relevant in relation to the GIS procedure. Emissions from area sources are calculated from production statistics and the resulting emissions are national totals as allocation of the sources (industrial plants) is not possible with the available data. Instead a proxy for the distribution is applied, in this case the location of industrial areas as given in the national topographic map KORT10 by the National Survey and Cadastre (Figure 9.2). The map of industrial areas is not reflecting differences in the location for different industries, but only holds industrial buildings (referred to as the industrial area as the buildings are treated as areas rather than units). The map is a shape file and the industrial areas are polygons.

Figure 9.2 Segment around Avedøre close to Copenhagen of the map of industrial areas (KORT10).

As SPREAD gives emissions on 1 km x 1 km, the map of industrial areas must be combined with the Danish 1 km x 1 km Grid Net. The grid is an orthogonal coordinate system and the cells are defined and named by their lower left corner coordinates. The grid net map is a shape file and the grid cells are polygons (Figure 9.3).

Figure 9.3 Segment around Avedøre in Copenhagen of the map of the Danish 1 km x 1 km grid net (KORT10).

To be able to distribute the emissions on 1 km x 1 km it is necessary to split the industrial polygons between the grid cells and thereby be able to calculate the industrial area in each grid cell (Figure 9.4). These functionalities are available in GIS, in this case ArcMAP. The split is made using the intersect tool, and afterwards the areas are applied to each cell using the Calculate Area function.

Figure 9.4 Segment around Avedøre in Copenhagen of the map of industrial areas and the Danish 1 km x 1 km grid net (KORT10).

The remaining part of the emission distribution for industrial processes is carried out in a database. The share of the national emissions that should be allocated to each grid cell is calculated as the industrial area of the cell divided by the total industrial area. The same distribution key is applied for all pollutants.

In the case of the Industrial Processes sector only one map is combined with the grid, but more maps or layers could be combined to make a distribution key. This is the case for some sources in the agricultural sector, e.g. emissions from organic soils where the distribution key is based on a map of organic soils, a map of the agricultural fields and the Danish Grid Net. A number of area sources are distributed on line features, e.g. emissions from railways and road traffic. In these cases the lines are split into segments by intersection with the 1 km x 1 km grid net. The emission in each grid cell is calculated as the national emission multiplied by the length of the line segment(s) in the cell and divided by the total length of the line feature.

For some sources the same distribution key can be applied for more or all years, while other sources demands a separate distribution key for every year. For Industrial Processes the distribution key can be applied for more years, as the dataset is not available on annual basis. Further, the industrial area does not change much from year to year. In other cases the distribution keys must be set up on annual basis as large changes occur from year to year. This is the case for e.g. agricultural soils and point sources (PS) in the energy sector.

National geographical data

A large number of national geographical data sets are implemented in the SPREAD model in preparation of the various distribution keys. The data sets are listed in Table 9.2 with specification of data owner and a short description of the content of each data set.

Table 9.2 List of geographic data applied in the emission gridding.

Data owner	Data set	Contents
The National Survey and Cadastre	Topographic map	Geo-referenced basic map layers on administrative units, Land cover, territorial borders, coastline and infrastructure.
National Agency for Enterprise and Construction	Central Dwelling and Building Register (Danish abbreviation BBR)	Geo-referenced information on dwellings and buildings
Danish Ministry of the Environment	The Area Information System (AIS)	National maps of spatial data related to nature and environment (e.g. railways, industrial areas and one-storey settlements)
The Directorate for Food, Fisheries and Agri Business	The Central Husbandry Register (CHR)	Information on stock of livestock at farm level
	The General Agricultural Register (GLR)	Information on agricultural farms and crops on field level
Ministry of food, agriculture and fisheries	The fertilizer and husbandry register (Danish abbreviation GHI)	Information on manure and fertiliser amounts on farm level
	The Land Parcel Identification System (LPIS)	Geo-referenced data on agricultural land parcels, including field IDs for fields located in the parcels
The Central Business Register	Central Business Register (Danish abbreviation CVR)	Geo-referenced information on businesses with a CVR number, e.g. farms
The Central Office of the Civil Registration	The Civil Registration System (Danish abbreviation CPR)	Geo-referenced information on population on address level
The Department of Environmental Science, Aarhus University	National road and traffic database	Geo-referenced traffic load on the Danish road network
The Danish Energy Agency	Energy producer accountings	Geo-referenced information on fuel consumption for district heating and/or power producing plants
	The regional inventory	Regional inventory of energy consumption for heating for oil boilers, natural gas boilers and solid fuel installations on municipality level
DCE - Danish Centre for Environment and Energy	Large Point Sources (LPS)	Geo-referenced information on power plants, large industrial plants and offshore installations
Danish Petroleum association	Service stations	Geo-referenced information on addresses for all Danish service stations
Energinet.dk	Measurement and regulator stations	Geo-referenced information on location of measurement and regulator stations in the Danish natural gas transmission network
Danish Forest and Nature Agency	Military training terrain	Geo-referenced information on military training terrains
The Danish Environmental Protection Agency	Information system for waste and recycling (Danish abbreviation ISAG)	Data on waste treatment companies on address level
Miljøportalen.dk	Waste water treatment plants	Data on waste water treatment on facility level, including flow rates and organic matter content

9.3 Gridded emission data

In this section selected maps of gridded emissions are presented, all referring to the year 2010. The selected maps in Figure 9.5 illustrate the emissions included in the national total in the NFR table (all emissions excluding Civil Aviation - Domestic and International Cruise, and international Maritime Navigation). All figures illustrate the sum of all included GNFR sectors. The Danish high resolution gridded emissions are aggregated on the 50 km x 50 km EMEP grid for reporting to CLRTAP. The share of each 1 km x 1 km grid cell located in the relevant EMEP grid cells are calculated and the aggregated emissions are calculated as the weighted sum of emissions in the 1 km grid cells intersecting each EMEP grid cell being partial or fully part of the Danish Exclusive Economic Zone, EEZ.

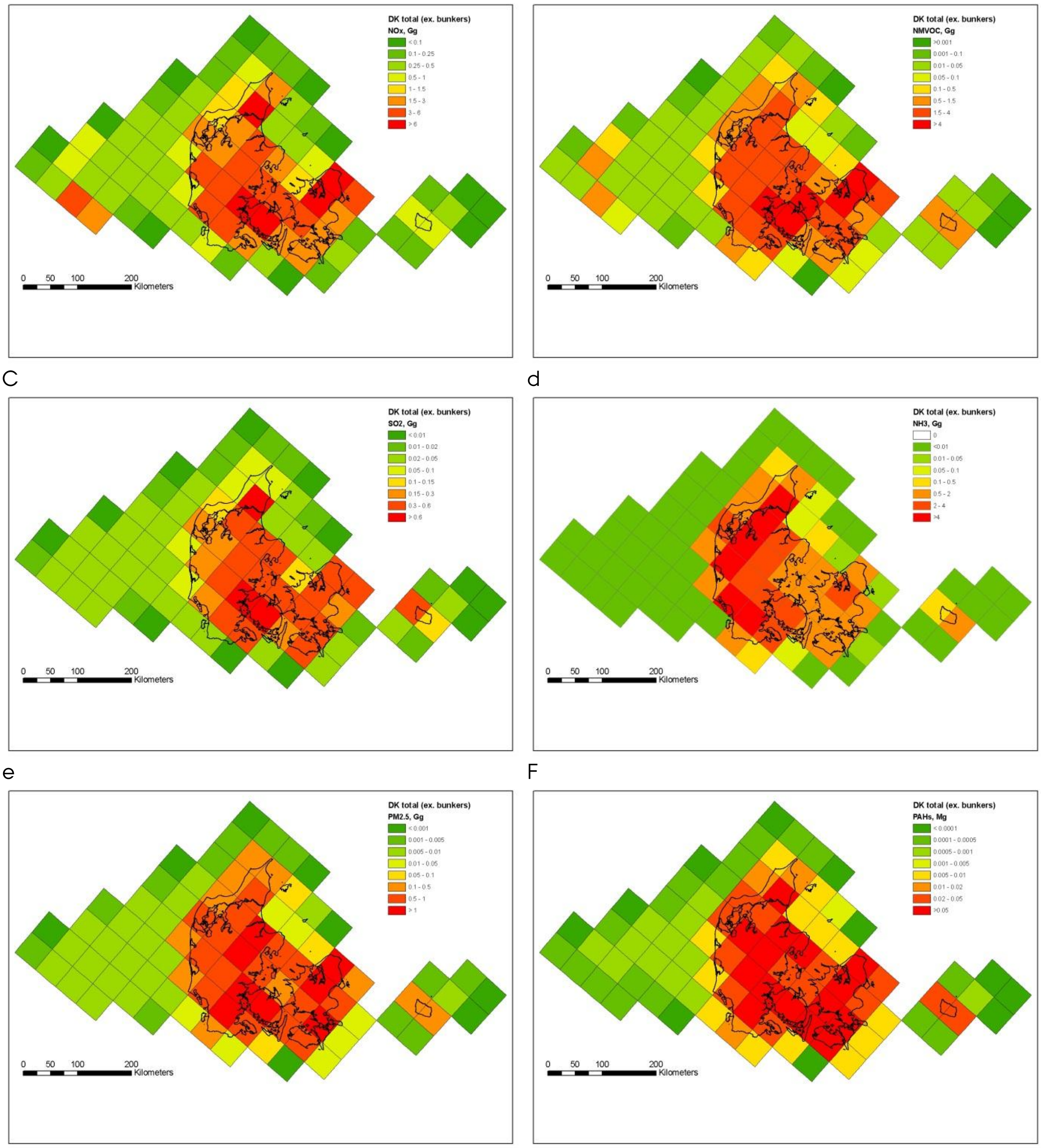

Figure 9.5 National total gridded emissions excluding civil aviation and international navigation of a) NO_x, b) NMVOC, c) SO_2, d) NH_3, e) $PM_{2.5}$ and f) PAHs (the sum of benzo(b)flouranthene, benzo(k)flouranthene, benzo(a)pyrene and indeno(1,2,3-c,d)pyrene) for the year 2010.

Even on the 50 km x 50 km aggregated level spatial patterns from the major sectors are recognisable for different pollutants.

9.3.1 NO_X

The major GNFR source to NO_x emissions is RoadRail followed by Shipping, OffRoadMob, PublicPower and IndustrialComb contributing 36 %, 16 %, 15 %, 15 % and 11 %, respectively. The pattern of the gridded NO_x emissions reflect the major road and rail network located in the eastern part of Jutland and across Funen and Zealand to Copenhagen (figure 9.5). Further, large emissions from PublicPower and IndustrialComb are seen around the major cities. Part of the fugitive emissions is located offshore due to extraction of oil and gas on the North Sea.

9.3.2 NMVOC

The major source of NMVOC is Solvents followed by SmallComb, RoadRail, OffRoadMob and Fugitive contributing 31 %, 18 %, 15 %, 11 % and 11 %, respectively. Both emissions from Solvents, SmallComb and OffRoadMob are to a large degree allocated according to population density and location of one-storey settlements. Part of the fugitive emissions is located offshore due to extraction of oil and gas on the North Sea.

9.3.3 SO_2

The major sources of SO_2 are PublicPower and IndustrialComb followed by SmallComb and Shipping contributing 27 %, 26 %, 19 %, and 13 %, respectively. Even though the SO_2 emission has decreased over the years due to implementation of techniques for reduction of sulphur in the flue gas, it still produces a distinct pattern reflecting the localisation of large power plants in Denmark. The allocation of emissions from IndustrialComb reflect the location of a large number of CHP plants not reported as LPS due to no plant specific emission factors. The allocation of emissions from SmallComb reflects the areas with high population density and mainly one-storey settlements.

For the ferries operating between Copenhagen and Bornholm part of the route is outside the Danish EEZ. The emissions from all these ferries are included in Shipping and distributed on the part of the straight line between Copenhagen and Bornholm inside the Danish EEZ. This leads to an aggregation of the emissions in few EMEP cells, and thereby artificial high emissions at the part of the route inside the EEZ.

9.3.4 NH_3

The agricultural sector is by far the major contributor to the NH_3 emission. 81 % of the national emissions excluding civil aviation and international navigation derive from AgriLivestock and another 15 % from AgriOther. Emission of NH_3 is mainly related to livestock farming and especially to manure management. Emissions are distributed according to very detailed data on animals and fields, and the geographical pattern is in good agreement with the localisation of the major Danish livestock farming in Jutland.

9.3.5 $PM_{2.5}$

The major source of $PM_{2.5}$ emissions is SmallComb contributing 73 %. RoadRail is the second largest source contributing 10 % of the $PM_{2.5}$ emission. Emissions from SmallComb are allocated rather evenly on the land area as a major source is residential wood combustion. Emissions from the residential sector are distributed on municipality level leading to equal emissions for larger areas. Further emissions from CHP plants are located in all parts of the country, also leading to a rather even distribution.

9.3.6 PAHs

Emissions of PAHs are the sum of benzo(b)flouranthene, benzo(k)flouranthene, benzo(a)pyrene and indeno(1,2,3-c,d)pyrene. The major source to emissions of PAHs in Denmark is SmallComb and hereof the all-important source is residential wood combustion. As described for $PM_{2.5}$ the distribution are made on municipality level leading to a rather even distribution on the land area.

9.4 References

EMEP/EEA, 2009: EMEP/EEA air pollutant emission inventory guidebook 2009. Technical guidance to prepare national emission inventories. EEA Technical Report 9/2009. Available at: http://www.eea.europa.eu/publications/emep-eea-emission-inventoryguidebook-2009 (10-02-2011).

Plejdrup, M.S. & Gyldenkærne, S. 2011: Spatial distribution of emissions to air – the SPREAD model. National Environmental Research Institute, Aarhus University, Denmark. 72 pp. – NERI Technical Report no. FR823. Available at: http://www.dmu.dk/Pub/FR823.pdf

UNECE, 2009: Guidelines for estimating and reporting emission data under the Convention on Long-range Transboundary Air Pollution (ECE/EB.AIR-/97). Available at: http://www.ceip.at/fileadmin/inhalte/emep/reporting_2009/Rep_Guidelines_ECE_EB_AIR_97_e.pdf

10 Recalculations and Improvements

In general, considerable work is being carried out to improve the inventories. Investigations and research carried out in Denmark and abroad produce new results and findings which are given consideration and, to the extent which is possible, are included as the basis for emission estimates and as data in the inventory databases. Furthermore, the updates of the EMEP/CORINAIR guidebook (Now the EMEP/EEA Guidebook), and the work of the Task Force on Emission Inventories and its expert panels are followed closely in order to be able to incorporate the best scientific information as the basis for the inventories.

The implementation of new results in inventories is made in a way so that improvements, as far as possible, better reflect Danish conditions and circumstances. This is in accordance with good practice. Furthermore, efforts are made to involve as many experts as possible in the reasoning, justification and feasibility of implementation of improvements.

In improving the inventories, care is taken to consider implementation of improvements for the whole time series of inventories to make it consistent. Such efforts lead to recalculation of previously submitted inventories. This submission includes recalculated inventories for the whole time series. The reasoning for the recalculations performed is to be found in the sectoral chapters of this report. The text below focuses on recalculations, in general, and further serves as an overview and summary of the relevant text in the sectoral chapters. For sector specific planned improvements please also refer to the relevant sectoral chapters.

10.1 Energy

Improvements and updates of the Danish energy statistics are made regularly by the producer of the statistics, the Danish Energy Agency. In close cooperation with the DEA, these improvements and updates are reflected in the emission inventory for the energy sector. The Danish energy statistics have, for the most part, been aggregated to the SNAP categorisation.

The inventories are still being improved through work to increase the number of large point sources, e.g. power plants, included in the databases as individual point sources. Such an inclusion makes it possible to use plant-specific data for emissions, etc., available e.g. in annual environmental reports from the plants in question.

10.1.1 Stationary Combustion

For stationary combustion plants, the emission estimates for the years 1990-2010 have been updated according to the latest energy statistics published by the Danish Energy Agency. The update included both end use and transformation sectors as well as a source category update.

In response to a recommendation during the EU ESD review in May-August of 2012 a recalculation was made regarding LPG use. In previous inventory submissions the LPG use in road transport was calculated bottom-up in the Danish road transport model. However, the difference between the bottom-up calculated LPG use and the official energy statistics was not handled. In the 2013 submission, the residual LPG use has been allocated to stationary combustion in residential plants. The allocation has been done in dialogue with the Danish Energy Agency. In general, the change in emission is very small. For most years, this has meant an increase in the reported emissions, but for some years in the early part of the time series the emissions have decreased.

The disaggregation of emissions in 1A2 Manufacturing industries and construction has been recalculated based on further improvements to the methodology that was implemented in the 2012 submission. This has caused a reallocation of emissions. The main change being that less emission are allocated to *1A2f Other* and that emissions reported for especially *1A2c Chemicals*, *1A2d Pulp, Paper and Print* and *1A2e Food Processing, Beverages and Tobacco* have increased.

A recalculation for stationary combustion was done as a consequence of the recalculation described for national navigation. An additional amount of fuel oil was allocated to stationary combustion in manufacturing industries and stationary combustion in agriculture and forestry.

A reallocation of emissions has been made from *1A1a Public Electricity and Heat Production* to *1A4a Commercial/Institutional*. This is caused by a different categorization of some combustion plants.

The reported SO_2 emission from 1A1b in 2005-2010 is lower than last year due to reallocation of emissions from refineries.

10.1.2 Mobile sources

The following recalculations and improvements of the emission inventories have been made since the emission reporting in 2012.

Road transport

The total mileage per vehicle category from 1985-2010 have been updated based on new data prepared by DTU Transport and minor fuel statistical changes from the Danish Energy Agency. Most importantly, the annual mileage for all vehicle types has been revised based on data from the Danish vehicle inspection and maintenance programme. Further, fuel efficiency data for new sold passenger cars in Denmark has been used to modify the default fuel consumption factors proposed by COPERT IV. Also, revisions have been made to the cut-off mileage for N2O emission deterioration for catalyst cars, being in line with the updated version of COPERT IV.

The percentage emission change interval and year of largest percentage differences (low %; high %, year) for the different emission components are: SO_2 (0 %; 0.2 %, 2010), NO_x (3.1 %; 10.7 %, 2009), NMVOC (-3.2 %; 16.1 %, 2009), CO (-11.7 %; 5.8 %, 1985), NH_3 (-14.1 %; 20.7 %, 2010) and Particulates (0.3 %; 10.6 %, 2009).

Navigation

The ferry share of round trips has been updated for the years 2008-2010 causing minor emission changes for domestic navigation. The following largest percentage differences (in brackets) for domestic navigation are noted for: SO_2 (0.2 %), NO_x (-0.1 %), NMVOC (0.0 %), CO (0.0 %), NH_3 (0.0 %) and Particulates (0.1 %)

Agriculture/forestry/fisheries

The number of machine pool tractors has been updated for the years 2008-2010, causing minor emission changes. The following largest percentage differences (in brackets) for agriculture/forestry/fisheries are noted for: SO_2 (0.1 %), NO_x (0.2 %), NMVOC (0.1 %), CO (0.1 %), NH_3 (0.5 %) and Particulates (0.3 %).

Military

Emission factors derived from the new road transport simulations have caused some emission changes from 1985-2010.The following largest percentage differences (in brackets) for military are noted for: SO_2 (0 %), NO_x (-7 %), NMVOC (-3.7 %,), CO (2.8 %), NH_3 (10.4 %) and Particulates (0.7 %,).

10.1.3 Fugitive emissions

Exploration

An error in the annual reports from the crude oil terminal has been corrected, resulting in a decrease of the NMVOC emission in 2010 of 221 Mg corresponding to 2.4 % of the total fugitive NMVOC in 2010.

Onshore loading

The implied emission factor is updated for 2010 due to the emission reduction initiatives at the crude oil terminal and harbor terminal, resulting in a decrease of the NMVOC emission in of 396 Mg corresponding to 4.3 % of the total fugitive NMVOC in 2010.

Refineries

A reallocation of SO2 emissions from one of the two Danish refineries has been implemented for the years 2005-2010. The reallocation has been carried out in close cooperation with the contact person at the relevant refinery. The changes have led to an increase of the SO2 emission in the NFR category "1 B 2 a iv Refining / storage" of 32 to 182 Mg (min: 2006, max: 2007) corresponding to 3.1 % and 12 % of the total fugitive SO2 emission in 2006 and 2007, respectively.

Natural gas distribution

Natural gas distribution has been recalculated for 2009 and 2010 according to the annual reports from two of the Danish distribution companies. The recalculation has increased the fugitive NMVOC emission by 31 Mg and 1 Mg corresponding to 0.3 % and 0.01 % of the total fugitive NMVOC in 2009 and 2010 respectively.

Venting

A minor change has been applied as the 2010 annual report from a natural gas storage facility has become available. The increase of the NMVOC emission is 4 Mg corresponding to 0.04 %.

10.2 Industrial processes

10.2.1 Mineral products

Emission of SO_2 from brickworks and facilities for production of expanded clay products has been included for 1990-2011. EFs for SO_2 has been estimated as weighted average for the years 2008-10 based on information from environmental reports from the relevant companies. The emissions have been adjusted for energy related emissions.

Time series have been completed to 1985 for 2A5, 2A6 and 2A7d.

10.2.2 Chemical industry

Time series have been completed to 1985 for chemical industry regarding SO_2, NO_x, NMVOC and NH_3.

10.2.3 Other production

Emissions from food and drink have been added for the years 1985-1989. Activity data for sugar have been changed for 2010 and activity data for coffee have been changed for 2006, 2008-10 due to changes in the statistics.

10.3 Solvent and other product use

Improvements and additions are continuously being implemented due to the comprehensiveness and complexity of the use and application of solvents and solvent containing products in industries and households. The main recalculations and their implications on the emissions in the 2013 reporting include the following:

- Recalculations increased the 2010 NMVOC emissions with approximately 500 t. The changes are caused by updated use category distribution keys (UCN) obtained from the Substances in Preparations In the Nordic countries (SPIN) database. Comprised chemicals are ethanol, turpentine, propyl alcohol, cyanates, xylene, butanoles and glycolethers in various use categories. Emission factors are identical to previous calculations, but since distributions of used amounts of chemicals in SNAP categories are adjusted the emissions are changed.
- There are changes in the used amount of ethanol in windscreen washing agents as a result of adjusted ethanol content in imported anti frost agents. This gives changes for all years back to 1985.
- The use of candles is included for the first time in this year's inventory.
- Cross-border shopping has been added to the activity data for tobacco smoking (2000-2011). Cross-border shopping accounts for between 4 % (2009) and 12 % (2002).

10.4 Agriculture

Compared with the previous NH_3 and PM emissions inventory (submission 2012), some changes and updates have been made. These changes cause a decrease in the NH_3 emission (2007 – 2009), an increase in the NH_3 emission in 2010 and an increase in the PM emission in 2000-2010.

Emission of NH_3 has decreased 1-2 % in the period 2007-2009 and increased 0.1 %in 2010 compared to the submission 2011. The main reason for the decrease is an adjustment of normative figures for the period 2007-2010. For 2010 a change of the number of animals for some categories is made and this influences the emission to increase. The number of animals is changed for fur animals due to updated numbers from Statistics Denmark and for weaners, fattening pigs and hens due to and error in the calculations.

Activity data for sewage sludge have been changed for 2010 due to updated data from the Danish AgriFish Agency.

Emission of PM increased all years due to correction of some data for non-dairy cattle and laying hens. Furthermore is the production cycle in 2010 changed for weaners, fattening pigs and hens due to changes in the number of animals.

10.5 Waste

No recalculations were made for sector 6.C. Waste Incineration.

For sector 6.D. Waste Other several recalculations were made. Activity data for composting of garden and park waste from the waste statistics include wood chippings, in previous submissions this relatively small part of the activity was subtracted in the whole time series with help from surrogate data (available for 1997-2000). The influence that this exclusion of wood chippings had on the activity data (3-6 %) could not justify the increase in uncertainty that it caused. Therefore, wood chippings are now included, adding in average 4 % to the total composting activity data.

For accidental building fires, emission factors for particles and heavy metals have been increased with a factor 1000 after personal contact with the author of the reference. Furthermore, a small mistake in the calculation of full-scale equivalent activity data for container fires has been corrected, giving a decrease for 1981-2010 between 2 % (2007) and 5 % (2009). Since container fires are just a small part of the fires contributing to emissions from accidental building fires, this recalculation is miniscule.

For accidental vehicle fires, an update in vehicle population data has given a very small decrease in the FSE activity data for accidental truck and passenger car fires.

11 Projections

Projections of emissions are carried out by DCE at irregular time intervals. The most recent projection was made in 2011, projecting the emissions of NO_x, SO_2, NMVOC, NH_3, TSP, PM_{10} and $PM_{2.5}$ to 2030.

The total projected emissions for these pollutants for 2020 and 2030 are shown in the table below. For further documentation, please refer to Nielsen et al. (2012).

Table 11.1 Projected emissions for 2020 and 2030, tonnes.

Pollutant	2020	2030
SO_2	15 270	15 773
NO_x	84 571	70 323
NMVOC	71 776	65 960
NH_3	57 781	55 092
TSP	30 860	28 591
PM_{10}	22 682	19 970
$PM_{2.5}$	16 892	13 853

11.1 References

Nielsen, O.-K., Plejdrup, M., Winther, M., Mikkelsen, M.H., Albrektsen, R., Nielsen, M., Fauser, P., Hoffmann, L., Hjelgaard, K. & Gyldenkærne, S. 2012. Projection of SO_2, NO_x, NH_3 and particle emissions - 2010-2030. Aarhus University, DCE – Danish Centre for Environment and Energy, 122 pp. Technical Report from DCE – Danish Centre for Environment and Energy No. 7 http://www.dmu.dk/Pub/TR7.pdf

Annex 1 – Key category analysis

Due to a lack of resources a key category analysis has not been performed for this submission.

Annex 2A - Stationary combustion

Annex 2A-1 Correspondence list for SNAP/CRF

Table 2A-1.1 Correspondence list for stationary combustion SNAP/CRF.

SNAP_id	SNAP	CRF_id	CRF_name
010100	Public power	1A1a	Electricity and heat production
010101	Combustion plants >= 300 MW (boilers)	1A1a	Electricity and heat production
010102	Combustion plants >= 50 and < 300 MW (boilers)	1A1a	Electricity and heat production
010103	Combustion plants < 50 MW (boilers)	1A1a	Electricity and heat production
010104	Gas turbines	1A1a	Electricity and heat production
010105	Stationary engines	1A1a	Electricity and heat production
010200	District heating plants	1A1a	Electricity and heat production
010201	Combustion plants >= 300 MW (boilers)	1A1a	Electricity and heat production
010202	Combustion plants >= 50 and < 300 MW (boilers)	1A1a	Electricity and heat production
010203	Combustion plants < 50 MW (boilers)	1A1a	Electricity and heat production
010204	Gas turbines	1A1a	Electricity and heat production
010205	Stationary engines	1A1a	Electricity and heat production
010300	Petroleum refining plants	1A1b	Petroleum refining
010301	Combustion plants >= 300 MW (boilers)	1A1b	Petroleum refining
010302	Combustion plants >= 50 and < 300 MW (boilers)	1A1b	Petroleum refining
010303	Combustion plants < 50 MW (boilers)	1A1b	Petroleum refining
010304	Gas turbines	1A1b	Petroleum refining
010305	Stationary engines	1A1b	Petroleum refining
010306	Process furnaces	1A1b	Petroleum refining
010400	Solid fuel transformation plants	1A1c	Manufacture of solid fuels and other energy industries
010401	Combustion plants >= 300 MW (boilers)	1A1c	Manufacture of solid fuels and other energy industries
010402	Combustion plants >= 50 and < 300 MW (boilers)	1A1c	Manufacture of solid fuels and other energy industries
010403	Combustion plants < 50 MW (boilers)	1A1c	Manufacture of solid fuels and other energy industries
010404	Gas turbines	1A1c	Manufacture of solid fuels and other energy industries
010405	Stationary engines	1A1c	Manufacture of solid fuels and other energy industries
010406	Coke oven furnaces	1A1c	Manufacture of solid fuels and other energy industries
010407	Other (coal gasification, liquefaction, …)	1A1c	Manufacture of solid fuels and other energy industries
010500	Coal mining, oil/gas extraction, pipeline compressors	1A1c	Manufacture of solid fuels and other energy industries
010501	Combustion plants >= 300 MW (boilers)	1A1c	Manufacture of solid fuels and other energy industries
010502	Combustion plants >= 50 and < 300 MW (boilers)	1A1c	Manufacture of solid fuels and other energy industries
010503	Combustion plants < 50 MW (boilers)	1A1c	Manufacture of solid fuels and other energy industries
010504	Gas turbines	1A1c	Manufacture of solid fuels and other energy industries
010505	Stationary engines	1A1c	Manufacture of solid fuels and other energy industries
020100	Commercial and institutional plants (t)	1A4a i	Commercial/Institutional plants
020101	Combustion plants >= 300 MW (boilers)	1A4a i	Commercial/Institutional plants
020102	Combustion plants >= 50 and < 300 MW (boilers)	1A4a i	Commercial/Institutional plants
020103	Combustion plants < 50 MW (boilers)	1A4a i	Commercial/Institutional plants
020104	Stationary gas turbines	1A4a i	Commercial/Institutional plants
020105	Stationary engines	1A4a i	Commercial/Institutional plants
020106	Other stationary equipments (n)	1A4a i	Commercial/Institutional plants
020200	Residential plants	1A4b i	Residential plants
020201	Combustion plants >= 50 MW (boilers)	1A4b i	Residential plants
020202	Combustion plants < 50 MW (boilers)	1A4b i	Residential plants
020203	Gas turbines	1A4b i	Residential plants
020204	Stationary engines	1A4b i	Residential plants
020205	Other equipments (stoves, fireplaces, cooking,…) [2)]	1A4b i	Residential plants
020300	Plants in agriculture, forestry and aquaculture	1A4c i	Agriculture/Forestry/Fishing, Stationary
020301	Combustion plants >= 50 MW (boilers)	1A4c i	Agriculture/Forestry/Fishing, Stationary
020302	Combustion plants < 50 MW (boilers)	1A4c i	Agriculture/Forestry/Fishing, Stationary
020303	Stationary gas turbines	1A4c i	Agriculture/Forestry/Fishing, Stationary
020304	Stationary engines	1A4c i	Agriculture/Forestry/Fishing, Stationary
020305	Other stationary equipments (n)	1A4c i	Agriculture/Forestry/Fishing, Stationary
030100	Comb. in boilers, gas turbines and stationary	1A2f i	Industry-Other
030101	Combustion plants >= 300 MW (boilers)	1A2f i	Industry-Other
030102	Combustion plants >= 50 and < 300 MW (boilers)	1A2f i	Industry-Other
030103	Combustion plants < 50 MW (boilers)	1A2f i	Industry-Other
030104	Gas turbines	1A2f i	Industry-Other
030105	Stationary engines	1A2f i	Industry-Other
030106	Other stationary equipments (n)	1A2f i	Industry-Other
030200	Process furnaces without contact	1A2f i	Industry-Other
030203	Blast furnace cowpers	1A2a	Industry-Iron and steel
030204	Plaster furnaces	1A2f i	Industry-Other
030205	Other furnaces	1A2f i	Industry-Other
030400	Iron and steel	1A2a	Iron and steel
030401	Combustion plants >= 300 MW (boilers)	1A2a	Iron and steel
030402	Combustion plants >= 50 and < 300 MW (boilers)	1A2a	Iron and steel
030403	Combustion plants < 50 MW (boilers)	1A2a	Iron and steel
030404	Gas turbines	1A2a	Iron and steel
030405	Stationary engines	1A2a	Iron and steel
030406	Other stationary equipments (n)	1A2a	Iron and steel
030500	Non-ferrous metals	1A2b	Non-ferrous metals
030501	Combustion plants >= 300 MW (boilers)	1A2b	Non-ferrous metals

SNAP_id	SNAP	CRF_id	CRF_name
030502	Combustion plants >= 50 and < 300 MW (boilers)	1A2b	Non-ferrous metals
030503	Combustion plants < 50 MW (boilers)	1A2b	Non-ferrous metals
030504	Gas turbines	1A2b	Non-ferrous metals
030505	Stationary engines	1A2b	Non-ferrous metals
030506	Other stationary equipments (n)	1A2b	Non-ferrous metals
030600	Chemical and petrochemical	1A2c	Chemicals
030601	Combustion plants >= 300 MW (boilers)	1A2c	Chemicals
030602	Combustion plants >= 50 and < 300 MW (boilers)	1A2c	Chemicals
030603	Combustion plants < 50 MW (boilers)	1A2c	Chemicals
030604	Gas turbines	1A2c	Chemicals
030605	Stationary engines	1A2c	Chemicals
030606	Other stationary equipments (n)	1A2c	Chemicals
030700	Non-metallic minerals	1A2f i	Industry-Other
030701	Combustion plants >= 300 MW (boilers)	1A2f i	Industry-Other
030702	Combustion plants >= 50 and < 300 MW (boilers)	1A2f i	Industry-Other
030703	Combustion plants < 50 MW (boilers)	1A2f i	Industry-Other
030704	Gas turbines	1A2f i	Industry-Other
030705	Stationary engines	1A2f i	Industry-Other
030706	Other stationary equipments (n)	1A2f i	Industry-Other
030800	Mining and Quarrying	1A2f i	Industry-Other
030801	Combustion plants >= 300 MW (boilers)	1A2f i	Industry-Other
030802	Combustion plants >= 50 and < 300 MW (boilers)	1A2f i	Industry-Other
030803	Combustion plants < 50 MW (boilers)	1A2f i	Industry-Other
030804	Gas turbines	1A2f i	Industry-Other
030805	Stationary engines	1A2f i	Industry-Other
030806	Other stationary equipments (n)	1A2f i	Industry-Other
030900	Food and tobacco	1A2e	Food processing, beverages and tobacco
030901	Combustion plants >= 300 MW (boilers)	1A2e	Food processing, beverages and tobacco
030902	Combustion plants >= 50 and < 300 MW (boilers)	1A2e	Food processing, beverages and tobacco
030903	Combustion plants < 50 MW (boilers)	1A2e	Food processing, beverages and tobacco
030904	Gas turbines	1A2e	Food processing, beverages and tobacco
030905	Stationary engines	1A2e	Food processing, beverages and tobacco
030906	Other stationary equipments (n)	1A2e	Food processing, beverages and tobacco
031000	Textile and leather	1A2f i	Industry-Other
031001	Combustion plants >= 300 MW (boilers)	1A2f i	Industry-Other
031002	Combustion plants >= 50 and < 300 MW (boilers)	1A2f i	Industry-Other
031003	Combustion plants < 50 MW (boilers)	1A2f i	Industry-Other
031004	Gas turbines	1A2f i	Industry-Other
031005	Stationary engines	1A2f i	Industry-Other
031006	Other stationary equipments (n)	1A2f i	Industry-Other
031100	Paper, pulp and print	1A2d	Pulp, Paper and Print
031101	Combustion plants >= 300 MW (boilers)	1A2d	Pulp, Paper and Print
031102	Combustion plants >= 50 and < 300 MW (boilers)	1A2d	Pulp, Paper and Print
031103	Combustion plants < 50 MW (boilers)	1A2d	Pulp, Paper and Print
031104	Gas turbines	1A2d	Pulp, Paper and Print
031105	Stationary engines	1A2d	Pulp, Paper and Print
031106	Other stationary equipments (n)	1A2d	Pulp, Paper and Print
031200	Transport equipment	1A2f i	Industry-Other
031201	Combustion plants >= 300 MW (boilers)	1A2f i	Industry-Other
031202	Combustion plants >= 50 and < 300 MW (boilers)	1A2f i	Industry-Other
031203	Combustion plants < 50 MW (boilers)	1A2f i	Industry-Other
031204	Gas turbines	1A2f i	Industry-Other
031205	Stationary engines	1A2f i	Industry-Other
031206	Other stationary equipments (n)	1A2f i	Industry-Other
031300	Machinery	1A2f i	Industry-Other
031301	Combustion plants >= 300 MW (boilers)	1A2f i	Industry-Other
031302	Combustion plants >= 50 and < 300 MW (boilers)	1A2f i	Industry-Other
031303	Combustion plants < 50 MW (boilers)	1A2f i	Industry-Other
031304	Gas turbines	1A2f i	Industry-Other
031305	Stationary engines	1A2f i	Industry-Other
031306	Other stationary equipments (n)	1A2f i	Industry-Other
031400	Wood and wood products	1A2f i	Industry-Other
031401	Combustion plants >= 300 MW (boilers)	1A2f i	Industry-Other
031402	Combustion plants >= 50 and < 300 MW (boilers)	1A2f i	Industry-Other
031403	Combustion plants < 50 MW (boilers)	1A2f i	Industry-Other
031404	Gas turbines	1A2f i	Industry-Other
031405	Stationary engines	1A2f i	Industry-Other
031406	Other stationary equipments (n)	1A2f i	Industry-Other
031500	Construction	1A2f i	Industry-Other
031501	Combustion plants >= 300 MW (boilers)	1A2f i	Industry-Other
031502	Combustion plants >= 50 and < 300 MW (boilers)	1A2f i	Industry-Other
031503	Combustion plants < 50 MW (boilers)	1A2f i	Industry-Other
031504	Gas turbines	1A2f i	Industry-Other
031505	Stationary engines	1A2f i	Industry-Other
031506	Other stationary equipments (n)	1A2f i	Industry-Other
031600	Cement production	1A2f i	Industry-Other

SNAP_id	SNAP	CRF_id	CRF_name
031601	Combustion plants >= 300 MW (boilers)	1A2f i	Industry-Other
031602	Combustion plants >= 50 and < 300 MW (boilers)	1A2f i	Industry-Other
031603	Combustion plants < 50 MW (boilers)	1A2f i	Industry-Other
031604	Gas turbines	1A2f i	Industry-Other
031605	Stationary engines	1A2f i	Industry-Other
031606	Other stationary equipments (n)	1A2f i	Industry-Other
032000	Non-specified (industry)	1A2f i	Industry-Other
032001	Combustion plants >= 300 MW (boilers)	1A2f i	Industry-Other
032002	Combustion plants >= 50 and < 300 MW (boilers)	1A2f i	Industry-Other
032003	Combustion plants < 50 MW (boilers)	1A2f i	Industry-Other
032004	Gas turbines	1A2f i	Industry-Other
032005	Stationary engines	1A2f i	Industry-Other
032006	Other stationary equipments (n)	1A2f i	Industry-Other

1) Not stationary combustion. Included in a NFR sector that also includes stationary combustion plants

2) Stoves, fireplaces and cooking is included in the sector 0202 or 020202 in the Danish inventory.

Annex 2A-2 Fuel rate

Table 2A-2.1 Fuel consumption rate of stationary combustion plants 2011, PJ.

fuel_type	fuel_gr_abbr	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
SOLID	ANODE CARBON										
	COAL	245.7	195.6	238.4	233.0	247.4	301.6	306.0	300.4	280.9	231.3
	SUB-BITUMINOUS										
	BROWN COAL BRI.	0.4	0.5	0.8	0.7	0.6	0.8	0.5	0.3	0.2	0.1
	COKE OVEN COKE	3.5	2.8	2.9	2.5	1.7	2.0	1.6	1.5	1.3	1.0
LIQUID	PETROLEUM COKE	1.1	2.6	6.1	7.2	7.2	8.6	9.7	8.2	5.9	4.6
	RESIDUAL OIL	177.0	137.5	116.7	95.9	87.8	83.7	72.1	52.5	41.2	34.9
	RESIDUAL OIL						0.4	1.3	2.1	2.7	2.6
	GAS OIL	147.2	121.2	107.8	99.6	93.9	109.9	102.7	101.1	83.4	71.2
	KEROSENE	3.9	3.6	3.6	3.6	3.3	4.6	3.9	3.0	1.9	1.8
	NAPHTA							0.1			
	ORIMULSION										
	LPG	6.4	5.6	5.6	5.6	5.9	5.6	5.3	4.6	3.7	3.0
	REFINERY GAS	11.0	11.7	10.6	11.9	12.8	11.5	13.2	13.3	13.6	14.6
GAS	NATURAL GAS	5.0	5.5	5.7	6.3	10.3	30.4	48.5	62.2	67.4	71.7
WASTE	WASTE	10.6	11.3	11.9	12.6	13.1	13.8	14.4	14.3	14.5	15.1
	INDUSTR. WASTES										
BIOMASS	WOOD	11.3	14.0	15.0	15.0	15.1	15.0	17.0	18.0	17.6	17.6
	STRAW	4.8	6.6	7.4	8.3	9.4	9.9	10.3	10.8	11.3	11.7
	BIO OIL								2.0	1.9	1.3
	BIOGAS	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.4	0.6
	BIO PROD GAS										
fuel_type	**fuel_gr_abbr**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**
SOLID	ANODE CARBON										
	COAL	253.4	344.3	286.8	300.8	323.4	270.3	371.9	276.3	234.3	196.5
	SUB-BITUMINOUS										
	BROWN COAL BRI.	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0
	COKE OVEN COKE	1.3	1.4	1.2	1.2	1.2	1.3	1.2	1.3	1.3	1.4
LIQUID	PETROLEUM COKE	4.5	4.4	4.3	5.7	7.5	5.3	5.9	6.0	5.3	6.8
	RESIDUAL OIL	31.4	37.5	37.8	32.1	45.5	32.3	37.0	25.9	29.3	23.0
	RESIDUAL OIL										
	GAS OIL	61.4	65.0	56.1	62.0	53.9	53.7	58.0	51.1	48.4	47.5
	KEROSENE	5.1	0.9	0.8	0.8	0.6	0.6	0.5	0.4	0.4	0.3
	NAPHTA										
	ORIMULSION						19.9	36.8	40.5	32.6	34.2
	LPG	2.9	2.7	2.4	2.5	2.5	2.7	3.0	2.6	2.8	2.5
	REFINERY GAS	14.2	14.5	14.9	15.4	16.4	20.8	21.4	16.9	15.2	15.7
GAS	NATURAL GAS	76.1	86.1	90.5	102.5	114.6	132.7	156.3	164.5	178.7	187.9
WASTE	WASTE	15.5	16.7	17.8	19.4	20.3	22.9	25.0	26.8	26.6	29.1
	INDUSTR. WASTES										
BIOMASS	WOOD	18.2	20.0	21.0	22.2	21.9	21.8	23.4	23.4	22.9	24.3
	STRAW	12.5	13.3	13.9	13.4	12.7	13.1	13.5	13.9	13.9	13.7
	BIO OIL	0.7	0.7	0.7	0.8	0.2	0.3	0.1	0.0	0.0	0.0
	BIOGAS	0.8	0.9	0.9	1.1	1.3	1.8	2.0	2.4	2.6	2.6
	BIO PROD GAS					0.1	0.0	0.0	0.0	0.0	0.1

fuel_type	**fuel_gr_abbr**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**
SOLID	ANODE CARBON										0.0
	COAL	164.7	174.3	174.7	239.0	182.5	154.0	232.0	194.1	170.5	167.7
	SUB-BITUMINOUS										
	BROWN COAL BRI.	0.0	0.0	0.0	0.0					0.0	0.0
	COKE OVEN COKE	1.2	1.1	1.1	1.0	1.1	1.0	1.0	1.1	1.0	0.8
LIQUID	PETROLEUM COKE	6.8	7.8	7.8	8.0	8.4	8.1	8.5	9.2	6.9	5.9
	RESIDUAL OIL	18.1	20.4	25.4	27.4	23.3	20.8	24.7	18.4	14.3	13.0
	RESIDUAL OIL										
	GAS OIL	41.3	43.6	38.6	38.9	35.8	31.7	26.6	21.6	20.8	23.6
	KEROSENE	0.2	0.3	0.3	0.3	0.2	0.3	0.2	0.1	0.1	0.1
	NAPHTA										
	ORIMULSION	34.1	30.2	23.8	1.9	0.0					
	LPG	2.4	2.1	2.0	2.1	2.1	2.2	2.2	1.9	1.7	1.5
	REFINERY GAS	15.6	15.8	15.2	16.6	15.9	15.3	16.1	15.9	14.8	15.4
GAS	NATURAL GAS	186.1	193.8	193.6	195.9	195.1	187.4	191.1	171.0	171.9	164.9
WASTE	WASTE	30.4	32.7	35.1	36.6	37.3	37.8	36.9	38.1	39.6	37.6
	INDUSTR. WASTES							1.5	1.6	2.0	1.7
BIOMASS	WOOD	27.5	30.8	31.6	38.9	43.9	49.7	52.1	60.3	63.6	66.0
	STRAW	12.2	13.7	15.7	16.9	17.9	18.5	18.5	18.8	15.9	17.4
	BIO OIL	0.0	0.2	0.1	0.4	0.6	0.8	1.1	1.2	1.8	1.7
	BIOGAS	2.9	3.0	3.3	3.6	3.8	3.8	3.9	3.9	4.0	4.2
	BIO PROD GAS	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.3

fuel_type	**fuel_gr_abbr**	**2010**	**2011**
SOLID	ANODE CARBON	0.0	0.0
	COAL	162.5	135.3
	SUB-BITUMINOUS		0.0
	BROWN COAL BRI.	0.0	0.0
	COKE OVEN COKE	0.7	0.7
LIQUID	PETROLEUM COKE	5.1	6.5
	RESIDUAL OIL	11.2	6.2
	RESIDUAL OIL		
	GAS OIL	21.8	14.7
	KEROSENE	0.1	0.0
	NAPHTA		
	ORIMULSION		
	LPG	1.4	1.3
	REFINERY GAS	14.3	15.0
GAS	NATURAL GAS	184.9	156.5
WASTE	WASTE	36.8	36.9
	INDUSTR. WASTES	1.4	1.7
BIOMASS	WOOD	80.3	78.3
	STRAW	23.6	19.8
	BIO OIL	2.0	0.8
	BIOGAS	4.3	4.2
	BIO PROD GAS	0.2	0.3

Table 2A-2.2 Detailed fuel consumption data for stationary combustion plants, PJ. 1980 – 2011.

fuel_type	fuel_gr_abbr	nfr_id_ EA	snap_ id	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
SOLID	ANODE CARBON	1A2f i	032000										
	COAL	1A1a	010100	226.2	177.7	221.8	216.5	220.6	271.3	276.5	272.1	253.8	206.8
			010101										
			010102										
			010103										
			010104										
			010105										
			010200	0.1	1.7	2.6	5.2	8.5	12.1	11.3	9.3	8.5	6.8
			010202										
			010203										
		1A2c	030600										
		1A2d	031100										
			031102										
		1A2e	030900										
			030902										
			030903										
		1A2f i	030100	17.7	13.3	11.4	8.0	13.5	9.8	9.0	10.3	10.4	9.1
			030106	0.4	0.4	0.5	0.4						
			030700										
			030703										
			030800										
			031200										
			031300										
			031400										
			031600						2.8	3.8	4.2	4.2	5.5
			032000										
		1A4a i	020100							0.0	0.0	0.2	0.0
		1A4b i	020200	1.1	1.5	0.9	1.0	1.3	1.0	0.9	0.3	0.3	0.4
		1A4c i	020300	0.3	1.0	1.2	1.8	3.5	4.6	4.5	4.1	3.7	2.6
			020304										
	FLY ASH	1A1a	010104										
	BROWN COAL BRI.	1A2f i	030100	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	
			030800										
		1A4a i	020100									0.0	0.0
		1A4b i	020200	0.4	0.5	0.8	0.7	0.6	0.6	0.3	0.2	0.1	0.1
		1A4c i	020300				0.0	0.0	0.1	0.1	0.1	0.0	0.0
	COKE OVEN COKE	1A2a	030400										
		1A2e	030900										
			030902										
			030903										
		1A2f i	030100	2.5	1.5	1.3	1.5	1.1	1.3	1.1	1.1	1.1	0.9
			030700										
			030800										
			031200										
			031300										
			031400										
			032000										
		1A4b i	020200	1.1	1.3	1.6	1.0	0.6	0.7	0.5	0.4	0.2	0.1
LIQUID	PETROLEUM COKE	1A1a	010100										
			010102										
			010200								0.2	0.1	
		1A2a	030400										
		1A2c	030600										
		1A2d	031100										
		1A2e	030900										
		1A2f i	030100	1.1	2.6	5.7	7.0	6.8	0.4	1.5	0.5	0.1	
			030700										
			030800										
			031000										
			031300										
			031400										
			031600										
			032000										

fuel_type	fuel_gr_abbr	nfr_id_EA	snap_id	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
		1A4a i	020100			0.1	0.1	0.1	0.2	0.0	0.3	0.3	0.1
		1A4b i	020200			0.3	0.2	0.3	0.8	0.7	1.1	0.9	0.5
		1A4c i	020300				0.0	0.0	0.4	0.7	0.7	0.7	0.2
	PETROLEUM COKE	1A2f i	031600						6.8	6.8	5.5	3.9	3.8
	RESIDUAL OIL	1A1a	010100 010101 010102 010103 010104 010105	47.7	25.0	18.0	8.5	6.9	13.3	14.3	10.5	13.0	10.8
			010200 010202 010203	49.0	43.7	40.8	34.7	29.2	25.1	15.7	11.5	5.4	3.0
		1A1b	010306	3.3	3.6	2.5	2.5	2.5	2.8	2.7	2.2	1.6	1.7
		1A2a	030400 030403										
		1A2b	030500										
		1A2c	030600										
		1A2d	031100 031102										
		1A2e	030900 030902 030903 030904 030905										
		1A2f i	030100 030700 030800 031000 031200 031300 031305 031400 031403 031500 031503 031600 031603 032000 032002 032003	49.9	40.0	34.9	33.0	31.8	29.2	28.7	20.6	16.4	15.9
		1A4a i	020100 020103	12.5	10.5	10.3	8.3	9.1	7.7	5.6	4.2	2.6	1.5
		1A4b i	020200	4.8	4.7	4.9	3.5	4.2	3.0	2.5	1.3	0.5	0.4
		1A4c i	020300 020302 020304	9.8	10.1	5.2	5.4	4.1	2.5	2.6	2.2	1.7	1.7
	RESIDUAL OIL	1A2f i	031600						0.4	1.3	2.1	2.7	2.6
	GAS OIL	1A1a	010100 010101 010102 010103 010104 010105	0.2	0.3	0.3	0.4	0.3	0.1	0.2	0.4	0.4	0.3
			010200 010202 010203	0.3	0.3	0.4	0.3	1.3	0.9	0.7	0.7	0.7	3.0
		1A1b	010306							0.0	0.0		
		1A1c	010504										
		1A2a	030400 030402 030403										
		1A2b	030500										
		1A2c	030600										

fuel_type	fuel_gr_abbr	nfr_id_ EA	snap_ id	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
			030602 030604										
		1A2d	031100 031102 031103										
		1A2e	030900 030902 030903 030904										
		1A2f i	030100 030700 030703 030800 031000 031200 031205 031300 031305 031400 031403 031600 031603 032000 032002 032005	6.1	2.9	1.1	0.8	3.1	3.6	2.9	2.2	0.9	0.9
		1A4a i	020100 020102 020103 020105	24.7	21.7	18.3	17.9	18.1	18.6	18.0	18.1	13.8	12.2
		1A4b i	020200 020204	113.2	94.4	87.1	79.7	69.4	84.8	79.4	78.5	67.1	54.3
		1A4c i	020300 020302 020304	2.6	1.5	0.7	0.5	1.7	1.9	1.5	1.3	0.5	0.6
	KEROSENE	1A2f i	030100 031500 032000	0.2	0.2	0.2	0.2	0.1	0.4	0.3	0.2	0.1	0.1
		1A4a i	020100	1.1	1.0	1.0	1.0	0.9	1.4	1.0	0.7	0.6	0.5
		1A4b i	020200	2.3	2.0	2.0	2.1	2.0	2.5	2.5	2.0	1.2	1.2
		1A4c i	020300	0.3	0.3	0.4	0.3	0.2	0.2	0.2	0.1	0.1	0.0
	NAPHTA	1A1a	010100							0.1			
	ORIMULSION	1A1a	010101										
	LPG	1A1a	010100 010101 010102 010103 010200 010202 010203	0.0	0.0	0.2	0.1	0.1	0.1	0.0	0.0	0.0	0.0
		1A1b	010306										
		1A2a	030400 030402										
		1A2b	030500										
		1A2c	030600 030602										
		1A2d	031100										
		1A2e	030900										
		1A2f i	030100 030700 030800 031000 031200 031300 031400	3.7	3.0	2.7	2.8	2.4	2.0	2.0	2.1	1.9	1.7

fuel_type	fuel_gr_abbr	nfr_id_ EA	snap_ id	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
			031500										
		1A4a i	020100	0.9	0.9	0.9	0.9	1.4	1.2	1.0	0.2	0.2	0.1
			020105										
		1A4b i	020200	1.2	1.2	1.3	1.4	2.0	2.4	2.2	2.0	1.4	0.9
		1A4c i	020300	0.6	0.6	0.5	0.4	0.1	0.1	0.1	0.2	0.2	0.3
	REFINERY GAS	1A1a	010203										
		1A1b	010300							0.1	0.1	0.2	0.3
			010304										
			010306	10.9	11.6	10.5	11.7	12.6	11.4	13.0	13.0	13.2	14.1
		1A2f i	030100	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2
			032000										
GAS	NATURAL GAS	1A1a	010100						3.2	5.6	3.5	6.0	6.5
			010101										
			010102										
			010103										
			010104										
			010105										
			010200				0.3	1.6	6.1	12.3	15.0	13.8	11.3
			010202										
			010203										
		1A1c	010503										
			010504	0.0	0.8	1.3	1.6	2.5	4.2	5.2	7.4	8.8	9.1
		1A2a	030400										
			030402										
		1A2b	030500										
		1A2c	030600										
			030602										
			030603										
			030604										
			030605										
		1A2d	031100										
			031102										
			031103										
			031104										
		1A2e	030900										
			030902										
			030903										
			030904										
			030905										
		1A2f i	030100	0.4	0.4	0.4	0.4	0.8	5.0	9.0	14.8	17.2	21.9
			030105										
			030106					0.2	0.2	0.0	0.3	0.3	0.2
			030700										
			030703										
			030705										
			030800										
			031000										
			031005										
			031200										
			031205										
			031300										
			031305										
			031400										
			031405										
			031500										
			031503										
			031604										
			031605										
			032000										
			032003										
			032005										
		1A4a i	020100	0.4	0.3	0.3	0.3	0.4	3.3	3.7	5.0	5.3	5.3
			020103										
			020104										

fuel_type	fuel_gr_abbr	nfr_id_ EA	snap_ id	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
			020105										
		1A4b i	020200	4.2	3.9	3.7	3.7	4.8	8.3	11.8	14.8	14.5	15.5
			020202										
			020204										
		1A4c i	020300					0.0	0.2	1.0	1.3	1.5	1.9
			020304										
WASTE	WASTE	1A1a	010100										
			010101										
			010102										
			010103										
			010104										
			010200	10.0	10.6	11.1	11.8	12.3	13.0	13.5	13.5	13.4	14.0
			010202										
			010203										
		1A2a	030400										
		1A2c	030600										
		1A2d	031100										
		1A2e	030900										
			030902										
		1A2f i	030100	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.2	0.3
			030700										
			030800										
			031000										
			031200										
			031300										
			031400										
			031600										
			032000										
		1A4a i	020100	0.6	0.6	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.9
			020103										
	INDUSTR. WASTES	1A2f i	031600										
BIOMASS	WOOD	1A1a	010100										
			010101										
			010102										
			010103										
			010104										
			010200							1.3	1.7	2.0	2.8
			010203										
		1A2a	030400										
		1A2b	030500										
		1A2c	030600										
		1A2d	031100										
			031102										
		1A2e	030900										
			030902										
			030903										
		1A2f i	030100	3.7	4.3	4.4	4.8	5.0	5.3	5.6	5.5	5.6	5.7
			030700										
			030800										
			031000										
			031200										
			031300										
			031400										
			031403										
			031603										
			032000										
		1A4a i	020100							0.2	0.2	0.2	0.2
		1A4b i	020200	7.6	9.7	10.6	10.2	9.9	9.6	9.9	10.6	9.8	8.9
			020202										
			020204										
		1A4c i	020300					0.2	0.1	0.1	0.1	0.1	0.1
			020303										
	STRAW	1A1a	010100						0.1	0.1	0.1		0.1
			010101										

fuel_type	fuel_gr_abbr	nfr_id_ EA	snap_ id	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
			010102										
			010103										
			010104										
			010200	0.3	0.3	0.3	0.6	1.0	1.4	1.7	2.3	2.7	3.1
			010203										
		1A2e	030903										
		1A2f i	031305										
		1A4a i	020103										
		1A4b i	020200	2.7	3.8	4.3	4.7	5.1	5.0	5.1	5.1	5.1	5.1
		1A4c i	020300	1.8	2.5	2.8	3.1	3.4	3.4	3.4	3.4	3.4	3.4
			020302										
	BIO OIL	1A1a	010101										
			010102										
			010105										
			010200								2.0	1.9	1.3
			010202										
			010203										
		1A2c	030605										
		1A2e	030903										
		1A2f i	031305										
			031600										
		1A4a i	020105										
		1A4b i	020200										
		1A4c i	020304										
	BIOGAS	1A1a	010100	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2
			010101										
			010102										
			010104										
			010105										
			010200						0.0	0.0	0.0	0.0	0.0
			010203										
		1A2a	030400										
		1A2e	030900										
			030902										
			030903										
			030905										
		1A2f i	030100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3
		1A4a i	020100	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2
			020103										
			020105										
		1A4c i	020300										
			020304										
	BIO PROD GAS	1A1a	010105										
		1A2f i	031305										
		1A4a i	020105										
		1A4c i	020304										

fuel_type	fuel_gr_abbr	nfr_id_ EA	snap_ id	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
SOLID	ANODE CARBON	1A2f i	032000										
	COAL	1A1a	010100	8.5	12.9	10.2	8.2						
			010101	207.9	294.7	241.8	256.3	284.7	233.2	333.6	244.3	206.2	172.0
			010102	14.0	11.0	13.2	15.4	18.9	19.4	22.6	17.1	14.2	12.8
			010103					0.5	0.4	0.1			
			010104					0.3	0.3	0.3	0.1		
			010105					0.0					
			010200	6.0	6.6	5.2	3.6						
			010202					1.1	0.7				
			010203					1.4	1.0	0.7	0.2	0.1	0.0
		1A2c	030600	0.1	0.1	0.1	0.7	0.7	0.6	0.6	0.5	0.5	0.5
		1A2d	031100	1.3	1.7	1.1	0.7	0.7	0.0				
			031102						0.1	0.0			
		1A2e	030900	4.0	4.0	3.1	3.4	2.5	2.3	1.6	1.4	1.8	1.0

fuel_type	fuel_gr_abbr	nfr_id_ EA	snap_ id	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
			030902					0.5	1.0	1.4	1.5	1.4	1.4
			030903					0.3	0.4	0.4	0.5	0.3	0.2
		1A2f i	030100	1.6	1.2	0.7	0.8						
			030106										
			030700	0.2			0.2	0.3	0.3	0.8	0.6	0.7	1.1
			030703										
			030800	1.6	1.9	1.7	1.9	1.6	1.3	1.3	1.5	1.4	0.9
			031200	0.0	0.0	0.0	0.0						
			031300	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
			031400										
			031600	5.0	6.0	6.6	6.6	6.9	7.2	7.1	7.2	6.6	5.6
			032000				0.0						
		1A4a i	020100	0.1	0.0	0.1	0.1	0.1	0.1	0.0	0.0	0.0	
		1A4b i	020200	0.6	1.1	0.9	0.8	0.6	0.4	0.1	0.1	0.1	0.1
		1A4c i	020300	2.5	2.9	2.2	2.1	2.3	1.8	1.4	1.2	0.9	0.7
			020304										
	FLY ASH	1A1a	010104										
	BROWN COAL BRI.	1A2f i	030100										
			030800	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
		1A4a i	020100	0.0	0.0		0.0	0.0	0.0	0.0	0.0		
		1A4b i	020200	0.1	0.1	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0
		1A4c i	020300	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	
	COKE OVEN COKE	1A2a	030400	0.0	0.0								0.0
		1A2e	030900	0.2	0.2	0.2	0.2	0.2	0.1	0.2	0.2	0.2	0.2
			030902										
			030903										
		1A2f i	030100										
			030700	0.8	1.0	0.9	0.8	0.9	0.1	0.1	0.1	0.1	0.1
			030800	0.0								0.0	0.0
			031200	0.0	0.0				0.0	0.0	0.0	0.0	
			031300	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	
			031400	0.0	0.0	0.0	0.0	0.0	0.0				
			032000	0.0	0.0	0.0	0.0		0.9	0.9	0.9	1.0	1.0
		1A4b i	020200	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0
LIQUID	PETROLEUM COKE	1A1a	010100				1.2						
			010102					3.0	0.9				
			010200										
		1A2a	030400										0.0
		1A2c	030600				0.0						
		1A2d	031100	0.0	0.0	0.0							
		1A2e	030900				0.1						
		1A2f i	030100										
			030700	0.2						0.1	0.0	0.0	0.0
			030800	0.1	0.1	0.1	0.0	0.1	0.2				0.0
			031000	0.0	0.0	0.0			0.0				
			031300	0.0	0.0	0.0			0.0	0.0		0.0	0.0
			031400	0.0	0.0	0.0	0.0	0.0	0.0				
			031600	2.5	3.0	3.2	3.2	3.5	3.7	5.0	5.2	4.8	6.4
			032000						0.0				
		1A4a i	020100	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
		1A4b i	020200	0.8	0.7	0.5	0.5	0.4	0.2	0.4	0.3	0.2	0.2
		1A4c i	020300	0.8	0.5	0.4	0.4	0.4	0.1	0.3	0.3	0.2	0.1
	PETROLEUM COKE	1A2f i	031600										
	RESIDUAL OIL	1A1a	010100	0.8	0.4	1.8	0.8						
			010101	6.5	9.6	8.3	7.8	21.5	8.5	11.6	5.2	8.9	6.0
			010102	0.7	0.4	0.5	0.7	0.7	2.6	4.5	2.7	2.8	1.6
			010103					0.1	0.1	0.0	0.2	0.2	0.0
			010104					0.0	0.0	0.0	0.0	0.0	0.0
			010105					0.0	0.0	0.0	0.0	0.0	0.0
			010200	2.0	2.2	1.1	0.9						
			010202					0.2	0.5	0.5	0.4	0.2	0.1
			010203					1.2	1.3	1.7	1.3	1.5	1.6
		1A1b	010306	1.3	2.0	3.6	3.5	3.3	2.3	2.2	1.6	1.1	1.1
		1A2a	030400	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0

fuel_type	fuel_gr_abbr	nfr_id_ EA	snap_ id	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
			030403										
		1A2b	030500	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0
		1A2c	030600	2.3	2.5	2.6	1.9	1.8	1.6	1.6	1.5	1.3	0.7
		1A2d	031100	1.0	1.0	0.7	0.8	0.6	0.5	0.1	0.2	0.2	0.1
			031102						0.0	0.1			
		1A2e	030900	7.1	7.4	7.3	6.6	6.7	5.4	5.4	4.7	5.1	5.1
			030902					0.6	0.7	0.6	0.6	0.4	0.5
			030903					0.1	0.2	0.1	0.1	0.1	0.2
			030904								0.1		
			030905										
		1A2f i	030100	1.3	1.3	1.3	1.4						
			030700	0.8	2.6	2.2	0.6	0.7	0.2	0.7	0.3		0.8
			030800	0.4	0.3	0.4	0.4	0.5	0.6	0.5	0.7	0.7	0.5
			031000	0.4	0.3	0.3	0.2	0.2	0.2	0.2	0.1	0.1	0.0
			031200	0.2	0.2	0.2	0.1	0.1	0.1	0.0		0.0	0.0
			031300	0.7	0.6	0.7	0.6	0.4	0.2	0.2	0.1	0.1	0.1
			031305										
			031400	0.4	0.4	0.3	0.4	0.4	0.4	0.5	0.6	0.5	0.4
			031403					0.0	0.0				
			031500	1.0	1.5	1.6	0.5	0.2	0.2	0.4	0.2	0.2	0.1
			031503						0.0				
			031600	1.8	2.2	2.4	2.4	2.6	2.8	1.8	1.9	2.5	0.9
			031603										
			032000	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1
			032002					0.2	0.2	0.1	0.1	0.1	0.1
			032003					0.0	0.0			0.0	
		1A4a i	020100	1.1	0.9	0.6	0.5	0.7	0.7	0.7	0.7	0.4	0.5
			020103					0.1	0.1				
		1A4b i	020200	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.0	0.0	0.1
		1A4c i	020300	1.2	1.3	1.6	1.7	1.9	2.6	3.1	2.5	2.6	2.4
			020302										
			020304									0.0	0.0
	RESIDUAL OIL	1A2f i	031600										
	GAS OIL	1A1a	010100	0.3	0.5	0.7	0.3						
			010101					0.0	0.1	0.0	0.1	0.1	0.3
			010102					0.0	0.0	0.0	0.0	0.0	0.1
			010103						0.0	0.0	0.0	0.0	0.0
			010104		0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.0
			010105					0.1	0.1	0.1	0.1	0.1	0.1
			010200	1.9	0.8	0.7	0.9						
			010202					0.1	0.2	0.8	0.5	0.4	0.3
			010203					1.0	0.7	0.8	0.7	0.8	0.4
		1A1b	010306		0.0	0.0	0.0	0.0	0.0	0.0	0.1		
		1A1c	010504										
		1A2a	030400	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			030402										
			030403										
		1A2b	030500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		1A2c	030600	0.0	0.1	0.1	0.0	0.0	0.1	0.1	0.1	0.1	0.1
			030602										
			030604										
		1A2d	031100	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1
			031102										
			031103							0.0	0.0	0.0	
		1A2e	030900	0.1	0.4	0.4	0.3	0.2	0.4	0.5	0.4	0.3	0.6
			030902					0.0	0.0	0.0	0.0	0.0	0.0
			030903					0.0	0.0				0.0
			030904								0.0	0.0	0.0
		1A2f i	030100										
			030700	0.1	0.2	0.2	0.1	0.1	0.2	0.4	0.5	0.5	0.2
			030703										
			030800	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2
			031000	0.0	0.1	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0
			031200	0.0	0.0	0.1	0.0	0.0	0.1	0.1	0.1	0.1	0.1

fuel_type	fuel_gr_abbr	nfr_id_ EA	snap_ id	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
			031205										
			031300	0.1	0.3	0.3	0.2	0.2	0.4	0.5	0.4	0.4	0.6
			031305									0.0	0.0
			031400	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.1
			031403					0.0	0.0		0.0	0.0	0.0
			031600										
			031603										
			032000	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.3
			032002						0.0				
			032005					0.0					
		1A4a i	020100	11.8	10.6	9.1	9.0	7.2	6.6	6.6	6.1	5.4	5.8
			020102					0.2		0.0		0.0	
			020103					0.0		0.1	0.1	0.1	0.0
			020105					0.0	0.0	0.0	0.0	0.0	0.0
		1A4b i	020200	46.5	50.6	42.9	50.0	43.7	43.3	45.3	39.6	37.8	35.7
			020204										
		1A4c i	020300	0.4	1.0	1.2	0.8	0.7	1.2	1.9	1.8	1.7	2.3
			020302								0.0		
			020304							0.0	0.0		
	KEROSENE	1A2f i	030100										
			031500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			032000	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		1A4a i	020100	0.6	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1
		1A4b i	020200	4.4	0.7	0.5	0.5	0.4	0.4	0.4	0.3	0.3	0.1
		1A4c i	020300	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	NAPHTA	1A1a	010100										
	ORIMULSION	1A1a	010101						19.9	36.8	40.5	32.6	34.2
	LPG	1A1a	010100		0.0	0.0	0.0						
			010101										
			010102										
			010103										
			010200	0.0	0.0	0.0							
			010202										
			010203					0.0	0.0				0.0
		1A1b	010306			0.0		0.0	0.0	0.0	0.0		
		1A2a	030400	0.1	0.1	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0
			030402										
		1A2b	030500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		1A2c	030600	0.0	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.0	0.0
			030602							0.0	0.0	0.0	0.0
		1A2d	031100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		1A2e	030900	0.3	0.2	0.2	0.2	0.1	0.1	0.2	0.1	0.1	0.1
		1A2f i	030100										
			030700	0.2	0.2	0.2	0.2	0.3	0.4	0.6	0.4	0.4	0.4
			030800	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
			031000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			031200	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			031300	0.2	0.3	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.2
			031400	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			031500	0.5	0.6	0.7	0.6	0.5	0.5	0.5	0.5	0.6	0.4
		1A4a i	020100	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
			020105										0.0
		1A4b i	020200	1.0	0.7	0.5	0.8	0.7	0.7	0.8	0.7	0.9	1.0
		1A4c i	020300	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1
	REFINERY GAS	1A1a	010203							0.0	0.0		
		1A1b	010300	0.5	0.9	1.5	0.0						
			010304				2.1	2.4	2.3	2.7	2.3	2.5	2.7
			010306	13.5	13.5	13.2	13.2	14.0	18.5	18.7	14.5	12.7	13.1
		1A2f i	030100										
			032000	0.2	0.1	0.1	0.1			0.0	0.1	0.0	
GAS	NATURAL GAS	1A1a	010100										
			010101	4.0	4.4	3.3	4.4	6.4	7.8	9.5	8.4	17.5	17.3
			010102					2.0	2.8	4.1	8.1	9.3	6.5
			010103					0.0	0.1	0.1	0.1	0.1	0.1

fuel_type	fuel_gr_abbr	nfr_id_ EA	snap_ id	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
			010104	1.5	2.0	4.5	7.0	7.6	8.2	13.8	15.7	12.6	21.3
			010105	0.7	1.3	2.2	4.2	8.6	16.7	21.9	23.4	26.4	26.6
			010200	11.0	13.7	12.4	11.4						
			010202					0.3	0.4	0.4	0.5	0.5	0.2
			010203					9.4	7.9	6.4	4.0	3.1	2.7
		1A1c	010503										
			010504	9.5	9.7	11.1	11.2	12.3	13.0	15.3	20.0	22.1	24.1
		1A2a	030400	1.7	1.5	1.5	1.5	1.6	0.1	0.1			
			030402						1.6	1.6	1.9	1.9	2.1
		1A2b	030500	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1
		1A2c	030600	1.0	1.3	1.5	1.2	1.4	1.2	1.1	1.4	2.8	3.3
			030602	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3
			030603					0.2	0.3	0.5	0.6	0.5	0.3
			030604	0.5	0.6	0.7	0.7	0.8	0.9	1.3	1.3	1.2	1.3
			030605								0.0	0.1	0.1
		1A2d	031100	2.3	1.8	1.6	1.2	1.3	1.3	1.5	1.4	1.6	1.8
			031102					0.7	1.1	0.9	1.1	1.1	1.0
			031103					0.0	0.1	0.1	0.1	0.1	0.1
			031104						0.1	0.9	1.0	1.0	1.0
		1A2e	030900	8.1	9.2	9.5	11.2	12.7	14.0	12.2	13.4	12.2	11.8
			030902						0.0	0.0	0.0	0.0	0.0
			030903					0.4	0.5	0.4	0.3	0.5	0.4
			030904					0.1	0.3	0.9	1.5	2.3	3.5
			030905					0.0	0.1	0.6	0.6	0.6	0.5
		1A2f i	030100	0.7	0.7	1.1	1.0						
			030105	0.0	0.0	0.0	0.0						
			030106	0.1	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.1
			030700	4.2	4.2	4.1	4.5	5.0	5.9	5.2	5.6	5.7	6.4
			030703										
			030705						0.0	0.0	0.0	0.0	0.0
			030800	0.2	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.7
			031000	1.2	1.4	1.4	1.3	1.3	1.2	1.2	1.2	1.0	1.3
			031005							0.0	0.0	0.0	0.0
			031200	0.2	0.2	0.3	0.4	0.5	0.7	0.7	0.7	0.7	0.6
			031205						0.1	0.2	0.2	0.2	0.2
			031300	1.4	2.0	2.2	2.5	2.8	2.9	3.5	3.2	3.2	3.8
			031305							0.0	0.0	0.1	0.2
			031400	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.2
			031405						0.0	0.1	0.1	0.1	0.1
			031500	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2
			031503						0.0				
			031604							0.1	0.2	0.2	0.2
			031605								0.0	0.0	0.0
			032000	1.1	1.2	1.2	1.5	1.6	1.7	1.9	1.8	2.0	2.1
			032003					0.1		0.0			0.0
			032005					0.0	0.0	0.0	0.0	0.0	0.0
		1A4a i	020100	6.3	6.8	7.1	8.6	7.3	8.4	11.2	9.1	8.7	7.5
			020103					0.0	0.0	0.0	0.0	0.2	0.0
			020104						0.0		0.0		
			020105	0.0	0.1	0.3	0.4	0.6	0.7	0.8	1.0	1.0	1.1
		1A4b i	020200	17.4	20.4	20.9	24.1	24.7	26.9	30.4	28.4	29.1	29.0
			020202					0.0	0.0	0.1	0.0	0.0	0.0
			020204		0.0	0.5	0.8	1.0	1.0	1.4	1.5	1.5	1.5
		1A4c i	020300	2.1	2.6	2.2	2.3	2.5	2.6	2.7	2.6	2.5	2.2
			020304	0.1	0.1	0.1	0.2	0.3	1.2	2.2	3.0	3.7	3.7
WASTE	WASTE	1A1a	010100	1.0	3.6	5.6	8.4						
			010101									1.3	1.3
			010102					5.1	4.4	6.3	7.7	8.1	14.5
			010103					4.1	5.3	6.0	5.6	4.7	1.1
			010104					0.6	0.9	1.9	1.9	1.6	1.5
			010200	13.6	12.1	11.1	9.8						
			010202						3.3	4.6	4.6	4.6	
			010203					9.3	7.8	4.8	5.7	5.6	9.2
		1A2a	030400					0.0	0.0				

fuel_type	fuel_gr_abbr	nfr_id_ EA	snap_ id	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
		1A2c	030600	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
		1A2d	031100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		1A2e	030900	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0
			030902										
		1A2f i	030100										
			030700	0.0	0.0	0.0	0.0	0.0	0.0			0.0	
			030800										
			031000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			031200	0.0	0.0			0.0	0.0				
			031300	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
			031400			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			031600										
			032000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		1A4a i	020100	0.9	1.0	1.1	1.1	1.2	1.3	1.2	1.2	0.7	1.5
			020103					0.0	0.0	0.0	0.0	0.0	0.0
	INDUSTR. WASTES	1A2f i	031600										
BIOMASS	WOOD	1A1a	010100			0.2	0.5						
			010101					0.0				0.3	
			010102					1.7	1.6	1.6	1.6	1.9	2.9
			010103					0.0	0.0	0.0	0.1	0.1	0.3
			010104						0.0				
			010200	3.2	3.6	4.1	3.8						
			010203					3.3	3.5	3.9	4.1	4.1	4.0
		1A2a	030400	0.0	0.0	0.0	0.0	0.0					
		1A2b	030500	0.0									
		1A2c	030600	0.0									
		1A2d	031100	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0
			031102										
		1A2e	030900	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
			030902									0.0	0.0
			030903										
		1A2f i	030100	1.1	1.1	1.1	1.1						
			030700	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			030800										
			031000					0.0	0.0				0.0
			031200	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
			031300	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2
			031400	3.2	3.0	3.0	3.0	3.0	3.0	2.7	2.8	2.9	2.9
			031403					0.4	0.4	0.5	0.4	0.3	0.4
			031603					0.0	0.0	0.0	0.0	0.0	0.0
			032000	1.4	1.4	1.5	1.5	1.3	1.1	1.2	1.2	1.2	0.9
		1A4a i	020100	0.2	0.2	0.2	0.2	0.2	0.3	0.4	0.5	0.5	0.6
		1A4b i	020200	9.0	10.4	10.7	11.9	11.6	11.8	12.7	12.6	11.1	11.6
			020202										
			020204										
		1A4c i	020300	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2
			020303										
	STRAW	1A1a	010100	0.5	1.0	1.5	1.6						
			010101					0.1	0.1	0.6	0.7	1.0	1.3
			010102					0.6	1.1	1.5	1.3	1.3	1.3
			010103					0.7	1.0	1.2	1.5	1.5	1.3
			010104										
			010200	3.5	3.8	3.9	3.8						
			010203					3.9	4.0	4.2	3.9	3.9	3.9
		1A2e	030903						0.0				
		1A2f i	031305									0.0	0.0
		1A4a i	020103										
		1A4b i	020200	5.1	5.1	5.1	4.8	4.4	4.1	3.6	3.9	3.8	3.4
		1A4c i	020300	3.4	3.4	3.4	3.2	2.9	2.7	2.4	2.6	2.5	2.3
			020302					0.0	0.0	0.0	0.0	0.0	0.0
	BIO OIL	1A1a	010101										
			010102										
			010105										
			010200	0.7	0.7	0.7	0.8						

fuel_type	fuel_gr_abbr	nfr_id_ EA	snap_ id	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
			010202										
			010203					0.2	0.3	0.1	0.0	0.0	0.0
		1A2c	030605										
		1A2e	030903										
		1A2f i	031305										
			031600										
		1A4a i	020105										
		1A4b i	020200										
		1A4c i	020304										
	BIOGAS	1A1a	010100	0.1	0.2	0.0	0.0						
			010101					0.0	0.0	0.0	0.0		
			010102					0.0		0.1	0.0	0.1	0.0
			010104					0.0	0.0	0.0			
			010105	0.1	0.2	0.3	0.5	0.5	0.6	0.7	0.8	1.0	1.0
			010200	0.0	0.0	0.1	0.1						
			010203					0.2	0.2	0.2	0.2	0.2	0.2
		1A2a	030400	0.0									
		1A2e	030900	0.0				0.0	0.1	0.1	0.1	0.1	0.0
			030902										
			030903					0.0	0.0	0.0	0.0	0.0	0.0
			030905										
		1A2f i	030100	0.3	0.3	0.4	0.4						
		1A4a i	020100					0.1	0.2	0.2	0.3	0.2	0.3
			020103						0.0	0.0	0.0	0.1	0.1
			020105	0.2	0.2	0.1	0.1	0.4	0.6	0.5	0.8	0.9	0.8
		1A4c i	020300					0.0	0.0	0.1	0.0	0.0	0.0
			020304	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	BIO PROD GAS	1A1a	010105					0.1	0.0	0.0	0.0	0.0	0.0
		1A2f i	031305										
		1A4a i	020105									0.0	0.0
		1A4c i	020304								0.0	0.0	0.0

fuel_type	fuel_gr_abbr	nfr_id_ EA	snap_ id	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
SOLID	ANODE CARBON	1A2f i	032000										0.0
	COAL	1A1a	010100										
			010101	143.8	156.2	158.3	223.5	167.9	140.0	218.4	180.9	159.4	161.9
			010102	9.3	7.7	8.0	6.4	4.5	4.0	3.3	3.1	2.8	2.0
			010103										
			010104										0.0
			010105										
			010200										
			010202										
			010203	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	
		1A2c	030600	0.5	0.5	0.4	0.6	0.6	0.5	0.2			
		1A2d	031100										
			031102										
		1A2e	030900	1.5	1.8	1.1	0.4	0.7	0.4	0.6	0.6	0.1	
			030902	1.1	1.0	1.0	1.6	1.5	1.5	1.2	1.2	1.2	1.2
			030903	0.4	0.4	0.1	0.1	0.1	0.1	0.2	0.2	0.3	0.3
		1A2f i	030100										
			030106										
			030700	0.3	0.3		1.6	1.8	1.6	1.8	1.9	1.1	0.6
			030703										
			030800	0.8	0.6	0.5	0.1	0.1	0.1	0.1	0.1	0.1	0.0
			031200										
			031300	0.0	0.0	0.0	0.0	0.0					
			031400	0.1			0.0	0.0					
			031600	5.7	4.5	4.3	3.4	3.8	3.9	4.3	4.0	3.5	1.1
			032000										0.1
		1A4a i	020100					0.0					
		1A4b i	020200	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		1A4c i	020300	1.1	1.2	0.9	1.2	1.4	1.8	1.9	2.1	1.8	0.5

fuel_type	fuel_gr_abbr	nfr_id_ EA	snap_ id	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
			020304					0.0	0.0				0.0
	FLY ASH	1A1a	010104										
	BROWN COAL BRI.	1A2f i	030100										
			030800									0.0	0.0
		1A4a i	020100										
		1A4b i	020200	0.0	0.0	0.0	0.0					0.0	0.0
		1A4c i	020300										
	COKE OVEN COKE	1A2a	030400	0.0	0.0	0.0							
		1A2e	030900	0.2	0.2	0.1	0.2	0.2	0.1	0.1	0.1		
			030902									0.1	0.1
			030903								0.0	0.0	0.1
		1A2f i	030100										
			030700	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0
			030800	0.0									
			031200										
			031300				0.0	0.0			0.0	0.0	0.0
			031400										
			032000	0.9	0.9	0.8	0.7	0.8	0.7	0.8	1.0	0.9	0.6
		1A4b i	020200	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LIQUID	PETROLEUM COKE	1A1a	010100										
			010102					0.0	0.0				0.0
			010200										
		1A2a	030400										
		1A2c	030600										
		1A2d	031100										
		1A2e	030900										
		1A2f i	030100										
			030700	0.2	0.1	0.1	0.1	0.1					
			030800	0.0	0.1	0.1	0.1	0.1	0.2				
			031000										
			031300										
			031400										
			031600	6.5	7.7	7.5	7.7	8.2	7.8	8.5	9.1	6.8	5.9
			032000										
		1A4a i	020100	0.0	0.0	0.0	0.0		0.1		0.0	0.1	
		1A4b i	020200	0.0	0.0	0.0	0.0		0.1	0.0	0.0	0.0	
		1A4c i	020300	0.0	0.0	0.0	0.0						
	PETROLEUM COKE	1A2f i	031600										
	RESIDUAL OIL	1A1a	010100										
			010101	3.4	3.5	3.7	5.8	4.6	4.3	3.3	5.4	2.8	3.6
			010102	0.7	2.3	1.2	1.7	1.3	1.5	1.8	0.3	0.9	1.9
			010103	0.3	0.1	0.1	0.1	0.2	0.2	0.1	0.6	0.2	0.1
			010104		1.7	6.6	9.3	7.4	6.3	8.4	4.5	4.5	2.9
			010105	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
			010200										
			010202										
			010203	1.1	1.0	1.0	0.6	0.3	0.5	0.4		0.1	0.1
		1A1b	010306	1.3	1.4	1.4	0.9	1.1	0.7	0.6	0.8	0.9	0.7
		1A2a	030400	0.0	0.0	0.0					0.0	0.0	
			030403						0.0	0.0			
		1A2b	030500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
		1A2c	030600	0.8	0.9	1.0	0.7	0.7	0.4	0.6	0.5	0.4	
		1A2d	031100	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	
			031102										
		1A2e	030900	5.0	4.6	5.2	4.0	3.6	2.2	3.7	2.0		
			030902	0.5	0.5	0.4	0.9	0.9	1.1	0.8	0.6	1.9	2.0
			030903	0.2	0.3	0.3	0.7	0.8	0.8	0.8	0.8	1.0	1.1
			030904										
			030905				0.0	0.0	0.0	0.0		0.0	
		1A2f i	030100										
			030700	0.5	0.5	0.6	0.2			0.2	0.1	0.4	0.4
			030800	0.4	0.3	0.4	0.3	0.3	0.2	0.3	0.2	0.2	
			031000	0.0	0.0	0.0					0.0	0.0	
			031200	0.0	0.0	0.0			0.0	0.0	0.0	0.0	

fuel_type	fuel_gr_abbr	nfr_id_ EA	snap_ id	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
			031300	0.1	0.1	0.1	0.1	0.1	0.4	0.6	0.2	0.2	
			031305		0.0	0.0							
			031400	0.3	0.2	0.3	0.2	0.2	0.3	0.4	0.1	0.1	
			031403										
			031500	0.0	0.0	0.0							
			031503										
			031600	0.9	0.5	0.6	0.6	0.8	0.7	1.0	1.1	0.5	0.2
			031603		0.0								
			032000	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.2	0.0	
			032002	0.1	0.1	0.1	0.0						
			032003						0.0				
		1A4a i	020100	0.3	0.2	0.5	0.2	0.1	0.1	0.3	0.2		
			020103										
		1A4b i	020200	0.0	0.0	0.1	0.0	0.0	0.0	0.2	0.0	0.0	
		1A4c i	020300	1.8	1.6	1.4	0.9	0.7	0.8	0.9	0.5		
			020302				0.0	0.0	0.0	0.0	0.0	0.0	
			020304	0.0	0.0	0.0	0.0						
	RESIDUAL OIL	1A2f i	031600										
	GAS OIL	1A1a	010100										
			010101	0.1	0.1	0.1	1.0	0.2	0.2	0.5	0.5	0.9	2.3
			010102	0.1	0.1	0.1	0.0	0.1	0.0	0.0	0.1	0.0	0.1
			010103	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			010104	0.1	0.0	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.1
			010105	0.1	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.1
			010200										
			010202	0.5	0.9	0.2		0.5	0.2	0.2	0.2	0.3	0.4
			010203	0.6	0.5	0.4	1.5	0.6	0.5	0.4	0.4	0.8	1.0
		1A1b	010306				0.0	0.0	0.0	0.0	0.0	0.0	0.0
		1A1c	010504										
		1A2a	030400	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
			030402										
			030403						0.0				
		1A2b	030500	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
		1A2c	030600	0.1	0.2	0.1	0.1	0.1	0.1	0.0			
			030602							0.0	0.0	0.0	0.0
			030604	0.0					0.0	0.0	0.0	0.0	0.0
		1A2d	031100	0.1	0.1	0.1	0.1	0.1	0.0	0.0			
			031102							0.0	0.0		
			031103			0.0	0.0	0.0	0.0	0.0	0.0		
		1A2e	030900	0.5	0.7	0.6	0.5	0.5	0.4	0.1			
			030902				0.0	0.0	0.0	0.0	0.0	0.0	0.0
			030903	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
			030904			0.0							
		1A2f i	030100										
			030700	0.2	0.3	0.2	0.3	0.2	0.2	0.1			
			030703										
			030800	0.3	0.5	0.4	0.5	0.4	0.3	0.1			
			031000	0.0	0.1	0.0	0.1	0.1	0.0	0.0			
			031200	0.1	0.1	0.1	0.1	0.1	0.1	0.0			
			031205									0.0	0.0
			031300	0.6	0.7	0.5	0.6	0.6	0.3	0.1			
			031305	0.0	0.0								
			031400	0.1	0.1	0.1	0.1	0.1	0.0	0.0			
			031403	0.1	0.0	0.0							
			031600							0.0	0.0	0.0	0.0
			031603			0.0							
			032000	0.2	0.3	0.2	0.3	0.3	0.1	0.0	0.0	0.0	0.0
			032002										
			032005										
		1A4a i	020100	5.0	4.7	4.0	4.3	4.4	3.8	3.0	2.6	2.8	2.8
			020102										
			020103	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
			020105	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		1A4b i	020200	30.3	31.5	29.0	27.0	25.3	23.9	21.2	17.4	15.6	16.7

fuel_type	fuel_gr_abbr	nfr_id_EA	snap_id	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
			020204									0.0	0.0
		1A4c i	020300	2.2	2.6	2.2	2.3	2.0	1.3	0.5			
			020302								0.0	0.0	0.0
			020304	0.0	0.0	0.0	0.0		0.0	0.0			0.0
	KEROSENE	1A2f i	030100										
			031500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			032000	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		1A4a i	020100	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0
		1A4b i	020200	0.1	0.2	0.1	0.2	0.1	0.2	0.1	0.1	0.1	0.1
		1A4c i	020300	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	NAPHTA	1A1a	010100										
	ORIMULSION	1A1a	010101	34.1	30.2	23.8	1.9	0.0					
	LPG	1A1a	010100										
			010101							0.0		0.0	0.0
			010102									0.0	0.0
			010103										
			010200										
			010202						0.0	0.0	0.0		
			010203	0.0					0.0		0.0	0.0	0.0
		1A1b	010306										
		1A2a	030400	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			030402										
		1A2b	030500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		1A2c	030600	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			030602	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		1A2d	031100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		1A2e	030900	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
		1A2f i	030100										
			030700	0.3	0.2	0.1	0.1	0.2	0.2	0.2	0.1	0.1	0.1
			030800	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			031000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			031200	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			031300	0.2	0.2	0.1	0.1	0.1	0.2	0.2	0.1	0.1	0.1
			031400	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			031500	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1
		1A4a i	020100	0.1	0.1	0.1	0.2	0.2	0.3	0.3	0.3	0.3	0.3
			020105						0.0	0.0	0.0	0.0	0.0
		1A4b i	020200	1.2	1.2	1.1	1.1	1.1	1.1	1.1	1.1	1.0	0.8
		1A4c i	020300	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0
	REFINERY GAS	1A1a	010203										
		1A1b	010300										
			010304	2.4	2.4	2.5	2.7	2.4	2.0	2.2	2.3	1.8	1.9
			010306	13.2	13.3	12.7	13.9	13.4	13.4	13.9	13.6	12.9	13.5
		1A2f i	030100										
			032000										
GAS	NATURAL GAS	1A1a	010100										
			010101	18.4	18.2	16.5	17.9	17.3	17.2	19.0	13.9	10.9	13.4
			010102	6.5	6.4	5.5	3.9	3.3	3.0	2.6	0.9	3.8	2.7
			010103	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0
			010104	22.8	24.8	30.0	29.6	30.5	25.4	32.0	26.1	27.7	24.6
			010105	25.5	27.8	27.6	26.7	26.9	24.0	21.4	17.1	18.2	15.2
			010200										
			010202	0.1	0.1	0.2	0.2	0.3	0.2	0.1	0.2	0.4	0.5
			010203	2.3	2.9	2.4	3.2	2.7	4.4	4.6	6.1	6.0	8.1
		1A1c	010503										
			010504	25.4	24.9	26.6	26.6	27.5	28.2	28.8	28.6	28.2	26.7
		1A2a	030400	0.1	0.0	1.7	0.3	0.1	0.3	0.2	0.2	0.2	0.7
			030402	1.6	1.8		1.2	1.2	1.2	1.3	1.4	1.4	0.7
		1A2b	030500	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1
		1A2c	030600	3.0	3.2	2.7	3.1	2.3	2.4	2.1	2.0	1.6	1.4
			030602	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.6	0.5
			030603	0.5									
			030604	1.4	1.7	1.8	1.7	1.6	1.3	1.2	1.1	1.1	1.1
			030605	0.1	0.1	0.1	0.1	0.1	0.0				

fuel_type	fuel_gr_abbr	nfr_id_EA	snap_id	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
		1A2d	031100	1.3	1.8	1.2	1.9	1.5	1.9	1.7	1.7	1.8	1.6
			031102	1.1	1.1	1.2	1.0	1.0	1.0	1.0	0.2	0.1	0.1
			031103	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0		
			031104	1.0	0.7	1.0	0.9	0.9	1.0	0.9	0.9	0.9	0.7
		1A2e	030900	11.1	11.7	10.2	9.0	9.9	10.9	10.8	11.4	11.2	10.3
			030902	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			030903	0.1	0.1	0.4	0.6	0.6	0.6	0.6	0.6	0.5	0.6
			030904	3.8	3.5	3.8	3.8	4.2	3.6	2.6	2.4	1.4	1.2
			030905	0.9	1.1	1.0	1.0	1.1	1.0	0.6	0.1	0.3	0.3
		1A2f i	030100										
			030105										
			030106	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
			030700	5.8	5.8	5.4	5.5	5.0	4.8	4.8	5.4	5.3	4.8
			030703										
			030705	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			030800	0.6	0.9	0.6	0.7	0.8	0.6	1.0	0.7	1.6	1.5
			031000	1.2	1.2	1.2	1.0	0.9	0.6	0.5	0.3	0.3	0.3
			031005	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			031200	0.5	0.5	0.4	0.5	0.5	0.4	0.5	0.6	0.6	0.5
			031205	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
			031300	3.6	4.1	3.7	4.1	3.8	3.4	3.3	3.3	3.3	3.0
			031305	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1
			031400	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3
			031405	0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
			031500	0.2	0.2	0.2	0.2	0.2	0.3	0.4	0.4	0.3	0.4
			031503			0.0							
			031604	0.2	0.2	0.2	0.1	0.1	0.1		0.0	0.0	0.0
			031605	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			032000	2.1	2.3	2.2	2.3	2.1	1.8	1.7	1.6	1.6	1.5
			032003	0.0	0.0	0.0	0.0						
			032005	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
		1A4a i	020100	7.2	7.3	7.6	9.2	9.2	9.7	10.8	10.1	10.0	10.1
			020103	0.2	0.2	0.2	0.0	0.1	0.0	0.1	0.0	0.1	0.0
			020104	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
			020105	1.1	1.1	1.2	1.1	1.1	1.0	1.0	0.9	0.8	0.8
		1A4b i	020200	27.6	29.3	28.1	30.0	29.9	29.5	28.6	26.6	26.5	26.7
			020202	0.1	0.1	0.0	0.1	0.1	0.0	0.1	0.1	0.1	0.1
			020204	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.3	1.2	1.1
		1A4c i	020300	2.4	2.7	2.5	2.3	2.3	2.2	2.2	1.9	1.7	1.7
			020304	3.3	3.1	3.4	3.2	3.3	2.9	2.0	1.4	1.1	0.9
WASTE	WASTE	1A1a	010100										
			010101		0.2	0.9	0.1					0.0	0.0
			010102	12.1	13.0	13.9	14.1	16.6	19.3	19.9	20.3	20.9	20.5
			010103	9.0	9.0	9.2	9.1	9.1	8.8	9.6	9.4	9.6	8.8
			010104	2.2	2.5	2.6	3.0	2.9	2.6	3.1	3.3	3.3	3.2
			010200										
			010202										
			010203	6.4	6.6	6.6	6.8	6.5	4.3	3.8	4.7	5.0	4.0
		1A2a	030400										
		1A2c	030600	0.0			0.0		0.0	0.0		0.0	0.0
		1A2d	031100	0.0			0.0		0.0	0.0		0.1	0.1
		1A2e	030900	0.1			0.0		0.0	0.0		0.0	0.1
			030902				0.0		0.0	0.0		0.0	
		1A2f i	030100										
			030700										
			030800						0.1	0.1		0.2	0.2
			031000	0.0								0.0	0.0
			031200										
			031300	0.0			0.0		0.0	0.0		0.0	0.0
			031400	0.0			0.0		0.0	0.0		0.0	0.0
			031600	0.5	1.4	1.9	1.5	2.0	2.0				
			032000				0.0		0.1	0.1		0.2	0.2
		1A4a i	020100				1.7	0.1	0.4	0.0	0.3	0.0	0.4
			020103	0.0	0.0	0.0	0.1	0.1	0.2	0.2	0.0	0.1	0.1

fuel_type	fuel_gr_abbr	nfr_id_ EA	snap_ id	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
	INDUSTR. WASTES	1A2f i	031600							1.5	1.6	2.0	1.7
BIOMASS	WOOD	1A1a	010100										
			010101		0.0	0.1	0.3	0.2	0.2	0.3	0.2	0.3	0.5
			010102	2.7	2.5	3.2	5.4	5.4	6.6	6.5	6.3	5.8	7.1
			010103	0.4	0.5	0.6	0.6	0.7	0.5	0.5	0.6	0.6	0.7
			010104			0.1	1.6	4.5	4.5	2.6	3.8	6.0	6.3
			010200										
			010203	3.9	4.5	5.0	5.6	6.2	6.6	7.0	7.1	7.9	8.6
		1A2a	030400				0.0	0.0					
		1A2b	030500										
		1A2c	030600										
		1A2d	031100	0.0	0.0	0.0	0.0	0.0	0.0				
			031102							0.0	1.1	1.2	1.2
		1A2e	030900	0.1	0.1	0.1	0.0	0.1	0.5	0.2	0.2	0.1	0.1
			030902	0.0	0.0								0.0
			030903					0.0	0.1	0.1	0.0		
		1A2f i	030100										
			030700	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			030800								0.1	0.1	0.1
			031000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			031200	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			031300	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.2	0.2	0.2
			031400	3.0	3.1	2.5	1.8	1.7	2.0	2.6	2.7	3.7	3.6
			031403	0.4	0.4	0.4	0.3	0.4	0.3	0.4	0.4	0.4	0.5
			031603	0.0	0.0	0.0							
			032000	1.2	1.3	0.7	1.6	1.6	1.1	1.4	1.1	1.8	1.7
		1A4a i	020100	0.8	0.7	0.7	0.7	0.7	0.8	1.0	1.0	1.1	1.0
		1A4b i	020200	14.6	17.5	18.1	20.9	22.3	26.4	29.4	35.5	34.5	34.3
			020202						0.0	0.0	0.0	0.0	0.0
			020204									0.0	0.0
		1A4c i	020300	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2
			020303										
	STRAW	1A1a	010100										
			010101	1.1	1.6	2.6	3.2	3.7	3.3	3.7	3.6	2.4	2.8
			010102	1.3	1.3	1.2	1.3	2.1	2.0	1.7	1.9	1.7	1.9
			010103	0.7	2.1	1.9	2.1	2.1	2.1	2.1	2.1	2.1	2.2
			010104		0.1	1.2	1.7	1.9	2.4	2.5	2.5	0.8	1.5
			010200										
			010203	3.8	3.8	3.8	3.8	3.4	3.7	3.7	3.8	3.9	4.1
		1A2e	030903										
		1A2f i	031305	0.0	0.0								
		1A4a i	020103										
		1A4b i	020200	3.1	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9
		1A4c i	020300	2.1	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
			020302	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	BIO OIL	1A1a	010101				0.1				0.0	0.0	
			010102										
			010105					0.0			0.0	0.0	0.0
			010200										
			010202				0.0	0.0	0.0	0.0	0.0	0.4	0.2
			010203	0.0	0.2	0.1	0.3	0.6	0.7	1.1	1.1	1.4	1.4
		1A2c	030605					0.0	0.0	0.0	0.0	0.0	0.0
		1A2e	030903			0.1							
		1A2f i	031305			0.0	0.0	0.0	0.0	0.0			
			031600										
		1A4a i	020105								0.0		
		1A4b i	020200								0.0	0.0	0.0
		1A4c i	020304	0.0	0.0	0.0							
	BIOGAS	1A1a	010100										
			010101										
			010102	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			010104										
			010105	1.1	1.1	1.3	1.3	1.4	1.6	1.6	1.7	1.6	1.9
			010200										

fuel_type	fuel_gr_abbr	nfr_id_ EA	snap_ id	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
			010203	0.3	0.3	0.2	0.3	0.1	0.1	0.1	0.1	0.2	0.1
		1A2a	030400										
		1A2e	030900	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1
			030902	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.1
			030903	0.0	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.1	0.1
			030905		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		1A2f i	030100										
		1A4a i	020100	0.3	0.4	0.4	0.3	0.4	0.4	0.5	0.4	0.4	0.3
			020103	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
			020105	0.9	0.8	0.8	0.8	0.8	0.8	0.6	0.6	0.5	0.6
		1A4c i	020300	0.1	0.1	0.1	0.1	0.2	0.1	0.3	0.3	0.4	0.2
			020304	0.1	0.1	0.2	0.4	0.5	0.6	0.5	0.6	0.5	0.6
	BIO PROD GAS	1A1a	010105	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.3
		1A2f i	031305								0.0	0.0	0.0
		1A4a i	020105		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
		1A4c i	020304	0.0	0.0								

fuel_type	fuel_gr_abbr	nfr_id_ EA	snap_id	2010	2011
SOLID	ANODE CARBON	1A2f i	032000	0.0	0.0
	COAL	1A1a	010100		
			010101	155.9	128.1
			010102	1.7	1.1
			010103		
			010104	0.0	0.7
			010105		
			010200		
			010202		
			010203		
		1A2c	030600		
		1A2d	031100		
			031102		
		1A2e	030900		1.0
			030902	1.0	1.2
			030903	0.2	0.2
		1A2f i	030100		
			030106		
			030700	0.5	0.1
			030703		0.2
			030800	0.0	0.0
			031200		
			031300		
			031400		
			031600	2.0	1.4
			032000	0.1	0.1
		1A4a i	020100		
		1A4b i	020200	0.0	0.0
		1A4c i	020300	1.1	1.2
			020304		
	FLY ASH	1A1a	010104		0.0
	BROWN COAL BRI.	1A2f i	030100		
			030800	0.0	0.0
		1A4a i	020100		
		1A4b i	020200	0.0	0.0
		1A4c i	020300		
	COKE OVEN COKE	1A2a	030400		
		1A2e	030900		
			030902	0.0	0.0
			030903	0.1	0.1
		1A2f i	030100		
			030700	0.0	0.1
			030800		
			031200		
			031300	0.0	0.0

fuel_type	fuel_gr_abbr	nfr_id_ EA	snap_id	2010	2011
			031400		
			032000	0.6	0.5
		1A4b i	020200	0.0	0.0
LIQUID	PETROLEUM COKE	1A1a	010100		
			010102	0.0	0.0
			010200		
		1A2a	030400		
		1A2c	030600		
		1A2d	031100		
		1A2e	030900		
		1A2f i	030100		
			030700		0.1
			030800	0.0	0.0
			031000		
			031300		
			031400		
			031600	5.1	6.4
			032000		
		1A4a i	020100	0.0	0.0
		1A4b i	020200	0.0	0.0
		1A4c i	020300		
	PETROLEUM COKE	1A2f i	031600		
	RESIDUAL OIL	1A1a	010100		
			010101	4.9	1.8
			010102	0.2	0.2
			010103	0.1	0.1
			010104	0.2	0.1
			010105	0.0	0.0
			010200		
			010202		
			010203	0.4	0.1
		1A1b	010306	0.5	0.5
		1A2a	030400	0.0	
			030403		
		1A2b	030500	0.0	
		1A2c	030600	0.3	
		1A2d	031100	0.1	
			031102		
		1A2e	030900		
			030902	1.9	1.9
			030903	1.0	1.0
			030904		
			030905		
		1A2f i	030100		
			030700	0.2	
			030800	0.1	
			031000	0.0	
			031200	0.0	
			031300	0.1	
			031305		
			031400	0.1	
			031403		
			031500		
			031503		
			031600	0.3	0.3
			031603		
			032000		
			032002		
			032003		
		1A4a i	020100	0.0	
			020103		
		1A4b i	020200	0.0	
		1A4c i	020300	0.6	0.2
			020302	0.0	
			020304	0.0	0.0

fuel_type	fuel_gr_abbr	nfr_id_ EA	snap_id	2010	2011
	RESIDUAL OIL	1A2f i	031600		
	GAS OIL	1A1a	010100		
			010101	1.3	1.3
			010102	0.2	0.1
			010103	0.0	0.1
			010104	0.1	0.0
			010105	0.1	0.0
			010200		
			010202	1.1	0.4
			010203	1.4	1.0
		1A1b	010306	0.0	0.0
		1A1c	010504		0.0
		1A2a	030400		
			030402		0.0
			030403		
		1A2b	030500		
		1A2c	030600		
			030602	0.0	0.0
			030604	0.0	0.0
		1A2d	031100		
			031102		0.0
			031103		
		1A2e	030900		
			030902	0.0	0.0
			030903	0.0	
			030904		
		1A2f i	030100		
			030700		
			030703		0.0
			030800		
			031000		
			031200		
			031205	0.0	0.0
			031300		
			031305		
			031400		
			031403		
			031600	0.0	0.0
			031603		
			032000	0.0	0.0
			032002		
			032005		
		1A4a i	020100	2.7	2.1
			020102		
			020103	0.1	0.1
			020105	0.0	0.0
		1A4b i	020200	14.7	9.8
			020204	0.0	
		1A4c i	020300		
			020302	0.0	0.0
			020304		
	KEROSENE	1A2f i	030100		
			031500	0.0	0.0
			032000	0.0	0.0
		1A4a i	020100	0.0	0.0
		1A4b i	020200	0.0	0.0
		1A4c i	020300	0.0	0.0
	NAPHTA	1A1a	010100		
	ORIMULSION	1A1a	010101		
	LPG	1A1a	010100		
			010101	0.0	0.0
			010102	0.1	0.0
			010103	0.0	0.0
			010200		
			010202		

fuel_type	fuel_gr_abbr	nfr_id_ EA	snap_id	2010	2011
			010203	0.0	0.0
		1A1b	010306		0.4
		1A2a	030400	0.0	0.0
			030402		0.0
		1A2b	030500	0.0	0.0
		1A2c	030600	0.0	0.0
			030602	0.0	0.0
		1A2d	031100	0.0	0.0
		1A2e	030900	0.1	0.0
		1A2f i	030100		
			030700	0.1	0.0
			030800	0.0	0.0
			031000	0.0	0.0
			031200	0.0	0.0
			031300	0.1	0.0
			031400	0.0	0.0
			031500	0.1	0.1
		1A4a i	020100	0.2	0.3
			020105	0.0	0.0
		1A4b i	020200	0.8	0.4
		1A4c i	020300	0.0	0.0
	REFINERY GAS	1A1a	010203		
		1A1b	010300		
			010304	1.5	1.5
			010306	12.7	13.4
		1A2f i	030100		
			032000		
GAS	NATURAL GAS	1A1a	010100		
			010101	14.4	9.1
			010102	4.6	3.1
			010103	0.0	0.0
			010104	28.6	21.8
			010105	19.5	16.0
			010200		
			010202	1.1	0.8
			010203	8.9	7.6
		1A1c	010503		0.2
			010504	26.0	24.9
		1A2a	030400	0.3	0.2
			030402	1.2	1.3
		1A2b	030500	0.1	0.1
		1A2c	030600	1.5	1.6
			030602	0.6	0.5
			030603		
			030604	1.0	0.8
			030605		
		1A2d	031100	1.7	1.7
			031102	0.1	0.1
			031103		
			031104	0.7	0.6
		1A2e	030900	11.0	11.0
			030902	0.1	0.0
			030903	0.5	0.5
			030904	2.4	1.2
			030905	0.4	0.3
		1A2f i	030100		
			030105		
			030106	0.1	0.0
			030700	5.2	5.2
			030703		0.0
			030705	0.0	0.0
			030800	1.6	1.6
			031000	0.3	0.3
			031005	0.0	0.0
			031200	0.6	0.5

fuel_type	fuel_gr_abbr	nfr_id_ EA	snap_id	2010	2011
			031205	0.1	0.1
			031300	3.3	3.2
			031305	0.1	0.1
			031400	0.3	0.3
			031405	0.1	0.0
			031500	0.4	0.4
			031503		
			031604	0.0	0.0
			031605	0.0	0.0
			032000	1.6	1.6
			032003		
			032005		
		1A4a i	020100	10.4	9.3
			020103	0.1	0.1
			020104		
			020105	0.8	0.6
		1A4b i	020200	31.3	26.3
			020202	0.1	0.1
			020204	1.1	0.9
		1A4c i	020300	1.8	1.4
			020304	1.0	0.8
WASTE	WASTE	1A1a	010100		
			010101		
			010102	20.0	20.2
			010103	8.5	8.6
			010104	3.3	3.2
			010200		
			010202		
			010203	4.2	4.3
		1A2a	030400		
		1A2c	030600	0.0	0.0
		1A2d	031100	0.1	0.1
		1A2e	030900	0.1	0.1
			030902		
		1A2f i	030100		
			030700		
			030800	0.1	0.1
			031000	0.0	0.0
			031200		
			031300	0.0	0.0
			031400	0.0	0.0
			031600		
			032000		0.2
		1A4a i	020100	0.4	
			020103	0.1	0.1
	INDUSTR. WASTES	1A2f i	031600	1.4	1.7
BIOMASS	WOOD	1A1a	010100		
			010101	3.3	4.7
			010102	9.3	8.8
			010103	1.2	1.1
			010104	11.3	11.8
			010200		
			010203	10.2	10.3
		1A2a	030400		
		1A2b	030500		
		1A2c	030600		
		1A2d	031100		
			031102	1.2	1.3
		1A2e	030900	0.0	0.0
			030902	0.0	0.1
			030903		
		1A2f i	030100		
			030700	0.0	0.0
			030800	0.1	0.1
			031000	0.0	0.0

fuel_type	fuel_gr_abbr	nfr_id_ EA	snap_id	2010	2011
			031200	0.0	0.0
			031300	0.2	0.2
			031400	3.3	3.5
			031403	0.4	0.4
			031603		
			032000	1.5	1.9
		1A4a i	020100	1.0	1.0
		1A4b i	020200	36.9	33.0
			020202	0.0	0.0
			020204	0.0	
		1A4c i	020300	0.2	0.2
			020303	0.0	0.0
	STRAW	1A1a	010100		
			010101	5.5	4.0
			010102	3.9	3.2
			010103	2.4	1.8
			010104	2.0	1.3
			010200		
			010203	5.0	4.7
		1A2e	030903		
		1A2f i	031305		
		1A4a i	020103		0.1
		1A4b i	020200	2.9	2.9
		1A4c i	020300	1.9	1.9
			020302		0.0
	BIO OIL	1A1a	010101		
			010102	0.1	0.0
			010105	0.0	0.0
			010200		
			010202	0.0	0.0
			010203	1.9	0.7
		1A2c	030605	0.0	
		1A2e	030903		
		1A2f i	031305		
			031600		0.0
		1A4a i	020105		
		1A4b i	020200	0.0	0.0
		1A4c i	020304		
	BIOGAS	1A1a	010100		
			010101	0.0	0.0
			010102	0.0	0.0
			010104		
			010105	2.0	1.9
			010200		
			010203	0.1	0.1
		1A2a	030400		
		1A2e	030900	0.2	0.1
			030902	0.0	0.0
			030903	0.1	0.1
			030905	0.0	0.0
		1A2f i	030100		
		1A4a i	020100	0.3	0.4
			020103	0.1	0.1
			020105	0.6	0.6
		1A4c i	020300	0.2	0.2
			020304	0.7	0.6
	BIO PROD GAS	1A1a	010105	0.2	0.3
		1A2f i	031305	0.0	
		1A4a i	020105	0.0	0.0
		1A4c i	020304		

Annex 2A-3 Default Lower Calorific Value (LCV) of fuels and fuel correspondance list

Table 56 Time-series for calorific values of fuels (DEA 2012b).

		1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Crude Oil, Average	GJ pr tonne	42.40	42.40	42.40	42.70	42.70	42.70	42.70	43.00	43.00	43.00
Crude Oil, Golf	GJ pr tonne	41.80	41.80	41.80	41.80	41.80	41.80	41.80	41.80	41.80	41.80
Crude Oil, North Sea	GJ pr tonne	42.70	42.70	42.70	42.70	42.70	42.70	42.70	43.00	43.00	43.00
Refinery Feedstocks	GJ pr tonne	41.60	41.60	41.60	41.60	41.60	41.60	41.60	42.70	42.70	42.70
Refinery Gas	GJ pr tonne	52.00	52.00	52.00	52.00	52.00	52.00	52.00	52.00	52.00	52.00
LPG	GJ pr tonne	46.00	46.00	46.00	46.00	46.00	46.00	46.00	46.00	46.00	46.00
Naphtha (LVN)	GJ pr tonne	44.50	44.50	44.50	44.50	44.50	44.50	44.50	44.50	44.50	44.50
Motor Gasoline	GJ pr tonne	43.80	43.80	43.80	43.80	43.80	43.80	43.80	43.80	43.80	43.80
Aviation Gasoline	GJ pr tonne	43.80	43.80	43.80	43.80	43.80	43.80	43.80	43.80	43.80	43.80
JP4	GJ pr tonne	43.80	43.80	43.80	43.80	43.80	43.80	43.80	43.80	43.80	43.80
Other Kerosene	GJ pr tonne	43.50	43.50	43.50	43.50	43.50	43.50	43.50	43.50	43.50	43.50
JP1	GJ pr tonne	43.50	43.50	43.50	43.50	43.50	43.50	43.50	43.50	43.50	43.50
Gas/Diesel Oil	GJ pr tonne	42.70	42.70	42.70	42.70	42.70	42.70	42.70	42.70	42.70	42.70
Fuel Oil	GJ pr tonne	40.40	40.40	40.40	40.40	40.40	40.40	40.70	40.65	40.65	40.65
Orimulsion	GJ pr tonne	27.60	27.60	27.60	27.60	27.60	28.13	28.02	27.72	27.84	27.58
Petroleum Coke	GJ pr tonne	31.40	31.40	31.40	31.40	31.40	31.40	31.40	31.40	31.40	31.40
Waste Oil	GJ pr tonne	41.90	41.90	41.90	41.90	41.90	41.90	41.90	41.90	41.90	41.90
White Spirit	GJ pr tonne	43.50	43.50	43.50	43.50	43.50	43.50	43.50	43.50	43.50	43.50
Bitumen	GJ pr tonne	39.80	39.80	39.80	39.80	39.80	39.80	39.80	39.80	39.80	39.80
Lubricants	GJ pr tonne	41.90	41.90	41.90	41.90	41.90	41.90	41.90	41.90	41.90	41.90
Natural Gas	GJ pr 1000 Nm^3	39.00	39.00	39.00	39.30	39.30	39.30	39.30	39.60	39.90	40.00
Town Gas	GJ pr 1000 m^3							17.00	17.00	17.00	17.00
Electricity Plant Coal	GJ pr tonne	25.30	25.40	25.80	25.20	24.50	24.50	24.70	24.96	25.00	25.00
Other Hard Coal	GJ pr tonne	26.10	26.50	26.50	26.50	26.50	26.50	26.50	26.50	26.50	26.50
Coke	GJ pr tonne	31.80	29.30	29.30	29.30	29.30	29.30	29.30	29.30	29.30	29.30
Brown Coal Briquettes	GJ pr tonne	18.30	18.30	18.30	18.30	18.30	18.30	18.30	18.30	18.30	18.30
Straw	GJ pr tonne	14.50	14.50	14.50	14.50	14.50	14.50	14.50	14.50	14.50	14.50
Wood Chips	GJ pr Cubic metre	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80
Wood Chips	GJ pr m^3	9.30	9.30	9.30	9.30	9.30	9.30	9.30	9.30	9.30	9.30
Firewood, Hardwood	GJ pr m^3	10.40	10.40	10.40	10.40	10.40	10.40	10.40	10.40	10.40	10.40
Firewood, Conifer	GJ pr tonne	7.60	7.60	7.60	7.60	7.60	7.60	7.60	7.60	7.60	7.60
Wood Pellets	GJ pr tonne	17.50	17.50	17.50	17.50	17.50	17.50	17.50	17.50	17.50	17.50
Wood Waste	GJ pr Cubic metre	14.70	14.70	14.70	14.70	14.70	14.70	14.70	14.70	14.70	14.70
Wood Waste	GJ pr 1000 m^3	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20
Biogas	GJ pr tonne								23.00	23.00	23.00
Wastes	GJ pr tonne	8.20	8.20	9.00	9.40	9.40	10.00	10.50	10.50	10.50	10.50
Bioethanol	GJ pr tonne	26.70	26.70	26.70	26.70	26.70	26.70	26.70	26.70	26.70	26.70
Liquid Biofuels	GJ pr tonne	37.60	37.60	37.60	37.60	37.60	37.60	37.60	37.60	37.60	37.60
Bio Oil	GJ pr tonne	37.20	37.20	37.20	37.20	37.20	37.20	37.20	37.20	37.20	37.20
Continued		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Crude Oil, Average	GJ pr tonne	43.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00
Crude Oil, Golf	GJ pr tonne	41.80	41.80	41.80	41.80	41.80	41.80	41.80	41.80	41.80	41.80
Crude Oil, North Sea	GJ pr tonne	43.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00
Refinery Feedstocks	GJ pr tonne	42.70	42.70	42.70	42.70	42.70	42.70	42.70	42.70	42.70	42.70
Refinery Gas	GJ pr tonne	52.00	52.00	52.00	52.00	52.00	52.00	52.00	52.00	52.00	52.00
LPG	GJ pr tonne	46.00	46.00	46.00	46.00	46.00	46.00	46.00	46.00	46.00	46.00
Naphtha (LVN)	GJ pr tonne	44.50	44.50	44.50	44.50	44.50	44.50	44.50	44.50	44.50	44.50
Motor Gasoline	GJ pr tonne	43.80	43.80	43.80	43.80	43.80	43.80	43.80	43.80	43.80	43.80
Aviation Gasoline	GJ pr tonne	43.80	43.80	43.80	43.80	43.80	43.80	43.80	43.80	43.80	43.80
JP4	GJ pr tonne	43.80	43.80	43.80	43.80	43.80	43.80	43.80	43.80	43.80	43.80
Other Kerosene	GJ pr tonne	43.50	43.50	43.50	43.50	43.50	43.50	43.50	43.50	43.50	43.50
JP1	GJ pr tonne	43.50	43.50	43.50	43.50	43.50	43.50	43.50	43.50	43.50	43.50
Gas/Diesel Oil	GJ pr tonne	42.70	42.70	42.70	42.70	42.70	42.70	42.70	42.70	42.70	42.70
Fuel Oil	GJ pr tonne	40.65	40.65	40.65	40.65	40.65	40.65	40.65	40.65	40.65	40.65
Orimulsion	GJ pr tonne	27.62	27.64	27.71	27.65	27.65	27.65	27.65	27.65	27.65	27.65
Petroleum Coke	GJ pr tonne	31.40	31.40	31.40	31.40	31.40	31.40	31.40	31.40	31.40	31.40
Waste Oil	GJ pr tonne	41.90	41.90	41.90	41.90	41.90	41.90	41.90	41.90	41.90	41.90
White Spirit	GJ pr tonne	43.50	43.50	43.50	43.50	43.50	43.50	43.50	43.50	43.50	43.50
Bitumen	GJ pr tonne	39.80	39.80	39.80	39.80	39.80	39.80	39.80	39.80	39.80	39.80
Lubricants	GJ pr tonne	41.90	41.90	41.90	41.90	41.90	41.90	41.90	41.90	41.90	41.90
Natural Gas	GJ pr 1000 Nm^3	40.15	39.99	40.06	39.94	39.77	39.67	39.54	39.59	39.48	39.46
Town Gas	GJ pr 1000 m^3	17.01	16.88	17.39	16.88	17.58	17.51	17.20	17.14	15.50	21.29

Continued											
Electricity Plant Coal	GJ pr tonne	24.80	24.90	25.15	24.73	24.60	24.40	24.80	24.40	24.30	24.60
Other Hard Coal	GJ pr tonne	26.50	26.50	26.50	26.50	26.50	26.50	26.50	26.50	25.81	25.13
Coke	GJ pr tonne	29.30	29.30	29.30	29.30	29.30	29.30	29.30	29.30	29.30	29.30
Brown Coal Briquettes	GJ pr tonne	18.30	18.30	18.30	18.30	18.30	18.30	18.30	18.30	18.30	18.30
Straw	GJ pr tonne	14.50	14.50	14.50	14.50	14.50	14.50	14.50	14.50	14.50	14.50
Wood Chips	GJ pr Cubic metre	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80
Wood Chips	GJ pr m^3	9.30	9.30	9.30	9.30	9.30	9.30	9.30	9.30	9.30	9.30
Firewood, Hardwood	GJ pr m^3	10.40	10.40	10.40	10.40	10.40	10.40	10.40	10.40	10.40	10.40
Firewood, Conifer	GJ pr tonne	7.60	7.60	7.60	7.60	7.60	7.60	7.60	7.60	7.60	7.60
Wood Pellets	GJ pr tonne	17.50	17.50	17.50	17.50	17.50	17.50	17.50	17.50	17.50	17.50
Wood Waste	GJ pr Cubic metre	14.70	14.70	14.70	14.70	14.70	14.70	14.70	14.70	14.70	14.70
Wood Waste	GJ pr 1000 m^3	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20
Biogas	GJ pr tonne	23.00	23.00	23.00	23.00	23.00	23.00	23.00	23.00	23.00	23.00
Wastes	GJ pr tonne	10.50	10.50	10.50	10.50	10.50	10.50	10.50	10.50	10.50	10.50
Bioethanol	GJ pr tonne	26.70	26.70	26.70	26.70	26.70	26.70	26.70	26.70	26.70	26.70
Liquid Biofuels	GJ pr tonne	37.60	37.60	37.60	37.60	37.60	37.60	37.60	37.60	37.50	37.50
Bio Oil	GJ pr tonne	37.20	37.20	37.20	37.20	37.20	37.20	37.20	37.20	37.20	37.20

Continued		2010	2011
Crude Oil, Average	GJ pr tonne	43.00	43.00
Crude Oil, Golf	GJ pr tonne	41.80	41.80
Crude Oil, North Sea	GJ pr tonne	43.00	43.00
Refinery Feedstocks	GJ pr tonne	42.70	42.70
Refinery Gas	GJ pr tonne	52.00	52.00
LPG	GJ pr tonne	46.00	46.00
Naphtha (LVN)	GJ pr tonne	44.50	44.50
Motor Gasoline	GJ pr tonne	43.80	43.80
Aviation Gasoline	GJ pr tonne	43.80	43.80
JP4	GJ pr tonne	43.80	43.80
Other Kerosene	GJ pr tonne	43.50	43.50
JP1	GJ pr tonne	43.50	43.50
Gas/Diesel Oil	GJ pr tonne	42.70	42.70
Fuel Oil	GJ pr tonne	40.65	40.65
Orimulsion	GJ pr tonne	27.65	27.65
Petroleum Coke	GJ pr tonne	31.40	31.40
Waste Oil	GJ pr tonne	41.90	41.90
White Spirit	GJ pr tonne	43.50	43.50
Bitumen	GJ pr tonne	39.80	39.80
Lubricants	GJ pr tonne	41.90	41.90
Natural Gas	GJ pr 1000 Nm3	39.46	39.51
Town Gas	GJ pr 1000 m3	21.35	21.37
Electricity Plant Coal	GJ pr tonne	24.44	24.38
Other Hard Coal	GJ pr tonne	24.44	24.38
Coke	GJ pr tonne	29.30	29.30
Brown Coal Briquettes	GJ pr tonne	18.30	18.30
Straw	GJ pr tonne	14.50	14.50
Wood Chips	GJ pr Cubic metre	2.80	2.80
Wood Chips	GJ pr m3	9.30	9.30
Firewood, Hardwood	GJ pr m3	10.40	10.40
Firewood, Conifer	GJ pr tonne	7.60	7.60
Wood Pellets	GJ pr tonne	17.50	17.50
Wood Waste	GJ pr Cubic metre	14.70	14.70
Wood Waste	GJ pr 1000 m3	3.20	3.20
Biogas	GJ pr tonne	23.00	23.00
Wastes	GJ pr tonne	10.50	10.50
Bioethanol	GJ pr tonne	26.70	26.70
Liquid Biofuels	GJ pr tonne	37.50	37.50
Bio Oil	GJ pr tonne	37.20	37.20

Table 2A-3.2 Fuel category correspondence list, DEA, DCE and Climate Convention reportings (IPCC).

Danish Energy Agency	DCE Emission database	IPCC fuel category
Other Hard Coal	Coal	Solid
Coke	Coke oven coke	Solid
Electricity Plant Coal	Coal	Solid
Brown Coal Briquettes	Brown coal briq.	Solid
-	Anode carbon	Solid
-	Fly ash	Solid
Orimulsion	Orimulsion	Liquid
Petroleum Coke	Petroleum coke	Liquid
Fuel Oil	Residual oil	Liquid
Waste Oil	Residual oil	Liquid
Gas/Diesel Oil	Gas oil	Liquid
Other Kerosene	Kerosene	Liquid
LPG	LPG	Liquid
Refinery Gas	Refinery gas	Liquid
Town Gas	Natural gas	Gas
Natural Gas	Natural gas	Gas
Straw	Straw	Biomass
Wood Waste	Wood and simil.	Biomass
Wood Pellets	Wood and simil.	Biomass
Wood Chips	Wood and simil.	Biomass
Firewood, Hardwood & Conifer	Wood and simil.	Biomass
Waste Combustion (biomass)	Municip. wastes	Biomass
Bio Oil	Bio oil	Biomass
Biogas	Biogas	Biomass
Biogas, other	Biogas	Biomass
Biogas, landfill	Biogas	Biomass
Biogas, sewage sludge	Biogas	Biomass
(Wood applied in gas engines)	Biomass producer gas	Biomass
Waste Combustion (fossil)	Fossil waste	Other fuel

Annex 2A-4 Emission factors

Table 2A-4.1 SO_2, NO_x, NMVOC and CO emission factors and references 2011.

					SO_2		NO_x		NMVOC		CO	
Fuel type	**Fuel**	**NFR**	**NFR_name**	**SNAP**	**g/GJ**	***Ref.***	**g/GJ**	***Ref.***	**g/GJ**	***Ref.***	**g/GJ**	***Ref.***
BIO-MASS	WOOD	1A1a	Electricity and heat production	010101	1.9	*12*	81	*12*	5.1	*12*	90	*12*
				010102	1.9	*12*	81	*12*	5.1	*12*	90	*12*
				010103	1.9	*12*	81	*12*	5.1	*12*	90	*12*
				010104	1.9	*12*	81	*12*	5.1	*12*	90	*12*
				010203	25	*22, 21*	90	*22, 21, 4*	7.3	*13*	240	*4*
		1A2d	Pulp paper and print	031102	25	*22, 21*	90	*22, 21, 4*	10	*13*	240	*4*
		1A2e	Food processing, beverages and tobacco	030900	25	*22, 21*	90	*22, 21, 4*	10	*13*	240	*4*
				030902	25	*22, 21*	90	*22, 21, 4*	10	*13*	240	*4*
		1A2f	Industry- Other	(all)	25	*22, 21*	90	*22, 21, 4*	10	*13*	240	*4*
		1A4a	Commercial/ Institutional	020100	25	*22, 21*	90	*22, 21, 4*	146	*13*	240	*4*
		1A4b i	Residential	020200	25	*22, 21*	120	*22*	343.2	*39*	3100	*39*
				020202	25	*22, 21*	120	*22*	343.2	*39*	3100	*39*
		1A4c i	Agriculture/ Forestry	020300	25	*22, 21*	90	*22, 21, 4*	146	*13*	240	*4*
				020303	25	*22, 21*	90	*22, 21, 4*	146	*13*	240	*4*
	STRAW	1A1a	Electricity and heat production	010101	49	*12*	125	*12*	0.78	*12*	67	*12*
				010102	49	*12*	125	*12*	0.78	*12*	67	*12*
				010103	49	*12*	125	*12*	0.78	*12*	67	*12*
				010104	49	*12*	125	*12*	0.78	*12*	67	*12*
				010203	130	*5*	90	*4, 28*	7.3	*13*	325	*4, 5*
		1A4a	Commercial/Institutional	020103	130	*5*	90	*4, 28*	146	*13*	4000	*1, 6, 7*
		1A4b i	Residential	020200	130	*5*	90	*4, 28*	400	*13*	4000	*1, 6, 7*
		1A4c i	Agriculture/ Forestry	020300	130	*5*	90	*4, 28*	146	*13*	4000	*1, 6, 7*
				020302	130	*5*	90	*4, 28*	10	*13*	325	*4, 5*
	BIO OIL	1A1a	Electricity and heat production	010102	1	*37*	249	*15*	0.8	*13*	15	*15*
				010105	1	*37*	700	*15*	37	*13*	15	*15*
				010202	1	*37*	65	*15*	0.8	*13*	15	*15*
				010203	1	*37*	65	*15*	0.8	*13*	15	*15*
		1A4b i	Residential	020200	1	*37*	65	*15*	15	*13*	100	*15*
	BIOGAS	1A1a	Electricity and heat production	010101	25	*26*	28	*4*	2	*16*	36	*4*
				010102	25	*26*	28	*4*	2	*16*	36	*4*
				010105	19.2	*31*	202	*12*	10	*12*	310	*12*
				010203	25	*26*	28	*4*	2	*16*	36	*4*
		1A2e	Food processing, beverages and tobacco	030900	25	*26*	28	*4*	2	*16*	36	*4*
				030902	25	*26*	59	*4*	2	*16*	36	*4*
				030903	25	*26*	28	*4*	2	*16*	36	*4*
				030905	19.2	*31*	202	*12*	10	*12*	310	*12*
		1A2f	Industry- Other	030102	25	*26*	59	*4*	2	*16*	36	*4*
				030103	25	*26*	28	*4*	2	*16*	36	*4*
				030105	19.2	*31*	202	*12*	10	*12*	310	*12*
		1A4a	Commercial/ Institutional	020100	25	*26*	28	*4*	2	*16*	36	*4*
				020103	25	*26*	28	*4*	2	*16*	36	*4*
				020105	19.2	*31*	202	*12*	10	*12*	310	*12*
		1A4c i	Agriculture/ Forestry	020300	25	*26*	28	*4*	2	*16*	36	*4*
				020304	19.2	*31*	202	*12*	10	*12*	310	*12*
	BIO PROD GAS	1A1a	Electricity and heat production	010105	1.9	*12*	173	*12*	2	*12*	586	*12*

Fuel type	Fuel	NFR	NFR_name	SNAP	SO2 g/GJ	SO2 Ref.	NOx g/GJ	NOx Ref.	NMVOC g/GJ	NMVOC Ref.	CO g/GJ	CO Ref.
		1A4a	Commercial/ Institutional	020105	1.9	*12*	173	*12*	2	*12*	586	*12*
WASTE	WASTE	1A1a	Electricity and heat production	010102	8.3	*12*	102	*12*	0.56	*12*	3.9	*12*
				010103	8.3	*12*	102	*12*	0.56	*12*	3.9	*12*
				010104	8.3	*12*	102	*12*	0.56	*12*	3.9	*12*
				010203	15	*34*	164	*9*	2	*13*	10	*9*
		1A2c	Chemicals	030600	15	*34*	164	*9*	2	*13*	10	*9*
		1A2d	Pulp, paper and print	031100	15	*34*	164	*9*	2	*13*	10	*9*
		1A2e	Food processing, beverages and tobacco	030900	15	*34*	164	*9*	2	*13*	10	*9*
		1A2f	Industry - Other	(all)	15	*34*	164	*9*	2	*13*	10	*9*
		1A4a	Commercial/ Institutional	020103	15	*34*	164	*9*	2	*13*	10	*9*
	INDISTRIAL WASTE	1A2f	Industry - Other	031600	15	*34*	164	*9*	2	*13*	10	*9*
GAS	NATURAL GAS	1A1a	Electricity and heat production	010101	0.3	*17*	55	*41*	2	*14*	15	*3*
				010102	0.3	*17*	55	*41*	2	*14*	15	*3*
				010103	0.3	*17*	42	*9*	2	*14*	28	*4*
				010104	0.3	*17*	48	*12*	1.6	*12*	4.8	*12*
				010105	0.3	*17*	135	*12*	92	*12*	58	*12*
				010202	0.3	*17*	42	*36*	2	*14*	28	*4*
				010203	0.3	*17*	42	*36*	2	*14*	28	*4*
		1A1c	Other energy industries	010504	0.3	*17*	250	*1, 8, 32*	1.6	*12*	4.8	*12*
		1A2a	Iron and steel	030400	0.3	*17*	42	*36*	2	*14*	28	*4*
				030402	0.3	*17*	42	*36*	2	*14*	28	*4*
		1A2b	Non-ferrous metals	030500	0.3	*17*	42	*36*	2	*14*	28	*4*
		1A2c	Chemicals	030600	0.3	*17*	42	*36*	2	*14*	28	*4*
				030602	0.3	*17*	42	*36*	2	*14*	28	*4*
				030604	0.3	*17*	48	*12*	1.6	*12*	4.8	*12*
		1A2d	Pulp, paper and print	031100	0.3	*17*	42	*36*	2	*14*	28	*4*
				031102	0.3	*17*	42	*36*	2	*14*	28	*4*
				030104	0.3	*17*	48	*12*	1.6	*12*	4.8	*12*
		1A2e	Food processing, beverages and tobacco	030900	0.3	*17*	42	*36*	2	*14*	28	*4*
				030902	0.3	*17*	42	*36*	2	*14*	28	*4*
				030903	0.3	*17*	42	*36*	2	*14*	28	*4*
				030904	0.3	*17*	48	*12*	1.6	*12*	4.8	*12*
				030905	0.3	*17*	135	*12*	92	*12*	58	*12*
		1A2f	Industry - Other	Turbines	0.3	*17*	48	*12*	1.6	*12*	4.8	*12*
				Engines	0.3	*17*	135	*12*	92	*12*	58	*12*
				030700	0.3	*17*	87	*42*	2	*14*	28	*4*
				(other)	0.3	*17*	42	*36*	2	*14*	28	*4*
		1A4a	Commercial/ Institutional	020100	0.3	*17*	30	*1,4,11*	2	*14*	28	*4*
				020103	0.3	*17*	30	*1,4,11*	2	*14*	28	*4*
				020105	0.3	*17*	135	*12*	92	*12*	58	*12*
		1A4b i	Residential	020200	0.3	*17*	30	*1,4,11*	4	*11*	20	*11*
				020202	0.3	*17*	30	*1,4,11*	4	*11*	20	*11*
				020204	0.3	*17*	135	*12*	92	*12*	58	*12*
		1A4c i	Agriculture/ Forestry	020300	0.3	*17*	30	*1,4,11*	2	*14*	28	*4*
				020304	0.3	*17*	135	*12*	92	*12*	58	*12*
LIQ-UID	PETROLE-UM COKE	1A1a	Electricity and heat production	010102	605	*20*	95	*38*	10	*38*	61	*38*

Fuel type	Fuel	NFR	NFR_name	SNAP	SO2 g/GJ	SO2 Ref.	NOx g/GJ	NOx Ref.	NMVOC g/GJ	NMVOC Ref.	CO g/GJ	CO Ref.
		1A2f	Industry - Other	(all)	605	*20*	95	*38*	10	*38*	61	*38*
		1A4a	Commercial/ Institutional	020100	605	*20*	50	*1*	88.8	*13*	1000	*1*
		1A4b	Residential	020200	605	*20*	50	*1*	484	*13*	1000	*1*
	RESIDUAL OIL	1A1a	Electricity and heat production	010101	218	*18*	138	*18*	0.8	*12*	15	*3*
				010102	218	*18*	138	*18*	0.8	*12*	2.8	*12*
				010103	218	*18*	138	*18*	0.8	*12*	2.8	*12*
				010104	218	*18*	138	*18*	2.3	*13*	15	*3*
				010105	218	*18*	138	*18*	2.3	*13*	15	*3*
				010203	344	*25, 10, 24*	142	*4*	2.3	*13*	30	*1*
		1A1b	Petroleum refining	010306	537	*33*	142	*4*	2.3	*13*	30	*1*
		1A2e	Food processing, beverages and tobacco	030902	344	*25, 10, 24*	136	*12*	0.8	*12*	2.8	*12*
				030903	344	*25, 10, 24*	136	*12*	0.8	*12*	2.8	*12*
		1A2f	Industry - other	(all)	344	*25, 10, 24*	130	*28*	0.8	*12*	2.8	*12*
		1A4c i	Agriculture/ Forestry	020300	344	*25, 10, 24*	142	*4*	5	*13*	30	*1*
				020304	344	*25, 10, 24*	130	*28*	10	*13*	100	*13*
	GAS OIL	1A1a	Electricity and heat production	010101	23	*27*	249	*18*	0.8	*13*	15	*3*
				010102	23	*27*	249	*18*	0.8	*13*	15	*3*
				010103	23	*27*	65	*28*	0.8	*13*	15	*3*
				010104	23	*27*	350	*9*	0.2	*13*	15	*3*
				010105	23	*27*	942	*12*	37	*13*	130	*12*
				010202	23	*27*	65	*28*	0.8	*13*	30	*1*
				010203	23	*27*	65	*28*	0.8	*13*	30	*1*
		1A1b	Petroleum refining	010306	23	*27*	65	*28*	0.8	*13*	30	*1*
		1A2c	Chemicals	030602	23	*27*	65	*28*	5	*13*	30	*1*
				030604	23	*27*	65	*28*	0.2	*13*	15	*3*
		1A2d	Pulp, paper and print	031102	23	*27*	65	*28*	5	*13*	30	*1*
		1A2e	Food processing, beverages and tobacco	030902	23	*27*	65	*28*	5	*13*	30	*1*
		1A2f	Industry - other	031205	23	*27*	942	*12*	37	*13*	130	*12*
				(other)	23	*27*	65	*28*	10	*13*	30	*1*
		1A4a	Commercial/ Institutional	020100	23	*27*	52	*4*	5	*13*	30	*1*
				020103	23	*27*	52	*4*	5	*13*	30	*1*
				020105	23	*27*	942	*12*	37	*13*	130	*12*
		1A4b i	Residential	020200	23	*27*	52	*4*	15	*13*	43	*1*
		1A4c	Agriculture/Forestry	020302	23	*27*	52	*4*	5	*13*	30	*1*
	KEROSENE	1A2f	Industry - other	031500	5	*30*	50	*1*	10	*13*	20	*1*
				032000	5	*30*	50	*1*	10	*13*	20	*1*
		1A4a	Commercial/ Institutional	020100	5	*30*	50	*1*	5	*13*	20	*1*
		1A4b i	Residential	020200	5	*30*	50	*1*	15	*13*	20	*1*
		1A4c i	Agriculture/ Forestry	020300	5	*30*	50	*1*	5	*13*	20	*1*
	LPG	1A1a	Electricity and heat production	010101	0.13	*23*	96	*32*	0.8	*13*	25	*1*
				010102	0.13	*23*	96	*32*	0.8	*13*	25	*1*
				010103	0.13	*23*	96	*32*	0.8	*13*	25	*1*
				010203	0.13	*23*	96	*32*	0.8	*13*	25	*1*
		1A2a	Iron and steel	030400	0.13	*23*	96	*32*	5	*13*	25	*1*
		1A2b	Non-ferrous metals	030500	0.13	*23*	96	*32*	5	*13*	25	*1*
		1A2c	Chemicals	030600	0.13	*23*	96	*32*	5	*13*	25	*1*
				030602	0.13	*23*	96	*32*	5	*13*	25	*1*
		1A2d	Pulp, paper and print	031100	0.13	*23*	96	*32*	5	*13*	25	*1*
		1A2e	Food processing, beverages	030900	0.13	*23*	96	*32*	5	*13*	25	*1*

Fuel type	Fuel	NFR	NFR_name	SNAP	SO2 g/GJ	Ref.	NOx g/GJ	Ref.	NMVOC g/GJ	Ref.	CO g/GJ	Ref.
			and tobacco									
		1A2f	Industry - other	(all)	0.13	*23*	96	*32*	5	*13*	25	*1*
		1A4a	Commercial/ Institutional	020100	0.13	*23*	71	*32*	5	*13*	25	*1*
				020105	0.13	*23*	71	*32*	5	*13*	25	*1*
		1A4b i	Residential	020200	0.13	*23*	47	*32*	10	*13*	25	*1*
		1A4c i	Agriculture/ Forestry	020300	0.13	*23*	71	*32*	5	*13*	25	*1*
	REFINERY GAS	1A1b	Petroleum refining	010304	1	*2*	170	*9*	1.4	*35*	6.2	*35*
				010306	1	*2*	80	*40*	1.4	*35*	6.2	*35*
SOLID	ANODE CARBON	1A2f	Industry - other	032000	574	*29*	95	*29*	10	*29*	10	*29*
	COAL	1A1a	Electricity and heat production	010101	9	*18*	30	*18*	1.2	*13*	10	*3*
				010102	9	*18*	30	*18*	1.2	*13*	10	*3*
				010104	9	*18*	30	*18*	1.2	*13*	10	*3*
		1A2e	Food processing, beverages and tobacco	(all)	574	*19*	95	*4*	10	*13*	10	*3*
		1A2f	Industry - other	(all)	574	*19*	95	*4*	10	*13*	10	*3*
		1A4b i	Residential	020200	574	*19*	95	*4*	484	*13*	2000	*32*
		1A4c i	Agriculture/ Forestry	020300	574	*19*	95	*4*	88.8	*13*	931	*13*
	BROWN COAL BRI.	1A2f i	Industry - other	030800	574	*19*	95	*4*	10	*13*	10	*3*
		1A4b i	Residential	020200	574	*19*	95	*4*	484	*13*	2000	*29*
	COKE OVEN COKE	1A2e	Food processing, beverages and tobacco	030902 030903	574	*19*	95	*4*	10	*13*	10	*29*
		1A2f i	Industry - other	(all)	574	*19*	95	*4*	10	*13*	10	*29*
		1A4b i	Residential	020200	574	*19*	95	*4*	484	*13*	2000	*29*

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Table 2A-4.2a SO_2, NO_x, NMVOC and CO emission factors time-series, g per GJ for the years 1990 to 1999.

						1990	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**
CO	BIO-MASS	BIOGAS	1A1a	Electricity and heat production	10105	230	234	239	243	248	252	256	260	265	269
			1A2e	Food processing, beverages and tobacco	30905										
			1A4a i	Commercial/Institutional plants	20105	230	234	239	243	248	252	256	260	265	269
			1A4c i	Agriculture/Forestry/Fishing, Stationary	20304	230	234	239	243	248	252	256	260	265	269
		STRAW	1A1a	Electricity and heat production	10203					417	371	325	325	325	325
					10200	600	554	508	463						
			1A4b i	Residential plants	20200	8500	8500	8500	8500	8500	7500	6500	5500	4500	4000
			1A4c i	Agriculture/Forestry/Fishing, Stationary	20300	8500	8500	8500	8500	8500	7500	6500	5500	4500	4000
		WOOD	1A1a	Electricity and heat production	10203					293	267	240	240	240	240
					10200	400	373	347	320						
			1A2a	Iron and steel	30400	400	373	347	320	293					
			1A2d	Pulp, Paper and Print	31100	400	373	347	320	293	267	240	240	240	240
			1A2e	Food processing, beverages and tobacco	30900	400	373	347	320	293	267	240	240	240	240
			1A2f i	Industry-Other	30700	400	373	347	320	293	267	240	240	240	240
					31000					293	267				240
					31200	400	373	347		293	267	240	240	240	240
					31300	400	373	347	320	293	267	240	240	240	240
					31400	400	373	347	320	293	267	240	240	240	240
					32000	400	373	347	320	293	267	240	240	240	240
					31403					293	267	240	240	240	240
					31603					293	267	240	240	240	240
					30100	400	373	347	320						
			1A4a i	Commercial/Institutional plants	20100	400	373	347	320	293	267	240	240	240	240
			1A4b i	Residential plants	20200	4428.68	4428.68	4428.68	4428.68	4428.68	4428.68	4428.68	4428.68	4428.68	4428.68
						6665	6665	6665	6665	6665	6665	6665	6665	6665	6665
					20204										
					20202										
			1A4c i	Agriculture/Forestry/Fishing, Stationary	20300	400	373	347	320	293	267	240	240	240	240
	GAS	NATURAL GAS	1A1a	Electricity and heat production	10104	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2
					10105	189	211	212	227	226	222	221	182	182	182
			1A1c	Manufacture of solid fuels and other energy industries	10504	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2
			1A2c	Chemicals	30604	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2
					30605								182	182	182
			1A2d	Pulp, Paper and Print	31104						6.2	6.2	6.2	6.2	6.2
			1A2e	Food processing, beverages and tobacco	30905					226	222	221	182	182	182
					30904					6.2	6.2	6.2	6.2	6.2	6.2
			1A2f i	Industry-Other	30105	189	211	212	227						
					30705						222	221	182	182	182
					31005							221	182	182	182
					31205						222	221	182	182	182
					31305							221	182	182	182
					31405						222	221	182	182	182
					31604							6.2	6.2	6.2	6.2
					31605								182	182	182

						1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
					32005					226	222	221	182	182	182
			1A4a i	Commercial/Institutional plants	20105	189	211	212	227	226	222	221	182	182	182
					20104						6.2		6.2		
			1A4b i	Residential plants	20204		211	212	227	226	222	221	182	182	182
			1A4c i	Agriculture/Forestry/Fishing, Stationary	20304	189	211	212	227	226	222	221	182	182	182
	WASTE	WASTE	1A1a	Electricity and heat production	10102					7.4	7.4	7.4	7.4	7.4	7.4
					10103					7.4	7.4	7.4	7.4	7.4	7.4
					10104					7.4	7.4	7.4	7.4	7.4	7.4
					10203					40	25	10	10	10	10
					10200	100	85	70	55						
			1A2a	Iron and steel	30400					40	25				
			1A2c	Chemicals	30600	100	85	70	55	40	25	10	10	10	
			1A2d	Pulp, Paper and Print	31100	100	85	70	55	40	25	10	10	10	10
			1A2e	Food processing, beverages and tobacco	30900	100	85	70	55	40	25	10		10	10
			1A2f i	Industry-Other	30700	100	85	70	55	40	25			10	
					31000	100	85	70	55	40	25	10	10	10	10
					31200	100	85			40	25				
					31300	100	85	70	55	40	25	10	10	10	
					31400			70	55	40	25	10	10	10	10
					32000	100	85	70	55	40	25	10	10	10	10
			1A4a i	Commercial/Institutional plants	20100	100	85	70	55	40	25	10	10	10	10
					20103					40	25	10	10	10	10
NMV OC	BIO-MASS	BIOGAS	1A1a	Electricity and heat production	10105	14	14	14	14	14	14	14	14	14	14
			1A2e	Food processing, beverages and tobacco	30905										
			1A4a i	Commercial/Institutional plants	20105	14	14	14	14	14	14	14	14	14	14
			1A4c i	Agriculture/Forestry/Fishing, Stationary	20304	14	14	14	14	14	14	14	14	14	14
		STRAW	1A4b i	Residential plants	20200	925	872.5	820	767	715	663	610	558	505	453
		WOOD	1A2a	Iron and steel	30400	146	132	119	105	92					
			1A2d	Pulp, Paper and Print	31100	146	132	119	105	92	78	64	51	37	24
			1A2e	Food processing, beverages and tobacco	30900	146	132	119	105	92	78	64	51	37	24
					30902									37	24
			1A2f i	Industry-Other	30700	146	132	119	105	92	78	64	51	37	24
					31000					92	78				24
					31200	146	132	119		92	78	64	51	37	24
					31300	146	132	119	105	92	78	64	51	37	24
					31400	146	132	119	105	92	78	64	51	37	24
					32000	146	132	119	105	92	78	64	51	37	24
					31403					92	78	64	51	37	24
					31603					92	78	64	51	37	24
					30100	146	132	119	105						
			1A4b i	Residential plants	20200	572.5	572.5	572.5	572.5	572.5	572.5	572.5	572.5	572.5	572.5
					20204										
					20202										
	GAS	NATURAL GAS	1A1a	Electricity and heat production	10104	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
					10105	60	69	81	127	140	142	138	124	122	122
			1A1c	Manufacture of solid fuels and other energy industries	10504	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4

						1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
			1A2c	Chemicals	30604	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
					30605								124	122	122
			1A2d	Pulp, Paper and Print	31104						1.4	1.4	1.4	1.4	1.4
			1A2e	Food processing, beverages and tobacco	30905					140	142	138	124	122	122
					30904					1.4	1.4	1.4	1.4	1.4	1.4
			1A2f i	Industry-Other	30105	60	69	81	127						
					30705						142	138	124	122	122
					31005							138	124	122	122
					31205						142	138	124	122	122
					31305							138	124	122	122
					31405						142	138	124	122	122
					31604							1.4	1.4	1.4	1.4
					31605								124	122	122
					32005					140	142	138	124	122	122
			1A4a i	Commercial/Institutional plants	20105	60	69	81	127	140	142	138	124	122	122
					20104						1.4		1.4		
			1A4b i	Residential plants	20204		69	81	127	140	142	138	124	122	122
			1A4c i	Agriculture/Forestry/Fishing, Stationary	20304	60	69	81	127	140	142	138	124	122	122
	WASTE	WASTE	1A1a	Electricity and heat production	10102					0.98	0.98	0.98	0.98	0.98	0.98
					10103					0.98	0.98	0.98	0.98	0.98	0.98
					10104					0.98	0.98	0.98	0.98	0.98	0.98
NOX	BIO-MASS	BIO OIL	1A1a	Electricity and heat production	10203					80	75	70	65	65	65
					10200	100	95	90	85						
		BIOGAS	1A1a	Electricity and heat production	10105	711	696	681	665	650	635	616	597	578	559
			1A2e	Food processing, beverages and tobacco	30905										
			1A4a i	Commercial/Institutional plants	20105	711	696	681	665	650	635	616	597	578	559
			1A4c i	Agriculture/Forestry/Fishing, Stationary	20304	711	696	681	665	650	635	616	597	578	559
		WOOD	1A1a	Electricity and heat production	10203					130	130	130	130	130	90
			1A2a	Iron and steel	30400	130	130	130	130	130					
			1A2d	Pulp, Paper and Print	31100	130	130	130	130	130	130	130	130	130	90
			1A2e	Food processing, beverages and tobacco	30900	130	130	130	130	130	130	130	130	130	90
					30902									130	90
			1A2f i	Industry-Other	30700	130	130	130	130	130	130	130	130	130	90
					31000					130	130				90
					31200	130	130	130		130	130	130	130	130	90
					31300	130	130	130	130	130	130	130	130	130	90
					31400	130	130	130	130	130	130	130	130	130	90
					32000	130	130	130	130	130	130	130	130	130	90
					31403					130	130	130	130	130	90
					31603					130	130	130	130	130	90
			1A4a i	Commercial/Institutional plants	20100	130	130	130	130	130	130	130	130	130	90
			1A4c i	Agriculture/Forestry/Fishing, Stationary	20300	130	130	130	130	130	130	130	130	130	90
	GAS	NATURAL GAS	1A1a	Electricity and heat production	10102					115	115			115	115
					10101					115	115		115		
					10104	161	157	153	149	145	141	138	134	131	127
					10105	276	241	235	214	199	194	193	170	167	167
			1A2c	Chemicals	30604	161	157	153	149	145	141	138	134	131	127

						1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
					30605								170	167	167
			1A2d	Pulp, Paper and Print	31104						141	138	134	131	127
			1A2e	Food processing, beverages and tobacco	30905					199	194	193	170	167	167
					30904					145	141	138	134	131	127
			1A2f i	Industry-Other	30105	276	241	235	214						
					30705						194	193	170	167	167
					31005							193	170	167	167
					31205						194	193	170	167	167
					31305							193	170	167	167
					31405						194	193	170	167	167
					31604							138	134	131	127
					31605								170	167	167
					32005					199	194	193	170	167	167
			1A4a i	Commercial/Institutional plants	20105	276	241	235	214	199	194	193	170	167	167
					20104						141		134		
			1A4b i	Residential plants	20204		241	235	214	199	194	193	170	167	167
			1A4c i	Agriculture/Forestry/Fishing, Stationary	20304	276	241	235	214	199	194	193	170	167	167
	LIQUID	GAS OIL	1A1a	Electricity and heat production	10103						75	65	65	65	65
					10105					1247	1196	1145	1094	1044	993
					10202					80	75	70	65	65	65
					10203					80	75	70	65	65	65
					10200	100	95	90	85						
			1A1b	Petroleum refining	10306		95	90	85	80	75	70	65		
			1A2a	Iron and steel	30400	100	95	90	85	80	75	70	65	65	65
			1A2b	Non-ferrous metals	30500	100	95	90	85	80	75	70	65	65	65
			1A2c	Chemicals	30600	100	95	90	85	80	75	70	65	65	65
			1A2d	Pulp, Paper and Print	31100	100	95	90	85	80	75	70	65	65	65
					31103							70	65	65	
			1A2e	Food processing, beverages and tobacco	30900	100	95	90	85	80	75	70	65	65	65
					30902					80	75	70	65	65	65
					30903					80	75				65
			1A2f i	Industry-Other	30700	100	95	90	85	80	75	70	65	65	65
					30800	100	95	90	85	80	75	70	65	65	65
					31000	100	95	90	85	80	75	70	65	65	65
					31200	100	95	90	85	80	75	70	65	65	65
					31300	100	95	90	85	80	75	70	65	65	65
					31400	100	95	90	85	80	75	70	65	65	65
					32000	100	95	90	85	80	75	70	65	65	65
					31403					80	75		65	65	65
					31305									1247	1247
			1A4a i	Commercial/Institutional plants	20105					1247	1196	1145	1094	1044	993
			1A4c i	Agriculture/Forestry/Fishing, Stationary	20304							1145	1094		
		ORIMULSION	1A1a	Electricity and heat production	10101						138	139	138	138	
		PETROLEUM COKE	1A1a	Electricity and heat production	10102					200	200				
			1A2f i	Industry-Other	30700	200						200	200	200	200
					30800	200	200	200	200	200	200				200
					31600	200	200	200	200	200	200	200	200	200	200
		REFINERY	1A1b	Petroleum refining	10306	100	100	100	100	80	80	80	80	80	80

						1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
		GAS													
		RESIDUAL OIL	1A1a	Electricity and heat production	10102	342	384	294	289	267	239	250	200	177	152
					10100	342	384	294	289						
					10101						239	250	200	177	152
					10103					267	239	250	200	177	152
					10104					267	239	250	200	177	152
					10105					267	239	250	200	177	152
			1A4c i	Agriculture/Forestry/Fishing, Stationary	20304									142	142
	SOLID	BROWN COAL BRI.	1A2f i	Industry-Other	30800	200	200	200	200	200	200	200	200		
			1A4b i	Residential plants	20200	200	200	200	200	200	200	200	200	200	200
		COAL	1A1a	Electricity and heat production	10102	342	384	294	289	267	239	250	200	177	152
					10100	342	384	294	289						
					10101	342	384	294	289	267	239	250	200	177	152
					10103					267	239	250			
					10104					267	239	250	200		
					10203					200	200	200	200	200	200
			1A2c	Chemicals	30600	200	200	200	200	200	200	200	200	200	200
			1A2e	Food processing, beverages and tobacco	30900	200	200	200	200	200	200	200	200	200	200
					30902					200	200	200	200	200	200
					30903					200	200	200	200	200	200
			1A2f i	Industry-Other	30700	200			200	200	200	200	200	200	200
					30800	200	200	200	200	200	200	200	200	200	200
					31600	200	200	200	200	200	200	200	200	200	200
					31300	200	200	200	200	200	200	200	200	200	
					32000				200						
			1A4a i	Commercial/Institutional plants	20100	200	200	200	200	200	200	200	200	200	
			1A4b i	Residential plants	20200	200	200	200	200	200	200	200	200	200	200
			1A4c i	Agriculture/Forestry/Fishing, Stationary	20300	200	200	200	200	200	200	200	200	200	200
		COKE OVEN COKE	1A2a	Iron and steel	30400	200	200								200
			1A2e	Food processing, beverages and tobacco	30900	200	200	200	200	200	200	200	200	200	200
			1A2f i	Industry-Other	30700	200	200	200	200	200	200	200	200	200	200
					30800	200								200	200
					31300	200	200	200	200	200	200	200	200	200	
					32000	200	200	200	200		200	200	200	200	200
			1A4b i	Residential plants	20200	200	200	200	200	200	200	200	200	200	200
	WASTE	WASTE	1A1a	Electricity and heat production	10102					134	134	134	134	134	129
					10103					134	134	134	134	134	129
					10104					134	134	134	134	134	129
SO2	LIQUID	GAS OIL	1A1a	Electricity and heat production	10102					94	23	23	23	23	23
					10101					94	23	23	23	23	23
					10104		94	94	94	94	23	23	23	23	23
					10105					94	23	23	23	23	23
					10202					94	23	23	23	23	23
					10203					94	23	23	23	23	23
			1A1b	Petroleum refining	10306		94	94	94	94	23	23	23		
			1A2a	Iron and steel	30400	94	94	94	94	94	23	23	23	23	23

						1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
			1A2b	Non-ferrous metals	30500	94	94	94	94	94	23	23	23	23	23
			1A2c	Chemicals	30600	94	94	94	94	94	23	23	23	23	23
			1A2d	Pulp, Paper and Print	31100	94	94	94	94	94	23	23	23	23	23
			1A2e	Food processing, beverages and tobacco	30900	94	94	94	94	94	23	23	23	23	23
					30902					94	23	23	23	23	23
					30903					94	23				23
			1A2f i	Industry-Other	30700	94	94	94	94	94	23	23	23	23	23
					30800	94	94	94	94	94	23	23	23	23	23
					31000	94	94	94	94	94	23	23	23	23	23
					31200	94	94	94	94	94	23	23	23	23	23
					31300	94	94	94	94	94	23	23	23	23	23
					31400	94	94	94	94	94	23	23	23	23	23
					32000	94	94	94	94	94	23	23	23	23	23
					31403					94	23		23	23	23
			1A4a i	Commercial/Institutional plants	20100	94	94	94	94	94	23	23	23	23	23
					20102					94		23		23	
					20103					94		23	23	23	23
					20105					94	23	23	23	23	23
			1A4b i	Residential plants	20200	94	94	94	94	94	23	23	23	23	23
			1A4c i	Agriculture/Forestry/Fishing, Stationary	20300	94	94	94	94	94	23	23	23	23	23
		ORIMULSION	1A1a	Electricity and heat production	10101						149	147	149	149	
		PETROLEUM COKE	1A1a	Electricity and heat production	10102					787	787				
			1A2f i	Industry-Other	30700	787						787	787	787	787
					30800	787	787	787	787	787	787				787
					31600	787	787	787	787	787	787	787	787	787	787
			1A4a i	Commercial/Institutional plants	20100	787	787	787	787	787	787	787	787	787	787
			1A4b i	Residential plants	20200	787	787	787	787	787	787	787	787	787	787
			1A4c i	Agriculture/Forestry/Fishing, Stationary	20300	787	787	787	787	787	787	787	787	787	787
		RESIDUAL OIL	1A1a	Electricity and heat production	10102	446	470	490	475	543	351	408	344	369	369
					10100	446	470	490	475						
					10101						351	408	344	369	369
					10103					543	351	408	344	369	369
					10104					543	351	408	344	369	369
					10105					543	351	408	344	369	369
					10202					495	495	495	344	344	344
					10203					495	495	495	344	344	344
			1A1b	Petroleum refining	10306	798	798	798	798	537	537	537	537	537	537
			1A2a	Iron and steel	30400	495	495	495	495	495	495	495	344	344	344
			1A2b	Non-ferrous metals	30500	495	495	495	495	495	495	495	344	344	344
			1A2c	Chemicals	30600	495	495	495	495	495	495	495	344	344	344
			1A2d	Pulp, Paper and Print	31100	495	495	495	495	495	495	495	344	344	344
			1A2e	Food processing, beverages and tobacco	30900	495	495	495	495	495	495	495	344	344	344
					30902					495	495	495	344	344	344
					30903					495	495	495	344	344	344
			1A2f i	Industry-Other	30700	495	495	495	495	495	495	495	344		344
					30800	495	495	495	495	495	495	495	344	344	344
					31600	495	495	495	495	495	495	495	344	344	344

						1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
					31000	495	495	495	495	495	495	495	344	344	344
					31200	495	495	495	495	495	495	495		344	344
					31300	495	495	495	495	495	495	495	344	344	344
					31400	495	495	495	495	495	495	495	344	344	344
					31500	495	495	495	495	495	495	495	344	344	344
					32000	495	495	495	495	495	495	495	344	344	344
					32002					495	495	495	344	344	344
					32003					495	495			344	
			1A4a i	Commercial/Institutional plants	20100	495	495	495	495	495	495	495	344	344	344
			1A4b i	Residential plants	20200	495	495	495	495	495	495	495	344	344	344
			1A4c i	Agriculture/Forestry/Fishing, Stationary	20300	495	495	495	495	495	495	495	344	344	344
	SOLID	COAL	1A1a	Electricity and heat production	10102	506	571	454	386	343	312	420	215	263	193
					10100	506	571	454	386						
					10101	506	571	454	386	343	312	420	215	263	193
					10103					343	312	420			
					10104					343	312	420	215		
	WASTE	INDUSTR. WASTES	1A2f i	Industry-Other	31600										
		WASTE	1A1a	Electricity and heat production	10102					52	30	29	28	26	25
					10100	138	116	95	73						
					10103					52	30	29	28	26	25
					10104					52	30	29	28	26	25
					10203					110	103	95	88	81	74
					10200	138	131	124	117						
			1A2a	Iron and steel	30400					110	103				
			1A2c	Chemicals	30600	138	131	124	117	110	103	95	88	81	
			1A2d	Pulp, Paper and Print	31100	138	131	124	117	110	103	95	88	81	74
			1A2e	Food processing, beverages and tobacco	30900	138	131	124	117	110	103	95		81	74
					30902										
			1A2f i	Industry-Other	30700	138	131	124	117	110	103			81	
					30800										
					31600										
					31000	138	131	124	117	110	103	95	88	81	74
					31200	138	131			110	103				
					31300	138	131	124	117	110	103	95	88	81	
					31400			124	117	110	103	95	88	81	74
					32000	138	131	124	117	110	103	95	88	81	74
			1A4a i	Commercial/Institutional plants	20100	138	131	124	117	110	103	95	88	81	74
					20103					110	103	95	88	81	74

Table 2A-4.2b SO_2, NO_x, NMVOC and CO emission factors time-series, g pr GJ for the years 2000 to 2011.

						2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
CO	BIO-MASS	BIOGAS	1A1a	Electricity and heat production	10105	273	279	285	292	298	304	310	310	310	310	310	310
			1A2e	Food processing, beverages and tobacco	30905		279	285	292	298	304	310	310	310	310	310	310
			1A4a i	Commercial/Institutional plants	20105	273	279	285	292	298	304	310	310	310	310	310	310
			1A4c i	Agriculture/Forestry/Fishing, Stationary	20304	273	279	285	292	298	304	310	310	310	310	310	310
		STRAW	1A1a	Electricity and heat production	10203	325	325	325	325	325	325	325	325	325	325	325	325
					10200												
			1A4b i	Residential plants	20200	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
			1A4c i	Agriculture/Forestry/Fishing, Stationary	20300	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
		WOOD	1A1a	Electricity and heat production	10203	240	240	240	240	240	240	240	240	240	240	240	240
					10200												
			1A2a	Iron and steel	30400				240	240							
			1A2d	Pulp, Paper and Print	31100	240	240	240	240	240	240						
			1A2e	Food processing, beverages and tobacco	30900	240	240	240	240	240	240	240	240	240	240	240	240
			1A2f i	Industry-Other	30700	240	240	240	240	240	240	240	240	240	240	240	240
					31000	240	240	240	240	240	240	240	240	240	240	240	240
					31200	240	240	240	240	240	240	240	240	240	240	240	240
					31300	240	240	240	240	240	240	240	240	240	240	240	240
					31400	240	240	240	240	240	240	240	240	240	240	240	240
					32000	240	240	240	240	240	240	240	240	240	240	240	240
					31403	240	240	240	240	240	240	240	240	240	240	240	240
					31603	240	240	240									
					30100												
			1A4a i	Commercial/Institutional plants	20100	240	240	240	240	240	240	240	240	240	240	240	240
			1A4b i	Residential plants	20200	4428.7	4027.3	3887.1	3880.5	3866.9	3734.9	3554.2	3643.8	3498.1	3292.7	3188.2	3099.9
					20204									3498.1	3292.7	3188.2	
					20202						3734.9	3554.2	3643.8	3498.1	3292.7	3188.2	3099.9
			1A4c i	Agriculture/Forestry/Fishing, Stationary	20300	240	240	240	240	240	240	240	240	240	240	240	240
	GAS	NATURAL GAS	1A1a	Electricity and heat production	10104	6.2	6.2	6.2	6.2	6.2	6.2	5.5	4.8	4.8	4.8	4.8	4.8
					10105	183	163	142	122	101	81	70	58	58	58	58	58
			1A1c	Manufacture of solid fuels and other energy industries	10504	6.2	6.2	6.2	6.2	6.2	6.2	5.5	4.8	4.8	4.8	4.8	4.8
			1A2c	Chemicals	30604	6.2	6.2	6.2	6.2	6.2	6.2	5.5	4.8	4.8	4.8	4.8	4.8
					30605	183	163	142	122	101	81						
			1A2d	Pulp, Paper and Print	31104	6.2	6.2	6.2	6.2	6.2	6.2	5.5	4.8	4.8	4.8	4.8	4.8
			1A2e	Food processing, beverages and tobacco	30905	183	163	142	122	101	81	70	58	58	58	58	58
					30904	6.2	6.2	6.2	6.2	6.2	6.2	5.5	4.8	4.8	4.8	4.8	4.8
			1A2f i	Industry-Other	30105												
					30705	183	163	142	122	101	81	70	58	58	58	58	58
					31005	183	163	142	122	101	81	70	58	58	58	58	58
					31205	183	163	142	122	101	81	70	58	58	58	58	58
					31305	183	163	142	122	101	81	70	58	58	58	58	58
					31405	183	163	142	122	101	81	70	58	58	58	58	58
					31604	6.2	6.2	6.2	6.2	6.2	6.2		4.8	4.8	4.8	4.8	4.8
					31605	183	163	142	122	101	81	70	58	58	58	58	58
					32005	183	163	142	122	101	81	70					

						2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
			1A4a i	Commercial/Institutional plants	20105	183	163	142	122	101	81	70	58	58	58	58	58
					20104	6.2	6.2	6.2	6.2	6.2	6.2	5.5	4.8				
			1A4b i	Residential plants	20204	183	163	142	122	101	81	70	58	58	58	58	58
			1A4c i	Agriculture/Forestry/Fishing, Stationary	20304	183	163	142	122	101	81	70	58	58	58	58	58
	WASTE	WASTE	1A1a	Electricity and heat production	10102	8	8	8	8	6.6	5.3	3.9	3.9	3.9	3.9	3.9	3.9
					10103	8	8	8	8	6.6	5.3	3.9	3.9	3.9	3.9	3.9	3.9
					10104	8			8			3.9				3.9	3.9
					10203	10	10	10	10	10	10	10	10	10	10	10	10
					10200												
			1A2a	Iron and steel	30400												
			1A2c	Chemicals	30600	10			10		10	10		10	10	10	10
			1A2d	Pulp, Paper and Print	31100	10			10		10	10		10	10	10	10
			1A2e	Food processing, beverages and tobacco	30900	10			10		10	10		10	10	10	10
			1A2f i	Industry-Other	30700												
					31000	10								10	10	10	10
					31200												
					31300	10			10		10	10		10	10	10	10
					31400	10			10		10	10		10	10	10	10
					32000				10		10	10		10	10		10
			1A4a i	Commercial/Institutional plants	20100				10	10	10	10	10	10	10	10	
					20103	10	10	10	10	10	10	10	10	10	10	10	10
NMVOC	BIO-MASS	BIOGAS	1A1a	Electricity and heat production	10105	14	13	13	12	11	10	10	10	10	10	10	10
			1A2e	Food processing, beverages and tobacco	30905		13	13	12	11	10	10	10	10	10	10	10
			1A4a i	Commercial/Institutional plants	20105	14	13	13	12	11	10	10	10	10	10	10	10
			1A4c i	Agriculture/Forestry/Fishing, Stationary	20304	14	13	13	12	11	10	10	10	10	10	10	10
		STRAW	1A4b i	Residential plants	20200	400	400	400	400	400	400	400	400	400	400	400	400
		WOOD	1A2a	Iron and steel	30400				10	10							
			1A2d	Pulp, Paper and Print	31100	10	10	10	10	10	10						
			1A2e	Food processing, beverages and tobacco	30900	10	10	10	10	10	10	10	10	10	10	10	10
					30902	10	10								10	10	10
			1A2f i	Industry-Other	30700	10	10	10	10	10	10	10	10	10	10	10	10
					31000	10	10	10	10	10	10	10	10	10	10	10	10
					31200	10	10	10	10	10	10	10	10	10	10	10	10
					31300	10	10	10	10	10	10	10	10	10	10	10	10
					31400	10	10	10	10	10	10	10	10	10	10	10	10
					32000	10	10	10	10	10	10	10	10	10	10	10	10
					31403	10	10	10	10	10	10	10	10	10	10	10	10
					31603	10	10	10									
					30100												
			1A4b i	Residential plants	20200	572.53 25704	510.02 96318	484.68 30984	477.85 17746	470.06 13922	446.63 58131	415.91 79856	421.85 72407	401.25 68457	373.35 9516	358.51 13658	343.21
					20204									401.25 68457	373.35 9516	358.51 13658	
					20202						446.63 58131	415.91 79856	421.85 72407	401.25 68457	373.35 9516	358.51 13658	343.21
	GAS	NATURAL GAS	1A1a	Electricity and heat production	10104	1.4	1.4	1.5	1.5	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6
					10105	121	114	108	101	95	88	90	92	92	92	92	92

						2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
			1A1c	Manufacture of solid fuels and other energy industries	10504	1.4	1.4	1.5	1.5	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6
			1A2c	Chemicals	30604	1.4	1.4	1.5	1.5	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6
					30605	121	114	108	101	95	88						
			1A2d	Pulp, Paper and Print	31104	1.4	1.4	1.5	1.5	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6
			1A2e	Food processing, beverages and tobacco	30905	121	114	108	101	95	88	90	92	92	92	92	92
					30904	1.4	1.4	1.5	1.5	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6
			1A2f i	Industry-Other	30105												
					30705	121	114	108	101	95	88	90	92	92	92	92	92
					31005	121	114	108	101	95	88	90	92	92	92	92	92
					31205	121	114	108	101	95	88	90	92	92	92	92	92
					31305	121	114	108	101	95	88	90	92	92	92	92	92
					31405	121	114	108	101	95	88	90	92	92	92	92	92
					31604	1.4	1.4	1.5	1.5	1.6	1.6		1.6	1.6	1.6	1.6	1.6
					31605	121	114	108	101	95	88	90	92	92	92	92	92
					32005	121	114	108	101	95	88	90					
			1A4a i	Commercial/Institutional plants	20105	121	114	108	101	95	88	90	92	92	92	92	92
					20104	1.4	1.4	1.5	1.5	1.6	1.6	1.6	1.6				
			1A4b i	Residential plants	20204	121	114	108	101	95	88	90	92	92	92	92	92
			1A4c i	Agriculture/Forestry/Fishing, Stationary	20304	121	114	108	101	95	88	90	92	92	92	92	92
	WASTE	WASTE	1A1a	Electricity and heat production	10102	0.98	0.98	0.98	0.98	0.84	0.7	0.56	0.56	0.56	0.56	0.56	0.56
					10103	0.98	0.98	0.98	0.98	0.84	0.7	0.56	0.56	0.56	0.56	0.56	0.56
					10104	0.98			0.98			0.56				0.56	0.56
NOX	BIO-MASS	BIO OIL	1A1a	Electricity and heat production	10203	65	65	65	65	65	65	65	65	65	65	65	65
					10200												
		BIOGAS	1A1a	Electricity and heat production	10105	540	484	427	371	315	259	202	202	202	202	202	202
			1A2e	Food processing, beverages and tobacco	30905		484	427	371	315	259	202	202	202	202	202	202
			1A4a i	Commercial/Institutional plants	20105	540	484	427	371	315	259	202	202	202	202	202	202
			1A4c i	Agriculture/Forestry/Fishing, Stationary	20304	540	484	427	371	315	259	202	202	202	202	202	202
		WOOD	1A1a	Electricity and heat production	10203	90	90	90	90	90	90	90	90	90	90	90	90
			1A2a	Iron and steel	30400				90	90							
			1A2d	Pulp, Paper and Print	31100	90	90	90	90	90	90						
			1A2e	Food processing, beverages and tobacco	30900	90	90	90	90	90	90	90	90	90	90	90	90
					30902	90	90								90	90	90
			1A2f i	Industry-Other	30700	90	90	90	90	90	90	90	90	90	90	90	90
					31000	90	90	90	90	90	90	90	90	90	90	90	90
					31200	90	90	90	90	90	90	90	90	90	90	90	90
					31300	90	90	90	90	90	90	90	90	90	90	90	90
					31400	90	90	90	90	90	90	90	90	90	90	90	90
					32000	90	90	90	90	90	90	90	90	90	90	90	90
					31403	90	90	90	90	90	90	90	90	90	90	90	90
					31603	90	90	90									
			1A4a i	Commercial/Institutional plants	20100	90	90	90	90	90	90	90	90	90	90	90	90
			1A4c i	Agriculture/Forestry/Fishing, Stationary	20300	90	90	90	90	90	90	90	90	90	90	90	90
	GAS	NATURAL GAS	1A1a	Electricity and heat production	10102	115	115	115	115	97	97	97	97	55	55	55	55
					10101	115	115	115	115	97	97	97	97	55	55	55	55
					10104	124	119	113	108	103	98	73	48	48	48	48	48

						2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
					10105	168	163	158	153	148	143	139	135	135	135	135	135
			1A2c	Chemicals	30604	124	119	113	108	103	98	73	48	48	48	48	48
					30605	168	163	158	153	148	143						
			1A2d	Pulp, Paper and Print	31104	124	119	113	108	103	98	73	48	48	48	48	48
			1A2e	Food processing, beverages and tobacco	30905	168	163	158	153	148	143	139	135	135	135	135	135
					30904	124	119	113	108	103	98	73	48	48	48	48	48
			1A2f i	Industry-Other	30105												
					30705	168	163	158	153	148	143	139	135	135	135	135	135
					31005	168	163	158	153	148	143	139	135	135	135	135	135
					31205	168	163	158	153	148	143	139	135	135	135	135	135
					31305	168	163	158	153	148	143	139	135	135	135	135	135
					31405	168	163	158	153	148	143	139	135	135	135	135	135
					31604	124	119	113	108	103	98		48	48	48	48	48
					31605	168	163	158	153	148	143	139	135	135	135	135	135
					32005	168	163	158	153	148	143	139					
			1A4a i	Commercial/Institutional plants	20105	168	163	158	153	148	143	139	135	135	135	135	135
					20104	124	119	113	108	103	98	73	48				
			1A4b i	Residential plants	20204	168	163	158	153	148	143	139	135	135	135	135	135
			1A4c i	Agriculture/Forestry/Fishing, Stationary	20304	168	163	158	153	148	143	139	135	135	135	135	135
	LIQUID	GAS OIL	1A1a	Electricity and heat production	10103		65	65	65	65	65	65	65	65	65	65	65
					10105	942	942	942	942	942	942	942	942	942	942	942	942
					10202	65	65	65		65	65	65	65	65	65	65	65
					10203	65	65	65	65	65	65	65	65	65	65	65	65
					10200												
			1A1b	Petroleum refining	10306				65	65	65	65	65	65	65	65	65
			1A2a	Iron and steel	30400	65	65	65	65	65	65	65					
			1A2b	Non-ferrous metals	30500	65	65	65	65	65	65	65					
			1A2c	Chemicals	30600	65	65	65	65	65	65	65					
			1A2d	Pulp, Paper and Print	31100	65	65	65	65	65	65	65					
					31103			65	65	65	65	65	65				
			1A2e	Food processing, beverages and tobacco	30900	65	65	65	65	65	65	65					
					30902				65	65	65	65	65	65	65	65	65
					30903	65	65	65	65	65	65	65	65	65		65	
			1A2f i	Industry-Other	30700	65	65	65	65	65	65	65					
					30800	65	65	65	65	65	65	65					
					31000	65	65	65	65	65	65	65					
					31200	65	65	65	65	65	65	65					
					31300	65	65	65	65	65	65	65					
					31400	65	65	65	65	65	65	65					
					32000	65	65	65	65	65	65	65	65	65	65	65	65
					31403	65	65	65									
					31305	942	942										
			1A4a i	Commercial/Institutional plants	20105	942	942	942	942	942	942	942	942	942	942	942	942
			1A4c i	Agriculture/Forestry/Fishing, Stationary	20304	942	942	942	942		942	942			942		
		ORIMULSION	1A1a	Electricity and heat production	10101		88	86	86	86							
		PETROLEUM COKE	1A1a	Electricity and heat production	10102											95	95
			1A2f i	Industry-Other	30700	95	95	95	95	95							95
					30800	95	95	95	95	95	95					95	95

						2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
					31600	95	95	95	95	95	95	95	95	95	95	95	95
		REFINERY GAS	1A1b	Petroleum refining	10306	80	80	80	80	80	80	80	80	80	80	80	80
		RESIDUAL OIL	1A1a	Electricity and heat production	10102	129	122	130	144	131	127	109	98	138	138	138	138
					10100												
					10101	129	122	130	144	131	127	109	98	138	138	138	138
					10103	129	122	130	144	131				138	138	138	138
					10104		122	130	144	131	127	109	98	138	138	138	138
					10105	129	122	130	144	131	127	109	98	138		138	138
			1A4c i	Agriculture/Forestry/Fishing, Stationary	20304	142	142	142	142							130	130
	SOLID	BROWN COAL BRI.	1A2f i	Industry-Other	30800									95	95	95	95
			1A4b i	Residential plants	20200	95	95	95	95					95	95	95	95
		COAL	1A1a	Electricity and heat production	10102	129	122	130	144	131	127	109	98	59	39	30	30
					10100												
					10101	129	122	130	144	131	127	109	98	59	39	30	30
					10103												
					10104											30	30
					10203	95	95	95	95	95	95	109	95	95			
			1A2c	Chemicals	30600	95	95	95	95	95	95	95					
			1A2e	Food processing, beverages and tobacco	30900	95	95	95	95	95	95	95	95	95			95
					30902	95	95	95	95	95	95	95	95	95	95	95	95
					30903	95	95	95	95	95	95	95	95	95	95	95	95
			1A2f i	Industry-Other	30700	95	95		95	95	95	95	95	95	95	95	95
					30800	95	95	95	95	95	95	95	95	95	95	95	95
					31600	95	95	95	95	95	95	95	95	95	95	95	95
					31300	95	95	95	95	95							
					32000										95	95	95
			1A4a i	Commercial/Institutional plants	20100					95							
			1A4b i	Residential plants	20200	95	95	95	95	95	95	95	95	95	95	95	95
			1A4c i	Agriculture/Forestry/Fishing, Stationary	20300	95	95	95	95	95	95	95	95	95	95	95	95
		COKE OVEN COKE	1A2a	Iron and steel	30400	95	95	95									
			1A2e	Food processing, beverages and tobacco	30900	95	95	95	95	95	95	95	95				
			1A2f i	Industry-Other	30700	95	95	95	95	95	95	95	95	95	95	95	95
					30800	95											
					31300				95	95			95	95	95	95	95
					32000	95	95	95	95	95	95	95	95	95	95	95	95
			1A4b i	Residential plants	20200	95	95	95	95	95	95	95	95	95	95	95	95
	WASTE	WASTE	1A1a	Electricity and heat production	10102	124	124	124	124	117	110	102	102	102	102	102	102
					10103	124	124	124	124	117	110	102	102	102	102	102	102
					10104	124			124			102				102	102
SO2	LIQUID	GAS OIL	1A1a	Electricity and heat production	10102	23	23	23	23	23	23	23	23	23	23	23	23
					10101	23	23	23	23	23	23	23	23	23	23	23	23
					10104	23	23	23	23	23	23	23	23	23	23	23	23
					10105	23	23	23	23	23	23	23	23	23	23	23	23
					10202	23	23	23		23	23	23	23	23	23	23	23
					10203	23	23	23	23	23	23	23	23	23	23	23	23
			1A1b	Petroleum refining	10306				23	23	23	23	23	23	23	23	23

						2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
			1A2a	Iron and steel	30400	23	23	23	23	23	23	23					
			1A2b	Non-ferrous metals	30500	23	23	23	23	23	23	23					
			1A2c	Chemicals	30600	23	23	23	23	23	23	23					
			1A2d	Pulp, Paper and Print	31100	23	23	23	23	23	23	23					
			1A2e	Food processing, beverages and tobacco	30900	23	23	23	23	23	23	23					
					30902				23	23	23	23	23	23	23	23	23
					30903	23	23	23	23	23	23	23	23	23		23	
			1A2f i	Industry-Other	30700	23	23	23	23	23	23	23					
					30800	23	23	23	23	23	23	23					
					31000	23	23	23	23	23	23	23					
					31200	23	23	23	23	23	23	23					
					31300	23	23	23	23	23	23	23					
					31400	23	23	23	23	23	23	23					
					32000	23	23	23	23	23	23	23	23	23	23	23	23
					31403	23	23	23									
			1A4a i	Commercial/Institutional plants	20100	23	23	23	23	23	23	23	23	23	23	23	23
					20102												
					20103	23	23	23	23	23	23	23	23	23	23	23	23
					20105	23	23	23	23	23	23	23	23	23	23	23	23
			1A4b i	Residential plants	20200	23	23	23	23	23	23	23	23	23	23	23	23
			1A4c i	Agriculture/Forestry/Fishing, Stationary	20300	23	23	23	23	23	23	23					
		ORIMULSION	1A1a	Electricity and heat production	10101		12	12	12	12							
		PETROLEUM COKE	1A1a	Electricity and heat production	10102											605	605
			1A2f i	Industry-Other	30700	787	605	605	605	605							605
					30800	787	605	605	605	605	605					605	605
					31600	787	605	605	605	605	605	605	605	605	605	605	605
			1A4a i	Commercial/Institutional plants	20100	787	605	605	605		605		605	605		605	605
			1A4b i	Residential plants	20200	787	605	605	605		605	605	605	605		605	605
			1A4c i	Agriculture/Forestry/Fishing, Stationary	20300	787	605	605	605								
		RESIDUAL OIL	1A1a	Electricity and heat production	10102	403	315	290	334	349	283	308	206	218	218	218	218
					10100												
					10101	403	315	290	334	349	283	308	206	218	218	218	218
					10103	403	315	290	334	349				218	218	218	218
					10104		315	290	334	349	283	308	206	218	218	218	218
					10105	403	315	290	334	349	283	308	206	218		218	218
					10202												
					10203	344	344	344	344	344	344	344		344	344	344	344
			1A1b	Petroleum refining	10306	537	537	537	537	537	537	537	537	537	537	537	537
			1A2a	Iron and steel	30400	344	344	344					344	344		344	
			1A2b	Non-ferrous metals	30500	344	344	344	344	344	344	344	344	344		344	
			1A2c	Chemicals	30600	344	344	344	344	344	344	344	344	344		344	
			1A2d	Pulp, Paper and Print	31100	344	344	344	344	344	344	344	344	344		344	
			1A2e	Food processing, beverages and tobacco	30900	344	344	344	344	344	344	344	344				
					30902	344	344	344	344	344	344	344	344	344	344	344	344
					30903	344	344	344	344	344	344	344	344	344	344	344	344
			1A2f i	Industry-Other	30700	344	344	344	344			344	344	344	344	344	
					30800	344	344	344	344	344	344	344	344	344		344	
					31600	344	344	344	344	344	344	344	344	344	344	344	344

						2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
					31000	344	344	344					344	344		344	
					31200	344	344	344			344	344	344	344		344	
					31300	344	344	344	344	344	344	344	344	344		344	
					31400	344	344	344	344	344	344	344	344	344		344	
					31500	344	344	344									
					32000	344	344	344	344	344	344	344	344	344			
					32002	344	344	344	344								
					32003						344						
			1A4a i	Commercial/Institutional plants	20100	344	344	344	344	344	344	344	344			344	
			1A4b i	Residential plants	20200	344	344	344	344	344	344	344	344	344		344	
			1A4c i	Agriculture/Forestry/Fishing, Stationary	20300	344	344	344	344	344	344	344	344			344	344
	SOLID	COAL	1A1a	Electricity and heat production	10102	64	47	45	61	42	41	37	40	26	14	10	9
					10100												
					10101	64	47	45	61	42	41	37	40	26	14	10	9
					10103												
					10104											10	9
	WASTE	INDUSTR. WASTES	1A2f i	Industry-Other	31600							22	15	15	15	15	15
		WASTE	1A1a	Electricity and heat production	10102	24	24	24	24	19	14	8.3	8.3	8.3	8.3	8.3	8.3
					10100												
					10103	24	24	24	24	19	14	8.3	8.3	8.3	8.3	8.3	8.3
					10104	24			24			8.3				8.3	8.3
					10203	67	60	52	45	37	30	22	15	15	15	15	15
					10200												
			1A2a	Iron and steel	30400												
			1A2c	Chemicals	30600	67			45		30	22		15	15	15	15
			1A2d	Pulp, Paper and Print	31100	67			45		30	22		15	15	15	15
			1A2e	Food processing, beverages and tobacco	30900	67			45		30	22		15	15	15	15
					30902				45		30	22		15			
			1A2f i	Industry-Other	30700												
					30800						30	22		15	15	15	15
					31600	67	60	52	45	37	30						
					31000	67								15	15	15	15
					31200												
					31300	67			45		30	22		15	15	15	15
					31400	67			45		30	22		15	15	15	15
					32000				45		30	22		15	15		15
			1A4a i	Commercial/Institutional plants	20100				45	37	30	22	15	15	15	15	
					20103	67	60	52	45	37	30	22	15	15	15	15	15

Table 2A-4.3 PM emission factors (in g per GJ) and references, 2011

fuel_type	fuel_id	fuel_gr_abbr	nfr_id_EA	snap_id	TSP	Ref	PM_{10}	Ref	$PM_{2.5}$	Ref
BIOMASS	111A	WOOD	1A1a	010101	10	18	7.45	8	4.82	8
				010102	10	18	7.45	8	4.82	8
				010103	10	18	7.45	8	4.82	8
				010104	10	18	7.45	8	4.82	8
				010203	19	1	13	2	10	1
			1A2 a-f	(all)	19	1	13	2	10	1
			1A4a i	020100	143	1	143	9	135	9
			1A4b i	020200	481	17	458	17	452	17
				020202	481	17	458	17	452	17
			1A4c i	020300	143	1	143	9	135	9
				020303	143	1	143	9	135	9
	117A	STRAW	1A1a	010101	2.3	18	1.71	3	1.11	3
				010102	2.3	18	1.71	3	1.11	3
				010103	2.3	18	1.71	3	1.11	3
				010104	2.3	18	1.71	3	1.11	3
				010203	21	1	15	2	12	2
			1A4a	020103	234	4	222	5	211	5
			1A4b i	020200	234	4	222	5	211	5
			1A4c i	020300	234	4	222	5	211	5
				020302	21	1	15	2	12	2
	215A	BIO OIL	1A1a	010102	5	15	5	15	5	15
				010105	5	15	5	15	5	15
				010202	5	15	5	15	5	15
				010203	5	15	5	15	5	15
			1A4b i	020200	5	15	5	15	5	15
	309A	BIOGAS	1A1a	010101	1.5	6	1.5	7	1.5	7
				010102	1.5	6	1.5	7	1.5	7
				010105	2.63	3	0.451	3	0.206	3
				010203	1.5	6	1.5	7	1.5	7
			1A2e	Engines	2.63	3	0.451	3	0.206	3
				Other	1.5	6	1.5	7	1.5	7
			1A4a i	020100	1.5	6	1.5	7	1.5	7
				020103	1.5	6	1.5	7	1.5	7
				020105	2.63	3	0.451	3	0.206	3
			1A4c i	020300	1.5	6	1.5	7	1.5	7
				020304	2.63	3	0.451	3	0.206	3
	310A	BIO PROD GAS	1A1a	010105	2.63	19	0.451	19	0.206	19
			1A2f i	030105	2.63	19	0.451	19	0.206	19
WASTE	114A	WASTE	1A1a	010102	0.29	18	0.29	3	0.29	3
				010103	0.29	18	0.29	3	0.29	3
				010104	0.29	18	0.29	3	0.29	3
				010203	4.2	20	0.29	10	0.29	10
			1A2 a-f	(all)	4.2	20	3.2	20	2.1	20
			1A4a i	020103	4.2	20	3.2	20	2.1	20
	115A	INDUSTRIAL WASTE	1A2f i	031600	4.2	20	3.2	20	2.1	20
GAS	301A	NATURAL GAS	1A1a	010101	0.1	9	0.1	9	0.1	9
				010102	0.1	9	0.1	9	0.1	9
				010103	0.1	9	0.1	9	0.1	9
				010104	0.1	3	0.061	3	0.051	3
				010105	0.76	3	0.189	3	0.161	3
				010202	0.1	9	0.1	9	0.1	9
				010203	0.1	9	0.1	9	0.1	9
			1A1c	010504	0.1	3	0.061	3	0.051	3
			1A2a-f	Engines	0.76	3	0.189	3	0.161	3
				Turbines	0.1	3	0.061	3	0.051	3
				Other	0.1	9	0.1	9	0.1	9
			1A4a i	020100	0.1	9	0.1	9	0.1	9
				020103	0.1	9	0.1	9	0.1	9
				020105	0.76	3	0.189	3	0.161	3
			1A4b i	020200	0.1	9	0.1	9	0.1	9
				020202	0.1	9	0.1	9	0.1	9
				020204	0.76	3	0.189	3	0.161	3
			1A4c i	020300	0.1	9	0.1	9	0.1	9
				020304	0.76	3	0.189	3	0.161	3
LIQUID	110A	PETROLEUM COKE	1A1a	010102	10	9	7	9	3	9
			1A2f	all	10	9	7	9	3	9
			1A4a	020100	100	9	60	9	30	9
			1A4b i	020200	100	9	60	9	30	9
	203A	RESIDUAL OIL	1A1a	010101	3	3	3	3	2.5	3
				010102	9.5	18	9.5	13	7.9	13
				010103	9.5	18	9.5	13	7.9	13
				010104	3	9	3	9	2.5	9
				010105	3	9	3	9	2.5	9

				010202	3	9	3	9	2.5	9
				010203	3	9	3	9	2.5	9
			1A1b	010306	50	9	40	9	35	9
			1A2 a-f	all	9.5	18	9.5	13	7.9	13
			1A4c i	020300	14	6	10.5	13	7	13
				020304	14	6	10.5	13	7	13
	204A	GAS OIL	1A1a	010101	5	9	5	9	5	9
				010102	5	9	5	9	5	9
				010103	5	9	5	9	5	9
				010104	5	9	5	9	5	9
				010105	5	9	5	9	5	9
				010202	5	9	5	9	5	9
				010203	5	9	5	9	5	9
			1A1b	010306	5	9	5	9	5	9
			1A2a-f	all	5	9	5	9	5	9
			1A4a i	020100	5	9	5	9	5	9
				020103	5	9	5	9	5	9
				020105	5	9	5	9	5	9
			1A4b i	020200	5	9	5	9	5	9
			1A4c i	020302	5	9	5	9	5	9
	206A	KEROSENE	1A2 a-f	all	5	9	5	9	5	9
			1A4a i	020100	5	9	5	9	5	9
			1A4b i	020200	5	9	5	9	5	9
			1A4c i	020300	5	9	5	9	5	9
	303A	LPG	1A1a	all	0.2	9	0.2	9	0.2	9
			1A2 a-f	all	0.2	9	0.2	9	0.2	9
			1A4a	all	0.2	9	0.2	9	0.2	9
			1A4b i	020200	0.2	9	0.2	9	0.2	9
			1A4c i	020300	0.2	9	0.2	9	0.2	9
	308A	REFINERY GAS	1A1b	010304	5	9	5	9	5	9
				010306	5	9	5	9	5	9
SOLID	101A	ANODE CARBON	1A2f i	032000	17	6	12	14	7	14
	102A	COAL	1A1a	010101	3	12	2.6	12	2.1	12
				010102	3	12	2.6	12	2.1	12
				010104	3	12	2.6	12	2.1	12
			1A2 a-f	all	17	6	12	14	7	14
			1A4b i	020200	17	6	12	14	7	14
			1A4c i	020300	17	6	12	14	7	14
	106A	BROWN COAL BRI.	1A2 f i	030800	17	16	12	16	7	16
			1A4b i	020200	17	16	12	16	7	16
	107A	COKE OVEN COKE	1A2 a-f	all	17	16	12	16	7	16
			1A4b i	020200	17	16	12	16	7	16

1. Danish legislation, Miljøstyrelsen 2001. Luftvejledningen, Begrænsning af luftforurening fra virksomheder, Vejledning fra Miljøstyrelsen nr 2 2001.
2. Particulate size distribution for wood and straw combustion in power plants refers to the TNO CEPMEIP emission factor database 2001 (wood). Available at: http://www.air.sk/tno/cepmeip/ (05-02-2011).
3. Nielsen, M. & Illerup, J.B: 2003. Emissionsfaktorer og emissionsopgørelse for decentral kraftvarme. Eltra PSO projekt 3141. Kortlægning af emissioner fra decentrale kraftvarmeværker. Delrapport 6. Danmarks Miljøundersøgelser. 116 s. –Faglig rapport fra DMU nr. 442.(In Danish, with an English summary). Available at: http://www.dmu.dk/1_viden/2_Publikationer/3_fagrapporter/rapporter/FR442.pdf (05-02-2011).
4. German, L., 2003. The Danish Technological Institute, Personal communication, rough estimate.
5. Particulate size distribution for wood and straw combustion in residential plants refers to the TNO CEPMEIP emission factor database 2001 (wood). Available at: http://www.air.sk/tno/cepmeip/ (05-02-2011).
6. Danish legislation. Miljøstyrelsen 1990, Bekendtgørelse 689, 15/10/1990, Bekendtgørelse om begrænsning af emissioner af svovldioxid, kvælstofoxider og støv fra store fyringsanlæg. (and Bekendtgørelse 518/1995).
7. All TSP emission is assumed to be <2,5µm (NERI assumption).
8. Estimated based on the TSP emission factor.
9. The TNO CEPMEIP emission factor database 2001. Available on the internet at: http://www.air.sk/tno/cepmeip/ (05-02-2011).
10. Error. Will be corrected in the next inventory.
11. Particulate size distribution is unknown. The PM10 fraction is assumed to equal 85 % of TSP and the PM2.5 fraction is assumed to equal 70 % of TSP (NERI assumption).
12. Livbjerg, H. Thellefsen, M. Sander, B. Simonsen, P., Lund, C., Poulsen, K. & Fogh, C.L., 2001. Feltstudier af Forbrændingsaerosoler, EFP - 98 Projekt, Aerosollaboratoriet DTU, FLS Miljø, Forskningscenter Risø, Elsam, Energi E2 (in Danish).
13. Particulate size distribution for residual oil combustion refers to the TNO CEPMEIP emission factor database 2001. Available at: http://www.air.sk/tno/cepmeip/ (05-02-2011).
14. Particulate size distribution for coal combustion refers to the TNO CEPMEIP emission factor database 2001. Available at: http://www.air.sk/tno/cepmeip/ (05-02-2011).
15. Assuming same emission factors as for gas oil (NERI assumption).
16. Same emission factor as for coal is assumed (NERI assumption).
17. Illerup, J. B., Henriksen, T. C., Lundhede, T., Breugel C. v., Jensen, N. Z. (2007) "Brændeovne og små kedler - partikelemissioner og reduktionstiltag". Miljøprojekt nr. 1164 2007. Miljøstyrelsen. Available at: http://www2.mst.dk/common/Udgivramme/Frame.asp?http://www2.mst.dk/Udgiv/publikationer/2007/978-87-7052-451-3/html/default.htm (25-02-2011).
18. Nielsen, M., Nielsen, O.K. & Thomsen, M. 2010c: Emissionskortlægning for decentral kraftvarme, Energinet.dk miljøprojekt nr. 07/1882. Delrapport 5. Emissionsfaktorer og emissionsopgørelse for decentral kraftvarme, 2006. National Environmental Research Institute, Aarhus University.
19. Same emission factor as for biogas assumed (NERI assumption).
20. The emission factor have been estimated by NERI based on plant specific data from MSW incineration plants, district heating, 2008.

Table 2A-4.4 PM emission factors, time-series for the years 2000 to 2011.

pol_abbr	fuel_type	fuel_gr_abbr	nfr_id_EA	nfr_name	snap_id	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
PM10	BIOMASS	WOOD	1A4b i	Residential plants	20200	721	647	620	617	612	588	564	574	544	503	479	458
					20204									544	503	479	
					20202						588	564	574	544	503	479	458
	GAS	NATURAL GAS	1A2d	Pulp, Paper and Print	31104	0.061	0.061	0.061	0.061	0.061	0.061	0.061	0.061	0.061	0.061	0.061	0.061
			1A2e	Food processing, beverages and tobacco	30905	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189
			1A2f i	Industry-Other	32003	0.1	0.1	0.1	0.1								
					30705	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189
					31005	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189
					31205	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189
					31305	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189
					31405	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189
					31604	0.061	0.061	0.061	0.061	0.061	0.061		0.061	0.061	0.061	0.061	0.061
					31605	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189
					31503			0.1									
	LIQUID	GAS OIL	1A2e	Food processing, beverages and tobacco	30903	5	5	5	5	5	5	5	5	5		5	
		RESIDUAL OIL	1A4c i	Agriculture/Forestry/Fishing, Stationary	20304	50	50	50	50							10.5	10.5
	SOLID	COAL	1A1a	Electricity and heat production	10203	6	6	6	6	6	6	2.6	6	6			
	WASTE	INDUSTR. WASTES	1A2f i	Industry-Other	31600							3.4	3.2	3.2	3.2	3.2	3.2
		WASTE	1A1a	Electricity and heat production	10102	1.126	1.126	1.126	1.126	1.126	0.87	0.29	0.29	0.29	0.29	0.29	0.29
					10103	1.126	1.126	1.126	1.126	1.126	0.87	0.29	0.29	0.29	0.29	0.29	0.29
					10104	1.126			1.126			0.29				0.29	0.29
					10203	4.6	4.4	4.2	4	3.8	3.6	3.4	0.29	0.29	0.29	0.29	0.29
			1A2c	Chemicals	30600	4.6			4		3.6	3.4		3.2	3.2	3.2	3.2
			1A2d	Pulp, Paper and Print	31100	4.6			4		3.6	3.4		3.2	3.2	3.2	3.2
			1A2e	Food processing, beverages and tobacco	30900	4.6			4		3.6	3.4		3.2	3.2	3.2	3.2
					30902				4		3.6	3.4		3.2			
			1A2f i	Industry-Other	30800						3.6	3.4		3.2	3.2	3.2	3.2
					31600	4.6	4.4	4.2	4	3.8	3.6						
					31000	4.6								3.2	3.2	3.2	3.2
					31300	4.6			4		3.6	3.4		3.2	3.2	3.2	3.2
					31400	4.6			4		3.6	3.4		3.2	3.2	3.2	3.2
					32000				4		3.6	3.4		3.2	3.2		3.2
			1A4a i	Commercial/Institutional plants	20100				4	3.8	3.6	3.4	3.2	3.2	3.2	3.2	
					20103	4.6	4.4	4.2	4	3.8	3.6	3.4	3.2	3.2	3.2	3.2	3.2
PM2,5	BIOMASS	WOOD	1A2f i	Industry-Other	31403	10	10	10	10	10	10	10	10	10	10	10	10
			1A4b i	Residential plants	20200	709	637	610	607	603	579	555	566	536	496	473	452
					20204									536	496	473	
					20202						579	555	566	536	496	473	452
	GAS	NATURAL GAS	1A2d	Pulp, Paper and Print	31104	0.051	0.051	0.051	0.051	0.051	0.051	0.051	0.051	0.051	0.051	0.051	0.051
			1A2e	Food processing, beverages and tobacco	30905	0.161	0.161	0.161	0.161	0.161	0.161	0.161	0.161	0.161	0.161	0.161	0.161
			1A2f i	Industry-Other	32003	0.1	0.1	0.1	0.1								
					30705	0.161	0.161	0.161	0.161	0.161	0.161	0.161	0.161	0.161	0.161	0.161	0.161
					31005	0.161	0.161	0.161	0.161	0.161	0.161	0.161	0.161	0.161	0.161	0.161	0.161
					31205	0.161	0.161	0.161	0.161	0.161	0.161	0.161	0.161	0.161	0.161	0.161	0.161
					31305	0.161	0.161	0.161	0.161	0.161	0.161	0.161	0.161	0.161	0.161	0.161	0.161
					31405	0.161	0.161	0.161	0.161	0.161	0.161	0.161	0.161	0.161	0.161	0.161	0.161
					31604	0.051	0.051	0.051	0.051	0.051	0.051		0.051	0.051	0.051	0.051	0.051

pol_abbr	fuel_type	fuel_gr_abbr	nfr_id_EA	nfr_name	snap_id	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
					31605	0.161	0.161	0.161	0.161	0.161	0.161	0.161	0.161	0.161	0.161	0.161	0.161
					31503			0.1									
	LIQUID	GAS OIL	1A2e	Food processing, beverages and tobacco	30903	5	5	5	5	5	5	5	5	5		5	
		RESIDUAL OIL	1A4c i	Agriculture/Forestry/Fishing, Stationary	20304	40	40	40	40							7	7
	SOLID	COAL	1A1a	Electricity and heat production	10203	5	5	5	5	5	5	2.1	5	5			
	WASTE	INDUSTR. WASTES	1A2f i	Industry-Other	31600							2.2	2.1	2.1	2.1	2.1	2.1
		WASTE	1A1a	Electricity and heat production	10102	1.084	1.084	1.084	1.084	1.084	0.87	0.29	0.29	0.29	0.29	0.29	0.29
					10103	1.084	1.084	1.084	1.084	1.084	0.87	0.29	0.29	0.29	0.29	0.29	0.29
					10104	1.084			1.084			0.29				0.29	0.29
					10203	3	2.9	2.7	2.6	2.5	2.4	2.2	0.29	0.29	0.29	0.29	0.29
			1A2c	Chemicals	30600	3			2.6		2.4	2.2		2.1	2.1	2.1	2.1
			1A2d	Pulp, Paper and Print	31100	3			2.6		2.4	2.2		2.1	2.1	2.1	2.1
			1A2e	Food processing, beverages and tobacco	30900	3			2.6		2.4	2.2		2.1	2.1	2.1	2.1
					30902				2.6		2.4	2.2		2.1			
			1A2f i	Industry-Other	30800						2.4	2.2		2.1	2.1	2.1	2.1
					31600	3	2.9	2.7	2.6	2.5	2.4						
					31000	3								2.1	2.1	2.1	2.1
					31300	3			2.6		2.4	2.2		2.1	2.1	2.1	2.1
					31400	3			2.6		2.4	2.2		2.1	2.1	2.1	2.1
					32000				2.6		2.4	2.2		2.1	2.1		2.1
			1A4a i	Commercial/Institutional plants	20100				2.6	2.5	2.4	2.2	2.1	2.1	2.1	2.1	
					20103	3	2.9	2.7	2.6	2.5	2.4	2.2	2.1	2.1	2.1	2.1	2.1
TSP	BIOMASS	WOOD	1A4b i	Residential plants	20200	757	680	652	648	643	617	593	604	572	529	503	481
					20204									572	529	503	
					20202						617	593	604	572	529	503	481
	SOLID	COAL	1A1a	Electricity and heat production	10203	6	6	6	6	6	6	3	6	6			
	WASTE	INDUSTR. WASTES	1A2f i	Industry-Other	31600							4.5	4.2	4.2	4.2	4.2	4.2
		WASTE	1A1a	Electricity and heat production	10102	2.02	2.02	2.02	2.02	1.44	0.87	0.29	0.29	0.29	0.29	0.29	0.29
					10103	2.02	2.02	2.02	2.02	1.44	0.87	0.29	0.29	0.29	0.29	0.29	0.29
					10104	2.02			2.02			0.29				0.29	0.29
					10203	6	5.7	5.5	5.2	5	4.7	4.5	4.2	4.2	4.2	4.2	4.2
			1A2c	Chemicals	30600	6			5.2		4.7	4.5		4.2	4.2	4.2	4.2
			1A2d	Pulp, Paper and Print	31100	6			5.2		4.7	4.5		4.2	4.2	4.2	4.2
			1A2e	Food processing, beverages and tobacco	30900	6			5.2		4.7	4.5		4.2	4.2	4.2	4.2
					30902				5.2		4.7	4.5		4.2			
			1A2f i	Industry-Other	30800						4.7	4.5		4.2	4.2	4.2	4.2
					31600	6	5.7	5.5	5.2	5	4.7						
					31000	6								4.2	4.2	4.2	4.2
					31300	6			5.2		4.7	4.5		4.2	4.2	4.2	4.2
					31400	6			5.2		4.7	4.5		4.2	4.2	4.2	4.2
					32000				5.2		4.7	4.5		4.2	4.2		4.2
			1A4a i	Commercial/Institutional plants	20100				5.2	5	4.7	4.5	4.2	4.2	4.2	4.2	
					20103	6	5.7	5.5	5.2	5	4.7	4.5	4.2	4.2	4.2	4.2	4.2

Table 2A-4.5 HM emission factors (mg per GJ) and references 2011.

fuel_type	fuel_gr_abbr	nfr	nfr_name	snap	As mg/GJ	Cd mg/GJ	Cr mg/GJ	Cu mg/GJ	Hg mg/GJ	Ni mg/GJ	Pb mg/GJ	Se mg/GJ	Zn mg/GJ	Reference
BIOMASS	WOOD	-	All non-residential	all	1.4	0.27	2.34	2.6	0.4	2.34	3.62	0.5	2.3	**2 and 4**
		1A4b i	Residential	all	0.5	1	2	8	0.4	2	40	0.5	100	**2**
	STRAW	1A1a	Electricity and heat production	all	1.4	0.32	1.6	1.7	0.31	1.7	6.2	0.5	0.41	**2 and 4**
		1A4a	Commercial/Institutional	020103	1	1.4	2.9	8.6	0.5	4.4	40	0.5	130	**2**
		1A4b i	Residential	020200	1	1.4	2.9	8.6	0.5	4.4	40	0.5	130	**2**
		1A4c i	Agriculture/ Forestry	020300	1	1.4	2.9	8.6	0.5	4.4	40	0.5	130	**2**
	BIO OIL	-	All non-residential	engines	0.055	0.011	0.2	0.3	0.11	0.013	0.15	0.22	58	**5**
		-	All non-residential	boilers	0.002	0.001	0.2	0.13	0.12	0.005	0.012	0.002	0.42	**5**
		1A4b i	Residential	020200	0.002	0.001	0.2	0.13	0.12	0.005	0.012	0.002	0.42	**5**
	BIOGAS	-	All	all	0.04	0.002	0.18	0.31	0.12	0.23	0.005	0.21	3.95	**4**
	BIO PROD GAS	-	All	all	0.12	0.009	0.029	0.045	0.54	0.014	0.022	0.18	0.058	**4**
WASTE	WASTE	-	All	all	0.59	0.44	1.56	1.3	1.79	2.06	5.52	1.11	2.33	**4**
	INDUSTRIAL WASTE	1A2f	Industry - Other	all	0.59	0.44	1.56	1.3	1.79	2.06	5.52	1.11	2.33	**4**
GAS	NATURAL GAS	-	Engines (reciprocating)	all	0.05	0.003	0.05	0.01	0.1	0.05	0.04	0.01	2.9	**4**
		-	All other	all	0.119	0.00025	0.00076	0.000076	0.1	0.00051	0.0015	0.01	0.0015	**7 and 2**
LIQUID	PETROLEUM COKE	all	All	all	4.3	1.3	2.7	5.7	0.4	362	4.9	2.2	94	**2**
	RESIDUAL OIL	1A1a	Electricity and heat production	all	2.1	0.53	2.6	2.4	0.21	362	2.6	1.2	7.4	**1**
		All other	All other	all	4.3	1.3	2.7	5.7	0.4	362	4.9	2.2	94	**2**
	GAS OIL	-	Engines (reciprocating)	all	0.055	0.011	0.2	0.3	0.11	0.013	0.15	0.22	58	**4**
		-	All other	all	0.002	0.001	0.2	0.13	0.12	0.005	0.012	0.002	0.42	**3**
	KEROSENE	All	All	all	0.002	0.001	0.2	0.13	0.12	0.005	0.012	0.002	0.42	**5**
	LPG	-	Engines (reciprocating)	all	0.055	0.011	0.2	0.3	0.11	0.013	0.15	0.22	58	**6**
		-	All other	all	0.002	0.001	0.2	0.13	0.12	0.005	0.012	0.002	0.42	**2**
	REFINERY GAS	1A1b	Petroleum refining	all	1.8	1.4	1.4	2.7	1.4	1.4	4.1	6.8	1.8	**2**
SOLID	ANODE CARBON	1A2f	Industry - Other	all	4	1.8	13.5	17.5	7.9	13	134	25	200	**2**
	COAL	1A1a	Electricity and heat production	all	0.51	0.07	0.86	0.48	1.3	0.97	0.62	5.9	1.9	**1**
		All other	All other	All	4	1.8	13.5	17.5	7.9	13	134	25	200	**2**
	BROWN COAL BRI.	1A2f	Industry - Other	030800	4	1.8	13.5	17.5	7.9	13	134	25	200	**2**
		1A4b i	Residential	020200	2.5	1.5	11.2	22.3	5.1	12.7	130	1	220	**2**
	COKE OVEN COKE	1A2 a-f	Industry - Other	all	4	1.8	13.5	17.5	7.9	13	134	25	200	**2**
		1A4b i	Residential	020200	2.5	1.5	11.2	22.3	5.1	12.7	130	1	220	**2**

Reference: 1. Implied emission factor 2008 estimated by NEIR based on plant specific emission data for power plants. 2. EMEP/EEA Emission inventory Guidebook, 2009 update (EEA 2009). 3. CONCAWE (Denier van der Gon & Kuenen, 2009). 4. Nielsen et al. 2010. 5. Assumed equal to gas oil. NERI assumption. 6. Assumed equal to natural gas fuelled engines. 7. Gruijthuijsen (2001).

Table 2A-4.7a HM emission factors time-series mg per GJ for the years 1990 to 1999.

pollutant	fuel_type	fuel_gr_abbr	nfr_id	nfr_name	snap	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
As	BIOMASS	BIO OIL	1A2c	Chemicals	30605										
			1A2f i	Industry-Other	31305										
		STRAW	1A4c i	Agriculture/Forestry/Fishing, Stationary	20302					1.4	1.4	1.4	1.4	1.4	1.4
	LIQUID	GAS OIL	1A2f i	Industry-Other	31205										
		PETROLEUM COKE	1A1a	Electricity and heat production	10102					2.1	2.1				
	SOLID	COAL	1A1a	Electricity and heat production	10102	3.3	2.8	2.4	1.9	1.4	0.93	0.9	0.87	0.83	0.8
					10100	3.3	2.8	2.4	1.9						
					10101	3.3	2.8	2.4	1.9	1.4	0.93	0.9	0.87	0.83	0.8
					10103					1.4	0.93	0.9			
					10104					1.4	0.93	0.9	0.87		
					10202					1.4	0.93				
					10203					1.4	0.93	0.9	0.87	0.83	0.8
					10200	3.3	2.8	2.4	1.9						
		COKE OVEN COKE	1A2e	Food processing, beverages and tobacco	30903										
	WASTE	WASTE	1A1a	Electricity and heat production	10102					7.8	7.8	7.6	7.4	7.2	7
					10103					7.8	7.8	7.6	7.4	7.2	7
					10104					7.8	7.8	7.6	7.4	7.2	7
					10203					7.8	7.8	7.7	7.6	7.4	7.3
			1A2c	Chemicals	30600	7.8	7.8	7.8	7.8	7.8	7.8	7.7	7.6	7.4	
			1A2d	Pulp, Paper and Print	31100	7.8	7.8	7.8	7.8	7.8	7.8	7.7	7.6	7.4	7.3
			1A2e	Food processing, beverages and tobacco	30900	7.8	7.8	7.8	7.8	7.8	7.8	7.7		7.4	7.3
					30902										
			1A2f i	Industry-Other	30700	7.8	7.8	7.8	7.8	7.8	7.8			7.4	
					30800										
					31600										
					31000	7.8	7.8	7.8	7.8	7.8	7.8	7.7	7.6	7.4	7.3
					31300	7.8	7.8	7.8	7.8	7.8	7.8	7.7	7.6	7.4	
					31400			7.8	7.8	7.8	7.8	7.7	7.6	7.4	7.3
					32000	7.8	7.8	7.8	7.8	7.8	7.8	7.7	7.6	7.4	7.3
			1A4a i	Commercial/Institutional plants	20100	7.8	7.8	7.8	7.8	7.8	7.8	7.7	7.6	7.4	7.3
					20103					7.8	7.8	7.7	7.6	7.4	7.3
Cd	BIOMASS	BIO OIL	1A2c	Chemicals	30605										
			1A2f i	Industry-Other	31305										
		STRAW	1A4c i	Agriculture/Forestry/Fishing, Stationary	20302					0.32	0.32	0.32	0.32	0.32	0.32
	LIQUID	GAS OIL	1A2f i	Industry-Other	31205										
		PETROLEUM COKE	1A1a	Electricity and heat production	10102					0.53	0.53				
	SOLID	COAL	1A1a	Electricity and heat production	10102	1.1	0.9	0.71	0.51	0.32	0.12	0.11	0.1	0.09	0.08
					10100	1.1	0.9	0.71	0.51						
					10101	1.1	0.9	0.71	0.51	0.32	0.12	0.11	0.1	0.09	0.08
					10103					0.32	0.12	0.11			
					10104					0.32	0.12	0.11	0.1		
					10202					0.32	0.12				
					10203					0.32	0.12	0.11	0.1	0.09	0.08
					10200	1.1	0.9	0.71	0.51						
	WASTE	WASTE	1A1a	Electricity and heat production	10102					14	9.2	8.3	7.4	6.6	5.7
					10100	31	27	22	18						

pollu-tant	fuel_type	fuel_gr_abbr	nfr_id	nfr_name	snap	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
					10103					14	9.2	8.3	7.4	6.6	5.7
					10104					14	9.2	8.3	7.4	6.6	5.7
					10203					14	9.2	8.7	8.1	7.6	7
					10200	31	27	22	18						
			1A2a	Iron and steel	30400					14	9.2				
			1A2c	Chemicals	30600	31	27	22	18	14	9.2	8.7	8.1	7.6	
			1A2d	Pulp, Paper and Print	31100	31	27	22	18	14	9.2	8.7	8.1	7.6	7
			1A2e	Food processing, beverages and tobacco	30900	31	27	22	18	14	9.2	8.7		7.6	7
					30902										
			1A2f i	Industry-Other	30700	31	27	22	18	14	9.2			7.6	
					30800										
					31600										
					31000	31	27	22	18	14	9.2	8.7	8.1	7.6	7
					31200	31	27			14	9.2				
					31300	31	27	22	18	14	9.2	8.7	8.1	7.6	
					31400			22	18	14	9.2	8.7	8.1	7.6	7
					32000	31	27	22	18	14	9.2	8.7	8.1	7.6	7
			1A4a i	Commercial/Institutional plants	20100	31	27	22	18	14	9.2	8.7	8.1	7.6	7
					20103					14	9.2	8.7	8.1	7.6	7
Cr	BIOMASS	STRAW	1A4c i	Agriculture/Forestry/Fishing, Stationary	20302					1.6	1.6	1.6	1.6	1.6	1.6
	LIQUID	PETROLEUM COKE	1A1a	Electricity and heat production	10102					2.6	2.6				
	SOLID	COAL	1A1a	Electricity and heat production	10102	8	7.3	6.7	6	5.4	4.7	4.1	3.5	2.9	2.3
					10100	8	7.3	6.7	6						
					10101	8	7.3	6.7	6	5.4	4.7	4.1	3.5	2.9	2.3
					10103					5.4	4.7	4.1			
					10104					5.4	4.7	4.1	3.5		
					10202					5.4	4.7				
					10203					5.4	4.7	4.1	3.5	2.9	2.3
					10200	8	7.3	6.7	6						
	WASTE	WASTE	1A1a	Electricity and heat production	10102					64	33	27	21	15	8.6
					10100	186	155	125	94						
					10103					64	33	27	21	15	8.6
					10104					64	33	27	21	15	8.6
					10203					64	33	29	25	22	18
					10200	186	155	125	94						
			1A2a	Iron and steel	30400					64	33				
			1A2c	Chemicals	30600	186	155	125	94	64	33	29	25	22	
			1A2d	Pulp, Paper and Print	31100	186	155	125	94	64	33	29	25	22	18
			1A2e	Food processing, beverages and tobacco	30900	186	155	125	94	64	33	29		22	18
					30902										
			1A2f i	Industry-Other	30700	186	155	125	94	64	33			22	
					30800										
					31600										
					31000	186	155	125	94	64	33	29	25	22	18
					31200	186	155			64	33				
					31300	186	155	125	94	64	33	29	25	22	
					31400			125	94	64	33	29	25	22	18
					32000	186	155	125	94	64	33	29	25	22	18

pollu-tant	fuel_type	fuel_gr_abbr	nfr_id	nfr_name	snap	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
			1A4a i	Commercial/Institutional plants	20100	186	155	125	94	64	33	29	25	22	18
					20103					64	33	29	25	22	18
Cu	BIOMASS	BIO OIL	1A2c	Chemicals	30605										
			1A2f i	Industry-Other	31305										
		STRAW	1A4c i	Agriculture/Forestry/Fishing, Stationary	20302					1.7	1.7	1.7	1.7	1.7	1.7
	LIQUID	GAS OIL	1A2f i	Industry-Other	31205										
		PETROLEUM COKE	1A1a	Electricity and heat production	10102					2.4	2.4				
	SOLID	COAL	1A1a	Electricity and heat production	10102	4.4	4.2	4	3.7	3.5	3.3	2.8	2.4	1.9	1.5
					10100	4.4	4.2	4	3.7						
					10101	4.4	4.2	4	3.7	3.5	3.3	2.8	2.4	1.9	1.5
					10103					3.5	3.3	2.8			
					10104					3.5	3.3	2.8	2.4		
					10202					3.5	3.3				
					10203					3.5	3.3	2.8	2.4	1.9	1.5
					10200	4.4	4.2	4	3.7						
	WASTE	WASTE	1A1a	Electricity and heat production	10102					50	32	28	23	19	14
					10100	123	105	87	68						
					10103					50	32	28	23	19	14
					10104					50	32	28	23	19	14
					10203					50	32	29	27	24	21
					10200	123	105	87	68						
			1A2a	Iron and steel	30400					50	32				
			1A2c	Chemicals	30600	123	105	87	68	50	32	29	27	24	
			1A2d	Pulp, Paper and Print	31100	123	105	87	68	50	32	29	27	24	21
			1A2e	Food processing, beverages and tobacco	30900	123	105	87	68	50	32	29		24	21
					30902										
			1A2f i	Industry-Other	30700	123	105	87	68	50	32			24	
					30800										
					31600										
					31000	123	105	87	68	50	32	29	27	24	21
					31200	123	105			50	32				
					31300	123	105	87	68	50	32	29	27	24	
					31400			87	68	50	32	29	27	24	21
					32000	123	105	87	68	50	32	29	27	24	21
			1A4a i	Commercial/Institutional plants	20100	123	105	87	68	50	32	29	27	24	21
					20103					50	32	29	27	24	21
Hg	BIOMASS	BIO OIL	1A2c	Chemicals	30605										
			1A2f i	Industry-Other	31305										
		STRAW	1A4c i	Agriculture/Forestry/Fishing, Stationary	20302					0.31	0.31	0.31	0.31	0.31	0.31
	LIQUID	GAS OIL	1A2f i	Industry-Other	31205										
		PETROLEUM COKE	1A1a	Electricity and heat production	10102					0.21	0.21				
	SOLID	COAL	1A1a	Electricity and heat production	10102	2.2	2.1	2	2	1.9	1.8	1.7	1.6	1.5	1.4
					10100	2.2	2.1	2	2						
					10101	2.2	2.1	2	2	1.9	1.8	1.7	1.6	1.5	1.4
					10103					1.9	1.8	1.7			
					10104					1.9	1.8	1.7	1.6		
					10202					1.9	1.8				
					10203					1.9	1.8	1.7	1.6	1.5	1.4

pollu-tant	fuel_type	fuel_gr_abbr	nfr_id	nfr_name	snap	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
					10200	2.2	2.1	2	2						
	WASTE	WASTE	1A1a	Electricity and heat production	10102					74	59	49	38	28	18
					10100	132	117	103	88						
					10103					74	59	49	38	28	18
					10104					74	59	49	38	28	18
					10203					74	59	53	46	40	33
					10200	132	117	103	88						
			1A2a	Iron and steel	30400					74	59				
			1A2c	Chemicals	30600	132	117	103	88	74	59	53	46	40	
			1A2d	Pulp, Paper and Print	31100	132	117	103	88	74	59	53	46	40	33
			1A2e	Food processing, beverages and tobacco	30900	132	117	103	88	74	59	53		40	33
					30902										
			1A2f i	Industry-Other	30700	132	117	103	88	74	59			40	
					30800										
					31600										
					31000	132	117	103	88	74	59	53	46	40	33
					31200	132	117			74	59				
					31300	132	117	103	88	74	59	53	46	40	
					31400			103	88	74	59	53	46	40	33
					32000	132	117	103	88	74	59	53	46	40	33
			1A4a i	Commercial/Institutional plants	20100	132	117	103	88	74	59	53	46	40	33
					20103					74	59	53	46	40	33
Ni	BIOMASS	BIO OIL	1A2c	Chemicals	30605										
			1A2f i	Industry-Other	31305										
		STRAW	1A4c i	Agriculture/Forestry/Fishing, Stationary	20302					1.7	1.7	1.7	1.7	1.7	1.7
	LIQUID	GAS OIL	1A2f i	Industry-Other	31205										
	SOLID	COAL	1A1a	Electricity and heat production	10102	6.8	6.8	6.8	6.8	6.8	6.8	6.3	5.8	5.4	4.9
					10101	6.8	6.8	6.8	6.8	6.8	6.8	6.3	5.8	5.4	4.9
					10103					6.8	6.8	6.3			
					10104					6.8	6.8	6.3	5.8		
					10203					6.8	6.8	6.3	5.8	5.4	4.9
	WASTE	WASTE	1A1a	Electricity and heat production	10102					82	55	45	35	25	15
					10100	192	165	137	110						
					10103					82	55	45	35	25	15
					10104					82	55	45	35	25	15
					10203					82	55	49	42	36	30
					10200	192	165	137	110						
			1A2a	Iron and steel	30400					82	55				
			1A2c	Chemicals	30600	192	165	137	110	82	55	49	42	36	
			1A2d	Pulp, Paper and Print	31100	192	165	137	110	82	55	49	42	36	30
			1A2e	Food processing, beverages and tobacco	30900	192	165	137	110	82	55	49		36	30
					30902										
			1A2f i	Industry-Other	30700	192	165	137	110	82	55			36	
					30800										
					31600										
					31000	192	165	137	110	82	55	49	42	36	30
					31200	192	165			82	55				
					31300	192	165	137	110	82	55	49	42	36	

pollu-tant	fuel_type	fuel_gr_abbr	nfr_id	nfr_name	snap	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
					31400			137	110	82	55	49	42	36	30
					32000	192	165	137	110	82	55	49	42	36	30
			1A4a i	Commercial/Institutional plants	20100	192	165	137	110	82	55	49	42	36	30
					20103					82	55	49	42	36	30
Pb	BIOMASS	BIO OIL	1A2c	Chemicals	30605										
			1A2f i	Industry-Other	31305										
		STRAW	1A4c i	Agriculture/Forestry/Fishing, Stationary	20302					6.2	6.2	6.2	6.2	6.2	6.2
	LIQUID	GAS OIL	1A2f i	Industry-Other	31205										
		PETROLEUM COKE	1A1a	Electricity and heat production	10102					2.6	2.6				
	SOLID	COAL	1A1a	Electricity and heat production	10102	6	6	6	6	6	6	5.1	4.2	3.4	2.5
					10101	6	6	6	6	6	6	5.1	4.2	3.4	2.5
					10103					6	6	5.1			
					10104					6	6	5.1	4.2		
					10203					6	6	5.1	4.2	3.4	2.5
	WASTE	WASTE	1A1a	Electricity and heat production	10102					255	138	135	132	129	126
					10100	723	606	489	372						
					10103					255	138	135	132	129	126
					10104					255	138	135	132	129	126
					10203					255	138	136	134	132	131
					10200	723	606	489	372						
			1A2a	Iron and steel	30400					255	138				
			1A2c	Chemicals	30600	723	606	489	372	255	138	136	134	132	
			1A2d	Pulp, Paper and Print	31100	723	606	489	372	255	138	136	134	132	131
			1A2e	Food processing, beverages and tobacco	30900	723	606	489	372	255	138	136		132	131
					30902										
			1A2f i	Industry-Other	30700	723	606	489	372	255	138			132	
					30800										
					31600										
					31000	723	606	489	372	255	138	136	134	132	131
					31200	723	606			255	138				
					31300	723	606	489	372	255	138	136	134	132	
					31400			489	372	255	138	136	134	132	131
					32000	723	606	489	372	255	138	136	134	132	131
			1A4a i	Commercial/Institutional plants	20100	723	606	489	372	255	138	136	134	132	131
					20103					255	138	136	134	132	131
Se	BIOMASS	BIO OIL	1A2c	Chemicals	30605										
			1A2f i	Industry-Other	31305										
	LIQUID	GAS OIL	1A2f i	Industry-Other	31205										
		PETROLEUM COKE	1A1a	Electricity and heat production	10102					1.2	1.2				
	SOLID	COAL	1A1a	Electricity and heat production	10102	13	12.6	12.2	11.8	11.4	11	10	9	7.9	6.9
					10100	13	12.6	12.2	11.8						
					10101	13	12.6	12.2	11.8	11.4	11	10	9	7.9	6.9
					10103					11.4	11	10			
					10104					11.4	11	10	9		
					10202					11.4	11				
					10203					11.4	11	10	9	7.9	6.9
					10200	13	12.6	12.2	11.8						
	WASTE	WASTE	1A1a	Electricity and heat production	10102					25	25	25	25	25	25

pollu-tant	fuel_type	fuel_gr_abbr	nfr_id	nfr_name	snap	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
					10103					25	25	25	25	25	25
					10104					25	25	25	25	25	25
					10203					25	25	25	25	25	25
			1A2c	Chemicals	30600	25	25	25	25	25	25	25	25	25	
			1A2d	Pulp, Paper and Print	31100	25	25	25	25	25	25	25	25	25	25
			1A2e	Food processing, beverages and tobacco	30900	25	25	25	25	25	25	25		25	25
					30902										
			1A2f i	Industry-Other	30800										
					31600										
					31000	25	25	25	25	25	25	25	25	25	25
					31300	25	25	25	25	25	25	25	25	25	
					31400			25	25	25	25	25	25	25	25
					32000	25	25	25	25	25	25	25	25	25	25
			1A4a i	Commercial/Institutional plants	20100	25	25	25	25	25	25	25	25	25	25
					20103					25	25	25	25	25	25
Zn	BIOMASS	BIO OIL	1A2c	Chemicals	30605										
			1A2f i	Industry-Other	31305										
		STRAW	1A4c i	Agriculture/Forestry/Fishing, Stationary	20302					0.41	0.41	0.41	0.41	0.41	0.41
	LIQUID	GAS OIL	1A2f i	Industry-Other	31205										
		PETROLEUM COKE	1A1a	Electricity and heat production	10102					7.4	7.4				
	SOLID	COAL	1A1a	Electricity and heat production	10102	19	18	17	16	14	13	12	11	10	8.9
					10100	19	18	17	16						
					10101	19	18	17	16	14	13	12	11	10	8.9
					10103					14	13	12			
					10104					14	13	12	11		
					10202					14	13				
					10203					14	13	12	11	10	8.9
					10200	19	18	17	16						
	WASTE	WASTE	1A1a	Electricity and heat production	10102					449	360	298	237	175	114
					10100	805	716	627	538						
					10103					449	360	298	237	175	114
					10104					449	360	298	237	175	114
					10203					449	360	322	283	245	206
					10200	805	716	627	538						
			1A2a	Iron and steel	30400					449	360				
			1A2c	Chemicals	30600	805	716	627	538	449	360	322	283	245	
			1A2d	Pulp, Paper and Print	31100	805	716	627	538	449	360	322	283	245	206
			1A2e	Food processing, beverages and tobacco	30900	805	716	627	538	449	360	322		245	206
					30902										
			1A2f i	Industry-Other	30700	805	716	627	538	449	360			245	
					30800										
					31600										
					31000	805	716	627	538	449	360	322	283	245	206
					31200	805	716			449	360				
					31300	805	716	627	538	449	360	322	283	245	
					31400			627	538	449	360	322	283	245	206
					32000	805	716	627	538	449	360	322	283	245	206
			1A4a i	Commercial/Institutional plants	20100	805	716	627	538	449	360	322	283	245	206

pollu-tant	fuel_type	fuel_gr_abbr	nfr_id	nfr_name	snap	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
					20103					449	360	322	283	245	206

Table 2A-4.7b HM emission factors time-series mg per GJ for the years 2000 to 2011.

pollu-tant	fuel_type	fuel_gr_abbr	nfr_id	nfr_name	snap	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
As	BIOMASS	BIO OIL	1A2c	Chemicals	30605					0.055	0.002	0.002	0.055	0.055	0.055	0.055	
			1A2f i	Industry-Other	31305			0.055	0.055	0.055	0.002	0.002					
		STRAW	1A4c i	Agriculture/Forestry/Fishing, Stationary	20302	1.4	1.4	1.4	1.4	1.4	1.4	1	1.4	1	1		1
	LIQUID	GAS OIL	1A2f i	Industry-Other	31205									0.002	0.002	0.002	0.055
		PETROLEUM COKE	1A1a	Electricity and heat production	10102											4.3	4.3
	SOLID	COAL	1A1a	Electricity and heat production	10102	0.77	0.72	0.67	0.63	0.58	0.53	0.523	0.517	0.51	0.51	0.51	0.51
					10100												
					10101	0.77	0.72	0.67	0.63	0.58	0.53	0.523	0.517	0.51	0.51	0.51	0.51
					10103												
					10104											0.51	0.51
					10202												
					10203	0.77	0.72	0.67	0.63	0.58	0.53	0.523	0.517	0.51			
					10200												
		COKE OVEN COKE	1A2e	Food processing, beverages and tobac-co	30903								3.2	4	4	4	4
	WASTE	WASTE	1A1a	Electricity and heat production	10102	6.8	6.8	6.8	6.8	4.7	2.7	0.59	0.59	0.59	0.59	0.59	0.59
					10103	6.8	6.8	6.8	6.8	4.7	2.7	0.59	0.59	0.59	0.59	0.59	0.59
					10104	6.8			6.8			0.59				0.59	0.59
					10203	7.2	7.1	6.9	6.8	4.7	2.7	0.59	0.59	0.59	0.59	0.59	0.59
			1A2c	Chemicals	30600	7.2			6.8		2.7	0.59		0.59	0.59	0.59	0.59
			1A2d	Pulp, Paper and Print	31100	7.2			6.8		2.7	0.59		0.59	0.59	0.59	0.59
			1A2e	Food processing, beverages and tobac-co	30900	7.2			6.8		2.7	0.59		0.59	0.59	0.59	0.59
					30902				6.8		2.7	0.59		0.59			
			1A2f i	Industry-Other	30700												
					30800						2.7	0.59		0.59	0.59	0.59	0.59
					31600	7.2	7.1	6.9	6.8	4.7	2.7						
					31000	7.2								0.59	0.59	0.59	0.59
					31300	7.2			6.8		2.7	0.59		0.59	0.59	0.59	0.59
					31400	7.2			6.8		2.7	0.59		0.59	0.59	0.59	0.59
					32000				6.8		2.7	0.59		0.59	0.59		0.59
			1A4a i	Commercial/Institutional plants	20100				6.8	4.7	2.7	0.59	0.59	0.59	0.59	0.59	
					20103	7.2	7.1	6.9	6.8	4.7	2.7	0.59	0.59	0.59	0.59	0.59	0.59
Cd	BIOMASS	BIO OIL	1A2c	Chemicals	30605					0.011	0.001	0.001	0.011	0.011	0.011	0.011	
			1A2f i	Industry-Other	31305			0.011	0.011	0.011	0.001	0.001					
		STRAW	1A4c i	Agriculture/Forestry/Fishing, Stationary	20302	0.32	0.32	0.32	0.32	0.32	0.32	1.4	0.32	1.4	1.4		1.4
	LIQUID	GAS OIL	1A2f i	Industry-Other	31205									0.001	0.001	0.001	0.011
		PETROLEUM COKE	1A1a	Electricity and heat production	10102											1.3	1.3
	SOLID	COAL	1A1a	Electricity and heat production	10102	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
					10100												

pollu-tant	fuel_type	fuel_gr_abbr	nfr_id	nfr_name	snap	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
					10101	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
					10103												
					10104											0.07	0.07
					10202												
					10203	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07			
					10200												
	WASTE	WASTE	1A1a	Electricity and heat production	10102	4.8	4.8	4.8	4.8	3.3	1.9	0.44	0.44	0.44	0.44	0.44	0.44
					10100												
					10103	4.8	4.8	4.8	4.8	3.3	1.9	0.44	0.44	0.44	0.44	0.44	0.44
					10104	4.8			4.8			0.44				0.44	0.44
					10203	6.5	5.9	5.4	4.8	3.3	1.9	0.44	0.44	0.44	0.44	0.44	0.44
					10200												
			1A2a	Iron and steel	30400												
			1A2c	Chemicals	30600	6.5			4.8		1.9	0.44		0.44	0.44	0.44	0.44
			1A2d	Pulp, Paper and Print	31100	6.5			4.8		1.9	0.44		0.44	0.44	0.44	0.44
			1A2e	Food processing, beverages and tobac-co	30900	6.5			4.8		1.9	0.44		0.44	0.44	0.44	0.44
					30902				4.8		1.9	0.44		0.44			
			1A2f i	Industry-Other	30700												
					30800						1.9	0.44		0.44	0.44	0.44	0.44
					31600	6.5	5.9	5.4	4.8	3.3	1.9						
					31000	6.5								0.44	0.44	0.44	0.44
					31200												
					31300	6.5			4.8		1.9	0.44		0.44	0.44	0.44	0.44
					31400	6.5			4.8		1.9	0.44		0.44	0.44	0.44	0.44
					32000				4.8		1.9	0.44		0.44	0.44		0.44
			1A4a i	Commercial/Institutional plants	20100				4.8	3.3	1.9	0.44	0.44	0.44	0.44	0.44	
					20103	6.5	5.9	5.4	4.8	3.3	1.9	0.44	0.44	0.44	0.44	0.44	0.44
Cr	BIOMASS	STRAW	1A4c i	Agriculture/Forestry/Fishing, Stationary	20302	1.6	1.6	1.6	1.6	1.6	1.6	2.9	1.6	2.9	2.9		2.9
	LIQUID	PETROLEUM COKE	1A1a	Electricity and heat production	10102											2.7	2.7
	SOLID	COAL	1A1a	Electricity and heat production	10102	1.7	1.6	1.4	1.3	1.1	1	0.95	0.91	0.86	0.86	0.86	0.86
					10100												
					10101	1.7	1.6	1.4	1.3	1.1	1	0.95	0.91	0.86	0.86	0.86	0.86
					10103												
					10104											0.86	0.86
					10202												
					10203	1.7	1.6	1.4	1.3	1.1	1	0.95	0.91	0.86			
					10200												
	WASTE	WASTE	1A1a	Electricity and heat production	10102	2.5	2.5	2.5	2.5	2.2	1.9	1.56	1.56	1.56	1.56	1.56	1.56
					10100												
					10103	2.5	2.5	2.5	2.5	2.2	1.9	1.56	1.56	1.56	1.56	1.56	1.56
					10104	2.5			2.5			1.56				1.56	1.56
					10203	14	10	6.3	2.5	2.2	1.9	1.56	1.56	1.56	1.56	1.56	1.56
					10200												
			1A2a	Iron and steel	30400												
			1A2c	Chemicals	30600	14			2.5		1.9	1.56		1.56	1.56	1.56	1.56
			1A2d	Pulp, Paper and Print	31100	14			2.5		1.9	1.56		1.56	1.56	1.56	1.56
			1A2e	Food processing, beverages and tobac-	30900	14			2.5		1.9	1.56		1.56	1.56	1.56	1.56

pollu-tant	fuel_type	fuel_gr_abbr	nfr_id	nfr_name	snap	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
				co													
					30902				2.5		1.9	1.56		1.56			
			1A2f i	Industry-Other	30700												
					30800						1.9	1.56		1.56	1.56	1.56	1.56
					31600	14	10	6.3	2.5	2.2	1.9						
					31000	14								1.56	1.56	1.56	1.56
					31200												
					31300	14			2.5		1.9	1.56		1.56	1.56	1.56	1.56
					31400	14			2.5		1.9	1.56		1.56	1.56	1.56	1.56
					32000				2.5		1.9	1.56		1.56	1.56		1.56
			1A4a i	Commercial/Institutional plants	20100				2.5	2.2	1.9	1.56	1.56	1.56	1.56	1.56	
					20103	14	10	6.3	2.5	2.2	1.9	1.56	1.56	1.56	1.56	1.56	1.56
Cu	BIOMASS	BIO OIL	1A2c	Chemicals	30605					0.3	0.13	0.13	0.3	0.3	0.3	0.3	
			1A2f i	Industry-Other	31305			0.3	0.3	0.3	0.13	0.13					
		STRAW	1A4c i	Agriculture/Forestry/Fishing, Stationary	20302	1.7	1.7	1.7	1.7	1.7	1.7	8.6	1.7	8.6	8.6		8.6
	LIQUID	GAS OIL	1A2f i	Industry-Other	31205									0.13	0.13	0.13	0.3
		PETROLEUM COKE	1A1a	Electricity and heat production	10102											5.7	5.7
	SOLID	COAL	1A1a	Electricity and heat production	10102	1	0.92	0.84	0.76	0.68	0.6	0.56	0.52	0.48	0.48	0.48	0.48
					10100												
					10101	1	0.92	0.84	0.76	0.68	0.6	0.56	0.52	0.48	0.48	0.48	0.48
					10103												
					10104											0.48	0.48
					10202												
					10203	1	0.92	0.84	0.76	0.68	0.6	0.56	0.52	0.48			
					10200												
	WASTE	WASTE	1A1a	Electricity and heat production	10102	10.1	10.1	10.1	10.1	7.2	4.2	1.3	1.3	1.3	1.3	1.3	1.3
					10100												
					10103	10.1	10.1	10.1	10.1	7.2	4.2	1.3	1.3	1.3	1.3	1.3	1.3
					10104	10.1			10.1			1.3				1.3	1.3
					10203	18	16	13	10.1	7.2	4.2	1.3	1.3	1.3	1.3	1.3	1.3
					10200												
			1A2a	Iron and steel	30400												
			1A2c	Chemicals	30600	18			10.1		4.2	1.3		1.3	1.3	1.3	1.3
			1A2d	Pulp, Paper and Print	31100	18			10.1		4.2	1.3		1.3	1.3	1.3	1.3
			1A2e	Food processing, beverages and tobac-co	30900	18			10.1		4.2	1.3		1.3	1.3	1.3	1.3
					30902				10.1		4.2	1.3		1.3			
			1A2f i	Industry-Other	30700												
					30800						4.2	1.3		1.3	1.3	1.3	1.3
					31600	18	16	13	10.1	7.2	4.2						
					31000	18								1.3	1.3	1.3	1.3
					31200												
					31300	18			10.1		4.2	1.3		1.3	1.3	1.3	1.3
					31400	18			10.1		4.2	1.3		1.3	1.3	1.3	1.3
					32000				10.1		4.2	1.3		1.3	1.3		1.3
			1A4a i	Commercial/Institutional plants	20100				10.1	7.2	4.2	1.3	1.3	1.3	1.3	1.3	
					20103	18	16	13	10.1	7.2	4.2	1.3	1.3	1.3	1.3	1.3	1.3
Hg	BIOMASS	BIO OIL	1A2c	Chemicals	30605					0.11	0.12	0.12	0.11	0.11	0.11	0.11	

pollu-tant	fuel_type	fuel_gr_abbr	nfr_id	nfr_name	snap	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
			1A2f i	Industry-Other	31305			0.11	0.11	0.11	0.12	0.12					
		STRAW	1A4c i	Agriculture/Forestry/Fishing, Stationary	20302	0.31	0.31	0.31	0.31	0.31	0.31	0.5	0.31	0.5	0.5		0.5
	LIQUID	GAS OIL	1A2f i	Industry-Other	31205									0.12	0.12	0.12	0.11
		PETROLEUM COKE	1A1a	Electricity and heat production	10102											0.4	0.4
	SOLID	COAL	1A1a	Electricity and heat production	10102	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3
					10100												
					10101	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3
					10103												
					10104											1.3	1.3
					10202												
					10203	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3			
					10200												
	WASTE	WASTE	1A1a	Electricity and heat production	10102	7.4	7.4	7.4	7.4	5.5	3.7	1.79	1.79	1.79	1.79	1.79	1.79
					10100												
					10103	7.4	7.4	7.4	7.4	5.5	3.7	1.79	1.79	1.79	1.79	1.79	1.79
					10104	7.4			7.4			1.79				1.79	1.79
					10203	27	20	14	7.4	5.5	3.7	1.79	1.79	1.79	1.79	1.79	1.79
					10200												
			1A2a	Iron and steel	30400												
			1A2c	Chemicals	30600	27			7.4		3.7	1.79		1.79	1.79	1.79	1.79
			1A2d	Pulp, Paper and Print	31100	27			7.4		3.7	1.79		1.79	1.79	1.79	1.79
			1A2e	Food processing, beverages and tobac-co	30900	27			7.4		3.7	1.79		1.79	1.79	1.79	1.79
					30902				7.4		3.7	1.79		1.79			
			1A2f i	Industry-Other	30700												
					30800						3.7	1.79		1.79	1.79	1.79	1.79
					31600	27	20	14	7.4	5.5	3.7						
					31000	27								1.79	1.79	1.79	1.79
					31200												
					31300	27			7.4		3.7	1.79		1.79	1.79	1.79	1.79
					31400	27			7.4		3.7	1.79		1.79	1.79	1.79	1.79
					32000				7.4		3.7	1.79		1.79	1.79		1.79
			1A4a i	Commercial/Institutional plants	20100				7.4	5.5	3.7	1.79	1.79	1.79	1.79	1.79	
					20103	27	20	14	7.4	5.5	3.7	1.79	1.79	1.79	1.79	1.79	1.79
Ni	BIOMASS	BIO OIL	1A2c	Chemicals	30605					0.013	0.005	0.005	0.013	0.013	0.013	0.013	
			1A2f i	Industry-Other	31305			0.013	0.013	0.013	0.005	0.005					
		STRAW	1A4c i	Agriculture/Forestry/Fishing, Stationary	20302	1.7	1.7	1.7	1.7	1.7	1.7	4.4	1.7	4.4	4.4		4.4
	LIQUID	GAS OIL	1A2f i	Industry-Other	31205									0.005	0.005	0.005	0.013
	SOLID	COAL	1A1a	Electricity and heat production	10102	4.4	3.8	3.2	2.5	1.9	1.3	1.2	1.1	0.97	0.97	0.97	0.97
					10101	4.4	3.8	3.2	2.5	1.9	1.3	1.2	1.1	0.97	0.97	0.97	0.97
					10103												
					10104											0.97	0.97
					10203	4.4	3.8	3.2	2.5	1.9	1.3	1.2	1.1	0.97			
	WASTE	WASTE	1A1a	Electricity and heat production	10102	4.8	4.8	4.8	4.8	3.9	3	2.06	2.06	2.06	2.06	2.06	2.06
					10100												
					10103	4.8	4.8	4.8	4.8	3.9	3	2.06	2.06	2.06	2.06	2.06	2.06
					10104	4.8			4.8			2.06				2.06	2.06
					10203	24	17	11	4.8	3.9	3	2.06	2.06	2.06	2.06	2.06	2.06

pollutant	fuel_type	fuel_gr_abbr	nfr_id	nfr_name	snap	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
					10200												
			1A2a	Iron and steel	30400												
			1A2c	Chemicals	30600	24			4.8		3	2.06		2.06	2.06	2.06	2.06
			1A2d	Pulp, Paper and Print	31100	24			4.8		3	2.06		2.06	2.06	2.06	2.06
			1A2e	Food processing, beverages and tobacco	30900	24			4.8		3	2.06		2.06	2.06	2.06	2.06
					30902				4.8		3	2.06		2.06			
			1A2f i	Industry-Other	30700												
					30800						3	2.06		2.06	2.06	2.06	2.06
					31600	24	17	11	4.8	3.9	3						
					31000	24								2.06	2.06	2.06	2.06
					31200												
					31300	24			4.8		3	2.06		2.06	2.06	2.06	2.06
					31400	24			4.8		3	2.06		2.06	2.06	2.06	2.06
					32000				4.8		3	2.06		2.06	2.06		2.06
			1A4a i	Commercial/Institutional plants	20100				4.8	3.9	3	2.06	2.06	2.06	2.06	2.06	
					20103	24	17	11	4.8	3.9	3	2.06	2.06	2.06	2.06	2.06	2.06
Pb	BIOMASS	BIO OIL	1A2c	Chemicals	30605					0.15	0.012	0.012	0.15	0.15	0.15	0.15	
			1A2f i	Industry-Other	31305			0.15	0.15	0.15	0.012	0.012					
		STRAW	1A4c i	Agriculture/Forestry/Fishing, Stationary	20302	6.2	6.2	6.2	6.2	6.2	6.2	40	6.2	40	40		40
	LIQUID	GAS OIL	1A2f i	Industry-Other	31205									0.012	0.012	0.012	0.15
		PETROLEUM COKE	1A1a	Electricity and heat production	10102											4.9	4.9
	SOLID	COAL	1A1a	Electricity and heat production	10102	1.6	1.5	1.4	1.2	1.1	1	0.87	0.75	0.62	0.62	0.62	0.62
					10101	1.6	1.5	1.4	1.2	1.1	1	0.87	0.75	0.62	0.62	0.62	0.62
					10103												
					10104											0.62	0.62
					10203	1.6	1.5	1.4	1.2	1.1	1	0.87	0.75	0.62			
	WASTE	WASTE	1A1a	Electricity and heat production	10102	123	123	123	123	84	45	5.52	5.52	5.52	5.52	5.52	5.52
					10100												
					10103	123	123	123	123	84	45	5.52	5.52	5.52	5.52	5.52	5.52
					10104	123			123			5.52				5.52	5.52
					10203	129	127	125	123	84	45	5.52	5.52	5.52	5.52	5.52	5.52
					10200												
			1A2a	Iron and steel	30400												
			1A2c	Chemicals	30600	129			123		45	5.52		5.52	5.52	5.52	5.52
			1A2d	Pulp, Paper and Print	31100	129			123		45	5.52		5.52	5.52	5.52	5.52
			1A2e	Food processing, beverages and tobacco	30900	129			123		45	5.52		5.52	5.52	5.52	5.52
					30902				123		45	5.52		5.52			
			1A2f i	Industry-Other	30700												
					30800						45	5.52		5.52	5.52	5.52	5.52
					31600	129	127	125	123	84	45						
					31000	129								5.52	5.52	5.52	5.52
					31200												
					31300	129			123		45	5.52		5.52	5.52	5.52	5.52
					31400	129			123		45	5.52		5.52	5.52	5.52	5.52
					32000				123		45	5.52		5.52	5.52		5.52
			1A4a i	Commercial/Institutional plants	20100				123	84	45	5.52	5.52	5.52	5.52	5.52	

pollu-tant	fuel_type	fuel_gr_abbr	nfr_id	nfr_name	snap	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
					20103	129	127	125	123	84	45	5.52	5.52	5.52	5.52	5.52	5.52
Se	BIOMASS	BIO OIL	1A2c	Chemicals	30605					0.22	0.002	0.002	0.22	0.22	0.22	0.22	
			1A2f i	Industry-Other	31305			0.22	0.22	0.22	0.002	0.002					
	LIQUID	GAS OIL	1A2f i	Industry-Other	31205									0.002	0.002	0.002	0.22
		PETROLEUM COKE	1A1a	Electricity and heat production	10102											2.2	2.2
	SOLID	COAL	1A1a	Electricity and heat production	10102	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9
					10100												
					10101	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9
					10103												
					10104											5.9	5.9
					10202												
					10203	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9			
					10200												
	WASTE	WASTE	1A1a	Electricity and heat production	10102	25	25	25	25	17	9.1	1.11	1.11	1.11	1.11	1.11	1.11
					10103	25	25	25	25	17	9.1	1.11	1.11	1.11	1.11	1.11	1.11
					10104	25			25			1.11				1.11	1.11
					10203	25	25	25	25	17	9.1	1.11	1.11	1.11	1.11	1.11	1.11
			1A2c	Chemicals	30600	25			25		9.1	1.11		1.11	1.11	1.11	1.11
			1A2d	Pulp, Paper and Print	31100	25			25		9.1	1.11		1.11	1.11	1.11	1.11
			1A2e	Food processing, beverages and tobac-co	30900	25			25		9.1	1.11		1.11	1.11	1.11	1.11
					30902				25		9.1	1.11		1.11			
			1A2f i	Industry-Other	30800						9.1	1.11		1.11	1.11	1.11	1.11
					31600	25	25	25	25	17	9.1						
					31000	25								1.11	1.11	1.11	1.11
					31300	25			25		9.1	1.11		1.11	1.11	1.11	1.11
					31400	25			25		9.1	1.11		1.11	1.11	1.11	1.11
					32000				25		9.1	1.11		1.11	1.11		1.11
			1A4a i	Commercial/Institutional plants	20100				25	17	9.1	1.11	1.11	1.11	1.11	1.11	
					20103	25	25	25	25	17	9.1	1.11	1.11	1.11	1.11	1.11	1.11
Zn	BIOMASS	BIO OIL	1A2c	Chemicals	30605					58	0.42	0.42	58	58	58	58	
			1A2f i	Industry-Other	31305			58	58	58	0.42	0.42					
		STRAW	1A4c i	Agriculture/Forestry/Fishing, Stationary	20302	0.41	0.41	0.41	0.41	0.41	0.41	130	0.41	130	130		130
	LIQUID	GAS OIL	1A2f i	Industry-Other	31205									0.42	0.42	0.42	58
		PETROLEUM COKE	1A1a	Electricity and heat production	10102											94	94
	SOLID	COAL	1A1a	Electricity and heat production	10102	7.7	6.6	5.5	4.4	3.2	2.1	2.03	1.97	1.9	1.9	1.9	1.9
					10100												
					10101	7.7	6.6	5.5	4.4	3.2	2.1	2.03	1.97	1.9	1.9	1.9	1.9
					10103												
					10104											1.9	1.9
					10202												
					10203	7.7	6.6	5.5	4.4	3.2	2.1	2.03	1.97	1.9			
					10200												
	WASTE	WASTE	1A1a	Electricity and heat production	10102	52	52	52	52	35	19	2.33	2.33	2.33	2.33	2.33	2.33
					10100												
					10103	52	52	52	52	35	19	2.33	2.33	2.33	2.33	2.33	2.33
					10104	52			52			2.33				2.33	2.33
					10203	168	129	91	52	35	19	2.33	2.33	2.33	2.33	2.33	2.33

pollu-tant	fuel_type	fuel_gr_abbr	nfr_id	nfr_name	snap	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
					10200												
			1A2a	Iron and steel	30400												
			1A2c	Chemicals	30600	168			52		19	2.33		2.33	2.33	2.33	2.33
			1A2d	Pulp, Paper and Print	31100	168			52		19	2.33		2.33	2.33	2.33	2.33
			1A2e	Food processing, beverages and tobacco	30900	168			52		19	2.33		2.33	2.33	2.33	2.33
					30902				52		19	2.33		2.33			
			1A2f i	Industry-Other	30700												
					30800						19	2.33		2.33	2.33	2.33	2.33
					31600	168	129	91	52	35	19						
					31000	168								2.33	2.33	2.33	2.33
					31200												
					31300	168			52		19	2.33		2.33	2.33	2.33	2.33
					31400	168			52		19	2.33		2.33	2.33	2.33	2.33
					32000				52		19	2.33		2.33	2.33		2.33
			1A4a i	Commercial/Institutional plants	20100				52	35	19	2.33	2.33	2.33	2.33	2.33	
					20103	168	129	91	52	35	19	2.33	2.33	2.33	2.33	2.33	2.33

Table 2A-4.8 PAH emission factors 2011.

fuel_type	fuel_id	fuel_gr_abbr	nfr_id	snap_id	Benzo(a)-pyrene µg per GJ	Ref.	Benzo(b)-flouran-thene µg per GJ	Ref.	Benzo(k)-flouran-thene µg per GJ	Ref.	Indeno-(1,2,3-c,d)-pyrene µg per GJ	Ref.
BIOMASS	111A	WOOD	1A1a	0101	11	7	15	7	5	7	0.8	7
				0102	6.46	4	1292.52	4	1292.52	4	11.56	4
			1A2 a-f	all	6.46	4	1292.52	4	1292.52	4	11.56	4
			1A4a i	020100	168707	4	221769	4	73469	4	119728	4
			1A4b i	All	113428	9	112622	9	65943	9	77088	9
			1A4c i	all	168707	4	221769	4	73469	4	119728	4
	117A	STRAW	1A1a	0101	0.5	7	0.5	7	0.5	7	0.5	7
				0102	1529	2	3452	2	1400	2	1029	2
			1A4a	020100	12956	2	12828	2	6912	2	4222	2
			1A4b i	020200	12956	2	12828	2	6912	2	4222	2
			1A4c i	020300	12956	2	12828	2	6912	2	4222	2
	215A	BIO OIL	1A1a	all	109.6	3	475.41	3	93.21	3	177.28	3
			1A4b i	020200	80	3	42	3	66	3	160	3
	309A	BIOGAS	1A1a	010105	1.3	7	1.2	7	1.2	7	0.6	7
			1A2e	030905	1.3	7	1.2	7	1.2	7	0.6	7
			1A4a i	020105	1.3	7	1.2	7	1.2	7	0.6	7
			1A4c i	020304	1.3	7	1.2	7	1.2	7	0.6	7
	310A	BIO PROD GAS	1A1a	010105	2	7	2	7	2	7	2	7
			1A4a	020105	2	7	2	7	2	7	2	7
WASTE	114A	WASTE	1A1a	all	0.8	7	1.7	7	0.9	7	1.1	7
			1A2 a-f	all	0.8	7	1.7	7	0.9	7	1.1	7
			1A4a i	020103	0.8	7	1.7	7	0.9	7	1.1	7
	115A	INDUSTRIAL WASTE	1A2f	031600	0.8	7	1.7	7	0.9	7	1.1	7
GAS	301A	NATURAL GAS	1A1a	010104	1	8	1	8	2	8	3	8
				010105	1.2	7	9	7	1.7	7	1.8	7
			1A1c	010504	1	8	1	8	2	8	3	8
			1A2 a-f	Turbines	1	8	1	8	2	8	3	8
				Engines	1.2	7	9	7	1.7	7	1.8	7
			1A4a i	020105	1.2	7	9	7	1.7	7	1.8	7
			1A4b i	020202	0.133	6	0.663	6	0.265	6	2.653	6
				020204	1.2	6	9	6	1.7	6	1.8	6
			1A4c i	020304	1.2	6	9	6	1.7	6	1.8	6
LIQUID	110A	PETROLEUM COKE	1A1a	010102	3184	5	9554	5	-	-	-	-
			1A2 a-f	all	3184	5	9554	5	-	-	-	-
			1A4a	020100	3184	5	9554	5	-	-	-	-
			1A4b i	020200	3184	5	9554	5	-	-	-	-
	203A	RESIDUAL OIL	1A1a	All	109.6	4	475.41	4	93.21	4	177.28	4
			1A1b	010306	109.6	4	475.41	4	93.21	4	177.28	4
			1A2 a-f	all	80	4	42	4	66	4	160	4
			1A4c i	all	80	4	42	4	66	4	160	4
	204A	GAS OIL	1A1a	Not engines	109.6	4	475.41	4	93.21	4	177.28	4
				Engines	1.9	7	15	7	1.7	7	1.5	7
			1A1b	010306	109.6	4	475.41	4	93.21	4	177.28	4
			1A2 a-f	Not engines	80	4	42	4	66	4	160	4

fuel_type	fuel_id	fuel_gr_abbr	nfr_id	snap_id	Benzo(a)-pyrene		Benzo(b)-flouran-thene		Benzo(k)-flouran-thene		Indeno-(1,2,3-c,d)-pyrene	
				Engines	1.9	7	15	7	1.7	7	1.5	7
			1A4a i	Not engines	80	4	42	4	66	4	160	4
				Engines	1.9	7	15	7	1.7	7	1.5	7
			1A4b i	020200	80	4	42	4	66	4	160	4
			1A4c i	020302	80	4	42	4	66	4	160	4
SOLID	102A	ANODE CARBON	1A2f	032000	23	4	929	4	929	4	698	4
		COAL	1A1a	All	0.14	4	0.29	4	0.29	4	0.28	4
			1A2 a-f	All	23	4	929	4	929	4	698	4
			1A4b i	020200	59524	4	63492	4	1984	4	119048	4
			1A4c i	020300	59524	4	63492	4	1984	4	119048	4
	106A	BROWN COAL BRI.	1A2f	030800	23	4	929	4	929	4	698	4
			1A4b i	020200	59524	4 (8)	63492	4 (8)	1984	4 (8)	119048	4 (8)
	107A	COKE OVEN COKE	1A2 a-f	all	23	4	929	4	929	4	698	4
			1A4b i	020200	59524	4 (8)	63492	4 (8)	1984	4 (8)	119048	4 (8)

1. -
2. Same emission factors as for gas oil is assumed (DCE assumption).
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8. Same emission factor as for coal is assumed (DCE assumption).
9. Aggregated emission factor based on the technology distribution in the sector and guidebook (EEA 2009) emission factors. Technology distribution based on: (Nielsen &t Hessberg 2011)

Table 2A-4.9a PAH emission factors time-series, µg pr GJ for the years 1990 to 1999.

pol_abbr	fuel_type	fuel_gr	nfr	nfr_name	snap	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Benzo(a)pyrene	BIOMASS	BIOGAS	1A1a	Electricity and heat production	10105	1	1	1	1	1	1	1	1	1	1
			1A2e	Food processing, beverages and tobacco	30905										
			1A4a i	Commercial/Institutional plants	20105	1	1	1	1	1	1	1	1	1	1
			1A4c i	Agriculture/Forestry/Fishing, Stationary	20304	1	1	1	1	1	1	1	1	1	1
		WOOD	1A4b i	Residential plants	20200	174015	174015	174015	174015	174015	174015	174015	174015	174015	174015
					20204										
					20202										
	GAS	NATURAL GAS	1A1a	Electricity and heat production	10105	3	3	3	3	3	3	3	3	3	3
			1A2c	Chemicals	30605								3	3	3
			1A2d	Pulp, Paper and Print	31104						0	0	0	1	0
			1A2e	Food processing, beverages and tobacco	30903					0	0	0	0	0	0
					30905					3	3	3	3	3	3
			1A2f i	Industry-Other	30705						3	3	3	3	3
					31005							3	3	3	3
					31205						3	3	3	3	3
					31305							3	3	3	3
					31405						3	3	3	3	3
					31604							0	0	1	0
					31605								3	3	3
					32005					3	3	3	3	3	3
			1A4a i	Commercial/Institutional plants	20105	3	3	3	3	3	3	3	3	3	3
			1A4b i	Residential plants	20204		3	3	3	3	3		3	3	3
			1A4c i	Agriculture/Forestry/Fishing, Stationary	20304	3	3	3	3	3	3	3	3	3	3
	LIQUID	GAS OIL	1A2f i	Industry-Other	31205										
Benzo(b)flouranthene	BIOMASS	BIOGAS	1A1a	Electricity and heat production	10105	1	1	1	1	1	1	1	1	1	1
			1A2e	Food processing, beverages and tobacco	30905										
			1A4a i	Commercial/Institutional plants	20105	1	1	1	1	1	1	1	1	1	1
			1A4c i	Agriculture/Forestry/Fishing, Stationary	20304	1	1	1	1	1	1	1	1	1	1
		WOOD	1A4b i	Residential plants	20200	180157	180157	180157	180157	180157	180157	180157	180157	180157	180157
					20204										
					20202										
	GAS	NATURAL GAS	1A1a	Electricity and heat production	10105	42	42	42	42	42	42	42	42	42	42
			1A2c	Chemicals	30605								42	42	42
			1A2d	Pulp, Paper and Print	31104						0	0	0	1	0
			1A2e	Food processing, beverages and tobacco	30903					0	0	0	0	0	0
					30905					42	42	42	42	42	42
			1A2f i	Industry-Other	30705						42	42	42	42	42
					31005							42	42	42	42
					31205						42	42	42	42	42
					31305							42	42	42	42
					31405						42	42	42	42	42

pol_abbr	fuel_type	fuel_gr	nfr	nfr_name	snap	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
					31604							0	0	1	0
					31605								42	42	42
					32005					42	42	42	42	42	42
			1A4a i	Commercial/Institutional plants	20105	42	42	42	42	42	42	42	42	42	42
			1A4b i	Residential plants	20204		42	42	42	42	42		42	42	42
			1A4c i	Agriculture/Forestry/Fishing, Stationary	20304	42	42	42	42	42	42	42	42	42	42
	LIQUID	GAS OIL	1A2f i	Industry-Other	31205										
Benzo(k)flouranthene	BIOMASS	BIOGAS	1A1a	Electricity and heat production	10105	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
			1A2e	Food processing, beverages and tobacco	30905										
			1A4a i	Commercial/Institutional plants	20105	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
			1A4c i	Agriculture/Forestry/Fishing, Stationary	20304	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
		WOOD	1A4b i	Residential plants	20200	107493	107493	107493	107493	107493	107493	107493	107493	107493	107493
					20204										
					20202										
	GAS	NATURAL GAS	1A1a	Electricity and heat production	10105	24	24	24	24	24	24	24	24	24	24
			1A2c	Chemicals	30605								24	24	24
			1A2d	Pulp, Paper and Print	31104						0	0	0	2	0
			1A2e	Food processing, beverages and tobacco	30903					0	0	0	0	0	0
					30905					24	24	24	24	24	24
			1A2f i	Industry-Other	30705						24	24	24	24	24
					31005							24	24	24	24
					31205						24	24	24	24	24
					31305							24	24	24	24
					31405						24	24	24	24	24
					31604							0	0	2	0
					31605								24	24	24
					32005					24	24	24	24	24	24
			1A4a i	Commercial/Institutional plants	20105	24	24	24	24	24	24	24	24	24	24
			1A4b i	Residential plants	20204		24	24	24	24	24		24	24	24
			1A4c i	Agriculture/Forestry/Fishing, Stationary	20304	24	24	24	24	24	24	24	24	24	24
	LIQUID	GAS OIL	1A2f i	Industry-Other	31205										
Indeno(1,2,3-c,d)pyrene	BIOMASS	BIOGAS	1A1a	Electricity and heat production	10105	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
			1A2e	Food processing, beverages and tobacco	30905										
			1A4a i	Commercial/Institutional plants	20105	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
			1A4c i	Agriculture/Forestry/Fishing, Stationary	20304	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
		WOOD	1A4b i	Residential plants	20200	122307	122307	122307	122307	122307	122307	122307	122307	122307	122307
					20204										
					20202										
	GAS	NATURAL GAS	1A1a	Electricity and heat production	10105	6	6	6	6	6	6	6	6	6	6
			1A2c	Chemicals	30605								6	6	6
			1A2d	Pulp, Paper and Print	31104						0	0	0	3	0
			1A2e	Food processing, beverages and to-	30903					0	0	0	0	0	0

pol_abbr	fuel_type	fuel_gr	nfr	nfr_name	snap	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
				bacco											
					30905					6	6	6	6	6	6
			1A2f i	Industry-Other	30705						6	6	6	6	6
					31005							6	6	6	6
					31205						6	6	6	6	6
					31305							6	6	6	6
					31405						6	6	6	6	6
					31604							0	0	3	0
					31605								6	6	6
					32005					6	6	6	6	6	6
			1A4a i	Commercial/Institutional plants	20105	6	6	6	6	6	6	6	6	6	6
			1A4b i	Residential plants	20204		6	6	6	6	6		6	6	6
			1A4c i	Agriculture/Forestry/Fishing, Stationary	20304	6	6	6	6	6	6	6	6	6	6
	LIQUID	GAS OIL	1A2f i	Industry-Other	31205										

Table 2A-4.9b PAH emission factors time-series, µg pr GJ for the years 2000 to 2011.

pol_abbr	fuel_type	fuel_gr	nfr	nfr_name	snap	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Benzo(a) pyrene	BIOMASS	BIOGAS	1A1a	Electricity and heat production	10105	1	1.1	1.1	1.2	1.2	1.3	1.3	1.3	1.3	1.3	1.3	1.3
			1A2e	Food processing, beverages and to-bacco	30905		0	0	0	0	0	0	0	0	0	0	1.3
			1A4a i	Commercial/Institutional plants	20105	1	1.1	1.1	1.2	1.2	1.3	1.3	1.3	1.3	1.3	1.3	1.3
			1A4c i	Agriculture/Forestry/Fishing, Stationary	20304	1	1.1	1.1	1.2	1.2	1.3	1.3	1.3	1.3	1.3	1.3	1.3
		WOOD	1A4b i	Residential plants	20200	174015	157123	150857	149977	148828	142999	134809	137505	130977	122261	117537	113428
					20204									130977	122261	117537	
					20202						142999	134809	137505	130977	122261	117537	113428
	GAS	NATURAL GAS	1A1a	Electricity and heat production	10105	3	2.7	2.5	2.2	2	1.7	1.5	1.2	1.2	1.2	1.2	1.2
			1A2c	Chemicals	30605	3	2.7	2.5	2.2	2	1.7						
			1A2d	Pulp, Paper and Print	31104	0	0	1	1	1	1	1	1	1	1	1	1
			1A2e	Food processing, beverages and to-bacco	30903	0	0	0	0	0	0	0	0	0	0	0	1.7
					30905	3	2.7	2.5	2.2	2	1.7	1.5	1.2	1.2	1.2	1.2	1.2
			1A2f i	Industry-Other	30705	3	2.7	2.5	2.2	2	1.7	1.5	1.2	1.2	1.2	1.2	1.2
					31005	3	2.7	2.5	2.2	2	1.7	1.5	1.2	1.2	1.2	1.2	1.2
					31205	3	2.7	2.5	2.2	2	1.7	1.5	1.2	1.2	1.2	1.2	1.2
					31305	3	2.7	2.5	2.2	2	1.7	1.5	1.2	1.2	1.2	1.2	1.2
					31405	3	2.7	2.5	2.2	2	1.7	1.5	1.2	1.2	1.2	1.2	1.2
					31604	0	0	1	1	1	1		1	1	1	1	1
					31605	3	2.7	2.5	2.2	2	1.7	1.5	1.2	1.2	1.2	1.2	1.2
					32005	3	2.7	2.5	2.2	2	1.7	1.5					
			1A4a i	Commercial/Institutional plants	20105	3	2.7	2.5	2.2	2	1.7	1.5	1.2	1.2	1.2	1.2	1.2
			1A4b i	Residential plants	20204	3	2.7	2.5	2.2	2	1.7	1.5	1.2	1.2	1.2	1.2	1.2

pol_abbr	fuel_type	fuel_gr	nfr	nfr_name	snap	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
			1A4c i	Agriculture/Forestry/Fishing, Stationary	20304	3	2.7	2.5	2.2	2	1.7	1.5	1.2	1.2	1.2	1.2	1.2
	LIQUID	GAS OIL	1A2f i	Industry-Other	31205									80	80	80	1.9
Benzo(b) flouranthene	BIOMASS	BIOGAS	1A1a	Electricity and heat production	10105	1	1	1.1	1.1	1.1	1.2	1.2	1.2	1.2	1.2	1.2	1.2
			1A2e	Food processing, beverages and tobacco	30905		0	0	0	0	0	0	0	0	0	0	1.2
			1A4a i	Commercial/Institutional plants	20105	1	1	1.1	1.1	1.1	1.2	1.2	1.2	1.2	1.2	1.2	1.2
			1A4c i	Agriculture/Forestry/Fishing, Stationary	20304	1	1	1.1	1.1	1.1	1.2	1.2	1.2	1.2	1.2	1.2	1.2
		WOOD	1A4b i	Residential plants	20200	180157	162116	155110	153661	151958	145540	137685	139711	132422	122952	117484	112622
					20204									132422	122952	117484	
					20202						145540	137685	139711	132422	122952	117484	112622
	GAS	NATURAL GAS	1A1a	Electricity and heat production	10105	42	37	33	28	23	18	14	9	9	9	9	9
			1A2c	Chemicals	30605	42	37	33	28	23	18						
			1A2d	Pulp, Paper and Print	31104	0	0	1	1	1	1	1	1	1	1	1	1
			1A2e	Food processing, beverages and tobacco	30903	0	0	0	0	0	0	0	0	0	0	0	155
					30905	42	37	33	28	23	18	14	9	9	9	9	9
			1A2f i	Industry-Other	30705	42	37	33	28	23	18	14	9	9	9	9	9
					31005	42	37	33	28	23	18	14	9	9	9	9	9
					31205	42	37	33	28	23	18	14	9	9	9	9	9
					31305	42	37	33	28	23	18	14	9	9	9	9	9
					31405	42	37	33	28	23	18	14	9	9	9	9	9
					31604	0	0	1	1	1	1		1	1	1	1	1
					31605	42	37	33	28	23	18	14	9	9	9	9	9
					32005	42	37	33	28	23	18	14					
			1A4a i	Commercial/Institutional plants	20105	42	37	33	28	23	18	14	9	9	9	9	9
			1A4b i	Residential plants	20204	42	37	33	28	23	18	14	9	9	9	9	9
			1A4c i	Agriculture/Forestry/Fishing, Stationary	20304	42	37	33	28	23	18	14	9	9	9	9	9
	LIQUID	GAS OIL	1A2f i	Industry-Other	31205									42	42	42	15
Benzo(k) flouranthene	BIOMASS	BIOGAS	1A1a	Electricity and heat production	10105	0.4	0.5	0.7	0.8	0.9	1	1.2	1.2	1.2	1.2	1.2	1.2
			1A2e	Food processing, beverages and tobacco	30905		0	0	0	0	0	0	0	0	0	0	1.2
			1A4a i	Commercial/Institutional plants	20105	0.4	0.5	0.7	0.8	0.9	1	1.2	1.2	1.2	1.2	1.2	1.2
			1A4c i	Agriculture/Forestry/Fishing, Stationary	20304	0.4	0.5	0.7	0.8	0.9	1	1.2	1.2	1.2	1.2	1.2	1.2
		WOOD	1A4b i	Residential plants	20200	107493	96657	92377	91385	90236	86303	81221	82230	77790	72142	68874	65943
					20204									77790	72142	68874	
					20202						86303	81221	82230	77790	72142	68874	65943
	GAS	NATURAL GAS	1A1a	Electricity and heat production	10105	24	21	18	14	11	8	5	1.7	1.7	1.7	1.7	1.7
			1A2c	Chemicals	30605	24	21	18	14	11	8						
			1A2d	Pulp, Paper and Print	31104	0	0	2	2	2	2	2	2	2	2	2	2
			1A2e	Food processing, beverages and to-	30903	0	0	0	0	0	0	0	0	0	0	0	1.7

pol_abbr	fuel_type	fuel_gr	nfr	nfr_name	snap	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
				bacco													
					30905	24	21	18	14	11	8	5	1.7	1.7	1.7	1.7	1.7
			1A2f i	Industry-Other	30705	24	21	18	14	11	8	5	1.7	1.7	1.7	1.7	1.7
					31005	24	21	18	14	11	8	5	1.7	1.7	1.7	1.7	1.7
					31205	24	21	18	14	11	8	5	1.7	1.7	1.7	1.7	1.7
					31305	24	21	18	14	11	8	5	1.7	1.7	1.7	1.7	1.7
					31405	24	21	18	14	11	8	5	1.7	1.7	1.7	1.7	1.7
					31604	0	0	2	2	2	2		2	2	2	2	2
					31605	24	21	18	14	11	8	5	1.7	1.7	1.7	1.7	1.7
					32005	24	21	18	14	11	8	5					
			1A4a i	Commercial/Institutional plants	20105	24	21	18	14	11	8	5	1.7	1.7	1.7	1.7	1.7
			1A4b i	Residential plants	20204	24	21	18	14	11	8	5	1.7	1.7	1.7	1.7	1.7
			1A4c i	Agriculture/Forestry/Fishing, Stationary	20304	24	21	18	14	11	8	5	1.7	1.7	1.7	1.7	1.7
	LIQUID	GAS OIL	1A2f i	Industry-Other	31205									66	66	66	1.7
Indeno(1,2,3-c,d)pyrene	BIOMASS	BIOGAS	1A1a	Electricity and heat production	10105	1.1	1	0.9	0.9	0.8	0.7	0.6	0.6	0.6	0.6	0.6	0.6
			1A2e	Food processing, beverages and to-bacco	30905		0	0	0	0	0	0	0	0	0	0	0.6
			1A4a i	Commercial/Institutional plants	20105	1.1	1	0.9	0.9	0.8	0.7	0.6	0.6	0.6	0.6	0.6	0.6
			1A4c i	Agriculture/Forestry/Fishing, Stationary	20304	1.1	1	0.9	0.9	0.8	0.7	0.6	0.6	0.6	0.6	0.6	0.6
		WOOD	1A4b i	Residential plants	20200	122307	110051	105383	104544	103515	99189	93064	94720	89908	83616	80143	77088
					20204									89908	83616	80143	
					20202						99189	93064	94720	89908	83616	80143	77088
	GAS	NATURAL GAS	1A1a	Electricity and heat production	10105	6	5.4	4.8	4.2	3.6	3	2.4	1.8	1.8	1.8	1.8	1.8
			1A2c	Chemicals	30605	6	5.4	4.8	4.2	3.6	3						
			1A2d	Pulp, Paper and Print	31104	0	0	3	3	3	3	3	3	3	3	3	3
			1A2e	Food processing, beverages and to-bacco	30903	0	0	0	0	0	0	0	0	0	0	0	6
					30905	6	5.4	4.8	4.2	3.6	3	2.4	1.8	1.8	1.8	1.8	1.8
			1A2f i	Industry-Other	30705	6	5.4	4.8	4.2	3.6	3	2.4	1.8	1.8	1.8	1.8	1.8
					31005	6	5.4	4.8	4.2	3.6	3	2.4	1.8	1.8	1.8	1.8	1.8
					31205	6	5.4	4.8	4.2	3.6	3	2.4	1.8	1.8	1.8	1.8	1.8
					31305	6	5.4	4.8	4.2	3.6	3	2.4	1.8	1.8	1.8	1.8	1.8
					31405	6	5.4	4.8	4.2	3.6	3	2.4	1.8	1.8	1.8	1.8	1.8
					31604	0	0	3	3	3	3		3	3	3	3	3
					31605	6	5.4	4.8	4.2	3.6	3	2.4	1.8	1.8	1.8	1.8	1.8
					32005	6	5.4	4.8	4.2	3.6	3	2.4					
			1A4a i	Commercial/Institutional plants	20105	6	5.4	4.8	4.2	3.6	3	2.4	1.8	1.8	1.8	1.8	1.8
			1A4b i	Residential plants	20204	6	5.4	4.8	4.2	3.6	3	2.4	1.8	1.8	1.8	1.8	1.8
			1A4c i	Agriculture/Forestry/Fishing, Stationary	20304	6	5.4	4.8	4.2	3.6	3	2.4	1.8	1.8	1.8	1.8	1.8
	LIQUID	GAS OIL	1A2f i	Industry-Other	31205									160	160	160	1.5

Table 2A-4.10 Dioxin and HCB emission factors 2011.

fuel_type	fuel_id	fuel_gr_abbr	nfr_id_EA	snap_id	HCB, ng pr GJ	Dioxin, ng pr GJ
BIOMASS	111A	WOOD	1A1a	0101	4000	14
				0102	4000	1
			1A2 a-f	all	4000	1
			1A4a i	020100	4000	400
			1A4b i	all	4000	391
			1A4c i	all	4000	400
	117A	STRAW	1A1a	0101	113	19
				0102	113	22
			1A4a	020103	113	400
			1A4b	020200	113	500
			1A4c i	all	113	400
	215A	BIO OIL	1A1a	all		0.882
			1A4b i	020200		10
	309A	BIOGAS	1A1a	010101		0.025
				010102		0.025
				010105	190	0.96
				010203		0.025
			1A2e	Not engines		0.025
				Engines	190	0.96
			1A4a i	Not engines		2
				020105	190	0.96
			1A4c i	020300		2
				020304	190	0.96
	310A	BIO PROD GAS	1A1a	010105		1.7
			1A4a	020105		1.7
WASTE	114A	WASTE	All	all	4300	5
	115A	INDUSTRIAL WASTE	All	All	4300	5
GAS	301A	NATURAL GAS	All	Engines		0.57
				Not engines		0.025
LIQUID	110A	PETROLEUM COKE	1A1a	010102		1.32
			1A2f	All		1.32
			1A4a	020100		300
			1A4b i	020200		800
	203A	RESIDUAL OIL	1A1a	all		0.882
			1A1b	010306		0.882
			1A2 a-f	all		0.882
			1A4c i	020300		10
				020304		0.882
	204A	GAS OIL	1A1a	Not engines		0.882
				Engines	220	0.99
			1A1b	010306		0.882
			1A2 a-f	Not engines		0.882
			1A4a i	Not engines		10
				Engines	220	0.99
			1A4b i	020200		10
			1A4c i	020302		10
	206A	KEROSENE	1A2f	all		0.882
			1A4a i	020100		10
			1A4b i	020200		10
			1A4c i	020300		10
	303A	LPG	1A1a	all		0.025
			1A2 a-f	all		0.025
			1A4a i	all		2
			1A4b i	020200		2
			1A4c i	020300		2
	308A	REFINERY GAS	1A1b	010304		0.025
				010306		0.025
SOLID	101A	ANODE CARBON	1A2f	032000		1.32
	102A	COAL	1A1a	All	640	1.32
			1A2 a-f	All	640	1.32
			1A4b i	020200	640	800
			1A4c i	020300	640	300
	106A	BROWN COAL BRI.	1A2f	030800		1.32
			1A4b i	020200		800
	107A	COKE OVEN COKE	1A2 a-f	all		1.32
			1A4b i	020200		800

Table 2A-4.11a Dioxin and HCB emission factor time-series for the years 1990 to 1999.

pol_abbr	fuel_type	fuel_gr_abbr	nfr_id_EA	nfr_name	snap_id	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
DIOXIN	BIOMASS	BIOGAS	1A2e	Food processing, beverages and tobacco	30905										
		WOOD	1A4b i	Residential plants	20200	587	587	587	587	587	587	587	587	587	587
					20204										
					20202										
	LIQUID	GAS OIL	1A2f i	Industry-Other	31205										
		RESIDUAL OIL	1A4c i	Agriculture/Forestry/Fishing, Stationary	20304									10	10
	WASTE	WASTE	1A1a	Electricity and heat production	10102					907	767	628	488	348	253
					10100	2095	1746	1396	1047						
					10103					907	767	628	488	348	253
					10104					907	767	628	488	348	253
					10203					907	767	628	488	348	348
					10200	2095	1746	1396	1047						
			1A2a	Iron and steel	30400					907	767				
			1A2c	Chemicals	30600	2095	1746	1396	1047	907	767	628	488	348	
			1A2d	Pulp, Paper and Print	31100	2095	1746	1396	1047	907	767	628	488	348	348
			1A2e	Food processing, beverages and tobacco	30900	2095	1746	1396	1047	907	767	628		348	348
					30902										
			1A2f i	Industry-Other	30700	2095	1746	1396	1047	907	767			348	
					31600										
					31000	2095	1746	1396	1047	907	767	628	488	348	348
					31200	2095	1746			907	767				
					31300	2095	1746	1396	1047	907	767	628	488	348	
					31400			1396	1047	907	767	628	488	348	348
					32000	2095	1746	1396	1047	907	767	628	488	348	348
			1A4a i	Commercial/Institutional plants	20100	2095	1746	1396	1047	907	767	628	488	348	348
					20103					907	767	628	488	348	348
HCB	BIOMASS	BIO PROD GAS	1A1a	Electricity and heat production	10105					82000	70000	57000	45000	32000	4000
	WASTE	WASTE	1A1a	Electricity and heat production	10102					82000	70000	57000	45000	32000	23000
					10100	190000	158000	127000	95000						
					10103					82000	70000	57000	45000	32000	23000
					10104					82000	70000	57000	45000	32000	23000
					10203					82000	70000	57000	45000	32000	23000
					10200	190000	158000	127000	95000						
			1A2a	Iron and steel	30400					82000	70000				
			1A2c	Chemicals	30600	190000	158000	127000	95000	82000	70000	57000	45000	32000	
			1A2d	Pulp, Paper and Print	31100	190000	158000	127000	95000	82000	70000	57000	45000	32000	23000
			1A2e	Food processing, beverages and tobacco	30900	190000	158000	127000	95000	82000	70000	57000		32000	23000
					30902										
			1A2f i	Industry-Other	30700	190000	158000	127000	95000	82000	70000			32000	
					31600										
					31000	190000	158000	127000	95000	82000	70000	57000	45000	32000	23000
					31200	190000	158000			82000	70000				
					31300	190000	158000	127000	95000	82000	70000	57000	45000	32000	
					31400			127000	95000	82000	70000	57000	45000	32000	23000
					32000	190000	158000	127000	95000	82000	70000	57000	45000	32000	23000
			1A4a i	Commercial/Institutional plants	20100	190000	158000	127000	95000	82000	70000	57000	45000	32000	23000
					20103					82000	70000	57000	45000	32000	23000

Table 2A-4.11b Dioxin and HCB emission factor time-series for the years 2000 to 2011.

pol_abbr	fuel_type	fuel_gr_abbr	nfr_id_EA	nfr_name	snap	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
DIOXIN	BIOMASS	BIOGAS	1A2e	Food processing, beverages & tobacco	30905		0	0	0	0	0	0	0	0	0	0	1
		WOOD	1A4b i	Residential plants	20200	587	528	507	505	502	482	456	468	447	419	404	391
					20204									447	419	404	
					20202						482	456	468	447	419	404	391
	LIQUID	GAS OIL	1A2f i	Industry-Other	31205									0.882	0.882	0.882	0.99
		RESIDUAL OIL	1A4c i	Agriculture/Forestry/Fishing, Stationary	20304	10	10	10	10							0.882	0.882
	WASTE	WASTE	1A1a	Electricity and heat production	10102	157	157	157	157	81	5	5	5	5	5	5	5
					10100												
					10103	157	157	157	157	81	5	5	5	5	5	5	5
					10104	157			157			5				5	5
					10203	348	348	348	348	177	5	5	5	5	5	5	5
					10200												
			1A2a	Iron and steel	30400												
			1A2c	Chemicals	30600	348			348		5	5		5	5	5	5
			1A2d	Pulp, Paper and Print	31100	348			348		5	5		5	5	5	5
			1A2e	Food processing, beverages & tobacco	30900	348			348		5	5		5	5	5	5
					30902				348		5	5		5			
			1A2f i	Industry-Other	30700												
					31600	348	348	348	348	177	5						
					31000	348								5	5	5	5
					31200												
					31300	348			348		5	5		5	5	5	5
					31400	348			348		5	5		5	5	5	5
					32000				348		5	5		5	5		5
			1A4a i	Commercial/Institutional plants	20100				348	177	5	5	5	5	5	5	
					20103	348	348	348	348	177	5	5	5	5	5	5	5
HCB	BIOMASS	BIO PROD GAS	1A1a	Electricity and heat production	10105	4000	4000	4000	4000	6000	4300	4300	4300				
	WASTE	WASTE	1A1a	Electricity and heat production	10102	14000	12000	10000	8000	6000	4300	4300	4300	4300	4300	4300	4300
					10100												
					10103	14000	12000	10000	8000	6000	4300	4300	4300	4300	4300	4300	4300
					10104	14000			8000			4300				4300	4300
					10203	14000	12000	10000	8000	6000	4300	4300	4300	4300	4300	4300	4300
					10200												
			1A2a	Iron and steel	30400												
			1A2c	Chemicals	30600	14000			8000		4300	4300		4300	4300	4300	4300
			1A2d	Pulp, Paper and Print	31100	14000			8000		4300	4300		4300	4300	4300	4300
			1A2e	Food processing, beverages & tobacco	30900	14000			8000		4300	4300		4300	4300	4300	4300
					30902				8000		4300	4300		4300			
			1A2f i	Industry-Other	30700												
					31600	14000	12000	10000	8000	6000	4300						
					31000	14000								4300	4300	4300	4300
					31200												
					31300	14000			8000		4300	4300		4300	4300	4300	4300
					31400	14000			8000		4300	4300		4300	4300	4300	4300
					32000				8000		4300	4300		4300	4300		4300
			1A4a i	Commercial/Institutional plants	20100				8000	6000	4300	4300	4300	4300		4300	
					20103	14000	12000	10000	8000	6000	4300	4300	4300	4300	4300	4300	4300

Table 2A-4.12 NH_3 emission factors 2011.

Fuel gr	Fuel	NFR		SNAP	NH_3 g/GJ
BIOMASS	WOOD	1A4b i	Residential	020200	5
				020202	5
	STRAW	1A4b i	Residential	020200	3.8
WASTE	MUNICIP. WASTES	1A1a	Electricity and heat production	010102	0.29
				010103	0.29
				010104	0.29
				010203	0.29
SOLID	COAL	1A4b i	Residential	020200	3.8
	BROWN COAL BRI.	1A4b i	Residential	020200	3.8
	COKE OVEN COKE	1A4b i	Residential	020200	3.8

Annex 2A-5 Implied emission factors for waste incineration plants and power plants combustion coal

Table 74 Implied emission factors for municipal waste incineration plants 2011.

Pollutant	Implied Emission factor	Unit
SO_2	6.0	g pr GJ
NO_x	100	g pr GJ
TSP	0.53	g pr GJ
PM_{10}	0.50	g pr GJ
$PM_{2.5}$	0.47	g pr GJ
As	0.56	Mg pr GJ
Cd	0.41	mg pr GJ
Cr	1.53	mg pr GJ
Cu	3.83	mg pr GJ
Hg	2.63	mg pr GJ
Ni	3.01	mg pr GJ
Pb	5.49	mg pr GJ
Se	1.14	mg pr GJ
Zn	2.42	mg pr GJ

Table 75 Implied emission factors for power plants combusting coal, 2011.

Pollutant	Implied Emission factor	Unit
SO_2	9	g pr GJ
NO_x	30	g pr GJ
TSP	2.5	g pr GJ
PM_{10}	2.1	g pr GJ
$PM_{2.5}$	1.7	g pr GJ
As	0.36	mg pr GJ
Cd	0.03	mg pr GJ
Cr	0.50	mg pr GJ
Cu	0.29	mg pr GJ
Hg	0.85	mg pr GJ
Ni	0.62	mg pr GJ
Pb	0.40	mg pr GJ
Se	4.4	mg pr GJ
Zn	1.29	mg pr GJ

Annex 2A-6 Large point sources

Table 2A-6.1 Large point sources, fuel consumption in 2011 (1A1, 1A2 and 1A4).

nfr_id_EA	lps_id	lps_name	fuel_id	fuel_gr_abbr	Fuel consumption, TJ
1A1a	001	Amagervaerket	102A	COAL	12880
1A1a	001	Amagervaerket	111A	WOOD	4465
1A1a	001	Amagervaerket	117A	STRAW	1575
1A1a	001	Amagervaerket	203A	RESIDUAL OIL	296
1A1a	002	Svanemoellevaerket	204A	GAS OIL	3
1A1a	002	Svanemoellevaerket	301A	NATURAL GAS	2909
1A1a	003	H.C.Oerstedsvaerket	203A	RESIDUAL OIL	73
1A1a	003	H.C.Oerstedsvaerket	204A	GAS OIL	100
1A1a	003	H.C.Oerstedsvaerket	301A	NATURAL GAS	3362
1A1a	004	Kyndbyvaerket	204A	GAS OIL	1041
1A1a	005	Masnedoevaerket	111A	WOOD	148
1A1a	005	Masnedoevaerket	117A	STRAW	498
1A1a	005	Masnedoevaerket	204A	GAS OIL	15
1A1a	007	Stigsnaesvaerket	203A	RESIDUAL OIL	226
1A1a	007	Stigsnaesvaerket	204A	GAS OIL	7
1A1a	008	Asnaesvaerket	102A	COAL	16651
1A1a	008	Asnaesvaerket	203A	RESIDUAL OIL	171
1A1a	008	Asnaesvaerket	204A	GAS OIL	29
1A1a	010	Avedoerevaerket	102A	COAL	12546
1A1a	010	Avedoerevaerket	103A	SUB-BITUMINOUS	22
1A1a	010	Avedoerevaerket	111A	WOOD	11704
1A1a	010	Avedoerevaerket	117A	STRAW	1267
1A1a	010	Avedoerevaerket	203A	RESIDUAL OIL	335
1A1a	010	Avedoerevaerket	204A	GAS OIL	7
1A1a	010	Avedoerevaerket	301A	NATURAL GAS	5577
1A1a	011	Fynsvaerket	102A	COAL	14065
1A1a	011	Fynsvaerket	117A	STRAW	2185
1A1a	011	Fynsvaerket	203A	RESIDUAL OIL	152
1A1a	011	Fynsvaerket	204A	GAS OIL	0
1A1a	011	Fynsvaerket	309A	BIOGAS	30
1A1a	012	Studstrupvaerket	102A	COAL	23057
1A1a	012	Studstrupvaerket	117A	STRAW	1133
1A1a	012	Studstrupvaerket	203A	RESIDUAL OIL	412
1A1a	012	Studstrupvaerket	204A	GAS OIL	8
1A1a	014	Nordjyllandsvaerket	102A	COAL	19045
1A1a	014	Nordjyllandsvaerket	203A	RESIDUAL OIL	106
1A1a	014	Nordjyllandsvaerket	204A	GAS OIL	27
1A1a	014	Nordjyllandsvaerket	303A	LPG	0
1A1a	018	Skaerbaekvaerket	204A	GAS OIL	91
1A1a	018	Skaerbaekvaerket	301A	NATURAL GAS	9045
1A1a	018	Skaerbaekvaerket	303A	LPG	0
1A1a	019	Enstedvaerket	102A	COAL	11443
1A1a	019	Enstedvaerket	111A	WOOD	271
1A1a	019	Enstedvaerket	117A	STRAW	1302
1A1a	019	Enstedvaerket	203A	RESIDUAL OIL	99
1A1a	019	Enstedvaerket	204A	GAS OIL	16
1A1a	019	Enstedvaerket	303A	LPG	0
1A1a	020	Esbjergvaerket	102A	COAL	19126
1A1a	020	Esbjergvaerket	203A	RESIDUAL OIL	183
1A1a	020	Esbjergvaerket	204A	GAS OIL	0
1A1a	020	Esbjergvaerket	303A	LPG	0
1A1a	022	Oestkraft	102A	COAL	480
1A1a	022	Oestkraft	111A	WOOD	191
1A1a	022	Oestkraft	203A	RESIDUAL OIL	48
1A1a	022	Oestkraft	204A	GAS OIL	4
1A1a	022	Oestkraft	303A	LPG	0
1A1a	025	Horsens Kraftvarmevaerk	114A	WASTE	894
1A1a	025	Horsens Kraftvarmevaerk	301A	NATURAL GAS	729
1A1a	026	Herningvaerket	111A	WOOD	3408
1A1a	026	Herningvaerket	203A	RESIDUAL OIL	0
1A1a	026	Herningvaerket	204A	GAS OIL	0
1A1a	026	Herningvaerket	215A	BIO OIL	8
1A1a	026	Herningvaerket	301A	NATURAL GAS	808
1A1a	027	I/S Vestforbraending	114A	WASTE	5852
1A1a	027	I/S Vestforbraending	204A	GAS OIL	1
1A1a	027	I/S Vestforbraending	301A	NATURAL GAS	15
1A1a	027	I/S Vestforbraending	303A	LPG	0
1A1a	028	Amagerforbraending	111A	WOOD	21
1A1a	028	Amagerforbraending	114A	WASTE	4242
1A1a	028	Amagerforbraending	303A	LPG	25
1A1a	029	Energi Randers Produktion	102A	COAL	138
1A1a	029	Energi Randers Produktion	110A	PETROLEUM COKE	2
1A1a	029	Energi Randers Produktion	111A	WOOD	2637

nfr_id_EA	lps_id	lps_name	fuel_id	fuel_gr_abbr	Fuel consumption, TJ
1A1a	029	Energi Randers Produktion	204A	GAS OIL	18
1A1a	029	Energi Randers Produktion	215A	BIO OIL	33
1A1a	029	Energi Randers Produktion	303A	LPG	0
1A1a	029	Energi Randers Produktion	309A	BIOGAS	6
1A1a	030	Grenaa Kraftvarmevaerk	102A	COAL	478
1A1a	030	Grenaa Kraftvarmevaerk	111A	WOOD	119
1A1a	030	Grenaa Kraftvarmevaerk	117A	STRAW	505
1A1a	030	Grenaa Kraftvarmevaerk	203A	RESIDUAL OIL	51
1A1a	030	Grenaa Kraftvarmevaerk	204A	GAS OIL	5
1A1a	030	Grenaa Kraftvarmevaerk	303A	LPG	0
1A1a	031	Hilleroed Kraftvarmevaerk	204A	GAS OIL	0
1A1a	031	Hilleroed Kraftvarmevaerk	301A	NATURAL GAS	2400
1A1a	032	Helsingoer Kraftvarmevaerk	301A	NATURAL GAS	1238
1A1a	036	Kolding Forbraendingsanlaeg TAS	111A	WOOD	237
1A1a	036	Kolding Forbraendingsanlaeg TAS	114A	WASTE	1367
1A1a	036	Kolding Forbraendingsanlaeg TAS	117A	STRAW	8
1A1a	037	Maabjergvaerket	111A	WOOD	641
1A1a	037	Maabjergvaerket	114A	WASTE	1322
1A1a	037	Maabjergvaerket	117A	STRAW	461
1A1a	037	Maabjergvaerket	301A	NATURAL GAS	66
1A1a	038	Soenderborg Kraftvarmevaerk	111A	WOOD	8
1A1a	038	Soenderborg Kraftvarmevaerk	114A	WASTE	737
1A1a	038	Soenderborg Kraftvarmevaerk	204A	GAS OIL	0
1A1a	038	Soenderborg Kraftvarmevaerk	301A	NATURAL GAS	792
1A1a	039	I/S Kara Affaldsforbraendingsanlaeg	111A	WOOD	13
1A1a	039	I/S Kara Affaldsforbraendingsanlaeg	114A	WASTE	2282
1A1a	039	I/S Kara Affaldsforbraendingsanlaeg	301A	NATURAL GAS	12
1A1a	040	Viborg Kraftvarme	204A	GAS OIL	0
1A1a	040	Viborg Kraftvarme	301A	NATURAL GAS	2100
1A1a	042	I/S Nordforbraending	111A	WOOD	364
1A1a	042	I/S Nordforbraending	114A	WASTE	1111
1A1a	046	Affaldscenter aarhus - Forbraendsanlaegget	114A	WASTE	2503
1A1a	047	I/S Reno Nord	114A	WASTE	1913
1A1a	047	I/S Reno Nord	204A	GAS OIL	2
1A1a	048	Silkeborg Kraftvarmevaerk	204A	GAS OIL	0
1A1a	048	Silkeborg Kraftvarmevaerk	301A	NATURAL GAS	3173
1A1a	050	AffaldPlus+, Naestved Forbraendingsanlaeg	114A	WASTE	1212
1A1a	051	AVV Forbraendingsanlaeg	111A	WOOD	59
1A1a	051	AVV Forbraendingsanlaeg	114A	WASTE	792
1A1a	051	AVV Forbraendingsanlaeg	117A	STRAW	0
1A1a	051	AVV Forbraendingsanlaeg	203A	RESIDUAL OIL	6
1A1a	051	AVV Forbraendingsanlaeg	204A	GAS OIL	2
1A1a	052	Affaldsforbraendingsanlaeg I/S REFA	114A	WASTE	1236
1A1a	053	Svendborg Kraftvarmevaerk	111A	WOOD	25
1A1a	053	Svendborg Kraftvarmevaerk	114A	WASTE	537
1A1a	053	Svendborg Kraftvarmevaerk	204A	GAS OIL	0
1A1a	053	Svendborg Kraftvarmevaerk	301A	NATURAL GAS	3
1A1a	054	Kommunekemi	114A	WASTE	1936
1A1a	054	Kommunekemi	203A	RESIDUAL OIL	83
1A1a	054	Kommunekemi	204A	GAS OIL	29
1A1a	055	I/S Faelles Forbraending	114A	WASTE	263
1A1a	058	I/S Reno Syd	111A	WOOD	41
1A1a	058	I/S Reno Syd	114A	WASTE	662
1A1a	058	I/S Reno Syd	117A	STRAW	1
1A1a	058	I/S Reno Syd	204A	GAS OIL	2
1A1a	059	I/S Kraftvarmevaerk Thisted	111A	WOOD	38
1A1a	059	I/S Kraftvarmevaerk Thisted	114A	WASTE	504
1A1a	059	I/S Kraftvarmevaerk Thisted	117A	STRAW	14
1A1a	061	Affaldplus+, Slagelse Forbr. and DONG Slagelse KVV	114A	WASTE	539
1A1a	061	Affaldplus+, Slagelse Forbr. and DONG Slagelse KVV	117A	STRAW	474
1A1a	065	Haderslev Kraftvarmevaerk	111A	WOOD	32
1A1a	065	Haderslev Kraftvarmevaerk	114A	WASTE	616
1A1a	065	Haderslev Kraftvarmevaerk	117A	STRAW	3
1A1a	065	Haderslev Kraftvarmevaerk	301A	NATURAL GAS	11
1A1a	066	Frederikshavn Affaldskraftvarmevaerk	111A	WOOD	42
1A1a	066	Frederikshavn Affaldskraftvarmevaerk	114A	WASTE	351
1A1a	066	Frederikshavn Affaldskraftvarmevaerk	204A	GAS OIL	0
1A1a	068	Bofa I/S	114A	WASTE	126
1A1a	069	DTU	301A	NATURAL GAS	1118
1A1a	070	AffaldPlus+, Naestved Kraftvarmevaerk	301A	NATURAL GAS	154
1A1a	072	Hjoerring Varmeforsyning	111A	WOOD	424
1A1a	072	Hjoerring Varmeforsyning	301A	NATURAL GAS	164
1A1a	085	L90 Affaldsforbraending	114A	WASTE	2295
1A1a	085	L90 Affaldsforbraending	204A	GAS OIL	6
1A1a	086	Hammel Fjernvarmeselskab	111A	WOOD	13
1A1a	086	Hammel Fjernvarmeselskab	114A	WASTE	313

nfr_id_EA	lps_id	lps_name	fuel_id	fuel_gr_abbr	Fuel consumption, TJ
1A1a	086	Hammel Fjernvarmeselskab	215A	BIO OIL	7
1A1a	087	Koege Kraftvarmevaerk	111A	WOOD	1342
1A1a	087	Koege Kraftvarmevaerk	203A	RESIDUAL OIL	2
1A1a	087	Koege Kraftvarmevaerk	204A	GAS OIL	0
1A1a	088	Skagen Forbraending	111A	WOOD	25
1A1a	088	Skagen Forbraending	114A	WASTE	124
1A1a	090	Odense Kraftvarmevaerk	111A	WOOD	62
1A1a	090	Odense Kraftvarmevaerk	114A	WASTE	2332
1A1a	090	Odense Kraftvarmevaerk	117A	STRAW	2
1A1a	090	Odense Kraftvarmevaerk	204A	GAS OIL	43
1A1a	091	Centralkommunernes Transmissionsselskab F_berg	204A	GAS OIL	217
1A1a	092	Frederikshavn Kraftvarmevaerk	301A	NATURAL GAS	364
1A1a	093	Fjernvarme Fyn, Centrum Varmecentral	301A	NATURAL GAS	81
1A1a	094	Special Waste System	114A	WASTE	39
1A1a	095	Grenaa Forbraending	114A	WASTE	251
1A1b	009	Statoil Raffinaderi	204A	GAS OIL	1
1A1b	009	Statoil Raffinaderi	303A	LPG	406
1A1b	009	Statoil Raffinaderi	308A	REFINERY GAS	7632
1A1b	017	Shell Raffinaderi	203A	RESIDUAL OIL	506
1A1b	017	Shell Raffinaderi	308A	REFINERY GAS	5668
1A1c	024	Nybro Gasbehandlingsanlaeg	204A	GAS OIL	1
1A1c	024	Nybro Gasbehandlingsanlaeg	301A	NATURAL GAS	202
1A2a	033	DanSteel	204A	GAS OIL	0
1A2a	033	DanSteel	301A	NATURAL GAS	1328
1A2a	033	DanSteel	303A	LPG	4
1A2c	081	Haldor Topsoee	204A	GAS OIL	0
1A2c	081	Haldor Topsoee	301A	NATURAL GAS	525
1A2c	081	Haldor Topsoee	303A	LPG	0
1A2c	084	Cheminova	204A	GAS OIL	1
1A2c	084	Cheminova	301A	NATURAL GAS	838
1A2d	034	Dalum Papir	111A	WOOD	1268
1A2d	034	Dalum Papir	204A	GAS OIL	0
1A2d	034	Dalum Papir	301A	NATURAL GAS	60
1A2e	023	Danisco Grindsted	102A	COAL	419
1A2e	023	Danisco Grindsted	111A	WOOD	10
1A2e	023	Danisco Grindsted	204A	GAS OIL	14
1A2e	023	Danisco Grindsted	301A	NATURAL GAS	29
1A2e	071	Maricogen	301A	NATURAL GAS	27
1A2e	082	Nordic Sugar Nakskov	102A	COAL	790
1A2e	082	Nordic Sugar Nakskov	107A	COKE OVEN COKE	6
1A2e	082	Nordic Sugar Nakskov	203A	RESIDUAL OIL	747
1A2e	082	Nordic Sugar Nakskov	204A	GAS OIL	4
1A2e	082	Nordic Sugar Nakskov	309A	BIOGAS	44
1A2e	083	Nordic Sugar Nykoebing	102A	COAL	198
1A2e	083	Nordic Sugar Nykoebing	107A	COKE OVEN COKE	59
1A2e	083	Nordic Sugar Nykoebing	203A	RESIDUAL OIL	1011
1A2e	083	Nordic Sugar Nykoebing	309A	BIOGAS	53
1A2e	089	AarhusKarlshamn Denmark A/S	111A	WOOD	42
1A2e	089	AarhusKarlshamn Denmark A/S	203A	RESIDUAL OIL	1162
1A2f i	045	Aalborg Portland	102A	COAL	1402
1A2f i	045	Aalborg Portland	110A	PETROLEUM COKE	6377
1A2f i	045	Aalborg Portland	115A	INDUSTR. WASTES	1696
1A2f i	045	Aalborg Portland	121A	FOSSIL WASTE	1696
1A2f i	045	Aalborg Portland	203A	RESIDUAL OIL	289
1A2f i	045	Aalborg Portland	204A	GAS OIL	2
1A2f i	045	Aalborg Portland	215A	BIO OIL	5
1A2f i	076	Rockwool A/S Vamdrup	101A	ANODE CARBON	19
1A2f i	076	Rockwool A/S Vamdrup	102A	COAL	119
1A2f i	076	Rockwool A/S Vamdrup	107A	COKE OVEN COKE	182
1A2f i	076	Rockwool A/S Vamdrup	204A	GAS OIL	0
1A2f i	076	Rockwool A/S Vamdrup	301A	NATURAL GAS	132
1A2f i	077	Rockwool A/S Doense	101A	ANODE CARBON	2
1A2f i	077	Rockwool A/S Doense	107A	COKE OVEN COKE	346
1A2f i	077	Rockwool A/S Doense	204A	GAS OIL	0
1A2f i	077	Rockwool A/S Doense	301A	NATURAL GAS	95
1A2f i	078	Ardagh Glass Holmegaard A/S	204A	GAS OIL	0
1A2f i	078	Ardagh Glass Holmegaard A/S	301A	NATURAL GAS	854
1A2f i	080	Saint-Gobain Isover A/S	301A	NATURAL GAS	115
1A2f i	096	Faxe Kalk	102A	COAL	180
1A2f i	096	Faxe Kalk	204A	GAS OIL	1
1A2f i	096	Faxe Kalk	301A	NATURAL GAS	4
1A4a i	049	Rensningsanlaegget Lynetten	114A	WASTE	75
1A4a i	049	Rensningsanlaegget Lynetten	204A	GAS OIL	8
1A4a i	049	Rensningsanlaegget Lynetten	309A	BIOGAS	91
TOTAL					**276940**

Table 2A-6.2 Large point sources, plant specific emissions (IPCC 1A1, 1A2 and 1A4)[1].

nfr_id	lps_id	lps_name	SO_2	NO_x	NMVOC	CO	NH_3	TSP	PM_{10}[2]	$PM_{2.5}$[2]	As	Cd	Cr	Cu	Hg	Ni	Pb	Se	Zn	HCB	Dioxin
1A1a	001	Amagervaerket	x	x				x	x	x	x	x	x	x	x	x	x	x	x		
1A1a	002	Svanemoellevaerket		x		x															
1A1a	003	H.C.Oerstedsvaerket	x	x				x	x	x	x	x	x	x	x	x	x	x	x		
1A1a	004	Kyndbyvaerket	x	x				x	x	x	x	x	x	x	x	x	x	x	x		
1A1a	005	Masnedoevaerket	x	x		x		x	x	x											
1A1a	007	Stigsnaesvaerket	x	x				x	x	x	x	x	x	x	x	x	x	x	x		
1A1a	008	Asnaesvaerket	x	x				x	x	x	x	x	x	x	x	x	x	x	x		
1A1a	010	Avedoerevaerket	x	x				x	x	x	x	x	x	x	x	x	x	x	x		
1A1a	011	Fynsvaerket	x	x				x	x	x	x	x	x	x	x	x	x	x	x		
1A1a	012	Studstrupvaerket	x	x				x	x	x	x	x	x	x	x	x	x	x	x		
1A1a	014	Nordjyllandsvaerket	x	x				x	x	x	x	x	x	x	x	x	x	x	x		
1A1a	015	Aalborgvaerket																			
1A1a	018	Skaerbaekvaerket	x	x				x	x	x	x	x	x	x	x	x	x	x	x		
1A1a	019	Enstedvaerket	x	x				x	x	x	x	x	x	x	x	x	x	x	x		
1A1a	020	Esbjergvaerket	x	x				x	x	x	x	x	x	x	x	x	x	x	x		
1A1a	022	Oestkraft	x	x																	
1A1a	025	Horsens Kraftvarmevaerk	x	x				x	x	x											
1A1a	026	Herningvaerket	x	x		x		x	x	x	x	x	x	x	x	x	x	x	x		
1A1a	027	I/S Vestforbraending	x	x											x						x
1A1a	028	Amagerforbraending	x	x		x		x	x	x					x						
1A1a	029	Energi Randers Produktion	x	x				x	x	x											
1A1a	030	Grenaa Kraftvarmevaerk	x	x		x		x	x	x	x	x	x	x	x	x	x	x	x		
1A1a	031	Hilleroed Kraftvarmevaerk		x																	
1A1a	032	Helsingoer Kraftvarmevaerk		x																	
1A1a	036	Kolding Forbraendingsanlaeg TAS	x	x	x	x	x	x	x	x					x						x
1A1a	037	Maabjergvaerket	x	x																	
1A1a	038	Soenderborg Kraftvarmevaerk	x	x	x	x		x	x	x	x				x						x
1A1a	039	I/S Kara Affaldsforbraendingsanlaeg	x	x		x		x	x	x					x						x
1A1a	040	Viborg Kraftvarme		x																	
1A1a	042	I/S Nordforbraending	x	x		x	x	x	x	x					x						x
1A1a	046	Affaldscenter aarhus - Forbraendsanlaegget	x	x	x			x	x	x					x						x
1A1a	047	I/S Reno Nord	x	x		x															
1A1a	048	Silkeborg Kraftvarmevaerk		x																	
1A1a	050	AffaldPlus+, Naestved Forbraendingsanlaeg	x	x	x	x		x	x	x					x						
1A1a	051	AVV Forbraendingsanlaeg	x	x	x	x		x	x	x					x						x
1A1a	052	Affaldsforbraendingsanlaeg I/S REFA	x	x		x					x	x	x	x	x	x	x				
1A1a	053	Svendborg Kraftvarmevaerk	x	x	x	x		x	x	x							x				x
1A1a	054	Kommunekemi	x	x	x	x		x	x	x											x
1A1a	055	I/S Faelles Forbraending	x	x	x	x		x	x	x					x						x
1A1a	058	I/S Reno Syd	x	x	x	x		x	x	x											x
1A1a	059	I/S Kraftvarmevaerk Thisted	x	x	x	x		x	x	x											x
1A1a	060	Knudmosevaerket																			
1A1a	061	Affaldplus+, Slagelse Forbr. and DONG Slagelse KVV	x	x	x	x		x	x	x					x						x
1A1a	062	VEGA (Vestforbraending Taastrup)																			
1A1a	063	Hadsund Bys Fjernvarmevaerk																			
1A1a	064	Aars Fjernvarmeforsyning																			

nfr_id	lps_id	lps_name	SO_2	NO_x	NMVOC	CO	NH_3	TSP	PM_{10} 2)	$PM_{2.5}$ 2)	As	Cd	Cr	Cu	Hg	Ni	Pb	Se	Zn	HCB	Dioxin
1A1a	065	Haderslev Kraftvarmevaerk	x	x		x		x	x	x											
1A1a	066	Frederikshavn Affaldskraftvarmevaerk	x	x		x		x	x	x	x	x	x	x	x	x	x				x
1A1a	067	Vejen Kraftvarmevaerk																			
1A1a	068	Bofa I/S	x	x		x		x	x	x	x	x	x	x	x	x	x				x
1A1a	069	DTU		x	x	x															
1A1a	070	AffaldPlus+, Naestved Kraftvarmevaerk		x		x															
1A1a	072	Hjoerring Varmeforsyning		x		x															
1A1a	085	L90 Affaldsforbraending	x	x		x		x	x	x	x	x	x	x	x	x	x				x
1A1a	086	Hammel Fjernvarmeselskab	x	x		x		x	x	x					x						x
1A1a	087	Koege Kraftvarmevaerk	x	x				x	x	x											
1A1a	088	Skagen Forbraending	x	x	x												x				x
1A1a	090	Odense Kraftvarmevaerk	x	x		x		x	x	x	x	x	x	x	x	x	x				
1A1a	091	Centralkommunernes Transmissionsselskab F_berg	x	x																	
1A1a	092	Frederikshavn Kraftvarmevaerk	x	x				x	x	x											
1A1a	094	Special Waste System	x	x	x	x									x						
1A1b	009	Statoil Raffinaderi	x	x																	
1A1b	017	Shell Raffinaderi	x	x																	
1A1c	024	Nybro Gasbehandlingsanlaeg		x																	
1A2a	033	DanSteel		x																	
1A2c	081	Haldor Topsoee																			
1A2c	084	Cheminova		x																	
1A2d	034	Dalum Papir		x																	
1A2e	023	Danisco Grindsted	x	x																	
1A2e	035	Danisco Sugar Assens																			
1A2e	071	Maricogen		x																	
1A2e	082	Nordic Sugar Nakskov	x	x																	
1A2e	083	Nordic Sugar Nykoebing	x					x	x	x											
1A2e	089	AarhusKarlshamn Denmark A/S	x	x				x	x	x											
1A2f i	045	Aalborg Portland	x	x		x		x	x	x					x						
1A2f i	076	Rockwool A/S Vamdrup	x	x																	
1A2f i	077	Rockwool A/S Doense	x	x																	
1A2f i	078	Ardagh Glass Holmegaard A/S		x		x		x	x	x											
1A2f i	080	Saint-Gobain Isover A/S	x	x																	
1A2f i	096	Faxe Kalk	x	x																	
1A4a i	049	Rensningsanlaegget Lynetten	x	x	x	x		x	x	x											
Grand Total			4440	1621	4	1574	4	488	417	323	48	10	86	134	217	133	98	614	318	0	128
Share of total emission from stationary combustion, %			49%	44%	0.03%	1%	2%	3%	2%	2%	20%	9%	22%	19%	65%	7%	4%	67%	6%	0%	1%

1) Emissions of the pollutants marked with “x” are plant specific. Emission of other pollutants is estimated based on emission factors. The total shown *in this table* only includes plant specific data.

2) Based on particle size distribution.

Annex 2A-7 Uncertainty estimates 2011

Table 2A-7.1 Uncertainty estimation.

SNAP	**Gas**	**Base year emission**	**Year t emission**	**Activity data uncertainty**	**Emission factor uncertainty**	**Combined uncertainty**	**Combined uncertainty as % of total national emissions in year t**	**Type A sensitivity**	**Type B sensitivity**	**Uncertainty i trend in national emissions introduced by emission factor uncertainty**	**Uncertainty in trend in national emissions introduced by activity data uncertainty**	**Uncertainty introduced into the trend in total national emissions**
		Input data Mg SO_2	Input data Mg SO_2	Input data %	Input data %	%	%	%	%	%	%	%
01	SO_2	127249.211	3135.582	2.000	10.000	10.198	3.552	-0.027	0.020	-0.273	0.057	0.279
02	SO_2	11484.617	2568.962	2.000	20.000	20.100	5.736	0.012	0.017	0.245	0.047	0.250
03	SO_2	16154.543	3297.032	2.000	10.000	10.198	3.735	0.015	0.021	0.152	0.060	0.164
Total	SO_2	154888.371	9001.575				59.476					0.167
Total uncertainties					Overall uncertainty i the year (%):		7.712			Trend uncertainty (%):		0.408

SNAP	**Gas**	**Base year emission**	**Year t emission**	**Activity data uncertainty**	**Emission factor uncertainty**	**Combined uncertainty**	**Combined uncertainty as % of total national emissions in year t**	**Type A sensitivity**	**Type B sensitivity**	**Uncertainty i trend in national emissions introduced by emission factor uncertainty**	**Uncertainty in trend in national emissions introduced by activity data uncertainty**	**Uncertainty introduced into the trend in total national emissions**
		Input data Mg NOx	Input data Mg NOx	Input data %	Input data %	%	%	%	%	%	%	%
01	NO_x	94671.318	24125.275	2.000	20.000	20.100	13.196	-0.052	0.209	-1.033	0.591	1.190
02	NO_x	7465.616	6987.255	2.000	50.000	50.040	9.515	0.040	0.061	1.996	0.171	2.003
03	NO_x	13299.143	5635.565	2.000	20.000	20.100	3.082	0.012	0.049	0.243	0.138	0.279
Total	NO_x	115436.078	36748.095				274.151					5.507
Total uncertainties					Overall uncertainty i the year (%):		16.558			Trend uncertainty (%):		2.347

SNAP	Gas	Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty i trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data Mg NMVOC	Input data Mg NMVOC	Input data %	Input data %	%	%	%	%	%	%	%
01	NMVOC	486.654	2061.007	2.000	50.000	50.040	6.474	0.108	0.148	5.393	0.418	5.409
02	NMVOC	12363.991	13563.341	2.000	50.000	50.040	42.607	-0.039	0.972	-1.970	2.750	3.383
03	NMVOC	1099.914	305.192	2.000	50.000	50.040	0.959	-0.068	0.022	-3.405	0.062	3.405
Total	NMVOC	13950.559	15929.540				1858.189					52.303
Total uncertainties					Overall uncertainty i the year (%):		43.107			Trend uncertainty (%):		7.232

SNAP	Gas	Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty i trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data Mg CO	Input data Mg CO	Input data %	Input data %	%	%	%	%	%	%	%
01	CO	8126.607	10873.885	2.000	20.000	20.100	1.563	0.018	0.081	0.354	0.230	0.422
02	CO	120682.828	125111.409	2.000	50.000	50.040	44.784	-0.009	0.937	-0.464	2.650	2.691
03	CO	4704.238	3809.850	2.000	20.000	20.100	0.548	-0.008	0.029	-0.167	0.081	0.186
Total	CO	133513.674	139795.143				2008.343					7.453
Total uncertainties					Overall uncertainty i the year (%):		44.815			Trend uncertainty (%):		2.730

SNAP	Gas	Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty i trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data	Input data	Input data	Input data							
		Mg NH_3	Mg NH_3	%	%	%	%	%	%	%	%	%
01	NH_3	0.287	13.586	2.000	1000.000	1000.002	71.644	0.190	0.202	190.040	0.572	190.041
02	NH_3	66.938	176.046	2.000	1000.000	1000.002	928.358	-0.188	2.619	-188.175	7.407	188.321
03	NH_3			2.000	1000.000	1000.002						
Total	NH_3	67.225	189.632				866981.877					71580.362
Total uncertainties					Overall uncertainty i the year (%):		931.119			Trend uncertainty (%):		267.545

SNAP	Gas	Base year emission (year 2000)	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty i trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data	Input data	Input data	Input data							
		Mg TSP	Mg TSP	%	%	%	%	%	%	%	%	%
01	TSP	1167.178	837.163	2.000	50.000	50.040	2.276	-0.043	0.057	-2.154	0.162	2.160
02	TSP	12688.728	17266.200	2.000	500.000	500.004	469.099	0.088	1.180	44.249	3.338	44.375
03	TSP	775.551	300.359	2.000	50.000	50.040	0.817	-0.046	0.021	-2.306	0.058	2.307
Total	TSP	14631.456	18403.722				220059.785					1979.087
Total uncertainties					Overall uncertainty i the year (%):		469.105			Trend uncertainty (%):		44.487

SNAP	Gas	Base year emission (year 2000)	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty i trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data	Input data	Input data	Input data							
		Mg PM_{10}	Mg PM_{10}	%	%	%	%	%	%	%	%	%
01	PM_{10}	961.467	667.642	2.000	50.000	50.040	1.928	-0.041	0.049	-2.046	0.139	2.051
02	PM_{10}	12077.723	16438.157	2.000	500.000	500.004	474.321	0.077	1.208	38.382	3.418	38.534
03	PM_{10}	564.374	222.433	2.000	50.000	50.040	0.642	-0.036	0.016	-1.824	0.046	1.825
Total	PM_{10}	13603.564	17328.232				224984.533					1492.413
Total uncertainties					Overall uncertainty i the year (%):		474.325			Trend uncertainty (%):		38.632

SNAP	Gas	Base year emission (year 2000)	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty i trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data	Input data	Input data	Input data							
		Mg $PM_{2.5}$	Mg $PM_{2.5}$	%	%	%	%	%	%	%	%	%
01	$PM_{2.5}$	818.324	548.767	2.000	50.000	50.040	1.627	-0.040	0.042	-1.991	0.120	1.995
02	$PM_{2.5}$	11820.501	16170.132	2.000	500.000	500.004	479.131	0.060	1.248	29.878	3.528	30.085
03	$PM_{2.5}$	323.168	155.671	2.000	50.000	50.040	0.462	-0.020	0.012	-1.022	0.034	1.023
Total	$PM_{2.5}$	12961.993	16874.570				229569.436					910.155
Total uncertainties					Overall uncertainty i the year (%):		479.134			Trend uncertainty (%):		30.169

SNAP	Gas	Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty i trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data kg As	Input data kg As	Input data %	Input data %	%	%	%	%	%	%	%
01	As	958.851	135.033	2.000	100.000	100.020	55.636	-0.055	0.116	-5.478	0.327	5.488
02	As	54.820	33.288	2.000	1000.000	1000.002	137.125	0.019	0.029	18.745	0.081	18.745
03	As	153.201	74.435	2.000	100.000	100.020	30.669	0.036	0.064	3.643	0.180	3.647
Total	As	1166.873	242.755				22839.307					394.791
Total uncertainties					Overall uncertainty i the year (%):		151.127			Trend uncertainty (%):		19.869

SNAP		Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty i trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data kg Cd	Input data kg Cd	Input data %	Input data %	%	%	%	%	%	%	%
01	Cd	740.086	51.785	2.000	100.000	100.020	43.842	-0.059	0.061	-5.877	0.172	5.880
02	Cd	60.719	42.639	2.000	1000.000	1000.002	360.916	0.040	0.050	40.070	0.141	40.071
03	Cd	53.023	23.717	2.000	100.000	100.020	20.079	0.019	0.028	1.917	0.079	1.919
Total	Cd	853.828	118.142				132585.375					1643.912
Total uncertainties					Overall uncertainty i the year (%):		364.123			Trend uncertainty (%):		40.545

SNAP		Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty i trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data kg Cr	Input data kg Cr	Input data %	Input data %	%	%	%	%	%	%	%
01	Cr	4662.870	207.255	2.000	100.000	100.020	52.759	-0.028	0.040	-2.839	0.114	2.841
02	Cr	282.408	102.533	2.000	1000.000	1000.002	260.959	0.016	0.020	15.695	0.056	15.695
03	Cr	214.523	83.121	2.000	100.000	100.020	21.160	0.013	0.016	1.294	0.046	1.295
Total	Cr	5159.800	392.909				71330.801					256.089
Total uncertainties					Overall uncertainty i the year (%):		267.078			Trend uncertainty (%):		16.003

SNAP		Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty i trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data kg Cu	Input data kg Cu	Input data %	Input data %	%	%	%	%	%	%	%
01	Cu	2915.710	273.044	2.000	100.000	100.020	38.351	-0.086	0.077	-8.587	0.216	8.590
02	Cu	349.446	333.490	2.000	1000.000	1000.002	468.323	0.074	0.093	73.849	0.264	73.850
03	Cu	302.781	105.561	2.000	100.000	100.020	14.827	0.013	0.030	1.264	0.084	1.267
Total	Cu	3567.936	712.094				221017.481					5529.144
Total uncertainties					Overall uncertainty i the year (%):		470.125			Trend uncertainty (%):		74.358

SNAP		Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty i trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data kg Hg	Input data kg Hg	Input data %	Input data %	%	%	%	%	%	%	%
01	Hg	2469.476	249.955	2.000	100.000	100.020	75.258	-0.014	0.088	-1.407	0.250	1.429
02	Hg	166.721	31.170	2.000	1000.000	1000.002	93.829	0.004	0.011	4.094	0.031	4.094
03	Hg	191.750	51.071	2.000	100.000	100.020	15.377	0.010	0.018	1.009	0.051	1.010
Total	Hg	2827.946	332.196				14704.181					19.826
Total uncertainties					Overall uncertainty i the year (%):		121.261			Trend uncertainty (%):		4.453

SNAP		Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty i trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data kg Ni	Input data kg Ni	Input data %	Input data %	%	%	%	%	%	%	%
01	Ni	8532.141	502.777	2.000	100.000	100.020	26.874	-0.029	0.031	-2.894	0.087	2.895
02	Ni	1785.272	180.219	2.000	1000.000	1000.002	96.311	-0.001	0.011	-1.491	0.031	1.491
03	Ni	6011.187	1188.218	2.000	100.000	100.020	63.513	0.030	0.073	3.047	0.206	3.054
Total	Ni	16328.600	1871.214				14031.941					19.931
Total uncertainties					Overall uncertainty i the year (%):		118.456			Trend uncertainty (%):		4.464

SNAP		Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty i trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data kg Pb	Input data kg Pb	Input data %	Input data %	%	%	%	%	%	%	%
01	Pb	12069.654	427.945	2.000	100.000	100.020	16.736	-0.102	0.028	-10.189	0.079	10.189
02	Pb	1829.069	1680.737	2.000	1000.000	1000.002	657.154	0.089	0.109	89.402	0.309	89.402
03	Pb	1480.369	448.925	2.000	100.000	100.020	17.556	0.013	0.029	1.317	0.083	1.320
Total	Pb	15379.092	2557.607				432439.080					8098.360
Total uncertainties					Overall uncertainty i the year (%):		657.601			Trend uncertainty (%):		89.991

SNAP		Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty i trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data kg Se	Input data kg Se	Input data %	Input data %	%	%	%	%	%	%	%
01	Se	3551.520	773.773	2.000	100.000	100.020	84.497	-0.013	0.196	-1.266	0.555	1.382
02	Se	119.949	50.013	2.000	1000.000	1000.002	54.604	0.006	0.013	5.617	0.036	5.617
03	Se	275.326	92.135	2.000	100.000	100.020	10.061	0.007	0.023	0.715	0.066	0.718
Total	Se	3946.795	915.921				10222.624					33.980
Total uncertainties					Overall uncertainty i the year (%):		101.107			Trend uncertainty (%):		5.829

SNAP		Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty i trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data kg Zn	Input data kg Zn	Input data %	Input data %	%	%	%	%	%	%	%
01	Zn	16446.353	576.329	2.000	100.000	100.020	10.000	-0.141	0.024	-14.074	0.068	14.074
02	Zn	3828.374	4216.638	2.000	1000.000	1000.002	731.460	0.138	0.176	137.520	0.499	137.521
03	Zn	3637.755	971.732	2.000	100.000	100.020	16.860	0.004	0.041	0.396	0.115	0.412
Total	Zn	23912.482	5764.700				535417.746					19110.278
Total uncertainties					Overall uncertainty i the year (%):		731.722			Trend uncertainty (%):		138.240

SNAP		Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty i trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data g Dioxin	Input data g Dioxin	Input data %	Input data %	%	%	%	%	%	%	%
01	Dioxin	30.913	1.039	2.000	500.000	500.004	30.054	-0.229	0.023	-114.297	0.064	114.297
02	Dioxin	14.158	16.185	2.000	1000.000	1000.002	936.642	0.236	0.352	235.567	0.996	235.569
03	Dioxin	0.903	0.056	2.000	1000.000	1000.002	3.253	-0.006	0.001	-6.160	0.003	6.160
Total	Dioxin	45.974	17.280				878211.720					68594.336
Total uncertainties					Overall uncertainty i the year (%):		937.130			Trend uncertainty (%):		261.905

SNAP		Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty i trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data kg Benzo(b)	Input data kg Benzo(b)	Input data %	Input data %	%	%	%	%	%	%	%
01	Benzo(b)	23.254	33.106	2.000	100.000	100.020	0.785	-0.007	0.016	-0.660	0.045	0.662
02	Benzo(b)	2017.949	4106.873	2.000	1000.000	1000.002	974.092	0.017	1.965	17.257	5.557	18.130
03	Benzo(b)	48.958	76.134	2.000	100.000	100.020	1.806	-0.011	0.036	-1.082	0.103	1.087
Total	Benzo(b)	2090.161	4216.114				948858.406					330.311
Total uncertainties					Overall uncertainty i the year (%):		974.094			Trend uncertainty (%):		18.174

SNAP		Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty i trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data kg Benzo(k)	Input data kg Benzo(k)	Input data %	Input data %	%	%	%	%	%	%	%
01	Benzo(k)	10.543	20.759	2.000	100.000	100.020	0.891	-0.002	0.019	-0.171	0.054	0.180
02	Benzo(k)	1053.260	2296.000	2.000	1000.000	1000.002	985.022	0.033	2.113	33.080	5.977	33.615
03	Benzo(k)	22.646	14.159	2.000	100.000	100.020	0.608	-0.032	0.013	-3.168	0.037	3.168
Total	Benzo(k)	1086.450	2330.918				970268.556					1140.065
Total uncertainties					Overall uncertainty i the year (%):		985.022			Trend uncertainty (%):		33.765

SNAP		Base year emission	Year t emission	Activity data uncer-tainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty i trend in national emissions introduced by emission factor un-certainty	Uncertainty in trend in national emissions introduced by activity data uncer-tainty	Uncertainty introduced into the trend in total na-tional emis-sions
		Input data kg Benzo(a)	Input data kg Benzo(a)	Input data %	Input data %	%	%	%	%	%	%	%
01	Benzo(a)	7.034	8.294	2.000	100.000	100.020	0.202	-0.003	0.004	-0.336	0.012	0.336
02	Benzo(a)	1926.992	4069.115	2.000	1000.000	1000.002	992.837	0.004	2.092	4.126	5.918	7.214
03	Benzo(a)	10.746	21.073	2.000	100.000	100.020	0.514	-0.001	0.011	-0.081	0.031	0.086
Total	Benzo(a)	1944.772	4098.482				985724.924					52.165
Total uncertainties					Overall uncertainty i the year (%):		992.837			Trend uncertainty (%):		7.223

SNAP		Base year emission	Year t emission	Activity data uncer-tainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty i trend in national emissions introduced by emission factor un-certainty	Uncertainty in trend in national emissions introduced by activity data uncer-tainty	Uncertainty introduced into the trend in total na-tional emis-sions
		Input data kg Indeno	Input data kg Indeno	Input data %	Input data %	%	%	%	%	%	%	%
01	Indeno	6.315	6.302	2.000	100.000	100.020	0.221	-0.003	0.004	-0.313	0.011	0.314
02	Indeno	1574.863	2843.134	2.000	1000.000	1000.002	996.448	0.016	1.783	15.680	5.043	16.471
03	Indeno	13.465	3.838	2.000	100.000	100.020	0.135	-0.013	0.002	-1.270	0.007	1.270
Total	Indeno	1594.643	2853.274				992908.913					273.015
Total uncertainties					Overall uncertainty i the year (%):		996.448			Trend uncertainty (%):		16.523

Annex 2A-8 Emission inventory 2011 based on SNAP sectors

Table 104 Emission inventory 2011 based on SNAP sectors.

SNAP	SO_2 [Mg]	NO_X [Mg]	NMVOC [Mg]	CH_4 [Mg]	CO [Mg]	CO_2 1) [Gg]	N_2O [Mg]	NH_3 [Mg]	TSP [Mg]	PM_{10} [Mg]	$PM_{2.5}$ [Mg]	As [kg]	Cd [kg]	Cr [kg]	Cu [kg]	Hg [kg]	Ni [kg]	Pb [kg]	Se [kg]	Zn [kg]	HCB [kg]	DIOX [g]	Benzo(b) [kg]	Benzo(k) [kg]	Benzo(a) [kg]	Indeno [kg]
1	3135.58	24125.28	2061.01	9321.4	10873.88	28408.54	308.6	13.59	837.16	667.64	548.77	135.03	51.79	207.25	273.04	249.95	502.78	427.95	773.77	576.33	0.39	1.04	33.11	20.76	8.29	6.3
101	1830.2	13925.24	1869.58	8806.88	6351.6	23256.38	213.35	12.22	429.07	356.23	284.62	78.39	23.93	146.15	189.01	210.26	257.68	275.11	658.3	464.59	0.33	0.9	2.39	0.61	0.78	0.83
10100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10101	1267.3	4654.36	201.67	135.51	2158.7	13850.8	112.62	0	329.33	285.26	230.19	45.99	6.85	74.83	43.52	110.59	85	57.75	568.86	253.43	0.1	0.31	1.54	0.34	0.4	0.58
10102	337.97	3410.82	66.47	37.34	1002.05	3889.78	36.92	5.87	59.26	48.82	37.33	18.43	10.87	43.73	118.34	66.13	109.46	127.12	32.58	111.12	0.12	0.27	0.33	0.09	0.15	0.08
10103	116.57	1060.19	8.39	7.36	196.05	1290.01	13.59	5.78	10.14	8.68	7.18	8.8	4.37	18.68	20.19	20.41	53.44	63.83	11.07	23.96	0.04	0.1	0.1	0.03	0.04	0.04
10104	65.87	2195.88	98.48	76.17	1300.59	3110.55	37.07	0.57	12.33	9.44	6.87	4.25	1.79	7.75	6.19	11.13	8.38	25.75	45.17	21.81	0.06	0.2	0.26	0.12	0.17	0.1
10105	42.48	2603.98	1494.57	8550.5	1694.21	1115.23	13.16	0	18.02	4.04	3.05	0.91	0.05	1.16	0.77	1.99	1.41	0.66	0.62	54.28	0	0.01	0.15	0.03	0.02	0.03
102	977.19	2370.11	128.9	453.14	4283.86	2783.18	66.77	1.37	305.39	214.83	170.36	24.56	6.25	38.69	40.71	16	40.86	88.99	12.4	37.01	0.06	0.14	30.45	20.05	7.43	5.31
10200	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10201	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10202	9.49	53.39	1.87	0.44	33.64	73.86	0.24	0	2.1	2.1	2.1	0.09	0	0.08	0.05	0.13	0	0.01	0.01	0.17	0	0	0.19	0.04	0.04	0.07
10203	967.7	2316.72	127.03	452.7	4250.22	2709.32	66.53	1.37	303.29	212.73	168.26	24.46	6.25	38.61	40.65	15.87	40.86	88.98	12.39	36.84	0.06	0.14	30.26	20.01	7.39	5.23
10204	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10205	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
103	320.66	1570.61	22.43	18.77	118.1	930.88	3.42	0	100.19	95.05	92.51	29.1	21.6	22.39	43.32	21.19	204.22	63.81	102.83	74.69	0	0	0.24	0.05	0.06	0.09
10300	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10301	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10302	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10303	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10304	2.5	249	2.14	2.6	9.47	90.11	1.53	0	7.64	7.64	7.64	2.75	2.14	2.14	4.13	2.14	2.14	6.27	10.39	2.75	0	0	0	0	0	0
10305	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10306	318.16	1321.61	20.29	16.17	108.63	840.77	1.89	0	92.55	87.41	84.87	26.35	19.46	20.25	39.2	19.05	202.08	57.55	92.44	71.94	0	0	0.24	0.05	0.06	0.09
104	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10400	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10401	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10402	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10403	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10404	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10405	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10406	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10407	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
105	7.53	6259.31	40.1	42.61	120.32	1438.1	25.06	0	2.51	1.53	1.28	2.98	0.01	0.02	0	2.51	0.01	0.04	0.25	0.04	0	0	0.03	0.05	0.02	0.07
10500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10501	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10502	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10503	0.06	43.8	0.32	0.34	0.97	11.52	0.2	0	0.02	0.01	0.01	0.02	0	0	0	0.02	0	0	0	0	0	0	0	0	0	0
10504	7.47	6215.51	39.78	42.27	119.35	1426.58	24.86	0	2.49	1.52	1.27	2.96	0.01	0.02	0	2.49	0.01	0.04	0.25	0.04	0	0	0.03	0.05	0.02	0.07
10505	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10506	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	2568.96	6987.26	13563.34	6814.78	125111.4	7759.92	196.06	176.05	17266.2	16438.16	16170.13	33.29	42.64	102.53	333.49	31.17	180.22	1680.74	50.01	4216.64	0.14	16.18	4106.87	2296	4069.12	2843.13
201	106.57	716.04	242.27	591.32	1024.07	949.76	28.24	0	168.15	165.87	157.21	2.66	0.39	3.29	3.79	1.82	3.18	6.36	0.92	16.95	0	0.46	218.32	72.59	166.37	118
20100	84.88	505.83	174.41	46.65	578.4	839.33	26.29	0	152.32	152.3	144.44	2.5	0.27	2.84	2.97	1.65	2.59	3.6	0.66	4.73	0	0.43	217.57	72.19	165.61	117.75
20101	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20102	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20103	10.55	14.45	8.85	20.24	235.89	29.82	0.71	0	13.88	13.19	12.55	0.11	0.11	0.31	0.63	0.04	0.43	2.74	0.13	8.11	0	0.02	0.75	0.4	0.76	0.25
20104	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20105	11.14	195.75	59.01	524.44	209.79	80.61	1.25	0	1.95	0.38	0.23	0.05	0	0.13	0.18	0.13	0.16	0.03	0.13	4.11	0	0	0.01	0	0	0
20106	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
202	1452.42	5658.26	12830.38	4974.69	114919.	6255.39	152.82	176.05	16595.81	15801.77	15571.75	22.7	37.11	76.83	290.76	18.77	79.45	1439.38	18.48	3688.63	0.13	14.52	3753.74	2195.54	3780.94	2559.6

SNAP	SO_2 [Mg]	NO_X [Mg]	NMVOC [Mg]	CH_4 [Mg]	CO [Mg]	CO_2 1) [Gg]	N_2O [Mg]	NH_3 [Mg]	TSP [Mg]	PM_{10} [Mg]	$PM_{2,5}$ [Mg]	As [kg]	Cd [kg]	Cr [kg]	Cu [kg]	Hg [kg]	Ni [kg]	Pb [kg]	Se [kg]	Zn [kg]	HCB [kg]	DIOX [g]	Benzo(b) [kg]	Benzo(k) [kg]	Benzo(a) [kg]	Indeno [kg]
					7																					
20200	1452.05	5538.64	12750.16	4562.8	114857.6	6198.94	152.3	176.03	16593.61	15800.12	15570.15	22.64	37.11	76.78	290.72	18.67	79.4	1439.22	18.47	3685.84	0.13	14.52	3753.37	2195.33	3780.57	2559.35
20201	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20202	0.12	4.3	1.62	1	12.57	7.79	0.03	0.02	1.56	1.48	1.47	0.02	0	0.01	0.03	0.01	0.01	0.13	0	0.32	0	0	0.36	0.21	0.36	0.25
20203	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20204	0.26	115.32	78.59	410.89	49.55	48.67	0.5	0	0.65	0.16	0.14	0.04	0	0.04	0.01	0.09	0.04	0.03	0.01	2.48	0	0	0.01	0	0	0
20205	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
203	1009.97	612.96	490.69	1248.77	9167.64	554.76	14.99	0	502.24	470.52	441.17	7.93	5.14	22.42	38.94	10.58	97.59	234.99	30.61	511.05	0	1.2	134.81	27.86	121.81	165.53
20300	994.03	377.15	413.42	600.51	8915.3	454.41	13.42	0	499.23	469.5	440.41	7.84	5.1	22.19	38.52	10.42	97.13	233.99	30.45	503.12	0	1.19	134.16	27.58	121.24	165.25
20301	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20302	3.15	2.22	0.25	0.72	7.83	2.72	0.1	0	0.51	0.37	0.29	0.02	0.03	0.07	0.21	0.01	0.11	0.96	0.01	3.12	0	0.01	0.31	0.17	0.31	0.1
20303	0.04	0.13	0.22	0.04	0.36	0.16	0.01	0	0.21	0.21	0.2	0	0	0	0	0	0	0.01	0	0	0	0	0.33	0.11	0.25	0.18
20304	12.76	233.46	76.81	647.49	244.15	97.47	1.47	0	2.28	0.44	0.26	0.07	0	0.16	0.21	0.15	0.35	0.04	0.14	4.81	0	0	0.01	0	0	0
20305	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	3297.03	5635.56	352.51	581.41	3824.6	4309.35	71.53	294.67	511.49	361.22	245.57	87.44	29.76	129.54	118.35	56.46	1241.1	816.98	283.59	1279.56	0.04	0.1	76.73	14.76	21.09	4.29
301	0	0.26	0.01	0.01	0.17	0.35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30101	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30102	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30103	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30104	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30105	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30106	0	0.26	0.01	0.01	0.17	0.35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
302	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30200	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30203	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30204	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30205	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
303	0	0	47.32	0	14.75	0	0	294.67	211.13	138.79	89.9	13	6.05	46.42	12.79	5.39	52.88	368.06	191.46	307.83	0	0.04	0.6	0.6	0.01	0.45
30300	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30301	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30302	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30303	0	0	0	0	0	0	0	0	68	20.4	3.06	10.2	4.76	37.4	0	0	44.2	244.8	170	170	0	0	0	0	0	0
30304	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30305	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30306	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30307	0	0	0	0	0	0	0	0	1.5	1.43	0.75	0	0.08	0	1.1	0	0	8.75	0	0	0	0	0	0	0	0
30308	0	0	0	0	0	0	0	0	1.21	0.97	0.73	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30309	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30310	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30311	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30312	0	0	0	0	0	0	0	0	21.81	10.9	2.18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30313	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30314	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30315	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0.09	0	25	17	25	0	0	0	0	0	0
30316	0	0	39	0	1.67	0	0	105	42	37.8	29.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30317	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30318	0	0	8.32	0	13.08	0	0	189.67	76.61	67.29	53.78	2.7	1.2	9.02	11.69	5.3	8.68	89.51	4.46	112.83	0	0.04	0.6	0.6	0.01	0.45
30319	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30320	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30321	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30322	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30323	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30324	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

SNAP	SO_2 [Mg]	NO_X [Mg]	NMVOC [Mg]	CH_4 [Mg]	CO [Mg]	CO_2 1) [Gg]	N_2O [Mg]	NH_3 [Mg]	TSP [Mg]	PM_{10} [Mg]	$PM_{2.5}$ [Mg]	As [kg]	Cd [kg]	Cr [kg]	Cu [kg]	Hg [kg]	Ni [kg]	Pb [kg]	Se [kg]	Zn [kg]	HCB [kg]	DIOX [g]	Benzo(b) [kg]	Benzo(k) [kg]	Benzo(a) [kg]	Indeno [kg]
30325	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30326	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
304	0.46	80.86	3.08	2.15	42.98	87.49	0.16	0	0.15	0.15	0.15	0.18	0	0	0	0.15	0	0	0.02	0	0	0	0	0	0	0
30400	0.06	8.57	0.41	0.29	5.7	11.61	0.02	0	0.02	0.02	0.02	0.02	0	0	0	0.02	0	0	0	0	0	0	0	0	0	0
30401	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30402	0.4	72.29	2.68	1.87	37.27	75.89	0.14	0	0.13	0.13	0.13	0.16	0	0	0	0.13	0	0	0.01	0	0	0	0	0	0	0
30403	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30404	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30405	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30406	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
305	0.03	4.88	0.23	0.16	3.25	6.61	0.01	0	0.01	0.01	0.01	0.01	0	0	0	0.01	0	0	0	0	0	0	0	0	0	0
30500	0.03	4.88	0.23	0.16	3.25	6.61	0.01	0	0.01	0.01	0.01	0.01	0	0	0	0.01	0	0	0	0	0	0	0	0	0	0
30501	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30502	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30503	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30504	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30505	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30506	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
306	0.85	214.29	5.55	4.8	62.63	168.43	1.11	0	0.31	0.26	0.24	0.36	0.01	0.03	0.02	0.32	0.03	0.09	0.05	0.04	0	0	0	0	0	0
30600	0.69	68.08	3.15	2.64	43.87	90.65	0.22	0	0.22	0.2	0.19	0.19	0.01	0.02	0.02	0.18	0.03	0.09	0.03	0.04	0	0	0	0	0	0
30601	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30602	0.16	22.11	1.05	0.74	14.72	29.97	0.05	0	0	0	0	0.06	0	0	0	0.05	0	0	0.01	0	0	0	0	0	0	0
30603	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30604	0	124.1	1.34	1.43	4.04	47.81	0.84	0	0.09	0.06	0.05	0.1	0	0	0	0.08	0	0	0.01	0	0	0	0	0	0	0
30605	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30606	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
307	164.32	483.46	16.33	16.55	162.18	345.24	1.26	0	8.49	6.13	3.8	2.52	0.8	5.55	7.32	3.65	29.49	52.86	7.98	84.65	0	0	1.05	0.41	0.22	0.27
30700	164.28	482.08	13.61	10.05	159.69	327.39	1.01	0	5.42	3.96	2.54	1.8	0.48	3.12	4.17	2.23	27.15	28.76	3.48	48.66	0	0	0.88	0.24	0.22	0.15
30701	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30702	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30703	0.04	0.06	1.82	1.8	1.93	17.29	0.25	0	3.06	2.16	1.26	0.72	0.32	2.43	3.15	1.42	2.34	24.1	4.5	35.96	0	0	0.17	0.17	0	0.13
30704	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30705	0	1.32	0.9	4.71	0.57	0.56	0.01	0	0.01	0	0	0	0	0	0	0	0	0	0	0.03	0	0	0	0	0	0
30706	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
308	59.24	97.95	5.24	6.7	71.07	119.2	0.96	0	3.58	2.55	1.75	0.76	0.21	1.16	1.49	0.77	16.43	7.89	1.44	14.68	0	0	0.57	0.17	0.14	0.04
30800	59.24	97.95	5.24	6.7	71.07	119.2	0.96	0	3.58	2.55	1.75	0.76	0.21	1.16	1.49	0.77	16.43	7.89	1.44	14.68	0	0	0.57	0.17	0.14	0.04
30801	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30802	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30803	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30804	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30805	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30806	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
309	1683.47	1351.39	78.12	210.22	411.88	1243.86	21.26	0	93.72	78.1	56.35	24.02	8.25	41.23	59.77	21.97	1089.35	342.38	66.29	765.4	0	0.01	2.57	2.56	0.29	2.18
30900	565.2	573.78	32.43	28.23	327.85	739.71	2.86	0	18.49	13.43	8.44	5.27	1.79	13.31	17.18	8.93	12.85	130.61	24.5	194.91	0	0	0.93	0.93	0.02	0.68
30901	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30902	791.93	487.48	10.02	15.68	32.95	277.33	11.47	0	40.89	32.61	22.53	13.15	4.68	21.69	32.29	10.39	707.01	172.32	34.47	422.7	0	0	1.28	1.32	0.18	1.16
30903	325.54	184.28	4.49	4.91	21.45	136.78	5.47	0	33.93	31.9	25.27	5.44	1.78	6.22	10.29	2.49	369.46	39.44	7.3	146.81	0	0	0.36	0.31	0.09	0.34
30904	0.37	59.74	1.98	2.11	5.95	70.61	1.24	0	0.12	0.08	0.06	0.15	0	0	0	0.12	0	0	0.01	0	0	0	0	0	0	0
30905	0.43	46.1	29.2	159.29	23.68	19.43	0.21	0	0.29	0.07	0.05	0.02	0	0.02	0.01	0.03	0.02	0.01	0.01	0.98	0	0	0	0	0	0
30906	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
310	0.12	15.04	1.38	4.2	9.76	19.29	0.04	0	0.05	0.04	0.04	0.04	0	0	0	0.04	0	0.01	0	0.03	0	0	0	0	0	0
31000	0.12	14	0.67	0.49	9.31	18.85	0.04	0	0.04	0.04	0.04	0.04	0	0	0	0.03	0	0.01	0	0	0	0	0	0	0	0
31001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31002	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

SNAP	SO_2 [Mg]	NO_x [Mg]	NMVOC [Mg]	CH_4 [Mg]	CO [Mg]	CO_2 1) [Gg]	N_2O [Mg]	NH_3 [Mg]	TSP [Mg]	PM_{10} [Mg]	$PM_{2.5}$ [Mg]	As [kg]	Cd [kg]	Cr [kg]	Cu [kg]	Hg [kg]	Ni [kg]	Pb [kg]	Se [kg]	Zn [kg]	HCB [kg]	DIOX [g]	Benzo(b) [kg]	Benzo(k) [kg]	Benzo(a) [kg]	Indeno [kg]
31003	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31004	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31005	0	1.04	0.71	3.71	0.45	0.44	0	0	0.01	0	0	0	0	0	0	0	0	0	0	0.02	0	0	0	0	0	0
31006	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
311	33.28	219.52	17.45	24.32	358.48	284.83	6.12	0	24.58	16.89	13.01	2.1	0.37	3.06	3.37	0.85	3.08	4.9	0.72	3.06	0.01	0	1.64	1.64	0.01	0.02
31100	1.36	83.02	3.63	4.13	49.37	105.71	0.4	0	0.41	0.35	0.29	0.24	0.03	0.09	0.07	0.27	0.12	0.31	0.08	0.14	0	0	0	0	0	0
31101	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31102	31.72	106	12.8	19.11	306.06	142.92	5.08	0	24.1	16.49	12.69	1.78	0.34	2.97	3.3	0.51	2.97	4.59	0.63	2.92	0.01	0	1.64	1.64	0.01	0.01
31103	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31104	0.19	30.5	1.02	1.08	3.05	36.2	0.64	0	0.06	0.04	0.03	0.08	0	0	0	0.06	0	0	0.01	0	0	0	0	0	0	0
31105	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31106	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
312	0.39	37.84	10.4	49.02	23.07	37.92	0.14	0	0.28	0.17	0.15	0.08	0	0.02	0.02	0.07	0.02	0.03	0.01	0.34	0	0	0.01	0.01	0	0
31200	0.35	23.89	1.18	0.88	17.2	32.19	0.09	0	0.2	0.15	0.13	0.08	0	0.02	0.02	0.06	0.02	0.03	0.01	0.02	0	0	0.01	0.01	0	0
31201	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31202	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31203	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31204	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31205	0.04	13.96	9.22	48.13	5.86	5.74	0.06	0	0.08	0.02	0.02	0.01	0	0.01	0	0.01	0.01	0	0	0.32	0	0	0	0	0	0
31206	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
313	8.29	180.25	20	66.14	153.36	221.44	1.42	0	4.87	3.41	2.69	0.73	0.08	0.61	0.66	0.49	0.61	1.25	0.18	1.38	0	0	0.3	0.3	0	0
31300	8.25	164.13	9.02	8.7	146.43	214.64	1.35	0	4.78	3.38	2.67	0.73	0.08	0.61	0.66	0.48	0.61	1.24	0.17	1.04	0	0	0.3	0.3	0	0
31301	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31302	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31303	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31304	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31305	0.04	16.12	10.99	57.44	6.93	6.8	0.07	0	0.09	0.02	0.02	0.01	0	0.01	0	0.01	0.01	0	0	0.35	0	0	0	0	0	0
31306	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
314	97.54	370.67	41.92	71.59	943.73	450.39	15.67	0	73.96	50.61	38.93	5.49	1.06	9.12	10.13	1.63	9.13	14.17	1.97	9.06	0.02	0	5.02	5.02	0.03	0.04
31400	87.57	331.38	35.6	53.36	846.65	405.12	14.06	0	66.37	45.43	34.95	4.93	0.95	8.19	9.09	1.46	8.2	12.73	1.77	8.07	0.01	0	4.51	4.51	0.02	0.04
31401	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31402	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31403	9.96	35.85	3.98	5.97	95.6	43.82	1.59	0	7.57	5.18	3.98	0.56	0.11	0.93	1.04	0.16	0.93	1.44	0.2	0.92	0	0	0.51	0.51	0	0
31404	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31405	0.01	3.44	2.34	12.25	1.48	1.45	0.01	0	0.02	0	0	0	0	0	0	0	0	0	0	0.07	0	0	0	0	0	0
31406	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
315	0.22	27.5	1.48	0.77	14.28	30.81	0.11	0	0.15	0.15	0.15	0.05	0	0.02	0.02	0.05	0	0	0	0.05	0	0	0	0	0	0
31500	0.22	27.5	1.48	0.77	14.28	30.81	0.11	0	0.15	0.15	0.15	0.05	0	0.02	0.02	0.05	0	0	0	0.05	0	0	0	0	0	0
31501	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31502	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31503	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31504	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31505	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31506	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
316	620	1946.37	82.37	82.93	1068.59	907.85	14.03	0	52.01	37.18	17.42	35.33	12.37	17.67	17.67	20	35.33	17.67	12.37	88.36	0.01	0.04	62.25	1.32	20.36	1.03
31600	620	1945	81.44	78.04	1068	907.27	14.02	0	52	37.18	17.42	35.33	12.37	17.67	17.67	20	35.33	17.67	12.37	88.33	0.01	0.04	62.25	1.32	20.36	1.03
31601	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31602	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31603	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31604	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31605	0	1.37	0.94	4.89	0.59	0.58	0.01	0	0.01	0	0	0	0	0	0	0	0	0	0	0.03	0	0	0	0	0	0
31606	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
320	628.81	605.29	21.61	41.84	484.42	385.63	9.24	0	38.2	26.78	20.97	2.77	0.58	4.64	5.09	1.08	4.72	7.68	1.12	4.69	0.01	0	2.73	2.73	0.02	0.25
32000	628.81	605.29	21.61	41.84	484.42	385.63	9.24	0	38.2	26.78	20.97	2.77	0.58	4.64	5.09	1.08	4.72	7.68	1.12	4.69	0.01	0	2.73	2.73	0.02	0.25

SNAP	SO_2 [Mg]	NO_X [Mg]	NMVOC [Mg]	CH_4 [Mg]	CO [Mg]	CO_2 1) [Gg]	N_2O [Mg]	NH_3 [Mg]	TSP [Mg]	PM_{10} [Mg]	$PM_{2.5}$ [Mg]	As [kg]	Cd [kg]	Cr [kg]	Cu [kg]	Hg [kg]	Ni [kg]	Pb [kg]	Se [kg]	Zn [kg]	HCB [kg]	DIOX [g]	Benzo(b) [kg]	Benzo(k) [kg]	Benzo(a) [kg]	Indeno [kg]
32001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32002	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32003	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32004	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32005	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32006	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

[1)] Including CO_2 emission from biomass.

Annex 2A-9 Description of the Danish energy statistics

This description of the Danish energy statistics has been prepared by Denmark's National Environmental Research Institute (NERI) in cooperation with the Danish Energy Agency (DEA) as background information to the Danish National Inventory Report (NIR).

The Danish energy statistics system

DEA is responsible for the Danish energy balance. Main contributors to the energy statistics outside DEA are Statistics Denmark and Danish Energy Association (before Association of Danish Energy Companies). The statistics is performed using an integrated statistical system building on an Access database and Excel spreadsheets.

The DEA follows the recommendations of the International Energy Agency as well as Eurostat.

The national energy statistics is updated annually and all revisions are immediately included in the published statistics, which can be found on the DEA homepage. It is an easy task to check for breaks in a series because the statistics is 100 % time-series oriented.

The national energy statistics does not include Greenland and Faroe Islands.

For historical reasons, DEA receive monthly information from the Danish oil companies regarding Danish deliveries of oil products to Greenland and Faroe Islands. However, the monthly (MOS) and annual (AOS) reporting of oil statistics to Eurostat and IEA exclude Greenland and Faroe Islands. For all other energy products, the Danish figures are also excluding Greenland and Faroe Islands.

Reporting to the Danish Energy Agency

The Danish Energy Agency receives monthly statistics for the following fuel groups:

- Crude oil and oil products.
    - Monthly data from 46 oil companies, the main purpose is monitoring oil stocks according to the oil preparedness system.
- Natural gas.
    - Fuel/flare from platforms in the North Sea.
    - Natural gas balance from the regulator Energinet.dk (National monopoly).
- Coal and coke.
    - Power plants (94 %).
    - Industry companies (4 %).
    - Coal and coke traders (2 %).
- Electricity.
    - Monthly reporting by e-mail from the regulator Energinet.dk (National monopoly).
    - The statistics covers:
        - Production by type of producer.
        - Own use of electricity.
        - Import and export by country.
        - Domestic supply (consumption + distribution loss).
- Town gas (quarterly) from two town gas producers.

- The large central power plants also report monthly consumption of biomass.

Annual data includes renewable energy including waste. The DEA conducts a biannual survey on wood pellets and wood fuel. Statistics Denmark conducts biannual surveys on the energy consumption in the service and industrial sectors. Statistics Denmark prepares annual surveys on forest (wood fuel) & straw.

Other annual data sources include:

- DEA:
  - Survey on production of electricity and heat and fuels used.
  - Survey on end use of oil.
  - Survey on end use of natural gas.
  - Survey on end use of coal and coke.
- DCE (former NERI), Aarhus University.
  - Energy consumption for domestic air transport.
- Danish Energy Association (Association of Danish Energy companies).
  - Survey on electricity consumption.
- Ministry of Taxation.
  - Border trade.
- Centre for Biomass Technology.
  - Annual estimates of final consumption of straw and wood chips.

Annual revisions

In general, DEA follows the same procedures as in the Danish national account. This means that normally only figures for the last two years are revised.

Aggregating the energy statistics on SNAP level

The sectors used in the official energy statistics have been mapped to SNAP categories, used in the Danish emission database. DCE aggregates the official energy statistics to SNAP level based on a source correspondence table.

In cooperation between DEA and DCE, a fuel correspondence table has been developed mapping the fuels used by the DEA in the official energy statistics with the fuel codes used in the Danish national emission database. The fuel correspondence table between fuel categories used by the DEA, DCE and IPCC is presented in Annex 2A-3.

The mapping between the energy statistics and the SNAP and fuel codes used by DCE can be seen in the table below.

Table 105 Correspondence between the Danish national energy statistics and the SNAP nomenclature (only stationary combustion part shown).

Unit: TJ		End-use		Transformation 1980-1993	
	SNAP	Fuel *(in Danish)*	Fuel-code	SNAP	Fuel-code
Foreign Trade					
- *Border Trade*					
- - Motor Gasoline					
- - Gas-/Diesel Oil					
- - Petroleum Coke	0202	Petrokoks	110A		
Vessels in Foreign Trade					
- *International Marine Bunkers*					
- - Gas-/Diesel Oil					
- - Fuel Oil					
- - Lubricants					
Energy Sector					
Extraction and Gasification					
- *Extraction*					
- - Natural Gas	010504	Naturgas	301A		
- *Gasification*					
- - Biogas, Landfill	091006	Biogas	309A		
- - Biogas, Other	091006	Biogas	309A		
Refineries					
- Own Use					
- - Refinery Gas	010306	Raffinaderigas	308A		
- - LPG	010306	LPG	303A		
- - Gas-/Diesel Oil	010306	Gas & Dieselolie	204A		
- - Fuel Oil	010306	Fuelolie & Spildolie	203A		
Transformation Sector					
Large-scale Power Units					
- *Fuels Used for Power Production*					
- - Gas-/Diesel Oil				0101	204A
- - Fuel Oil				0101	203A
- - Electricity Plant Coal				0101	102A
- - Straw				0101	117A
Large-Scale CHP Units					
- *Fuels Used for Power Production*					
- - Refinery Gas				0103	308A
- - LPG				0101	303A
- - Naphtha (LVN)				0101	210A
- - Gas-/Diesel Oil				0101	204A
- - Fuel Oil				0101	203A
- - Petroleum Coke				0101	110A
- - Orimulsion				0101	225A
- - Natural Gas				0101	301A
- - Electricity Plant Coal				0101	102A
- - Straw				0101	117A
- - Wood Chips				0101	111A
- - Wood Pellets				0101	111A
- - Wood Waste				0101	111A
- - Biogas, Landfill				0101	309A
- - Biogas, Others				0101	309A
- - Waste, Non-renewable				0101	114A
- - Wastes, Renewable				0101	114A
- *Fuels Used for Heat Production*					
- - Refinery Gas				0103	308A
- - LPG				0101	303A
- - Naphtha (LVN)				0101	210A
- - Gas-/Diesel Oil				0101	204A
- - Fuel Oil				0101	203A
- - Petroleum Coke				0101	110A
- - Orimulsion				0101	225A
- - Natural Gas				0101	301A
- - Electricity Plant Coal				0101	102A
- - Straw				0101	117A
- - Wood Chips				0101	111A
- - Wood Pellets				0101	111A
- - Wood Waste				0101	111A
- - Biogas, Landfill				0101	309A
- - Biogas, Other				0101	309A
- - Waste, Non-renewable				0101	114A

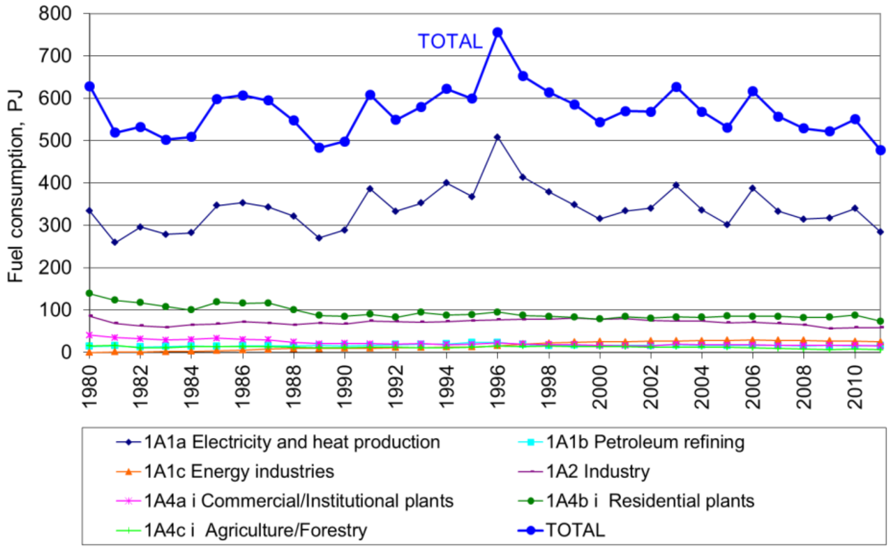
Unit: TJ		End-use		Transformation 1980-1993	
	SNAP	Fuel *(in Danish)*	Fuel-code	SNAP	Fuel-code
- - Wastes, Renewable				0101	114A
Small-Scale CHP Units					
- Fuels Used for Power Production					
- - Gas-/Diesel Oil				0101	204A
- - Fuel Oil				0101	203A
- - Natural Gas				0101	301A
- - Hard Coal				0101	102A
- - Straw				0101	117A
- - Wood Chips				0101	111A
- - Wood Pellets				0101	111A
- - Wood Waste				0101	111A
- - Biogas, Landfill				0101	309A
- - Biogas, Other				0101	309A
- - Waste, Non-renewable				0101	114A
- - Wastes, Renewable				0101	114A
- Fuels Used for Heat Production					
- - Gas-/Diesel Oil				0101	204A
- - Fuel Oil				0101	203A
- - Natural Gas				0101	301A
- - Coal				0101	102A
- - Straw				0101	117A
- - Wood Chips				0101	111A
- - Wood Pellets				0101	111A
- - Wood Waste				0101	111A
- - Biogas, Landfill				0101	309A
- - Biogas, Other				0101	309A
- - Waste, Non-renewable				0101	114A
- - Wastes, Renewable				0101	114A
District Heating Units					
- Fuels Used for Heat Production					
- - Refinery Gas				0103	308A
- - LPG				0102	303A
- - Gas-/Diesel Oil				0102	204A
- - Fuel Oil				0102	203A
- - Waste Oil				0102	203A
- - Petroleum Coke				0102	110A
- - Natural Gas				0102	301A
- - Electricity Plant Coal				0102	102A
- - Coal				0102	102A
- - Straw				0102	117A
- - Wood Chips				0102	111A
- - Wood Pellets				0102	111A
- - Wood Waste				0102	111A
- - Biogas, Landfill				0102	309A
- - Biogas, Sludge				0102	309A
- - Biogas, Other				0102	309A
- - Waste, Non-renewable				0102	114A
- - Wastes, Renewable				0102	114A
- - Fish Oil				0102	215A
Autoproducers, Electricity Only					
- Fuels Used for Power Production					
- - Natural Gas				0320	301A
- - Biogas, Landfill				0320	309A
- - Biogas, Sewage Sludge				0320	309A
- - Biogas, Other				0320	309A
Autoproducers, CHP Units					
- Fuels Used for Power Production					
- - Refinery Gas				0103	308A
- - Gas-/Diesel Oil				0320	204A
- - Fuel Oil				0320	203A
- - Waste Oil				0320	203A
- - Natural Gas				0320	301A
- - Coal				0320	102A
- - Straw				0320	117A
- - Wood Chips				0320	111A
- - Wood Pellets				0320	111A
- - Wood Waste				0320	111A
- - Biogas, Landfill				0320	309A
- - Biogas, Sludge				0320	309A

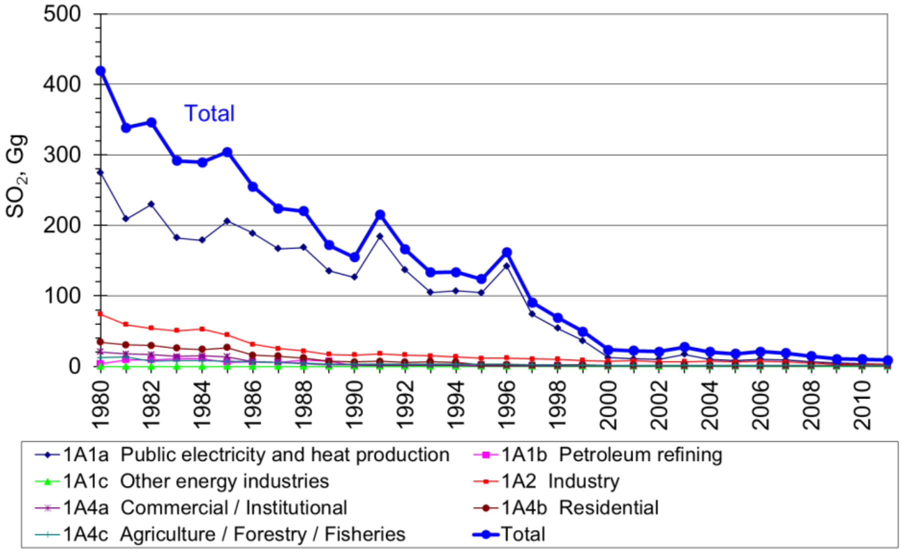
Unit: TJ	SNAP	End-use Fuel *(in Danish)*	Fuel-code	Transformation 1980-1993 SNAP	Fuel-code
- - Biogas, Other				0320	309A
- - Fish Oil				0320	215A
- - Waste, Non-renewable				0320	114A
- - Wastes, Renewable				0320	114A
- *Fuels Used for Heat Production*					
- - Refinery Gas				0103	308A
- - Gas-/Diesel Oil				0320	204A
- - Fuel Oil				0320	203A
- - Waste Oil				0320	203A
- - Natural Gas				0320	301A
- - Coal				0320	102A
- - Wood Chips				0320	111A
- - Wood Waste				0320	111A
- - Biogas, Landfill				0320	309A
- - Biogas, Sludge				0320	309A
- - Biogas, Other				0320	309A
- - Waste, Non-renewable				0320	114A
- - Wastes, Renewable				0320	114A
Autoproducers, Heat Only					
- *Fuels Used for Heat Production*					
- - Gas-/Diesel Oil				0320	204A
- - Fuel Oil				0320	203A
- - Waste Oil				0320	203A
- - Natural Gas				0320	301A
- - Straw				0320	117A
- - Wood Chips				0320	111A
- - Wood Chips				0320	111A
- - Wood Waste				0320	111A
- - Biogas, Landfill				0320	309A
- - Biogas, Sludge				0320	309A
- - Biogas, Other				0320	309A
- - Waste, Non-renewable				0102	114A
- - Wastes, Renewable				0102	114A
Town Gas Units	030106	Naturgas	301A		
- Fuels Used for Production of District Heating	030106	Kul (-83) / Gasolie (84-)	102A / 204A		
Transport sector					
Military Transport					
- Aviation Gasoline					
- Motor Gasoline					
- JP4					
- JP1					
- Gas-/Diesel Oil					
Road					
- LPG					
- Motor Gasoline					
- Other Kerosene	0202	Petroleum	206A		
- Gas-/Diesel Oil					
- Fuel Oil					
Rail					
- Motor Gasoline					
- Other Kerosene					
- Gas-/Diesel Oil					
- Electricity					
Domestic Sea Transport					
- LPG					
- Other Kerosene					
- Gas-/Diesel Oil					
- Fuel Oil					
Air Transport, Domestic					
- LPG					
- Aviation Gasoline					
- Motor Gasoline					
- Other Kerosene	0201	Petroleum	206A		
- JP1					
Air Transport, International					
- Aviation Gasoline					
- JP1					
Agriculture and Forestry					

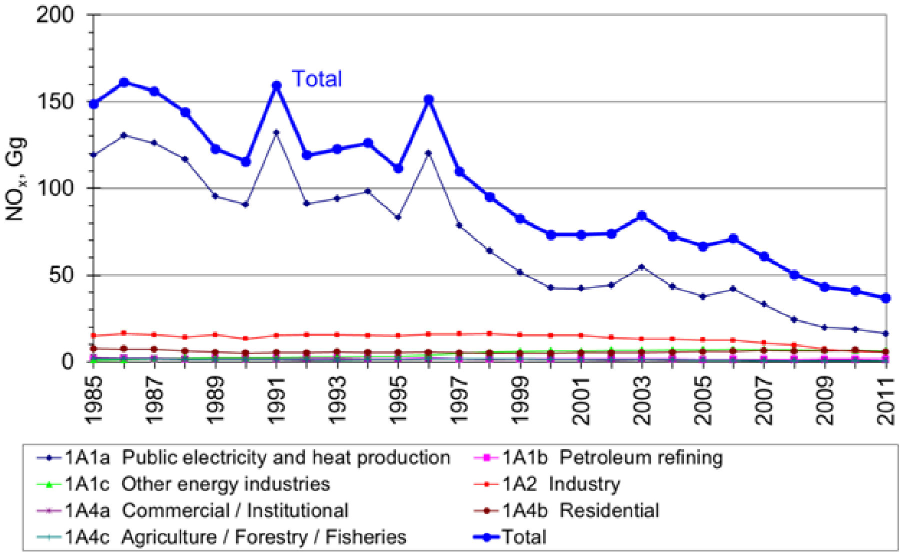
Unit: TJ		End-use		Transformation 1980-1993	
	SNAP	Fuel *(in Danish)*	Fuel-code	SNAP	Fuel-code
- LPG					
- Motor Gasoline					
- Other Kerosene	0203	Petroleum	206A		
- Gas-/Diesel Oil					
- Fuel Oil	0203	Fuelolie & Spildolie	203A		
- Petroleum Coke	0203	Petrokoks	110A		
- Natural Gas	0203	Naturgas	301A		
- Coal	0203	Kul	102A		
- Brown Coal Briquettes	0203	Brunkul	106A		
- Straw	0203	Halm	117A		
- Wood Chips	0203	Træ	111A		
- Wood Waste	0203	Træ	111A		
- Biogas, Other	0203	Biogas	309A		
Horticulture					
- LPG					
- Motor Gasoline					
- Gas-/Diesel Oil					
- Fuel Oil	0203	Fuelolie & Spildolie	203A		
- Petroleum Coke	0203	Petrokoks	110A		
- Natural Gas	0203	Naturgas	301A		
- Coal	0203	Kul	102A		
- Wood Waste	0203	Træ	111A		
Fishing					
- LPG					
- Motor Gasoline					
- Other Kerosene					
- Gas-/Diesel Oil					
- Fuel Oil					
Manufacturing Industry					
- Refinery Gas	0320	Raffinaderigas	308A		
- LPG					
- Naphtha (LVN)					
- Motor Gasoline					
- Other Kerosene	0320	Petroleum	206A		
- Gas-/Diesel Oil					
- Fuel Oil	0320	Fuelolie & Spildolie	203A		
- Waste Oil	0320	Fuelolie & Spildolie	203A		
- Petroleum Coke	0320	Petrokoks	110A		
- Natural Gas	0320	Naturgas	301A		
- Coal	0320	Kul	102A		
- Coke	0320	Koks	107A		
- Brown Coal Briquettes	0320	Brunkul	106A		
- Wood Pellets	0320	Træ	111A		
- Wood Waste	0320	Træ	111A		
- Biogas, Landfill	0320	Biogas	309A		
- Biogas, Other	0320	Biogas	309A		
- Wastes, Non-renewable	0320	Affald	114A		
- Wastes, Renewable	0320	Affald	114A		
- Town Gas	0320	Naturgas	301A		
Construction					
- LPG	0320	LPG	303A		
- Motor Gasoline					
- Other Kerosene	0320	Petroleum	206A		
- Gas-/Diesel Oil					
- Fuel Oil	0320	Fuelolie & Spildolie	203A		
- Natural Gas	0320	Naturgas	301A		
Wholesale					
- LPG	0201	LPG	303A		
- Motor Gasoline	0201	Petroleum	206A		
- Other Kerosene	0201	Gas & Dieselolie	204A		
- Gas-/Diesel Oil	0201	Fuelolie & Spildolie	203A		
- Petroleum Coke	0201	Petrokoks	110A		
- Natural Gas	0201	Naturgas	301A		
- Wood Waste	0201	Træ	111A		
Retail Trade					
- LPG	0201	LPG	303A		
- Other Kerosene	0201	Petroleum	206A		
- Gas-/Diesel Oil	0201	Gas & Dieselolie	204A		
- Fuel Oil	0201	Fuelolie & Spildolie	203A		

Unit: TJ		End-use		Transformation 1980-1993	
	SNAP	Fuel *(in Danish)*	Fuel-code	SNAP	Fuel-code
- Petroleum Coke	0201	Petrokoks	110A		
- Natural Gas	0201	Naturgas	301A		
Private Service					
- LPG	0201	LPG	303A		
- Other Kerosene	0201	Petroleum	206A		
- Gas-/Diesel Oil	0201	Gas & Dieselolie	204A		
- Fuel Oil	0201	Fuelolie & Spildolie	203A		
- Waste Oil	0201	Fuelolie & Spildolie	203A		
- Petroleum Coke	0201	Petrokoks	110A		
- Natural Gas	0201	Naturgas	301A		
- Wood Chips	0201	Træ	111A		
- Wood Waste	0201	Træ	111A		
- Biogas, Landfill	0201	Biogas	309A		
- Biogas, Sludge	0201	Biogas	309A		
- Biogas, Other	0201	Biogas	309A		
- Wastes, Non-renewable	0201	Affald	114A		
- Wastes, Renewable	0201	Affald	114A		
- Town Gas	0201	Naturgas	301A		
Public Service					
- LPG	0201	LPG	303A		
- Other Kerosene	0201	Petroleum	206A		
- Gas-/Diesel Oil	0201	Gas & Dieselolie	204A		
- Fuel Oil	0201	Fuelolie & Spildolie	203A		
- Petroleum Coke	0201	Petrokoks	110A		
- Natural Gas	0201	Naturgas	301A		
- Coal	0201	Kul	102A		
- Brown Coal Briquettes	0201	Brunkul	106A		
- Wood Chips	0201	Træ	111A		
- Wood Pellets	0201	Træ	111A		
- Town Gas	0201	Naturgas	301A		
Single Family Houses					
- LPG	0202	LPG	303A		
- Motor Gasoline					
- Other Kerosene	0202	Petroleum	206A		
- Gas-/Diesel Oil	0202	Gas & Dieselolie	204A		
- Fuel Oil	0202	Fuelolie & Spildolie	203A		
- Petroleum Coke	0202	Petrokoks	110A		
- Natural Gas	0202	Naturgas	301A		
- Coal	0202	Kul	102A		
- Coke	0202	koks	107A		
- Brown Coal Briquettes	0202	Brunkul	106A		
- Straw	0202	Halm	117A		
- Firewood	0202	Træ	111A		
- Wood Chips	0202	Træ	111A		
- Wood Pellets	0202	Træ	111A		
- Town Gas	0202	Naturgas	301A		
Multi-family Houses					
- LPG	0202	LPG	303A		
- Other Kerosene	0202	Petroleum	206A		
- Gas-/Diesel Oil	0202	Gas & Dieselolie	204A		
- Fuel Oil	0202	Fuelolie & Spildolie	203A		
- Petroleum Coke	0202	Petrokoks	110A		
- Natural Gas	0202	Naturgas	301A		
- Coal	0202	Kul	102A		
- Coke	0202	Koks	107A		
- Brown Coal Briquettes	0202	Brunkul	106A		
- Town Gas	0202	Naturgas	301A		

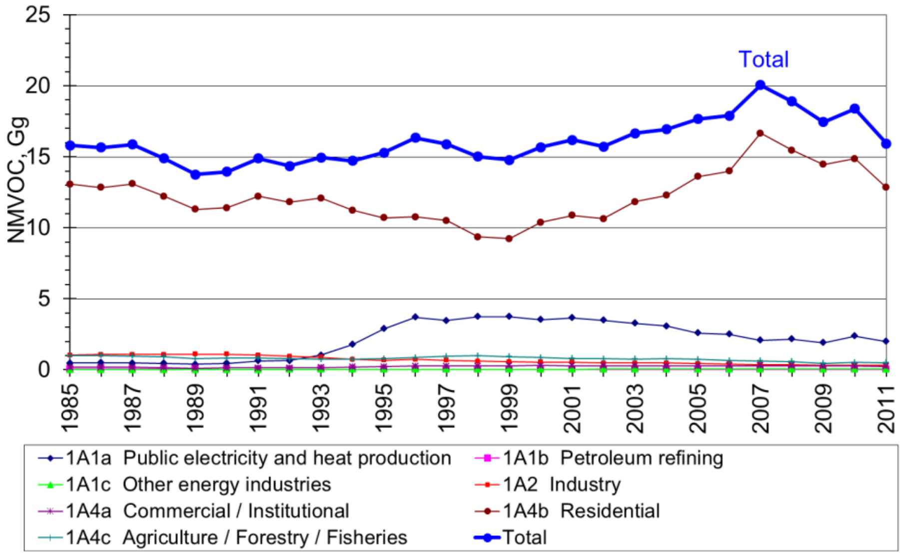
Annex 2A-10 Time-series 1980/1985-2011







Continued



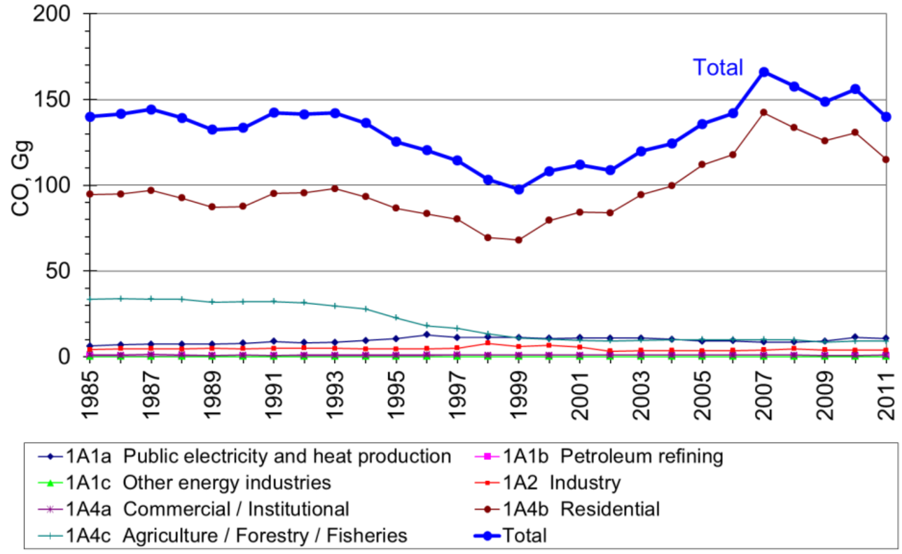


Figure 2A-10.1 Time-series for fuel consumption and emissions, 1980/1985 - 2011.

Annex 2A-11 QA/QC for stationary combustion

An updated quality manual for the Danish emission inventories has been published in 2013 (Nielsen et al. 2013). The quality manual (Sørensen et al. 2005) describes the concepts of quality work and definitions of sufficient quality, critical control points and a list of Point for Measuring (PM).

Documentation concerning verification of the Danish emission inventories has been published by Fauser et al. (2007). The reference approach for the energy sector is shown in Chapter 3.4.

Former editions of the sector report for stationary combustion (Nielsen et al. 2011) has been reviewed by external experts in 2004, 2006 and 2009 (Nielsen et al. 2004, Nielsen et al. 2006 and Nielsen et al. 2009). This forms a vital part of the QA activities for stationary combustion.

Source specific QA/QC and PM's are shown below.

Data storage, level 1

Table 3.2.38 lists the sectoral PM's for data storage level 1.

Table 3.2.38 List of PM, data storage level 1.

Level	**CCP**	**Id**	**Description**	**Sectoral/general**	Stationary combustion
Data Storage level 1	1. Accuracy	DS.1.1.1	General level of uncertainty for every dataset including the reasoning for the specific values.	Sectoral	Uncertainties are estimated and references given in NIR chapter 3.2.5.
	2. Comparability	DS1.2.1	Comparability of the emission factors/calculation parameters with data from international guidelines, and evaluation of major discrepancies.	Sectoral	In general if national referenced emission factors differ considerably from IPCC Guideline/EEA Guidebook values this is discussed in NIR chapter 3.2.4. This documentation is improved annually based on reviews. At CRF level, a project has been carried out comparing the Danish inventories with those of other countries (Fauser et al. 2007).
	3.Completeness	DS.1.3.1	Ensuring that the best possible national data for all sources are included, by setting down the reasoning behind the selection of datasets.	Sectoral	A list of external data are shown and discussed below.
	4.Consistency	DS.1.4.1	The original external data has to be archived with proper reference.	Sectoral	It is ensured that all external data are archived at DCE. Subsequent data processing takes place in other spreadsheets or databases. The datasets are archived annually in order to ensure that the basic data for a given report are always available in their original form.
	6.Robustness	DS.1.6.1	Explicit agreements between the external institution holding the data and DCE about the conditions of delivery	Sectoral	For stationary combustion, a data delivery agreement is made with the DEA. NERI (now DCE) and DEA have renewed the data delivery agreement in 2011. Most of the other external data sources are available due to legislatory requirements. See Table 3.2.39.
	7.Transparency	DS.1.7.1	Listing of all archived datasets and external contacts.	Sectoral	A list of external datasets and external contacts is shown in Table 3.2.39 below.

Table 3.2.39 List of external data sources.

Dataset	**Description**	**AD or Emf.**	**Reference**	**Contact(s)**	**Data agreement/ Comment**
Energiproducenttællingen.xls	Data set for all electricity and heat producing plants.	Activity data	The Danish Energy Agency (DEA)	Kaj Stærkind	Data agreement in place
Gas consumption for gas engines and gas turbines 1990-1994	Historical data set for gas engines and gas turbines.	Activity data	The Danish Energy Agency (DEA)	Peter Dal / Jane Rusbjerg (from 2013)	No data agreement. Historical data
Basic data (Grunddata.xls)	The Danish energy statistics. Data set applied for both the reference approach and the national approach.	Activity data	The Danish Energy Agency (DEA)	Peter Dal / Jane Rusbjerg (from 2013)	Data agreement in place. However, the data set is also published as part of national energy statistics
Energy statistics for industrial subsectors	Disaggregation of the industrial fuel consumption. The data set have been applied for the first time in the inventory reported in 2012.	Activity data	The Danish Energy Agency (DEA)	Peter Dal / Jane Rusbjerg (from 2013)	Only informal data delivery agreement. The data set will be included in the next update of the data delivery agreement with DEA.
SO_2 & NO_x data, plants>25 MW_e	Annual emission data for all power plants > 25 MW_e. Includes information on methodology: measurements or emission factor.	Emissions	Energinet.dk	Christian F.B. Nielsen	No data agreement in place
Emission factors	Emission factors stems from a large number of sources.	Emission factors	See chapter regarding emission factors		Some of the annually updated CO_2 emission factors are based on EU ETS data, see below. For the other emission factors no formal data delivery agreement.
HM and PM from public power plants	Emissions from the two large power plant operators in DK DONG Energy and Vattenfall	Emissions	Dong Energy Vattenfall	Marina Snowman Møller, Heidi Demant	No formal data agreement in place
Annual environmental reports / environmental data	Emissions from plants defined as large point sources	Emissions	Various plants		No data agreement necessary. Plants are obligated by law and data published on the Danish EPA homepage.
EU ETS data	Plant specific CO_2 emission factors	Emission factors and fuel consumption	The Danish Energy Agency (DEA)	Dorte Maimann Helen Falster	Plants are obligated by law. The availability of detailed information is part of the renewed data agreement with DEA.

Energiproducenttaellingen - statistic on fuel consumption from district heating and power plants (DEA)

The data set includes all plants producing power or district heating. The spreadsheet from DEA is listing fuel consumption of all plants included as large point sources in the emission inventory. The statistic on fuel consumption from district heating and power plants is regarded as complete and with no significant uncertainty since the plants are bound by law to report their fuel consumption and other information.

Gas consumption for gas engines and gas turbines 1990-1994 (DEA)

For the years 1990-1994, DEA has estimated consumption of natural gas and biogas in gas engines and gas turbines. DCE assesses that the estimation by the DEA are the best available data.

Basic data (DEA)

The Danish energy statistics. The spreadsheet from DEA is used for the CO_2 emission calculation in accordance with the IPCC reference approach and is also the first data set applied in the national approach. The data set is included in the data delivery agreement with DEA, but it is also published annually on DEA's homepage.

Energy statistics for industrial subsectors (DEA)

This data set has been applied for the first time in the inventory reported in 2012. The data includes disaggregation of the fuel consumption for industrial plants. The data set is estimated for the reporting to Eurostat. The data delivery agreement is informal at this time, but the dataset will be included in the next update of the agreement with DEA.

SO_2 and NO_x emission data from electricity producing plants > 25MW_e (Energinet.dk)

Plants larger than 25 MW_e are obligated to report emission data for SO_2 and NO_x to the DEA annually. Data are on production unit level and classified. The data on plant level are part of the plants annually environmental reports. DCE's QC of the data consists of a comparison with data from previous years and with data from the plants' annual environmental reports.

Emission factors

For specific references, see the chapter regarding emission factors. Some of the annually updated CO_2 emission factors are based on EU ETS data, se below.

Data for emission of heavy metals and particles from central power plants, DONG Energy and Vattenfall

The two major Danish power plant operators assess heavy metal emissions from their plants using model calculations based on fuel data and type of flue gas cleaning. DCE's QC of the data consists of a comparison with data from previous years and with data from the plants' annual environmental reports.

Annual environmental reports (DEPA)

A large number of plants are obligated by law to report annual environmental data including emission data. DCE compares the data with those from previous years and large discrepancies are checked.

EU ETS data (DEA)

EU ETS data are information on fuel consumption, heating values, carbon content of fuel, oxidation factor and CO_2 emissions. DCE receives the verified reports for all plants which utilises a detailed estimation methodology. DCE's QC of the received data consists of comparing to calculation using standard emission factors as well as comparing reported values with those for previous years.

Data processing, level 1

Table 3.2.40 lists the sectoral PM's for data processing level 1.

Table 3.2.40 List of PM, data processing level 1.

Level	CCP	Id	Description	Sectoral / general	Stationary combustion
Data Processing level 1	1. Accuracy	DP.1.1.1	Uncertainty assessment for every data source not part of DS.1.1.1 as input to Data Storage level 2 in relation to type and scale of variability.	Sectoral	Uncertainties are estimated and references given in NIR chapter 3.2.5.
	2.Comparability	DP.1.2.1	The methodologies have to follow the international guidelines suggested by UNFCCC and IPCC.	Sectoral	The methodological approach is consistent with international guidelines. An overview of tiers is given in NIR Chapter 3.2.5
	3.Completeness	DP.1.3.1	Identification of data gaps with regard to data sources that could improve quantitative knowledge.	Sectoral	The energy statistics is considered complete.
	4.Consistency	DP.1.4.1	Documentation and reasoning of methodological changes during the time series and the qualitative assessment of the impact on time series consistency.	Sectoral	The two main methodological changes in the time series; implementation of Energiproducenttaellingen (plant specific fuel consumption data) from 1994 onwards and implementation of EU ETS data from 2006 onwards is discussed in NIR chapter 3.2.
	5.Correctness	DP.1.5.2	Verification of calculation results using time series	Sectoral	time series for activity data on SNAP and CRF source category level are used to identify possible errors. time series for emission factors and the emission from CRF subcategories are also examined.
		DP.1.5.3	Verification of calculation results using other measures	Sectoral	The IPCC reference approach validates the fuel consumption rates and CO_2 emission. Both differ less than 2.0 % (1990-2011). The reference approach is further discussed in NIR Chapter 3.4.
	7.Transparency	DP.1.7.1	The calculation principle, the equations used and the assumptions made must be described.	Sectoral	This is included in NIR chapter 3.2.5.
		DP.1.7.2	Clear reference to dataset at Data Storage level 1	Sectoral	This is included in NIR chapter 3.2.5.
		DP.1.7.3	A manual log to collect information about recalculations.	Sectoral	-

Data storage, level 2

Table 3.2.41 lists the sectoral PM's for data storage level 2.

Table 3.2.41 List of PM, data storage level 2.

Level	CCP	Id	Description	Sectoral / general	Stationary combustion
Data Storage level 2	5.Correctness	DS.2.5.1	Check if a correct data import to level 2 has been made	Sectoral	To ensure a correct connection between data on level 2 and level 1 different controls are in place, e.g. control of sums and random tests.

Data storage level 4

Table 3.2.42 lists the sectoral PM's for data storage level 4.

Table 3.2.42 List of PM, data storage level 4.

Level	CCP	Id	Description	Sectoral / general	Stationary combustion
Data Storage level 4	4. Consistency	DS.4.4.3	The IEFs from the CRF are checked both regarding level and trend. The level is compared to relevant emission factors to ensure correctness. Large dips/jumps in the time series are explained.	Sectoral	Large dips/jumps in time series are discussed and explained in NIR chapter 3.2.

Other QC procedures

The emission from each large point source is compared with the emission reported the previous year.

Some automated checks have been prepared for the emission databases:

- Check of units for fuel rate, emission factors and plant-specific emissions.
- Check of emission factors for large point sources. Emission factors for pollutants that are not plant-specific should be the same as those defined for area sources.
- Additional checks on database consistency.
- Emission factor references are included in this report.
- Annual environmental reports are kept for subsequent control of plant-specific emission data.
- QC checks of the country-specific emission factors have not been performed, but most factors are based on input from companies that have implemented some QA/QC work. The major power plant owner/operators in Denmark, DONG Energy and Vattenfall have obtained the ISO 14001 certification for an environmental management system. The Danish Gas Technology Centre and Force Technology both run accredited laboratories for emission measurements.

National external review

The 2005, 2007 and 2011 updates of the sector report for stationary Former editions of the sector report for stationary combustion (Nielsen et al. 2011) has been reviewed by external experts in 2004, 2006 and 2009 (Nielsen et al. 2004, Nielsen et al. 2006 and Nielsen et al. 2009). This forms a vital part of the QA activities for stationary combustion.

Annex 2B

Transport

List of content

Annex 2B-1: Fleet data 1985-2011 for road transport (No. vehicles)

Sector	Subsector	Tech 2	FYear	LYear	1985	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Passenger Cars	Gasoline <1,4 l	PRE ECE	0	1969	75564	16627	13368	10706	8571	7246	6992	6618	6159	5646	5194
Passenger Cars	Gasoline <1,4 l	ECE 15/00-01	1970	1978	404441	179963	156167	134583	102209	66638	55669	43359	30440	19722	12950
Passenger Cars	Gasoline <1,4 l	ECE 15/02	1979	1980	97500	87416	63723	53008	61799	45282	38690	30726	21910	14275	8539
Passenger Cars	Gasoline <1,4 l	ECE 15/03	1981	1985	152241	318622	330062	307289	254029	235152	221928	204914	179982	150784	119474
Passenger Cars	Gasoline <1,4 l	ECE 15/04	1986	1990		165103	178393	209260	261580	258381	253651	249450	243072	232062	220895
Passenger Cars	Gasoline <1,4 l	Euro I	1991	1996			28375	60724	96923	141546	180780	219477	218990	216002	214711
Passenger Cars	Gasoline <1,4 l	Euro II	1997	2000									39547	74071	107025
Passenger Cars	Gasoline <1,4 l	Euro III	2001	2005											
Passenger Cars	Gasoline <1,4 l	Euro IV	2006	2010											
Passenger Cars	Gasoline <1,4 l	Euro V	2011	2014											
Passenger Cars	Gasoline 1,4 - 2,0 l	PRE ECE	0	1969	90872	28856	23474	19524	15744	13167	12527	11642	10624	9570	8659
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/00-01	1970	1978	344505	171158	152919	137410	110812	76213	63961	50125	35583	23605	15800
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/02	1979	1980	87587	74393	54644	44813	52998	40866	35395	28785	21181	14516	9144
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/03	1981	1985	210664	276842	281144	261222	218176	205239	196225	184150	165329	142253	115689
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/04	1986	1990		221807	211098	215194	242499	240697	238039	236139	232642	225250	217019
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro I	1991	1996			51521	101611	148509	235536	319571	414973	413070	407030	404816
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro II	1997	2000									105322	217501	303709
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro III	2001	2005											
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro IV	2006	2010											
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro V	2011	2014											
Passenger Cars	Gasoline >2,0 l	PRE ECE	0	1969	3246	1388	1186	1033	897	911	945	971	986	987	989
Passenger Cars	Gasoline >2,0 l	ECE 15/00-01	1970	1978	3113	3661	3581	3373	3096	2800	2589	2352	2039	1657	1381
Passenger Cars	Gasoline >2,0 l	ECE 15/02	1979	1980	1078	564	531	687	859	865	865	846	773	702	599
Passenger Cars	Gasoline >2,0 l	ECE 15/03	1981	1985	4087	2263	2037	1700	1575	1659	1801	1950	2055	2081	2018
Passenger Cars	Gasoline >2,0 l	ECE 15/04	1986	1990		4323	3630	3161	2668	2810	3052	3331	3638	3874	4089
Passenger Cars	Gasoline >2,0 l	Euro I	1991	1996			1263	2350	3350	5384	7888	10682	11000	11250	11334
Passenger Cars	Gasoline >2,0 l	Euro II	1997	2000									3980	8667	14011
Passenger Cars	Gasoline >2,0 l	Euro III	2001	2005											
Passenger Cars	Gasoline >2,0 l	Euro IV	2006	2010											
Passenger Cars	Gasoline >2,0 l	Euro V	2011	2014											
Passenger Cars	Diesel <2,0 l	Conventional	0	1990	69406	71018	70198	69500	68720	65169	62762	59117	54631	50590	48238
Passenger Cars	Diesel <2,0 l	Euro I	1991	1996			979	2163	3799	6613	9919	13122	13689	14318	15305
Passenger Cars	Diesel <2,0 l	Euro II	1997	2000									3064	8535	18568
Passenger Cars	Diesel <2,0 l	Euro III	2001	2005											

Continued

Passenger Cars	Diesel <2,0 l	Euro IV	2006	2010											
Passenger Cars	Diesel <2,0 l	Euro V	2011	2014											
Passenger Cars	Diesel >2,0 l	Conventional	0	1990	14055	14871	13888	13012	12136	11757	11413	10708	10043	9269	8435
Passenger Cars	Diesel >2,0 l	Euro I	1991	1996			1017	1988	3035	4323	5638	7401	7600	7595	7716
Passenger Cars	Diesel >2,0 l	Euro II	1997	2000									2079	5072	9087
Passenger Cars	Diesel >2,0 l	Euro III	2001	2005											
Passenger Cars	Diesel >2,0 l	Euro IV	2006	2010											
Passenger Cars	Diesel >2,0 l	Euro V	2011	2014											
Passenger Cars	LPG cars	Conventional	0	1990	1136	1163	1166	1173	1184	734	495	310	171	96	56
Passenger Cars	LPG cars	Euro I	1991	1996				1	4	4	3	1	1	1	3
Passenger Cars	LPG cars	Euro II	1997	2000											
Passenger Cars	LPG cars	Euro III	2001	2005											
Passenger Cars	LPG cars	Euro IV	2006	2010											
Passenger Cars	2-Stroke	Conventional	0	9999	4823	5417	4804	4308	3747	3029	2443	1824	1248	761	400
Passenger Cars	Electric cars	Conventional	0	9999	130	133	133	134	136	155	163	187	230	292	298
Light Duty Vehicles	Gasoline <3,5t	Conventional	0	1994	34172	44442	45625	46865	48934	49865	46712	42710	37987	34274	30224
Light Duty Vehicles	Gasoline <3,5t	Euro I	1995	1998							3773	7509	12025	17550	17352
Light Duty Vehicles	Gasoline <3,5t	Euro II	1999	2001											5272
Light Duty Vehicles	Gasoline <3,5t	Euro III	2002	2006											
Light Duty Vehicles	Gasoline <3,5t	Euro IV	2007	2011											
Light Duty Vehicles	Diesel <3,5t	Conventional	0	1994	113019	146986	150898	154999	161842	169142	160228	148520	133718	120795	105967
Light Duty Vehicles	Diesel <3,5t	Euro I	1995	1998							16899	35370	56836	76717	75753
Light Duty Vehicles	Diesel <3,5t	Euro II	1999	2001											24555
Light Duty Vehicles	Diesel <3,5t	Euro III	2002	2006											
Light Duty Vehicles	Diesel <3,5t	Euro IV	2007	2011											
Light Duty Vehicles	Diesel <3,5t	Euro V	2012	2015											
Light Duty Vehicles	LPG <3,5t	Conventional	0	1994	684	889	913	938	979	632	462	295	196	125	90
Light Duty Vehicles	LPG <3,5t	Euro I	1995	1998										1	1
Light Duty Vehicles	LPG <3,5t	Euro II	1999	2001											
Light Duty Vehicles	LPG <3,5t	Euro III	2002	2006											
Light Duty Vehicles	LPG <3,5t	Euro IV	2007	2011											
Light Duty Vehicles	Electric <3,5t	Conventional	0	9999	3	4	4	4	4	3	2	2	1	1	1
Heavy Duty Vehicles	Gasoline >3,5t	Conventional	0	9999	621	530	510	497	503	455	412	365	326	336	318
Heavy Duty Vehicles	Diesel RT 3,5 - 7,5t	Conventional	0	1993	8686	7049	6675	6430	6419	6194	5738	5137	4646	4156	3518
Heavy Duty Vehicles	Diesel RT 3,5 - 7,5t	Euro I	1994	1996					66	376	711	976	973	967	906
Heavy Duty Vehicles	Diesel RT 3,5 - 7,5t	Euro II	1997	2001								89	521	1236	1782
Heavy Duty Vehicles	Diesel RT 3,5 - 7,5t	Euro III	2002	2006											

Continued

Heavy Duty Vehicles	Diesel RT 3,5 - 7,5t	Euro IV	2007	2009											
Heavy Duty Vehicles	Diesel RT 3,5 - 7,5t	Euro V	2010	2013											
Heavy Duty Vehicles	Diesel RT 7,5 - 12t	Conventional	0	1993	7266	5897	5584	5379	5375	5316	5373	5207	4854	4491	4116
Heavy Duty Vehicles	Diesel RT 7,5 - 12t	Euro I	1994	1996					51	298	671	968	1002	1081	1102
Heavy Duty Vehicles	Diesel RT 7,5 - 12t	Euro II	1997	2001								94	429	798	1200
Heavy Duty Vehicles	Diesel RT 7,5 - 12t	Euro III	2002	2006											
Heavy Duty Vehicles	Diesel RT 7,5 - 12t	Euro IV	2007	2009											
Heavy Duty Vehicles	Diesel RT 7,5 - 12t	Euro V	2010	2013											
Heavy Duty Vehicles	Diesel RT 12 - 14 t	Conventional	0	1993	4984	4519	4461	4388	4454	3991	3248	2731	2360	1984	1623
Heavy Duty Vehicles	Diesel RT 12 - 14 t	Euro I	1994	1996					37	156	234	285	283	286	289
Heavy Duty Vehicles	Diesel RT 12 - 14 t	Euro II	1997	2001								21	126	216	262
Heavy Duty Vehicles	Diesel RT 12 - 14 t	Euro III	2002	2006											
Heavy Duty Vehicles	Diesel RT 12 - 14 t	Euro IV	2007	2009											
Heavy Duty Vehicles	Diesel RT 12 - 14 t	Euro V	2010	2013											
Heavy Duty Vehicles	Diesel RT 14 - 20t	Conventional	0	1993	5171	4689	4628	4552	4601	4348	4047	3669	3316	2924	2537
Heavy Duty Vehicles	Diesel RT 14 - 20t	Euro I	1994	1996					58	334	708	1001	1007	985	963
Heavy Duty Vehicles	Diesel RT 14 - 20t	Euro II	1997	2001								98	535	937	1371
Heavy Duty Vehicles	Diesel RT 14 - 20t	Euro III	2002	2006											
Heavy Duty Vehicles	Diesel RT 14 - 20t	Euro IV	2007	2009											
Heavy Duty Vehicles	Diesel RT 14 - 20t	Euro V	2010	2013											
Heavy Duty Vehicles	Diesel RT 20 - 26t	Conventional	0	1993	4307	5179	5237	5326	5315	5031	4565	4059	3536	3067	2596
Heavy Duty Vehicles	Diesel RT 20 - 26t	Euro I	1994	1996					67	469	1003	1452	1442	1400	1322
Heavy Duty Vehicles	Diesel RT 20 - 26t	Euro II	1997	2001								152	748	1330	1898
Heavy Duty Vehicles	Diesel RT 20 - 26t	Euro III	2002	2006											
Heavy Duty Vehicles	Diesel RT 20 - 26t	Euro IV	2007	2009											
Heavy Duty Vehicles	Diesel RT 20 - 26t	Euro V	2010	2013											
Heavy Duty Vehicles	Diesel RT 26 - 28t	Conventional	0	1993	7	8	8	9	9	7	6	6	6	6	6
Heavy Duty Vehicles	Diesel RT 26 - 28t	Euro I	1994	1996							0	1	1	1	1
Heavy Duty Vehicles	Diesel RT 26 - 28t	Euro II	1997	2001								0	1	2	3
Heavy Duty Vehicles	Diesel RT 26 - 28t	Euro III	2002	2006											
Heavy Duty Vehicles	Diesel RT 26 - 28t	Euro IV	2007	2009											
Heavy Duty Vehicles	Diesel RT 26 - 28t	Euro V	2010	2013											
Heavy Duty Vehicles	Diesel RT 28 - 32t	Conventional	0	1993	271	326	329	335	327	326	329	321	300	262	231
Heavy Duty Vehicles	Diesel RT 28 - 32t	Euro I	1994	1996					11	62	152	239	246	252	253
Heavy Duty Vehicles	Diesel RT 28 - 32t	Euro II	1997	2001								28	147	289	455
Heavy Duty Vehicles	Diesel RT 28 - 32t	Euro III	2002	2006											
Heavy Duty Vehicles	Diesel RT 28 - 32t	Euro IV	2007	2009											

Continued

Heavy Duty Vehicles	Diesel RT 28 - 32t	Euro V	2010	2013											
Heavy Duty Vehicles	Diesel RT >32t	Conventional	0	1993	0	0	0	0	0	0	1	0	0	1	1
Heavy Duty Vehicles	Diesel RT >32t	Euro I	1994	1996							0	1	1	1	1
Heavy Duty Vehicles	Diesel RT >32t	Euro II	1997	2001								0	1	0	0
Heavy Duty Vehicles	Diesel RT >32t	Euro III	2002	2006											
Heavy Duty Vehicles	Diesel RT >32t	Euro IV	2007	2009											
Heavy Duty Vehicles	Diesel RT >32t	Euro V	2010	2013											
Heavy Duty Vehicles	Diesel TT/AT 28 - 34t	Conventional	0	1993	5617	5132	5080	5011	5065	4783	4448	4025	3645	3208	2772
Heavy Duty Vehicles	Diesel TT/AT 28 - 34t	Euro I	1994	1996					63	356	759	1069	1076	1051	1028
Heavy Duty Vehicles	Diesel TT/AT 28 - 34t	Euro II	1997	2001								104	570	1000	1467
Heavy Duty Vehicles	Diesel TT/AT 28 - 34t	Euro III	2002	2006											
Heavy Duty Vehicles	Diesel TT/AT 28 - 34t	Euro IV	2007	2009											
Heavy Duty Vehicles	Diesel TT/AT 28 - 34t	Euro V	2010	2013											
Heavy Duty Vehicles	Diesel TT/AT 34 - 40t	Conventional	0	1993	8359	10252	10740	11202	11174	10480	8917	7262	5877	4730	3842
Heavy Duty Vehicles	Diesel TT/AT 34 - 40t	Euro I	1994	1996					204	1616	3609	4958	4683	4110	3555
Heavy Duty Vehicles	Diesel TT/AT 34 - 40t	Euro II	1997	2001								495	2223	4240	5939
Heavy Duty Vehicles	Diesel TT/AT 34 - 40t	Euro III	2002	2006											
Heavy Duty Vehicles	Diesel TT/AT 34 - 40t	Euro IV	2007	2009											
Heavy Duty Vehicles	Diesel TT/AT 34 - 40t	Euro V	2010	2013											
Heavy Duty Vehicles	Diesel TT/AT 40 - 50t	Conventional	0	1993	1672	2083	2242	2382	2379	2398	2257	2045	1799	1469	1240
Heavy Duty Vehicles	Diesel TT/AT 40 - 50t	Euro I	1994	1996					49	333	888	1316	1327	1314	1305
Heavy Duty Vehicles	Diesel TT/AT 40 - 50t	Euro II	1997	2001								143	778	1564	2540
Heavy Duty Vehicles	Diesel TT/AT 40 - 50t	Euro III	2002	2006											
Heavy Duty Vehicles	Diesel TT/AT 40 - 50t	Euro IV	2007	2009											
Heavy Duty Vehicles	Diesel TT/AT 40 - 50t	Euro V	2010	2013											
Heavy Duty Vehicles	Diesel TT/AT 50 - 60t	Euro I	1994	1996								1	1	1	1
Heavy Duty Vehicles	Diesel TT/AT 50 - 60t	Euro II	1997	2001										1	1
Heavy Duty Vehicles	Diesel TT/AT 50 - 60t	Euro IV	2007	2009											
Heavy Duty Vehicles	Diesel TT/AT >60t	Euro V	2010	2013											
Buses	Gasoline Urban Buses	Conventional	0	9999	8	8	9	11	14	11	11	16	17	17	15
Buses	Diesel Urban Buses <15t	Conventional	0	1993	347	352	433	488	639	558	494	411	335	281	250
Buses	Diesel Urban Buses <15t	Euro I	1994	1996						49	81	122	130	132	124
Buses	Diesel Urban Buses <15t	Euro II	1997	2001									103	295	438
Buses	Diesel Urban Buses <15t	Euro III	2002	2006											
Buses	Diesel Urban Buses <15t	Euro IV	2007	2009											
Buses	Diesel Urban Buses <15t	Euro V	2010	2013											
Buses	Diesel Urban Buses 15 - 18t	Conventional	0	1993	2083	2109	2597	2928	3833	3475	3205	2861	2691	2353	2012

Continued

Buses	Diesel Urban Buses 15 - 18t	Euro I	1994	1996						397	632	985	989	891	891
Buses	Diesel Urban Buses 15 - 18t	Euro II	1997	2001									183	568	817
Buses	Diesel Urban Buses 15 - 18t	Euro III	2002	2006											
Buses	Diesel Urban Buses 15 - 18t	Euro IV	2007	2009											
Buses	Diesel Urban Buses 15 - 18t	Euro V	2010	2013											
Buses	Diesel Urban Buses >18t	Conventional	0	1993	5	5	6	7	9	8	6	7	6	3	2
Buses	Diesel Urban Buses >18t	Euro I	1994	1996						1	1	3	3	3	2
Buses	Diesel Urban Buses >18t	Euro II	1997	2001										6	20
Buses	Diesel Urban Buses >18t	Euro III	2002	2006											
Buses	Diesel Urban Buses >18t	Euro IV	2007	2009											
Buses	Diesel Urban Buses >18t	Euro V	2010	2013											
Buses	Gasoline Coaches	Conventional	0	9999	931	942	1161	1309	1508	1762	1775	1786	1791	1808	1810
Buses	Diesel Coaches <15t	Conventional	0	1993	3710	3756	4627	5215	6010	5926	5739	5506	5208	4941	4629
Buses	Diesel Coaches <15t	Euro I	1994	1996						420	682	1113	1103	1091	1056
Buses	Diesel Coaches <15t	Euro II	1997	2001									370	695	1039
Buses	Diesel Coaches <15t	Euro III	2002	2006											
Buses	Diesel Coaches <15t	Euro IV	2007	2009											
Buses	Diesel Coaches <15t	Euro V	2010	2013											
Buses	Diesel Coaches 15 - 18t	Conventional	0	1993	804	814	1003	1131	1303	1389	1393	1342	1253	1241	1184
Buses	Diesel Coaches 15 - 18t	Euro I	1994	1996						35	89	153	162	163	159
Buses	Diesel Coaches 15 - 18t	Euro II	1997	2001									44	77	119
Buses	Diesel Coaches 15 - 18t	Euro III	2002	2006											
Buses	Diesel Coaches 15 - 18t	Euro IV	2007	2009											
Buses	Diesel Coaches 15 - 18t	Euro V	2010	2013											
Buses	Diesel Coaches >18t	Conventional	0	1993	122	123	152	171	197	210	221	211	193	193	206
Buses	Diesel Coaches >18t	Euro I	1994	1996						20	42	78	84	82	81
Buses	Diesel Coaches >18t	Euro II	1997	2001									25	54	99
Buses	Diesel Coaches >18t	Euro III	2002	2006											
Buses	Diesel Coaches >18t	Euro IV	2007	2009											
Buses	Diesel Coaches >18t	Euro V	2010	2013											
Mopeds	<50 cm³	Conventional	0	1999	151000	120000	118000	113000	109000	105000	114167	123333	132496	141636	150802
Mopeds	<50 cm³	Euro I	2000	2003											
Mopeds	<50 cm³	Euro II	2004	9999											
Motorcycles	2-stroke >50 cm³	Conventional	0	1999	6072	6470	6653	6737	6949	7255	7666	8228	8891	9524	10316
Motorcycles	2-stroke >50 cm³	Euro I	2000	2003											
Motorcycles	2-stroke >50 cm³	Euro II	2004	2006											
Motorcycles	2-stroke >50 cm³	Euro III	2007	9999											

Continued															
Motorcycles	4-stroke <250 cm³	Conventional	0	1999	6881	7333	7541	7635	7875	8222	8688	9325	10077	10794	11692
Motorcycles	4-stroke <250 cm³	Euro I	2000	2003											
Motorcycles	4-stroke <250 cm³	Euro II	2004	2006											
Motorcycles	4-stroke <250 cm³	Euro III	2007	9999											
Motorcycles	4-stroke 250 - 750 cm³	Conventional	0	1999	18923	20165	20737	20996	21657	22611	23892	25645	27712	29683	32152
Motorcycles	4-stroke 250 - 750 cm³	Euro I	2000	2003											
Motorcycles	4-stroke 250 - 750 cm³	Euro II	2004	2006											
Motorcycles	4-stroke 250 - 750 cm³	Euro III	2007	9999											
Motorcycles	4-stroke >750 cm³	Conventional	0	1999	8601	9166	9426	9544	9844	10278	10860	11657	12596	13492	14615
Motorcycles	4-stroke >750 cm³	Euro I	2000	2003											
Motorcycles	4-stroke >750 cm³	Euro II	2004	2006											
Motorcycles	4-stroke >750 cm³	Euro III	2007	9999											

Sector	Subsector	Tech 2	FYear	LYear	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Passenger Cars	Gasoline <1,4 l	PRE ECE	0	1969	4994	4949	4963	5045	5223	5417	5720	6082	6465	6723	6926	7025
Passenger Cars	Gasoline <1,4 l	ECE 15/00-01	1970	1978	9402	7791	6441	5527	4770	4352	4074	4103	4093	4147	4114	4141
Passenger Cars	Gasoline <1,4 l	ECE 15/02	1979	1980	5582	4146	3061	2228	1672	1270	1027	857	728	634	570	523
Passenger Cars	Gasoline <1,4 l	ECE 15/03	1981	1985	95486	78149	62695	47507	35638	25239	18617	13047	9409	6535	4744	3297
Passenger Cars	Gasoline <1,4 l	ECE 15/04	1986	1990	203911	188827	166452	145685	119764	96438	73966	56842	40818	29938	20925	14666
Passenger Cars	Gasoline <1,4 l	Euro I	1991	1996	212883	211037	207661	203273	197813	189161	177736	161965	144909	127490	107674	87719
Passenger Cars	Gasoline <1,4 l	Euro II	1997	2000	132974	131683	130255	129818	128942	127649	126013	122908	119257	116066	111745	104861
Passenger Cars	Gasoline <1,4 l	Euro III	2001	2005		20508	43702	64814	94621	136765	135422	134549	133396	132826	131095	129085
Passenger Cars	Gasoline <1,4 l	Euro IV	2006	2010							46184	87915	132944	172546	231467	229799
Passenger Cars	Gasoline <1,4 l	Euro V	2011	2014												67990
Passenger Cars	Gasoline 1,4 - 2,0 l	PRE ECE	0	1969	8291	8215	8200	8321	8638	9068	9589	10256	10933	11397	11659	11778
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/00-01	1970	1978	11566	9555	7938	6866	5944	5373	5149	5260	5418	5580	5670	5749
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/02	1979	1980	6258	4775	3690	2780	2170	1670	1386	1183	1020	895	801	724
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/03	1981	1985	94495	78552	64108	49671	37838	27501	20744	15212	11502	8470	6409	4690
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/04	1986	1990	203364	190772	171667	153308	129613	107638	85474	67960	51214	39587	29267	21797
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro I	1991	1996	402938	402008	397847	391775	383212	370014	348949	317429	286223	256620	220109	181443
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro II	1997	2000	363267	359633	355644	355739	352843	349396	344681	334040	320095	310597	298463	279986
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro III	2001	2005		51628	107387	148845	196878	250957	248647	251018	248415	247287	243808	238204
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro IV	2006	2010							55169	101831	130442	145805	160846	156500
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro V	2011	2014												15853
Passenger Cars	Gasoline >2,0 l	PRE ECE	0	1969	1024	1079	1128	1237	1391	1600	2060	2628	3223	3590	3776	3921

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Passenger Cars	Gasoline >2,0 l	ECE 15/00-01	1970	1978	1181	1034	936	859	830	841	1031	1314	1734	2009	2238	2457
Passenger Cars	Gasoline >2,0 l	ECE 15/02	1979	1980	520	479	444	399	369	318	311	330	319	297	271	243
Passenger Cars	Gasoline >2,0 l	ECE 15/03	1981	1985	1904	1798	1696	1572	1431	1299	1182	1129	1031	935	835	734
Passenger Cars	Gasoline >2,0 l	ECE 15/04	1986	1990	4161	4188	4196	4099	3992	3847	3772	3641	3404	3151	2818	2454
Passenger Cars	Gasoline >2,0 l	Euro I	1991	1996	11470	11572	11776	11983	12425	12702	13039	13204	12846	12337	11594	10655
Passenger Cars	Gasoline >2,0 l	Euro II	1997	2000	18867	18776	18757	18984	19326	19848	20510	21171	20947	20665	20096	19209
Passenger Cars	Gasoline >2,0 l	Euro III	2001	2005		4628	9892	14692	21393	29899	30850	32713	33445	33954	33934	32908
Passenger Cars	Gasoline >2,0 l	Euro IV	2006	2010							7690	14232	18439	20011	21349	20824
Passenger Cars	Gasoline >2,0 l	Euro V	2011	2014												858
Passenger Cars	Diesel <2,0 l	Conventional	0	1990	46384	44480	41523	38006	34340	30089	26006	22027	18000	14361	10988	8083
Passenger Cars	Diesel <2,0 l	Euro I	1991	1996	16471	17245	18106	19220	20895	21616	21549	20568	19168	17786	15909	13595
Passenger Cars	Diesel <2,0 l	Euro II	1997	2000	30074	30082	30026	30342	30592	30774	31125	33912	32692	32055	31708	31034
Passenger Cars	Diesel <2,0 l	Euro III	2001	2005		12723	30100	46644	70013	100191	102310	119573	120469	122109	123349	122763
Passenger Cars	Diesel <2,0 l	Euro IV	2006	2010							32073	82104	115316	127332	135760	134996
Passenger Cars	Diesel <2,0 l	Euro V	2011	2014							3564	15517	49124	83077	145885	217364
Passenger Cars	Diesel >2,0 l	Conventional	0	1990	7728	7120	6345	5723	5039	4460	3895	3402	2908	2516	2094	1656
Passenger Cars	Diesel >2,0 l	Euro I	1991	1996	7698	7640	7463	7353	7287	7147	6943	6586	6018	5575	5022	4380
Passenger Cars	Diesel >2,0 l	Euro II	1997	2000	13139	13250	13151	13303	13569	13890	13944	14951	14445	14012	13616	12925
Passenger Cars	Diesel >2,0 l	Euro III	2001	2005		3892	8650	12988	18896	25773	26255	31305	31716	32159	32304	31710
Passenger Cars	Diesel >2,0 l	Euro IV	2006	2010							6437	15562	18659	20592	22309	22795
Passenger Cars	Diesel >2,0 l	Euro V	2011	2014							715	2819	5908	9868	14513	20124
Passenger Cars	LPG cars	Conventional	0	1990	30	24	17	11	10	10	10	7	8	7	6	6
Passenger Cars	LPG cars	Euro I	1991	1996	2	2	3	2	4	4	3	2	2	2	3	2
Passenger Cars	LPG cars	Euro II	1997	2000			1	2	1	1	1			1	1	4
Passenger Cars	LPG cars	Euro III	2001	2005								1	2	4	3	3
Passenger Cars	LPG cars	Euro IV	2006	2010										1	1	4
Passenger Cars	2-Stroke	Conventional	0	9999	300	200	150	100	50							
Passenger Cars	Electric cars	Conventional	0	9999	322	301	280	250	211	183	183	188	191	273	348	767
Light Duty Vehicles	Gasoline <3,5t	Conventional	0	1994	27140	23832	21083	18787	16405	14063	11895	9932	7994	6336	4955	3852
Light Duty Vehicles	Gasoline <3,5t	Euro I	1995	1998	17103	16862	16703	16454	16011	15464	14728	13331	12215	11198	10027	8622
Light Duty Vehicles	Gasoline <3,5t	Euro II	1999	2001	9655	14319	14153	14012	13791	13616	13420	10302	9611	8985	8074	6752
Light Duty Vehicles	Gasoline <3,5t	Euro III	2002	2006			3784	8014	13934	20623	26271	18997	18316	17583	15860	13792
Light Duty Vehicles	Gasoline <3,5t	Euro IV	2007	2011								3184	3814	3801	4055	4105
Light Duty Vehicles	Diesel <3,5t	Conventional	0	1994	94102	80466	67925	56940	46624	37412	29736	24088	18856	14741	11426	9018
Light Duty Vehicles	Diesel <3,5t	Euro I	1995	1998	74373	72684	71182	69081	66775	63284	58501	52343	46834	41796	36667	31364
Light Duty Vehicles	Diesel <3,5t	Euro II	1999	2001	49951	74831	73532	72069	70326	68384	65625	55257	49908	45261	40307	34072
Light Duty Vehicles	Diesel <3,5t	Euro III	2002	2006			27192	54236	92157	139815	191430	165441	156173	147683	134874	120633

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Light Duty Vehicles	Diesel <3,5t	Euro IV	2007	2011								37658	54077	54534	62080	78410
Light Duty Vehicles	Diesel <3,5t	Euro V	2012	2015							2831	11914	20902	21750	34043	32718
Light Duty Vehicles	LPG <3,5t	Conventional	0	1994	60	36	27	21	14	10	9	7	5	4	4	4
Light Duty Vehicles	LPG <3,5t	Euro I	1995	1998	1	1										
Light Duty Vehicles	LPG <3,5t	Euro II	1999	2001	1				1	3	3	2	2	3	3	2
Light Duty Vehicles	LPG <3,5t	Euro III	2002	2006							5	7	7	8	8	7
Light Duty Vehicles	LPG <3,5t	Euro IV	2007	2011								1	3	4	3	4
Light Duty Vehicles	Electric <3,5t	Conventional	0	9999	1								1	7	4	17
Heavy Duty Vehicles	Gasoline >3,5t	Conventional	0	9999	307	295	291	283	268	287	296	328	325	340	343	346
Heavy Duty Vehicles	Diesel RT 3,5 - 7,5t	Conventional	0	1993	3011	2552	2088	1709	1430	1244	1075	937	793	653	540	481
Heavy Duty Vehicles	Diesel RT 3,5 - 7,5t	Euro I	1994	1996	834	769	715	656	594	492	437	360	290	234	191	157
Heavy Duty Vehicles	Diesel RT 3,5 - 7,5t	Euro II	1997	2001	2136	2254	2161	2078	2003	1901	1722	1504	1250	1060	893	750
Heavy Duty Vehicles	Diesel RT 3,5 - 7,5t	Euro III	2002	2006		166	460	755	1049	1437	1677	1662	1576	1450	1315	1209
Heavy Duty Vehicles	Diesel RT 3,5 - 7,5t	Euro IV	2007	2009							53	364	758	911	968	972
Heavy Duty Vehicles	Diesel RT 3,5 - 7,5t	Euro V	2010	2013								2	5	27	155	322
Heavy Duty Vehicles	Diesel RT 7,5 - 12t	Conventional	0	1993	3782	3406	3069	2766	2503	2241	2077	1899	1683	1419	1250	1128
Heavy Duty Vehicles	Diesel RT 7,5 - 12t	Euro I	1994	1996	1099	1070	1040	985	948	885	827	747	667	545	481	418
Heavy Duty Vehicles	Diesel RT 7,5 - 12t	Euro II	1997	2001	1575	1783	1840	1884	1858	1838	1706	1587	1352	1201	1079	951
Heavy Duty Vehicles	Diesel RT 7,5 - 12t	Euro III	2002	2006		155	443	713	1061	1501	1936	1996	1924	1798	1631	1529
Heavy Duty Vehicles	Diesel RT 7,5 - 12t	Euro IV	2007	2009		2	2	2	2	3	93	427	824	889	935	937
Heavy Duty Vehicles	Diesel RT 7,5 - 12t	Euro V	2010	2013				1	1	1	2	42	181	352	551	724
Heavy Duty Vehicles	Diesel RT 12 - 14 t	Conventional	0	1993	1368	1094	896	734	612	500	435	367	299	228	187	139
Heavy Duty Vehicles	Diesel RT 12 - 14 t	Euro I	1994	1996	278	274	248	203	174	152	138	113	100	86	67	57
Heavy Duty Vehicles	Diesel RT 12 - 14 t	Euro II	1997	2001	298	312	291	285	278	273	267	239	205	162	142	122
Heavy Duty Vehicles	Diesel RT 12 - 14 t	Euro III	2002	2006		10	32	46	58	82	99	108	108	104	95	77
Heavy Duty Vehicles	Diesel RT 12 - 14 t	Euro IV	2007	2009					1	1	2	25	52	65	63	58
Heavy Duty Vehicles	Diesel RT 12 - 14 t	Euro V	2010	2013									8	11	35	52
Heavy Duty Vehicles	Diesel RT 14 - 20t	Conventional	0	1993	2143	1897	1382	1158	1003	884	895	724	536	430	351	289
Heavy Duty Vehicles	Diesel RT 14 - 20t	Euro I	1994	1996	905	983	787	701	638	562	574	461	330	242	205	169
Heavy Duty Vehicles	Diesel RT 14 - 20t	Euro II	1997	2001	1642	1926	1653	1586	1587	1564	1711	1454	1083	862	733	629
Heavy Duty Vehicles	Diesel RT 14 - 20t	Euro III	2002	2006		194	389	665	919	1245	1740	1655	1469	1330	1207	1098
Heavy Duty Vehicles	Diesel RT 14 - 20t	Euro IV	2007	2009		4	4	6	7	14	101	457	699	747	757	748
Heavy Duty Vehicles	Diesel RT 14 - 20t	Euro V	2010	2013						3	21	106	254	415	572	717
Heavy Duty Vehicles	Diesel RT 20 - 26t	Conventional	0	1993	2097	1769	1231	984	797	655	623	463	307	217	163	140
Heavy Duty Vehicles	Diesel RT 20 - 26t	Euro I	1994	1996	1204	1206	935	815	728	643	654	515	356	267	204	164
Heavy Duty Vehicles	Diesel RT 20 - 26t	Euro II	1997	2001	2179	2589	2176	2053	1970	1846	1969	1668	1245	986	838	697
Heavy Duty Vehicles	Diesel RT 20 - 26t	Euro III	2002	2006		197	487	803	1143	1583	2273	2160	1907	1748	1590	1407

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Heavy Duty Vehicles	Diesel RT 20 - 26t	Euro IV	2007	2009		3	3	3	3	26	126	593	910	988	990	964
Heavy Duty Vehicles	Diesel RT 20 - 26t	Euro V	2010	2013						7	24	124	293	493	696	920
Heavy Duty Vehicles	Diesel RT 26 - 28t	Conventional	0	1993	4	4	4	4	4	4	4	4	3	2	2	2
Heavy Duty Vehicles	Diesel RT 26 - 28t	Euro I	1994	1996	1	2	1	1	1	0	1	1	1	0	1	
Heavy Duty Vehicles	Diesel RT 26 - 28t	Euro II	1997	2001	3	3	2	2	2	2	2	2	1	1	1	1
Heavy Duty Vehicles	Diesel RT 26 - 28t	Euro III	2002	2006				0	2	2	3	3	3	3	3	3
Heavy Duty Vehicles	Diesel RT 26 - 28t	Euro IV	2007	2009								3	3	1	2	1
Heavy Duty Vehicles	Diesel RT 26 - 28t	Euro V	2010	2013								1	1	1	1	2
Heavy Duty Vehicles	Diesel RT 28 - 32t	Conventional	0	1993	185	139	93	70	50	42	36	22	13	9	6	6
Heavy Duty Vehicles	Diesel RT 28 - 32t	Euro I	1994	1996	239	241	190	157	134	114	95	68	40	26	20	15
Heavy Duty Vehicles	Diesel RT 28 - 32t	Euro II	1997	2001	618	792	670	641	637	639	702	590	439	327	279	231
Heavy Duty Vehicles	Diesel RT 28 - 32t	Euro III	2002	2006		82	193	341	509	747	1189	1157	1016	924	873	815
Heavy Duty Vehicles	Diesel RT 28 - 32t	Euro IV	2007	2009			0	1	1	21	86	400	619	674	686	677
Heavy Duty Vehicles	Diesel RT 28 - 32t	Euro V	2010	2013							10	69	157	255	341	504
Heavy Duty Vehicles	Diesel RT >32t	Conventional	0	1993	2	2	1	2	2	2	1	1	1			
Heavy Duty Vehicles	Diesel RT >32t	Euro I	1994	1996	0	1	1	1	1	1	1	1	1	1	1	1
Heavy Duty Vehicles	Diesel RT >32t	Euro II	1997	2001	1	1	0									
Heavy Duty Vehicles	Diesel RT >32t	Euro III	2002	2006		1	1	2	1	2	3	3	3	3	3	2
Heavy Duty Vehicles	Diesel RT >32t	Euro IV	2007	2009								1	1	1		
Heavy Duty Vehicles	Diesel RT >32t	Euro V	2010	2013										1	2	4
Heavy Duty Vehicles	Diesel TT/AT 28 - 34t	Conventional	0	1993	2481	1887	1804	1515	1250	1033	756	655	552	445	365	304
Heavy Duty Vehicles	Diesel TT/AT 28 - 34t	Euro I	1994	1996	1025	954	1006	898	781	648	475	407	333	244	207	170
Heavy Duty Vehicles	Diesel TT/AT 28 - 34t	Euro II	1997	2001	1862	1872	2119	2035	1942	1802	1407	1275	1087	865	736	633
Heavy Duty Vehicles	Diesel TT/AT 28 - 34t	Euro III	2002	2006		188	497	852	1123	1432	1434	1454	1473	1333	1211	1103
Heavy Duty Vehicles	Diesel TT/AT 28 - 34t	Euro IV	2007	2009		3	6	8	8	15	83	402	707	754	764	754
Heavy Duty Vehicles	Diesel TT/AT 28 - 34t	Euro V	2010	2013						3	17	93	255	416	573	718
Heavy Duty Vehicles	Diesel TT/AT 34 - 40t	Conventional	0	1993	3173	2250	1980	1585	1255	973	705	576	456	328	253	223
Heavy Duty Vehicles	Diesel TT/AT 34 - 40t	Euro I	1994	1996	2884	2100	1834	1472	1214	979	713	596	465	345	271	224
Heavy Duty Vehicles	Diesel TT/AT 34 - 40t	Euro II	1997	2001	7098	7055	6586	5636	4638	3653	2744	2272	1781	1351	1128	937
Heavy Duty Vehicles	Diesel TT/AT 34 - 40t	Euro III	2002	2006		1009	2342	3625	4439	5378	5558	4873	4150	3380	2811	2234
Heavy Duty Vehicles	Diesel TT/AT 34 - 40t	Euro IV	2007	2009		4	7	6	10	76	213	992	1635	1720	1738	1605
Heavy Duty Vehicles	Diesel TT/AT 34 - 40t	Euro V	2010	2013		1	1	1		27	151	672	1162	1550	2018	2802
Heavy Duty Vehicles	Diesel TT/AT 40 - 50t	Conventional	0	1993	1029	708	549	388	287	219	170	123	95	67	61	58
Heavy Duty Vehicles	Diesel TT/AT 40 - 50t	Euro I	1994	1996	1215	1060	967	781	616	482	352	286	176	114	101	84
Heavy Duty Vehicles	Diesel TT/AT 40 - 50t	Euro II	1997	2001	3548	4062	4016	3731	3293	2841	2248	1798	1225	823	654	538
Heavy Duty Vehicles	Diesel TT/AT 40 - 50t	Euro III	2002	2006		552	1706	3011	4472	6217	7584	7031	5985	4772	3954	3229
Heavy Duty Vehicles	Diesel TT/AT 40 - 50t	Euro IV	2007	2009		1	5	6	6	82	328	2117	3557	3680	3845	3624

Continued

Heavy Duty Vehicles	Diesel TT/AT 40 - 50t	Euro V	2010	2013		1	2	2	2	1	68	722	1428	1909	2680	3768
Heavy Duty Vehicles	Diesel TT/AT 50 - 60t	Euro I	1994	1996	1	1	1	1	1	1						
Heavy Duty Vehicles	Diesel TT/AT 50 - 60t	Euro II	1997	2001	1	1	1	1	1	1	1	1	1	1	1	1
Heavy Duty Vehicles	Diesel TT/AT 50 - 60t	Euro IV	2007	2009								1	1	1	1	
Heavy Duty Vehicles	Diesel TT/AT >60t	Euro V	2010	2013									1	3		1
Buses	Gasoline Urban Buses	Conventional	0	9999	11	9	7	1	2	2	2	4	7	9	9	10
Buses	Diesel Urban Buses <15t	Conventional	0	1993	200	183	154	123	101	80	68	56	49	33	25	16
Buses	Diesel Urban Buses <15t	Euro I	1994	1996	118	118	96	106	88	84	75	57	53	28	16	15
Buses	Diesel Urban Buses <15t	Euro II	1997	2001	525	542	553	569	535	545	494	427	367	221	117	90
Buses	Diesel Urban Buses <15t	Euro III	2002	2006			56	155	248	378	461	438	433	416	363	332
Buses	Diesel Urban Buses <15t	Euro IV	2007	2009								119	262	434	425	461
Buses	Diesel Urban Buses <15t	Euro V	2010	2013											165	266
Buses	Diesel Urban Buses 15 - 18t	Conventional	0	1993	1701	1506	1175	1030	880	758	621	538	460	336	276	217
Buses	Diesel Urban Buses 15 - 18t	Euro I	1994	1996	845	810	749	691	620	561	476	399	338	296	253	180
Buses	Diesel Urban Buses 15 - 18t	Euro II	1997	2001	1049	1165	1156	1136	1066	1061	1032	1002	919	851	744	636
Buses	Diesel Urban Buses 15 - 18t	Euro III	2002	2006			288	456	596	733	991	992	989	962	969	951
Buses	Diesel Urban Buses 15 - 18t	Euro IV	2007	2009								107	327	624	628	629
Buses	Diesel Urban Buses 15 - 18t	Euro V	2010	2013											217	404
Buses	Diesel Urban Buses >18t	Conventional	0	1993	37	47	45	25	24	23	16	7	6	6	2	2
Buses	Diesel Urban Buses >18t	Euro I	1994	1996	28	44	52	51	42	44	44	23	6	4	2	1
Buses	Diesel Urban Buses >18t	Euro II	1997	2001	106	220	225	224	218	217	215	213	161	148	142	105
Buses	Diesel Urban Buses >18t	Euro III	2002	2006			135	228	337	388	448	439	414	398	389	377
Buses	Diesel Urban Buses >18t	Euro IV	2007	2009								124	247	338	340	333
Buses	Diesel Urban Buses >18t	Euro V	2010	2013											97	162
Buses	Gasoline Coaches	Conventional	0	9999	1796	1788	1763	1722	1663	1586	1521	1422	1306	1186	1052	913
Buses	Diesel Coaches <15t	Conventional	0	1993	4340	3989	3649	3360	3029	2726	2438	2162	1927	1662	1439	1184
Buses	Diesel Coaches <15t	Euro I	1994	1996	1079	1053	1031	982	956	920	873	814	733	664	614	545
Buses	Diesel Coaches <15t	Euro II	1997	2001	1347	1658	1694	1740	1908	2023	2144	2144	2077	2011	1914	1801
Buses	Diesel Coaches <15t	Euro III	2002	2006			253	482	751	1052	1351	1423	1439	1461	1454	1365
Buses	Diesel Coaches <15t	Euro IV	2007	2009								227	480	793	822	798
Buses	Diesel Coaches <15t	Euro V	2010	2013											204	328
Buses	Diesel Coaches 15 - 18t	Conventional	0	1993	1133	1061	1013	957	914	847	758	682	609	540	463	377
Buses	Diesel Coaches 15 - 18t	Euro I	1994	1996	148	161	173	176	176	184	177	177	178	193	179	154
Buses	Diesel Coaches 15 - 18t	Euro II	1997	2001	173	208	221	220	230	240	238	236	226	245	258	267
Buses	Diesel Coaches 15 - 18t	Euro III	2002	2006			19	46	61	71	90	81	99	106	107	109
Buses	Diesel Coaches 15 - 18t	Euro IV	2007	2009								11	38	69	66	65
Buses	Diesel Coaches 15 - 18t	Euro V	2010	2013											41	48

Continued

Buses	Diesel Coaches >18t	Conventional	0	1993	192	177	157	142	138	121	92	77	56	48	38	31
Buses	Diesel Coaches >18t	Euro I	1994	1996	78	76	79	74	70	65	60	56	49	46	36	26
Buses	Diesel Coaches >18t	Euro II	1997	2001	145	190	196	201	192	192	202	199	173	165	156	141
Buses	Diesel Coaches >18t	Euro III	2002	2006			32	92	152	230	293	302	312	321	322	309
Buses	Diesel Coaches >18t	Euro IV	2007	2009								55	114	180	194	197
Buses	Diesel Coaches >18t	Euro V	2010	2013											39	70
Mopeds	<50 cm³	Conventional	0	1999	143569	136233	128203	120288	112245	103814	95124	86612	78807	71061	63625	56546
Mopeds	<50 cm³	Euro I	2000	2003	16403	28734	42762	48678	46056	43440	40733	37815	35222	32562	29999	27566
Mopeds	<50 cm³	Euro II	2004	9999					10661	21704	33066	44454	50847	56239	59082	62540
Motorcycles	2-stroke >50 cm³	Conventional	0	1999	10536	10539	10440	10400	10480	10665	10932	11121	11004	10594	10060	9465
Motorcycles	2-stroke >50 cm³	Euro I	2000	2003	464	779	1097	1409	1356	1339	1342	1363	1357	1308	1250	1190
Motorcycles	2-stroke >50 cm³	Euro II	2004	2006					450	1115	1939	1849	1769	1655	1543	1425
Motorcycles	2-stroke >50 cm³	Euro III	2007	9999								1030	1673	1927	2033	2060
Motorcycles	4-stroke <250 cm³	Conventional	0	1999	11941	12429	12827	13327	14028	14931	16034	17116	17806	18061	18108	18033
Motorcycles	4-stroke <250 cm³	Euro I	2000	2003	526	918	1348	1805	1814	1874	1969	2098	2196	2230	2250	2267
Motorcycles	4-stroke <250 cm³	Euro II	2004	2006					603	1560	2843	2846	2863	2822	2777	2715
Motorcycles	4-stroke <250 cm³	Euro III	2007	9999								1586	2707	3285	3659	3924
Motorcycles	4-stroke 250 - 750 cm³	Conventional	0	1999	32838	34180	35273	36650	38576	41061	44093	47069	48967	49667	49797	49591
Motorcycles	4-stroke 250 - 750 cm³	Euro I	2000	2003	1447	2525	3707	4964	4990	5154	5414	5770	6038	6133	6188	6234
Motorcycles	4-stroke 250 - 750 cm³	Euro II	2004	2006					1657	4291	7820	7827	7873	7761	7638	7467
Motorcycles	4-stroke 250 - 750 cm³	Euro III	2007	9999								4360	7445	9033	10061	10791
Motorcycles	4-stroke >750 cm³	Conventional	0	1999	14926	15536	16033	16659	17535	18664	20042	21395	22258	22576	22635	22541
Motorcycles	4-stroke >750 cm³	Euro I	2000	2003	658	1148	1685	2257	2268	2343	2461	2623	2745	2788	2813	2834
Motorcycles	4-stroke >750 cm³	Euro II	2004	2006					753	1950	3554	3558	3578	3528	3472	3394
Motorcycles	4-stroke >750 cm³	Euro III	2007	9999								1982	3384	4106	4573	4905

Annex 2B-2: Mileage data 1985-2011 for road transport (km)

Sector	Subsector	Tech 2	FYear	LYear	1985	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Passenger Cars	Gasoline <1,4 l	PRE ECE	0	1969	10987	10126	10512	10813	10717	10998	10369	9770	9516	9206	8738
Passenger Cars	Gasoline <1,4 l	ECE 15/00-01	1970	1978	13512	12672	13276	13818	13785	14238	13441	12686	12361	11935	11315
Passenger Cars	Gasoline <1,4 l	ECE 15/02	1979	1980	15074	14174	14709	15129	15002	15478	14621	13813	13487	13071	12472
Passenger Cars	Gasoline <1,4 l	ECE 15/03	1981	1985	15016	15385	16091	16689	16643	17193	16255	15377	15047	14633	13973
Passenger Cars	Gasoline <1,4 l	ECE 15/04	1986	1990		15922	18158	18617	18423	18995	17947	16963	16578	16099	15347
Passenger Cars	Gasoline <1,4 l	Euro I	1991	1996			9822	15599	17451	17935	18227	17893	19347	18764	17873
Passenger Cars	Gasoline <1,4 l	Euro II	1997	2000									10518	15722	16673
Passenger Cars	Gasoline <1,4 l	Euro III	2001	2005											
Passenger Cars	Gasoline <1,4 l	Euro IV	2006	2010											
Passenger Cars	Gasoline <1,4 l	Euro V	2011	2014											
Passenger Cars	Gasoline 1,4 - 2,0 l	PRE ECE	0	1969	13245	12360	12855	13288	13221	13566	12782	12036	11712	11322	10737
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/00-01	1970	1978	16412	15390	16109	16770	16715	17277	16317	15407	15023	14509	13761
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/02	1979	1980	18351	17283	17934	18482	18333	18919	17876	16896	16503	15993	15257
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/03	1981	1985	17890	18791	19630	20355	20297	20965	19820	18752	18345	17823	16992
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/04	1986	1990		19005	22385	22891	22603	23307	22019	20810	20338	19743	18813
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro I	1991	1996			12083	18712	20806	21397	21850	21413	23821	23096	21991
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro II	1997	2000									12863	18602	20692
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro III	2001	2005											
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro IV	2006	2010											
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro V	2011	2014											
Passenger Cars	Gasoline >2,0 l	PRE ECE	0	1969	14692	13694	14191	14612	14494	14941	14084	13263	12911	12478	11825
Passenger Cars	Gasoline >2,0 l	ECE 15/00-01	1970	1978	17959	16981	17820	18516	18543	19119	18039	17008	16558	16029	15211
Passenger Cars	Gasoline >2,0 l	ECE 15/02	1979	1980	20799	19449	20135	20768	20669	21331	20133	19014	18551	17943	17090
Passenger Cars	Gasoline >2,0 l	ECE 15/03	1981	1985	20329	21465	22268	22895	22702	23415	22104	20877	20384	19776	18841
Passenger Cars	Gasoline >2,0 l	ECE 15/04	1986	1990		21408	25931	26252	25851	26645	25127	23708	23150	22469	21401
Passenger Cars	Gasoline >2,0 l	Euro I	1991	1996			14128	21423	23687	24914	24459	24235	26905	26023	24747
Passenger Cars	Gasoline >2,0 l	Euro II	1997	2000									14567	20725	22243
Passenger Cars	Gasoline >2,0 l	Euro III	2001	2005											
Passenger Cars	Gasoline >2,0 l	Euro IV	2006	2010											
Passenger Cars	Gasoline >2,0 l	Euro V	2011	2014											
Passenger Cars	Diesel <2,0 l	Conventional	0	1990	35362	42261	43428	41168	40097	42647	40813	39720	39124	37694	36384
Passenger Cars	Diesel <2,0 l	Euro I	1991	1996			67316	85071	76115	63947	57531	55204	56392	48899	44832
Passenger Cars	Diesel <2,0 l	Euro II	1997	2000									35632	44754	42277
Passenger Cars	Diesel <2,0 l	Euro III	2001	2005											

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Passenger Cars	Diesel <2,0 l	Euro IV	2006	2010											
Passenger Cars	Diesel <2,0 l	Euro V	2011	2014											
Passenger Cars	Diesel >2,0 l	Conventional	0	1990	46795	53584	53600	45969	41568	42757	40159	38685	37779	36369	35249
Passenger Cars	Diesel >2,0 l	Euro I	1991	1996			75908	100414	95448	94680	87668	79953	77912	58365	47748
Passenger Cars	Diesel >2,0 l	Euro II	1997	2000									62706	82066	72541
Passenger Cars	Diesel >2,0 l	Euro III	2001	2005											
Passenger Cars	Diesel >2,0 l	Euro IV	2006	2010											
Passenger Cars	Diesel >2,0 l	Euro V	2011	2014											
Passenger Cars	LPG cars	Conventional	0	1990	25575	26636	28202	29712	30233	31206	29655	28181	27555	26612	25314
Passenger Cars	LPG cars	Euro I	1991	1996				38174	37417	38309	37546	35227	34476	33513	33998
Passenger Cars	LPG cars	Euro II	1997	2000											
Passenger Cars	LPG cars	Euro III	2001	2005											
Passenger Cars	LPG cars	Euro IV	2006	2010											
Passenger Cars	2-Stroke	Conventional	0	9999	14642	15402	16008	16500	16419	16953	16011	15123	14770	14328	13647
Passenger Cars	Electric cars	Conventional	0	9999	10260	10737	11377	11996	12218	15192	14786	13930	13775	13126	13594
Light Duty Vehicles	Gasoline <3,5t	Conventional	0	1994	18978	20887	20962	20087	19633	21179	21374	20955	20560	19867	19297
Light Duty Vehicles	Gasoline <3,5t	Euro I	1995	1998							13717	20050	21300	21453	24587
Light Duty Vehicles	Gasoline <3,5t	Euro II	1999	2001											13275
Light Duty Vehicles	Gasoline <3,5t	Euro III	2002	2006											
Light Duty Vehicles	Gasoline <3,5t	Euro IV	2007	2011											
Light Duty Vehicles	Diesel <3,5t	Conventional	0	1994	29423	32398	32514	31159	30456	31409	31302	30275	29362	28039	26952
Light Duty Vehicles	Diesel <3,5t	Euro I	1995	1998							20709	29650	31926	32950	36388
Light Duty Vehicles	Diesel <3,5t	Euro II	1999	2001											20042
Light Duty Vehicles	Diesel <3,5t	Euro III	2002	2006											
Light Duty Vehicles	Diesel <3,5t	Euro IV	2007	2011											
Light Duty Vehicles	Diesel <3,5t	Euro V	2012	2015											
Light Duty Vehicles	LPG <3,5t	Conventional	0	1994	20338	19332	19790	20538	20660	20626	19555	18924	18421	17853	16944
Light Duty Vehicles	LPG <3,5t	Euro I	1995	1998										16428	30783
Light Duty Vehicles	LPG <3,5t	Euro II	1999	2001											
Light Duty Vehicles	LPG <3,5t	Euro III	2002	2006											
Light Duty Vehicles	LPG <3,5t	Euro IV	2007	2011											
Light Duty Vehicles	Electric <3,5t	Conventional	0	9999	12109	11522	11796	12244	12317	12509	11218	10676	12192	11836	11262
Heavy Duty Vehicles	Gasoline >3,5t	Conventional	0	9999	23080	24575	25891	24613	22172	22042	22255	21598	20371	19032	19306
Heavy Duty Vehicles	Diesel RT 3,5 - 7,5t	Conventional	0	1993	31593	30572	33046	29469	24828	23910	25188	22923	20954	19357	17441
Heavy Duty Vehicles	Diesel RT 3,5 - 7,5t	Euro I	1994	1996					23054	26299	36682	37885	39907	36293	32353
Heavy Duty Vehicles	Diesel RT 3,5 - 7,5t	Euro II	1997	2001								24587	27344	31676	34881
Heavy Duty Vehicles	Diesel RT 3,5 - 7,5t	Euro III	2002	2006											

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Heavy Duty Vehicles	Diesel RT 3,5 - 7,5t	Euro IV	2007	2009											
Heavy Duty Vehicles	Diesel RT 3,5 - 7,5t	Euro V	2010	2013											
Heavy Duty Vehicles	Diesel RT 7,5 - 12t	Conventional	0	1993	37315	36012	38915	34698	29224	28272	29993	27218	24915	23136	20841
Heavy Duty Vehicles	Diesel RT 7,5 - 12t	Euro I	1994	1996					27938	31807	42654	45806	48666	44243	39319
Heavy Duty Vehicles	Diesel RT 7,5 - 12t	Euro II	1997	2001								29796	34383	41420	41775
Heavy Duty Vehicles	Diesel RT 7,5 - 12t	Euro III	2002	2006											
Heavy Duty Vehicles	Diesel RT 7,5 - 12t	Euro IV	2007	2009											
Heavy Duty Vehicles	Diesel RT 7,5 - 12t	Euro V	2010	2013											
Heavy Duty Vehicles	Diesel RT 12 - 14 t	Conventional	0	1993	27513	30299	32856	31321	26652	28985	28652	23167	21675	21127	22642
Heavy Duty Vehicles	Diesel RT 12 - 14 t	Euro I	1994	1996					23844	32017	43687	39124	40920	39134	41053
Heavy Duty Vehicles	Diesel RT 12 - 14 t	Euro II	1997	2001								24863	28125	38236	47869
Heavy Duty Vehicles	Diesel RT 12 - 14 t	Euro III	2002	2006											
Heavy Duty Vehicles	Diesel RT 12 - 14 t	Euro IV	2007	2009											
Heavy Duty Vehicles	Diesel RT 12 - 14 t	Euro V	2010	2013											
Heavy Duty Vehicles	Diesel RT 14 - 20t	Conventional	0	1993	49555	54586	59192	56427	48056	53001	52789	42730	40125	39183	41631
Heavy Duty Vehicles	Diesel RT 14 - 20t	Euro I	1994	1996					41509	54202	69364	66546	72839	69704	72983
Heavy Duty Vehicles	Diesel RT 14 - 20t	Euro II	1997	2001								43283	49885	65693	77115
Heavy Duty Vehicles	Diesel RT 14 - 20t	Euro III	2002	2006											
Heavy Duty Vehicles	Diesel RT 14 - 20t	Euro IV	2007	2009											
Heavy Duty Vehicles	Diesel RT 14 - 20t	Euro V	2010	2013											
Heavy Duty Vehicles	Diesel RT 20 - 26t	Conventional	0	1993	77104	85021	80265	84890	81445	80397	77249	73888	64558	62670	54432
Heavy Duty Vehicles	Diesel RT 20 - 26t	Euro I	1994	1996					67784	77139	97621	109399	112920	107957	92583
Heavy Duty Vehicles	Diesel RT 20 - 26t	Euro II	1997	2001								71827	78066	100546	97926
Heavy Duty Vehicles	Diesel RT 20 - 26t	Euro III	2002	2006											
Heavy Duty Vehicles	Diesel RT 20 - 26t	Euro IV	2007	2009											
Heavy Duty Vehicles	Diesel RT 20 - 26t	Euro V	2010	2013											
Heavy Duty Vehicles	Diesel RT 26 - 28t	Conventional	0	1993	74213	81865	77431	81805	78420	81812	79350	79054	67611	64481	54742
Heavy Duty Vehicles	Diesel RT 26 - 28t	Euro I	1994	1996							121173	94707	117422	111012	95016
Heavy Duty Vehicles	Diesel RT 26 - 28t	Euro II	1997	2001								72706	86469	88492	100146
Heavy Duty Vehicles	Diesel RT 26 - 28t	Euro III	2002	2006											
Heavy Duty Vehicles	Diesel RT 26 - 28t	Euro IV	2007	2009											
Heavy Duty Vehicles	Diesel RT 26 - 28t	Euro V	2010	2013											
Heavy Duty Vehicles	Diesel RT 28 - 32t	Conventional	0	1993	85446	94256	89150	94186	91028	93121	88668	84213	73749	72366	63109
Heavy Duty Vehicles	Diesel RT 28 - 32t	Euro I	1994	1996					69026	80737	95841	108625	114746	109433	93715
Heavy Duty Vehicles	Diesel RT 28 - 32t	Euro II	1997	2001								72706	78416	98957	96100
Heavy Duty Vehicles	Diesel RT 28 - 32t	Euro III	2002	2006											
Heavy Duty Vehicles	Diesel RT 28 - 32t	Euro IV	2007	2009											

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Heavy Duty Vehicles	Diesel RT 28 - 32t	Euro V	2010	2013											
Heavy Duty Vehicles	Diesel RT >32t	Conventional	0	1993	56752	62603	59212	62557	59968	56125	80742	49186	42044	75528	64645
Heavy Duty Vehicles	Diesel RT >32t	Euro I	1994	1996							71581	107606	120397	114825	89613
Heavy Duty Vehicles	Diesel RT >32t	Euro II	1997	2001								72706	86871	118546	65151
Heavy Duty Vehicles	Diesel RT >32t	Euro III	2002	2006											
Heavy Duty Vehicles	Diesel RT >32t	Euro IV	2007	2009											
Heavy Duty Vehicles	Diesel RT >32t	Euro V	2010	2013											
Heavy Duty Vehicles	Diesel TT/AT 28 - 34t	Conventional	0	1993	53602	59453	64508	61415	52944	58371	58054	47394	44784	43638	46143
Heavy Duty Vehicles	Diesel TT/AT 28 - 34t	Euro I	1994	1996					45559	59585	76332	73342	80388	77115	80607
Heavy Duty Vehicles	Diesel TT/AT 28 - 34t	Euro II	1997	2001								47629	54989	72613	85114
Heavy Duty Vehicles	Diesel TT/AT 28 - 34t	Euro III	2002	2006											
Heavy Duty Vehicles	Diesel TT/AT 28 - 34t	Euro IV	2007	2009											
Heavy Duty Vehicles	Diesel TT/AT 28 - 34t	Euro V	2010	2013											
Heavy Duty Vehicles	Diesel TT/AT 34 - 40t	Conventional	0	1993	84648	90436	86534	82989	83916	86825	79943	79896	73919	69127	62197
Heavy Duty Vehicles	Diesel TT/AT 34 - 40t	Euro I	1994	1996					61500	71410	83419	102475	117340	106705	99624
Heavy Duty Vehicles	Diesel TT/AT 34 - 40t	Euro II	1997	2001								66415	81057	94399	102490
Heavy Duty Vehicles	Diesel TT/AT 34 - 40t	Euro III	2002	2006											
Heavy Duty Vehicles	Diesel TT/AT 34 - 40t	Euro IV	2007	2009											
Heavy Duty Vehicles	Diesel TT/AT 34 - 40t	Euro V	2010	2013											
Heavy Duty Vehicles	Diesel TT/AT 40 - 50t	Conventional	0	1993	109789	114598	111039	100652	104396	108389	95165	94197	91124	81657	76380
Heavy Duty Vehicles	Diesel TT/AT 40 - 50t	Euro I	1994	1996					79563	92663	99809	121225	138856	122156	112610
Heavy Duty Vehicles	Diesel TT/AT 40 - 50t	Euro II	1997	2001								79383	92909	107228	111657
Heavy Duty Vehicles	Diesel TT/AT 40 - 50t	Euro III	2002	2006											
Heavy Duty Vehicles	Diesel TT/AT 40 - 50t	Euro IV	2007	2009											
Heavy Duty Vehicles	Diesel TT/AT 40 - 50t	Euro V	2010	2013											
Heavy Duty Vehicles	Diesel TT/AT 50 - 60t	Euro I	1994	1996								138231	135435	116422	110608
Heavy Duty Vehicles	Diesel TT/AT 50 - 60t	Euro II	1997	2001										72370	137511
Heavy Duty Vehicles	Diesel TT/AT 50 - 60t	Euro IV	2007	2009											
Heavy Duty Vehicles	Diesel TT/AT >60t	Euro V	2010	2013											
Buses	Gasoline Urban Buses	Conventional	0	9999	33795	38364	31174	26355	20203	31483	28698	24397	27259	25917	22855
Buses	Diesel Urban Buses <15t	Conventional	0	1993	183187	207698	168762	142671	109361	117960	108353	102142	95506	91310	81140
Buses	Diesel Urban Buses <15t	Euro I	1994	1996						96215	142149	144219	157743	147146	129832
Buses	Diesel Urban Buses <15t	Euro II	1997	2001									91225	119788	134152
Buses	Diesel Urban Buses <15t	Euro III	2002	2006											
Buses	Diesel Urban Buses <15t	Euro IV	2007	2009											
Buses	Diesel Urban Buses <15t	Euro V	2010	2013											
Buses	Diesel Urban Buses 15 - 18t	Conventional	0	1993	173862	197367	160377	135588	103937	112696	103596	99477	92134	87205	79407

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Buses	Diesel Urban Buses 15 - 18t	Euro I	1994	1996						96215	142765	138879	157646	147436	129270
Buses	Diesel Urban Buses 15 - 18t	Euro II	1997	2001									91225	117036	134961
Buses	Diesel Urban Buses 15 - 18t	Euro III	2002	2006											
Buses	Diesel Urban Buses 15 - 18t	Euro IV	2007	2009											
Buses	Diesel Urban Buses 15 - 18t	Euro V	2010	2013											
Buses	Diesel Urban Buses >18t	Conventional	0	1993	226400	257009	208841	176562	135345	148089	129169	116874	115488	93970	71924
Buses	Diesel Urban Buses >18t	Euro I	1994	1996						96215	172711	115545	162038	150495	138207
Buses	Diesel Urban Buses >18t	Euro II	1997	2001										91104	108076
Buses	Diesel Urban Buses >18t	Euro III	2002	2006											
Buses	Diesel Urban Buses >18t	Euro IV	2007	2009											
Buses	Diesel Urban Buses >18t	Euro V	2010	2013											
Buses	Gasoline Coaches	Conventional	0	9999	19222	22557	18395	15619	14029	15879	19904	22765	22247	21231	20295
Buses	Diesel Coaches <15t	Conventional	0	1993	32231	37854	30875	26219	23552	24864	28995	33414	32601	31028	29775
Buses	Diesel Coaches <15t	Euro I	1994	1996						16383	30705	36060	43701	40996	38736
Buses	Diesel Coaches <15t	Euro II	1997	2001									24161	34986	37028
Buses	Diesel Coaches <15t	Euro III	2002	2006											
Buses	Diesel Coaches <15t	Euro IV	2007	2009											
Buses	Diesel Coaches <15t	Euro V	2010	2013											
Buses	Diesel Coaches 15 - 18t	Conventional	0	1993	46554	54705	44620	37893	34040	32112	38024	44216	43217	41123	39642
Buses	Diesel Coaches 15 - 18t	Euro I	1994	1996						26952	45374	59695	72100	67579	63924
Buses	Diesel Coaches 15 - 18t	Euro II	1997	2001									39748	59444	60735
Buses	Diesel Coaches 15 - 18t	Euro III	2002	2006											
Buses	Diesel Coaches 15 - 18t	Euro IV	2007	2009											
Buses	Diesel Coaches 15 - 18t	Euro V	2010	2013											
Buses	Diesel Coaches >18t	Conventional	0	1993	92397	108585	88569	75217	67569	66502	77292	89552	86760	82331	77761
Buses	Diesel Coaches >18t	Euro I	1994	1996						42878	72260	92808	115142	107985	102147
Buses	Diesel Coaches >18t	Euro II	1997	2001									63234	87431	91329
Buses	Diesel Coaches >18t	Euro III	2002	2006											
Buses	Diesel Coaches >18t	Euro IV	2007	2009											
Buses	Diesel Coaches >18t	Euro V	2010	2013											
Mopeds	<50 cm^3	Conventional	0	1999	1416	1341	1400	1469	1509	1544	1599	1711	1963	2203	2000
Mopeds	<50 cm^3	Euro I	2000	2003											
Mopeds	<50 cm^3	Euro II	2004	9999											
Motorcycles	2-stroke >50 cm^3	Conventional	0	1999	6850	6697	6704	7068	7252	7410	7244	6880	6680	6463	6078
Motorcycles	2-stroke >50 cm^3	Euro I	2000	2003											
Motorcycles	2-stroke >50 cm^3	Euro II	2004	2006											
Motorcycles	2-stroke >50 cm^3	Euro III	2007	9999											

Continued															
Motorcycles	4-stroke <250 cm³	Conventional	0	1999	6850	6697	6704	7068	7252	7410	7244	6880	6680	6463	6078
Motorcycles	4-stroke <250 cm³	Euro I	2000	2003											
Motorcycles	4-stroke <250 cm³	Euro II	2004	2006											
Motorcycles	4-stroke <250 cm³	Euro III	2007	9999											
Motorcycles	4-stroke 250 - 750 cm³	Conventional	0	1999	6850	6697	6704	7068	7252	7410	7244	6880	6680	6463	6078
Motorcycles	4-stroke 250 - 750 cm³	Euro I	2000	2003											
Motorcycles	4-stroke 250 - 750 cm³	Euro II	2004	2006											
Motorcycles	4-stroke 250 - 750 cm³	Euro III	2007	9999											
Motorcycles	4-stroke >750 cm³	Conventional	0	1999	6850	6697	6704	7068	7252	7410	7244	6880	6680	6463	6078
Motorcycles	4-stroke >750 cm³	Euro I	2000	2003											
Motorcycles	4-stroke >750 cm³	Euro II	2004	2006											
Motorcycles	4-stroke >750 cm³	Euro III	2007	9999											

Sector	Subsector	Tech 2	FYear	LYear	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Passenger Cars	Gasoline <1,4 l	PRE ECE	0	1969	8323	7870	7770	7596	7415	6928	6586	6421	6142	5764	5457	5277
Passenger Cars	Gasoline <1,4 l	ECE 15/00-01	1970	1978	10751	10162	9983	9715	9422	8762	8276	7981	7615	7133	6730	6496
Passenger Cars	Gasoline <1,4 l	ECE 15/02	1979	1980	11911	11294	11143	10907	10635	9950	9443	9187	8803	8269	7825	7567
Passenger Cars	Gasoline <1,4 l	ECE 15/03	1981	1985	13388	12814	12664	12395	12115	11365	10836	10361	10048	9463	8939	8599
Passenger Cars	Gasoline <1,4 l	ECE 15/04	1986	1990	14691	14014	13872	13588	13301	12476	11897	11501	11103	10466	9927	9602
Passenger Cars	Gasoline <1,4 l	Euro I	1991	1996	17077	16213	16022	15677	15306	14321	13624	13268	12739	11999	11380	11030
Passenger Cars	Gasoline <1,4 l	Euro II	1997	2000	17170	18161	17952	17562	17146	16010	15205	14849	14187	13314	12601	12188
Passenger Cars	Gasoline <1,4 l	Euro III	2001	2005		9693	14118	15944	15905	15191	17251	16863	16099	15101	14289	13811
Passenger Cars	Gasoline <1,4 l	Euro IV	2006	2010							9207	13794	14545	14702	13915	15576
Passenger Cars	Gasoline <1,4 l	Euro V	2011	2014												8370
Passenger Cars	Gasoline 1,4 - 2,0 l	PRE ECE	0	1969	10220	9650	9530	9316	9097	8503	8084	7895	7552	7089	6709	6485
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/00-01	1970	1978	13081	12346	12134	11813	11464	10646	10046	9718	9240	8648	8162	7878
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/02	1979	1980	14571	13790	13616	13328	13000	12149	11532	11249	10750	10094	9547	9234
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/03	1981	1985	16263	15472	15294	14954	14598	13645	12974	12546	12056	11321	10707	10328
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/04	1986	1990	17996	17104	16933	16588	16228	15198	14463	14063	13490	12683	12006	11612
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro I	1991	1996	21009	19937	19700	19272	18814	17596	16735	16302	15637	14717	13952	13515
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro II	1997	2000	21345	22234	21970	21486	20974	19590	18608	18140	17353	16292	15421	14917
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro III	2001	2005		11900	17421	20042	20206	19497	20975	20404	19538	18350	17368	16790
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro IV	2006	2010							11301	17022	18920	19048	18224	18724
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro V	2011	2014												10259
Passenger Cars	Gasoline >2,0 l	PRE ECE	0	1969	11256	10612	10490	10286	10094	9471	9056	8887	8517	8001	7560	7298

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Passenger Cars	Gasoline >2,0 l	ECE 15/00-01	1970	1978	14494	13699	13483	13160	12859	11913	11178	10796	10239	9577	9056	8772
Passenger Cars	Gasoline >2,0 l	ECE 15/02	1979	1980	16276	15350	15173	14800	14491	13543	12867	12585	12030	11282	10668	10349
Passenger Cars	Gasoline >2,0 l	ECE 15/03	1981	1985	17996	16990	16809	16437	16044	14973	14212	13896	13258	12428	11749	11348
Passenger Cars	Gasoline >2,0 l	ECE 15/04	1986	1990	20448	19316	19095	18692	18263	17058	16200	15842	15136	14196	13447	12994
Passenger Cars	Gasoline >2,0 l	Euro I	1991	1996	23620	22337	22055	21563	21055	19673	18688	18221	17420	16352	15479	14966
Passenger Cars	Gasoline >2,0 l	Euro II	1997	2000	23104	25210	24888	24327	23743	22171	21051	20459	19587	18390	17403	16819
Passenger Cars	Gasoline >2,0 l	Euro III	2001	2005		13436	19511	21922	22038	21478	23713	23009	22027	20685	19578	18918
Passenger Cars	Gasoline >2,0 l	Euro IV	2006	2010							12721	19291	21427	21775	20931	20914
Passenger Cars	Gasoline >2,0 l	Euro V	2011	2014												11522
Passenger Cars	Diesel <2,0 l	Conventional	0	1990	33576	30320	29620	30616	30541	29274	27667	23427	23916	21981	21126	20803
Passenger Cars	Diesel <2,0 l	Euro I	1991	1996	40681	36095	35037	36004	35733	33901	31747	28409	27772	25286	24295	23894
Passenger Cars	Diesel <2,0 l	Euro II	1997	2000	40929	43589	40975	41459	40981	38490	35716	33029	31677	28700	27582	27090
Passenger Cars	Diesel <2,0 l	Euro III	2001	2005		23303	31765	37349	37728	36433	39515	36871	34916	31565	30375	29827
Passenger Cars	Diesel <2,0 l	Euro IV	2006	2010							21480	29332	32800	33111	32533	32733
Passenger Cars	Diesel <2,0 l	Euro V	2011	2014							21480	25821	25583	28229	27590	29115
Passenger Cars	Diesel >2,0 l	Conventional	0	1990	32406	28491	27934	28895	28837	27142	25197	24549	22627	20334	19582	19188
Passenger Cars	Diesel >2,0 l	Euro I	1991	1996	41514	35904	34534	35189	34697	32384	29921	29322	26849	24114	23222	22835
Passenger Cars	Diesel >2,0 l	Euro II	1997	2000	64157	62353	48680	43211	40595	37256	34105	32070	30144	27137	26090	25616
Passenger Cars	Diesel >2,0 l	Euro III	2001	2005		42645	58024	62470	56785	51340	50047	39522	35121	31008	29517	28759
Passenger Cars	Diesel >2,0 l	Euro IV	2006	2010							33573	45594	49366	41890	36999	33697
Passenger Cars	Diesel >2,0 l	Euro V	2011	2014							33573	39886	44536	43272	42750	40507
Passenger Cars	LPG cars	Conventional	0	1990	25035	22418	21855	20931	20412	19102	18167	15996	15410	14326	13025	12567
Passenger Cars	LPG cars	Euro I	1991	1996	31571	28390	28004	28497	27887	25940	24515	23370	22331	20959	20113	20048
Passenger Cars	LPG cars	Euro II	1997	2000			31543	30761	29821	29709	29758			24510	22858	21123
Passenger Cars	LPG cars	Euro III	2001	2005								18336	26500	27191	25594	23268
Passenger Cars	LPG cars	Euro IV	2006	2010										14393	27297	25736
Passenger Cars	2-Stroke	Conventional	0	9999	13028	12293	12156	11894	11613							
Passenger Cars	Electric cars	Conventional	0	9999	13436	12365	12490	12257	11684	10975	10426	8917	9620	8680	9556	7705
Light Duty Vehicles	Gasoline <3,5t	Conventional	0	1994	18154	19778	19001	19450	19474	17899	16253	17311	14360	13385	13436	13580
Light Duty Vehicles	Gasoline <3,5t	Euro I	1995	1998	22874	24599	23424	23810	23756	21766	19769	21134	17721	16735	17153	17819
Light Duty Vehicles	Gasoline <3,5t	Euro II	1999	2001	19214	22707	26152	26569	26492	24254	22023	23524	19716	18602	19056	19775
Light Duty Vehicles	Gasoline <3,5t	Euro III	2002	2006			13988	21161	23023	22864	22432	27181	22788	21491	22022	22867
Light Duty Vehicles	Gasoline <3,5t	Euro IV	2007	2011								14897	22787	23547	23644	24729
Light Duty Vehicles	Diesel <3,5t	Conventional	0	1994	25174	23502	22537	22743	22326	20930	19308	19880	17959	16965	16684	16803
Light Duty Vehicles	Diesel <3,5t	Euro I	1995	1998	33611	30983	29452	29494	28811	26889	24815	25562	23119	21855	21559	21835
Light Duty Vehicles	Diesel <3,5t	Euro II	1999	2001	27910	29281	33835	33865	33065	30820	28434	29271	26470	24993	24653	24954
Light Duty Vehicles	Diesel <3,5t	Euro III	2002	2006			18329	27834	29420	29370	28935	35060	31744	29979	29588	29951

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Light Duty Vehicles	Diesel <3,5t	Euro IV	2007	2011								19433	29809	33261	32377	30392
Light Duty Vehicles	Diesel <3,5t	Euro V	2012	2015							18124	23184	27549	32761	30052	34949
Light Duty Vehicles	LPG <3,5t	Conventional	0	1994	16709	15380	14696	13672	12036	10285	10196	9921	8503	8514	8262	8208
Light Duty Vehicles	LPG <3,5t	Euro I	1995	1998	29698	26885										
Light Duty Vehicles	LPG <3,5t	Euro II	1999	2001	16112				26629	23991	23207	23507	22231	21368	20736	21154
Light Duty Vehicles	LPG <3,5t	Euro III	2002	2006							21649	26766	25744	25597	25096	25066
Light Duty Vehicles	LPG <3,5t	Euro IV	2007	2011								15016	23865	28615	27958	27870
Light Duty Vehicles	Electric <3,5t	Conventional	0	9999	11035								11793	9576	11670	8846
Heavy Duty Vehicles	Gasoline >3,5t	Conventional	0	9999	17791	19056	19934	19709	19742	17893	19716	22000	19116	17631	18400	18047
Heavy Duty Vehicles	Diesel RT 3,5 - 7,5t	Conventional	0	1993	16445	17543	15876	15337	15061	11861	10362	9318	7530	5964	5553	5434
Heavy Duty Vehicles	Diesel RT 3,5 - 7,5t	Euro I	1994	1996	30102	31774	28649	27656	27107	21485	19217	17634	14652	11982	11561	11396
Heavy Duty Vehicles	Diesel RT 3,5 - 7,5t	Euro II	1997	2001	36137	41394	39137	37782	36999	29464	26383	24094	20072	16417	15837	15657
Heavy Duty Vehicles	Diesel RT 3,5 - 7,5t	Euro III	2002	2006		26588	33480	40500	43882	36874	36323	35921	29987	24554	23721	23495
Heavy Duty Vehicles	Diesel RT 3,5 - 7,5t	Euro IV	2007	2009							24001	26731	29939	30677	32341	32808
Heavy Duty Vehicles	Diesel RT 3,5 - 7,5t	Euro V	2010	2013								23779	28627	22299	22653	29806
Heavy Duty Vehicles	Diesel RT 7,5 - 12t	Conventional	0	1993	19688	20984	19013	18465	18103	14274	12566	11265	9023	7185	6579	6181
Heavy Duty Vehicles	Diesel RT 7,5 - 12t	Euro I	1994	1996	36679	38545	34796	33370	32677	25814	23023	21000	17393	14340	13775	13625
Heavy Duty Vehicles	Diesel RT 7,5 - 12t	Euro II	1997	2001	43223	49555	47447	45921	45180	35896	32099	29322	24495	20203	19343	19225
Heavy Duty Vehicles	Diesel RT 7,5 - 12t	Euro III	2002	2006		32725	41476	50509	52524	44269	43033	43482	36702	30471	29301	29098
Heavy Duty Vehicles	Diesel RT 7,5 - 12t	Euro IV	2007	2009		32061	57783	47662	46639	34558	29654	34267	37245	39008	39254	39199
Heavy Duty Vehicles	Diesel RT 7,5 - 12t	Euro V	2010	2013				47007	45998	36346	30756	29394	30983	33151	36073	39498
Heavy Duty Vehicles	Diesel RT 12 - 14 t	Conventional	0	1993	17014	17184	15655	15090	14545	13349	11871	10782	8923	7214	6985	6916
Heavy Duty Vehicles	Diesel RT 12 - 14 t	Euro I	1994	1996	30398	30551	27535	26598	25491	23451	21003	18983	15793	12865	12366	12254
Heavy Duty Vehicles	Diesel RT 12 - 14 t	Euro II	1997	2001	37268	39757	36287	35138	33791	31320	28200	25799	21534	17354	16852	16838
Heavy Duty Vehicles	Diesel RT 12 - 14 t	Euro III	2002	2006		25920	33089	40212	40945	39571	40432	40241	33818	27544	26930	26793
Heavy Duty Vehicles	Diesel RT 12 - 14 t	Euro IV	2007	2009					43734	40250	31118	28109	33779	33685	37531	37096
Heavy Duty Vehicles	Diesel RT 12 - 14 t	Euro V	2010	2013									24276	34216	27991	36939
Heavy Duty Vehicles	Diesel RT 14 - 20t	Conventional	0	1993	31109	31331	28444	27721	26633	24681	21940	19831	16380	13172	12674	12404
Heavy Duty Vehicles	Diesel RT 14 - 20t	Euro I	1994	1996	53975	54009	48898	47549	45758	42114	37633	34224	28297	22988	22374	22090
Heavy Duty Vehicles	Diesel RT 14 - 20t	Euro II	1997	2001	63586	70374	66662	64731	62294	57524	51579	47173	39184	31942	31199	30936
Heavy Duty Vehicles	Diesel RT 14 - 20t	Euro III	2002	2006		46931	60755	68831	74223	72806	70587	71240	59503	48513	47602	47097
Heavy Duty Vehicles	Diesel RT 14 - 20t	Euro IV	2007	2009		45370	70731	71590	79327	62923	52170	54676	62799	62067	63294	62946
Heavy Duty Vehicles	Diesel RT 14 - 20t	Euro V	2010	2013						48905	53755	54175	55379	54616	59983	63998
Heavy Duty Vehicles	Diesel RT 20 - 26t	Conventional	0	1993	50533	44666	41037	40052	38113	34850	31039	28300	23318	18874	17970	17565
Heavy Duty Vehicles	Diesel RT 20 - 26t	Euro I	1994	1996	84546	73900	67491	65832	62116	56677	50575	46333	38364	31410	30178	29708
Heavy Duty Vehicles	Diesel RT 20 - 26t	Euro II	1997	2001	99836	95945	91372	89216	84415	77114	68987	63415	52666	43254	41678	41359
Heavy Duty Vehicles	Diesel RT 20 - 26t	Euro III	2002	2006		63640	80312	96976	100654	97796	95269	98494	82191	67699	65637	65375

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Heavy Duty Vehicles	Diesel RT 20 - 26t	Euro IV	2007	2009		62331	106200	110591	97960	69168	76580	74076	84836	84214	85679	85268
Heavy Duty Vehicles	Diesel RT 20 - 26t	Euro V	2010	2013						66132	81225	74140	75826	73673	80026	85600
Heavy Duty Vehicles	Diesel RT 26 - 28t	Conventional	0	1993	52362	44907	42091	39952	37602	34341	30494	27804	23210	17896	18290	17904
Heavy Duty Vehicles	Diesel RT 26 - 28t	Euro I	1994	1996	86373	72817	66793	64783	59626	59907	52786	48130	39766	34528	32466	
Heavy Duty Vehicles	Diesel RT 26 - 28t	Euro II	1997	2001	107590	94748	86405	83804	79735	73072	64386	58250	50807	39541	43506	42588
Heavy Duty Vehicles	Diesel RT 26 - 28t	Euro III	2002	2006				65899	81573	110305	109028	99412	82135	67372	68856	67403
Heavy Duty Vehicles	Diesel RT 26 - 28t	Euro IV	2007	2009								63744	94030	90156	90862	90197
Heavy Duty Vehicles	Diesel RT 26 - 28t	Euro V	2010	2013								63744	105332	86399	92141	91450
Heavy Duty Vehicles	Diesel RT 28 - 32t	Conventional	0	1993	58423	51466	46804	45051	42989	39616	35598	31727	26593	21279	22326	20516
Heavy Duty Vehicles	Diesel RT 28 - 32t	Euro I	1994	1996	85322	74861	68990	67254	63066	57696	50798	46101	38055	31503	32021	31746
Heavy Duty Vehicles	Diesel RT 28 - 32t	Euro II	1997	2001	96164	97299	96133	93729	88555	81341	72092	66037	54787	45224	46486	45516
Heavy Duty Vehicles	Diesel RT 28 - 32t	Euro III	2002	2006		63351	82618	95960	100631	98268	93723	100403	84208	69485	71219	70044
Heavy Duty Vehicles	Diesel RT 28 - 32t	Euro IV	2007	2009			62509	84351	120737	69991	79477	74200	85018	84184	90853	89776
Heavy Duty Vehicles	Diesel RT 28 - 32t	Euro V	2010	2013							64317	71216	76365	74767	87119	86470
Heavy Duty Vehicles	Diesel RT >32t	Conventional	0	1993	59883	56173	51526	27600	26053	23966	18901	17234	14239			
Heavy Duty Vehicles	Diesel RT >32t	Euro I	1994	1996	78068	69948	69983	67877	63883	58545	51586	47036	38862	31877	35289	34544
Heavy Duty Vehicles	Diesel RT >32t	Euro II	1997	2001	82400	110744	105815									
Heavy Duty Vehicles	Diesel RT >32t	Euro III	2002	2006		62695	115016	98801	102382	87353	82924	79532	72786	75355	77015	86878
Heavy Duty Vehicles	Diesel RT >32t	Euro IV	2007	2009								63744	105332	86399		
Heavy Duty Vehicles	Diesel RT >32t	Euro V	2010	2013										86399	67234	76001
Heavy Duty Vehicles	Diesel TT/AT 28 - 34t	Conventional	0	1993	34185	32385	29357	28810	28173	26001	24008	22225	19255	14453	15121	15138
Heavy Duty Vehicles	Diesel TT/AT 28 - 34t	Euro I	1994	1996	58744	55294	50026	49040	48062	44237	40821	38102	33270	25433	26992	27284
Heavy Duty Vehicles	Diesel TT/AT 28 - 34t	Euro II	1997	2001	69250	72151	68282	66817	65430	60369	55618	52158	45767	35132	37566	38178
Heavy Duty Vehicles	Diesel TT/AT 28 - 34t	Euro III	2002	2006		48016	62116	70929	77866	76366	76129	78846	69452	53314	57281	57977
Heavy Duty Vehicles	Diesel TT/AT 28 - 34t	Euro IV	2007	2009		46419	72315	73777	83174	65902	56307	60541	73732	68421	76555	77768
Heavy Duty Vehicles	Diesel TT/AT 28 - 34t	Euro V	2010	2013						51220	57876	59782	64580	60067	72075	78521
Heavy Duty Vehicles	Diesel TT/AT 34 - 40t	Conventional	0	1993	56607	48077	43655	43069	41832	38101	36705	34495	30915	24057	26567	27421
Heavy Duty Vehicles	Diesel TT/AT 34 - 40t	Euro I	1994	1996	90653	78342	71103	70014	67577	61427	58753	54974	48605	37606	41688	43470
Heavy Duty Vehicles	Diesel TT/AT 34 - 40t	Euro II	1997	2001	102070	101110	96847	96455	93818	84960	83041	76848	67713	52214	57090	58941
Heavy Duty Vehicles	Diesel TT/AT 34 - 40t	Euro III	2002	2006		68202	86192	101468	108479	104411	116811	121725	109497	85410	94956	96276
Heavy Duty Vehicles	Diesel TT/AT 34 - 40t	Euro IV	2007	2009		64092	96734	118167	90867	76442	88994	87257	109238	102241	119506	124049
Heavy Duty Vehicles	Diesel TT/AT 34 - 40t	Euro V	2010	2013		63580	116831	116468		69664	89280	89869	107631	99141	120166	128174
Heavy Duty Vehicles	Diesel TT/AT 40 - 50t	Conventional	0	1993	72647	75948	68701	65405	60947	53747	51070	45604	37407	32816	30488	30398
Heavy Duty Vehicles	Diesel TT/AT 40 - 50t	Euro I	1994	1996	105647	110617	100499	96294	90185	80348	76061	69454	57645	53343	51893	53997
Heavy Duty Vehicles	Diesel TT/AT 40 - 50t	Euro II	1997	2001	115303	139815	136603	131793	123967	111137	104863	94429	77270	70738	66552	67236
Heavy Duty Vehicles	Diesel TT/AT 40 - 50t	Euro III	2002	2006		90126	110882	129505	134258	129075	135512	141073	118856	111018	106805	108086
Heavy Duty Vehicles	Diesel TT/AT 40 - 50t	Euro IV	2007	2009		87846	102383	148243	155103	90057	103868	96801	114091	130330	132590	137347

Continued

Heavy Duty Vehicles	Diesel TT/AT 40 - 50t	Euro V	2010	2013		87846	123079	159624	150766	129406	90085	93658	109621	120985	124709	130842
Heavy Duty Vehicles	Diesel TT/AT 50 - 60t	Euro I	1994	1996	103981	113672	103575	99529	94007	83724						
Heavy Duty Vehicles	Diesel TT/AT 50 - 60t	Euro II	1997	2001	129273	141320	128768	123738	116872	104089	100961	91257	76772	72020	70447	72774
Heavy Duty Vehicles	Diesel TT/AT 50 - 60t	Euro IV	2007	2009								87678	147521	138390	135367	
Heavy Duty Vehicles	Diesel TT/AT >60t	Euro V	2010	2013									79313	102938		93469
Buses	Gasoline Urban Buses	Conventional	0	9999	19189	18986	18527	18229	16904	23314	23365	43037	39450	42101	37626	33814
Buses	Diesel Urban Buses <15t	Conventional	0	1993	73653	69434	65512	62869	59217	54324	48727	45021	43178	37467	33574	31068
Buses	Diesel Urban Buses <15t	Euro I	1994	1996	116876	108504	100855	96615	91447	82804	75911	72093	66241	58294	52809	49467
Buses	Diesel Urban Buses <15t	Euro II	1997	2001	132881	131765	127741	123123	116884	105611	97390	92615	84837	76393	70779	67343
Buses	Diesel Urban Buses <15t	Euro III	2002	2006			81799	110519	130228	125992	126971	137466	126205	110310	100831	96471
Buses	Diesel Urban Buses <15t	Euro IV	2007	2009								84356	113987	117263	134824	126662
Buses	Diesel Urban Buses <15t	Euro V	2010	2013											77230	120259
Buses	Diesel Urban Buses 15 - 18t	Conventional	0	1993	72388	67834	64300	62183	59004	53563	50338	48011	44752	39939	37263	35416
Buses	Diesel Urban Buses 15 - 18t	Euro I	1994	1996	115612	106730	98826	94288	89478	81047	74952	71418	65511	57764	53020	49256
Buses	Diesel Urban Buses 15 - 18t	Euro II	1997	2001	129296	130404	130450	125233	118888	107418	99045	94497	87282	76887	70623	66676
Buses	Diesel Urban Buses 15 - 18t	Euro III	2002	2006			81799	130278	136587	130576	121207	135753	125167	110092	100595	94266
Buses	Diesel Urban Buses 15 - 18t	Euro IV	2007	2009								84356	107458	112364	136681	128517
Buses	Diesel Urban Buses 15 - 18t	Euro V	2010	2013											77230	114002
Buses	Diesel Urban Buses >18t	Conventional	0	1993	86232	80591	76026	73295	68929	63633	59135	54366	52505	43476	37740	37962
Buses	Diesel Urban Buses >18t	Euro I	1994	1996	112230	104678	99624	95518	90585	82076	75583	73659	61921	54011	48366	45484
Buses	Diesel Urban Buses >18t	Euro II	1997	2001	103121	119160	142657	136759	129386	117175	107649	102768	94303	83549	76169	72318
Buses	Diesel Urban Buses >18t	Euro III	2002	2006			81799	126939	131057	135364	127986	132072	122172	107733	98514	92787
Buses	Diesel Urban Buses >18t	Euro IV	2007	2009								84356	119620	124409	132905	125046
Buses	Diesel Urban Buses >18t	Euro V	2010	2013											77230	117893
Buses	Gasoline Coaches	Conventional	0	9999	18802	18334	17808	18003	18130	17036	15686	15234	13947	12231	12034	11786
Buses	Diesel Coaches <15t	Conventional	0	1993	27544	26909	26105	26427	26500	24591	22591	21825	19930	17377	16984	16400
Buses	Diesel Coaches <15t	Euro I	1994	1996	35538	34219	32903	33004	32917	30447	27853	26840	24534	21441	21009	20337
Buses	Diesel Coaches <15t	Euro II	1997	2001	37423	38017	40127	40132	39966	37008	33929	32776	30009	26247	25717	24865
Buses	Diesel Coaches <15t	Euro III	2002	2006			23548	37249	40567	40570	39360	42272	38603	33725	33052	31985
Buses	Diesel Coaches <15t	Euro IV	2007	2009								24634	33408	33289	40587	39171
Buses	Diesel Coaches <15t	Euro V	2010	2013											22437	34970
Buses	Diesel Coaches 15 - 18t	Conventional	0	1993	37170	36107	35319	35773	35947	33826	31265	30459	28069	24894	24629	24278
Buses	Diesel Coaches 15 - 18t	Euro I	1994	1996	58735	56436	54101	54280	54062	49989	45588	43921	40032	35102	34267	33076
Buses	Diesel Coaches 15 - 18t	Euro II	1997	2001	60166	63339	66087	66372	66028	60807	55477	53467	48967	42780	42026	40795
Buses	Diesel Coaches 15 - 18t	Euro III	2002	2006			38738	56023	71744	69900	65548	68318	62135	54106	52898	51038
Buses	Diesel Coaches 15 - 18t	Euro IV	2007	2009								40525	50034	53913	67455	65143
Buses	Diesel Coaches 15 - 18t	Euro V	2010	2013											36910	65703

Continued

Buses	Diesel Coaches >18t	Conventional	0	1993	72196	69777	67607	68266	68697	63567	58276	56586	52124	45018	44693	43585
Buses	Diesel Coaches >18t	Euro I	1994	1996	93670	90313	87156	87123	86554	79727	73302	70445	64494	56308	55229	53135
Buses	Diesel Coaches >18t	Euro II	1997	2001	95282	97545	107393	107800	107497	98908	89946	86398	79156	69549	68172	66145
Buses	Diesel Coaches >18t	Euro III	2002	2006			61628	85949	104851	104268	104847	110990	101402	88629	86988	83703
Buses	Diesel Coaches >18t	Euro IV	2007	2009								64471	90854	92634	105601	102184
Buses	Diesel Coaches >18t	Euro V	2010	2013											58720	89679
Mopeds	<50 cm³	Conventional	0	1999	2010	1565	1592	1582	1545	1511	1509	1499	1503	1483	1450	1421
Mopeds	<50 cm³	Euro I	2000	2003	1076	1330	1516	1594	1703	1665	1663	1651	1656	1633	1597	1564
Mopeds	<50 cm³	Euro II	2004	9999					915	1309	1492	1587	1682	1729	1724	1719
Motorcycles	2-stroke >50 cm³	Conventional	0	1999	5740	5283	5051	4711	4285	3874	3541	3265	3029	2780	2762	2716
Motorcycles	2-stroke >50 cm³	Euro I	2000	2003	4322	6296	6495	6372	6666	5981	5415	4944	4562	4182	4153	4081
Motorcycles	2-stroke >50 cm³	Euro II	2004	2006					3555	4477	4604	5442	5021	4602	4569	4489
Motorcycles	2-stroke >50 cm³	Euro III	2007	9999								2846	4195	4414	4592	4631
Motorcycles	4-stroke <250 cm³	Conventional	0	1999	5740	5283	5051	4711	4285	3874	3541	3265	3029	2780	2762	2716
Motorcycles	4-stroke <250 cm³	Euro I	2000	2003	4322	6296	6495	6372	6666	5981	5415	4944	4562	4182	4153	4081
Motorcycles	4-stroke <250 cm³	Euro II	2004	2006					3555	4477	4604	5442	5021	4602	4569	4489
Motorcycles	4-stroke <250 cm³	Euro III	2007	9999								2846	4195	4414	4592	4631
Motorcycles	4-stroke 250 - 750 cm³	Conventional	0	1999	5740	5283	5051	4711	4285	3874	3541	3265	3029	2780	2762	2716
Motorcycles	4-stroke 250 - 750 cm³	Euro I	2000	2003	4322	6296	6495	6372	6666	5981	5415	4944	4562	4182	4153	4081
Motorcycles	4-stroke 250 - 750 cm³	Euro II	2004	2006					3555	4477	4604	5442	5021	4602	4569	4489
Motorcycles	4-stroke 250 - 750 cm³	Euro III	2007	9999								2846	4195	4414	4592	4631
Motorcycles	4-stroke >750 cm³	Conventional	0	1999	5740	5283	5051	4711	4285	3874	3541	3265	3029	2780	2762	2716
Motorcycles	4-stroke >750 cm³	Euro I	2000	2003	4322	6296	6495	6372	6666	5981	5415	4944	4562	4182	4153	4081
Motorcycles	4-stroke >750 cm³	Euro II	2004	2006					3555	4477	4604	5442	5021	4602	4569	4489
Motorcycles	4-stroke >750 cm³	Euro III	2007	9999								2846	4195	4414	4592	4631

Annex 2B-3: EU directive emission limits for road transportation vehicles

Annex 3: EU directive emission limits for road transportation vehicles

Private cars and light duty vehicles I (<1305 kg).

G prkm		EURO 1	EURO 2	EURO 3[1)]	EURO 4	EURO 5	EURO 6
Normal temp.							
CO	Gasoline	2.72	2.2	2.3	1.0	1.0	1.0
	Diesel	2.72	1.0	0.64	0.5	0.5	0.5
HC	Gasoline	-	-	0.20	0.10	0.1	0.1
NMHC	Gasoline	-	-	-	-	0.068	0.068
NO_x	Gasoline	-	-	0.15	0.08	0.06	0.06
	Diesel	-	-	0.5	0.25	0.18	0.08
HC+NO_x	Gasoline	0.97	0.5	-	-		-
	Diesel	0.97	0.7/0.9[2)]	0.56	0.30	0.23	0.17
Particulates	Diesel	0.14	0.08/0.10[2)]	0.05	0.025	0.005	0.005
Particulates (#)		-	-	-	-	-	$6x10^{11}$ [4)]
Low temp.							
CO	Gasoline	-	-	-	15	15	15
HC	Gasoline	-	-	-	1.8	1.8	1.8
Evaporation							
HC[3)]	Gasoline	2.0	2.0	2.0	2.0	2.0	2.0

[1)] Changed test procedure at normal temperatures (40 s warm-up phase omitted) and for evaporation measurements. [2)] Less stringent emission limits for direct injection diesel engines. [3)] Unit: g/test. [4)] Applicable for diesel and gasoline direct injection (GDI). $6x10^{12}$ within first three years of Euro 6 effective dates

Light duty vehicles II (1305-1760 kg)

G pr km		EURO 1	EURO 2	EURO 3[1)]	EURO 4	EURO 5	EURO 6
Normal temp.							
CO	Gasoline	5.17	4.0	4.17	1.81	1.81	1.81
	Diesel	5.17	1.25	0.80	0.63	0.63	0.63
HC	Gasoline	-	-	0.25	0.13	0.13	0.13
NMHC	Gasoline	-	-	-	-	0.9	0.9
NO_x	Gasoline	-	-	0.18	0.10	0.75	0.75
	Diesel	-	-	0.65	0.33	0.235	0.105
HC+NO_x	Gasoline	1.4	0.6	-	-	-	-
	Diesel	1.4	1.0/1.3[2)]	0.72	0.39	0.295	0.195
Particulates	Gasoline					0.005	0.005
	Diesel	0.19	0.12/0.14[2)]	0.07	0.04	0.005	0.005
Particulates (#)		-	-	-	-	-	$6x10^{11}$ [4)]
Low temp.							
CO	Gasoline	-	-	-	24	24	24
HC	Gasoline	-	-		2.7	2.7	2.7
Evaporation							
HC[3)]	Gasoline	2.0	2.0	2.0	2.0	2.0	2.0

[1)] Changed test procedure at normal temperatures (40 s warm-up phase omitted) and for evaporation measurements. [2)] Less stringent emission limits for direct injection diesel engines. [3)] Unit: g/test. [4)] Applicable for diesel and gasoline direct injection (GDI). $6x10^{12}$ within first three years of Euro 6 effective dates

Light duty vehicles III (>1760 kg).

G pr km		EURO 1	EURO 2	EURO 3[1]	EURO 4	EURO 5	EURO 6
Normal temp.							
CO	Gasoline	6.9	5.0	5.22	2.27	2.27	2.27
	Diesel	6.9	1.5	0.95	0.74	0.74	0.74
HC	Gasoline	-	-	0.29	0.16	0.16	0.16
NMHC	Gasoline					0.108	0.108
NO_x	Gasoline	-	-	0.21	0.11	0.082	0.082
	Diesel	-	-	0.78	0.39	0.28	0.125
$HC+NO_x$	Gasoline	1.7	0.7	-	-	-	-
	Diesel	1.7	1.2/1.6[2]	0.86	0.46	0.35	0.215
Particulates	Gasoline					0.005	0.005
	Diesel	0.25	0.17/0.20[2]	0.10	0.06	0.005	0.005
Particulates (#)		-	-	-	-	-	$6x10^{11}$[4]
Low temp.							
CO	Gasoline	-	-	-	30	30	30
HC	Gasoline	-	-	-	3.2	3.2	3.2
Evaporation							
HC[3]	Gasoline	2.0	2.0	2.0	2.0	2.0	2.0

[1] Changed test procedure at normal temperatures (40 s warm-up phase omitted) and for evaporation measurements. [2] Less stringent emission limits for direct injection diesel engines. [3] Unit: g/test. [4] Applicable for diesel and gasoline direct injection (GDI). $6x10^{12}$ within first three years of Euro 6 effective dates.

Heavy duty diesel vehicles.

(g pr kWh)		EURO I	EURO II	EURO III	EURO IV	EURO V	EURO VI	EEV[2]
	Test[1]	1993	1996	2001	2006	2009	2014	2000
CO	ECE/ESC	4.5	4.0	2.1	1.5	1.5	1.5	1.5
	ETC	-	-	(5.45)	4.0	4.0	4.0	3.0
HC	ECE/ESC	1.1	1.1	0.66	0.46	0.46	0.13	0.25
	ETC	-	-	(0.78)	0.55	0.55	0.16	0.40
NO_x	ECE/ESC	8.0	7.0	5.0	3.5	2.0	0.4	2.0
	ETC	-	-	(5.0)	3.5	2.0	0.4	2.0
Particulates[3]	ECE/ESC	0.36/0.61	0.15/0.25	0.10/0.13	0.02	0.02	0.01	0.02
	ETC	-	-	(0.16/0.21)	0.03	0.03	0.01	0.02
	ELR	-	-	0.8	0.5	0.5		0.15
NH_3	ECE/ESC						10 (ppm)	
	ETC						10 (ppm)	

[1] Test procedure: Euro 1 og Euro 2: ECE (stationary)

Euro 3: ESC (stationary) + ELR (load response)

Euro 4, Euro 5 og EEV: ESC (stationary) + ETC (transient) + ELR (load response)

[2] EEV: Emission limits for extra environmental friendly vehicles, used as a basis for economical incitaments (gas fueled vehicles).

[3] For Euro 1, Euro 2 og Euro 3 less stringent emission limits apply for small engines:

Euro 1: <85 kW

Euro 2: <0,7 l

Euro 3: <0,75 l

Annex 2B-4: Basis emission factors (g pr km)

Sector	Subsector	Tech 2	FYear	LYear	FCu	FCr	FCh	COu	COr	COh	PMu	PMr	PMh	NOxu	NOxr	NOxh
Passenger Cars	Gasoline <1,4 l	PRE ECE	0	1969	67,499	55,000	62,743	27,505	19,333	15,520	0,063	0,044	0,041	1,849	2,062	2,023
Passenger Cars	Gasoline <1,4 l	ECE 15/00-01	1970	1978	58,240	44,460	48,600	18,966	14,480	18,620	0,063	0,044	0,041	1,849	2,062	2,023
Passenger Cars	Gasoline <1,4 l	ECE 15/02	1979	1980	53,248	45,170	51,200	15,859	8,200	8,260	0,063	0,044	0,041	1,619	2,102	2,909
Passenger Cars	Gasoline <1,4 l	ECE 15/03	1981	1985	53,248	45,170	51,200	16,752	8,793	7,620	0,042	0,029	0,029	1,680	2,253	3,276
Passenger Cars	Gasoline <1,4 l	ECE 15/04	1986	1990	51,420	43,440	47,700	9,087	4,956	4,292	0,030	0,020	0,020	1,691	2,089	2,662
Passenger Cars	Gasoline <1,4 l	Euro I	1991	1996	47,399	41,954	46,055	1,765	1,372	1,765	0,003	0,002	0,002	0,273	0,281	0,458
Passenger Cars	Gasoline <1,4 l	Euro II	1997	2000	46,486	39,509	44,016	0,659	0,575	0,749	0,003	0,002	0,002	0,154	0,154	0,181
Passenger Cars	Gasoline <1,4 l	Euro III	2001	2005	48,687	42,255	45,323	0,519	0,691	1,148	0,001	0,001	0,001	0,076	0,060	0,052
Passenger Cars	Gasoline <1,4 l	Euro IV	2006	2010	50,038	44,193	48,285	0,195	0,287	0,529	0,001	0,001	0,001	0,054	0,030	0,019
Passenger Cars	Gasoline <1,4 l	Euro V	2011	2014	50,038	44,193	48,285	0,195	0,287	0,529	0,001	0,001	0,001	0,041	0,023	0,014
Passenger Cars	Gasoline 1,4 - 2,0 l	PRE ECE	0	1969	79,277	67,000	76,386	27,505	19,333	15,520	0,063	0,044	0,041	2,164	2,683	3,130
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/00-01	1970	1978	67,779	51,090	60,300	18,966	14,480	18,620	0,063	0,044	0,041	2,164	2,683	3,130
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/02	1979	1980	61,731	50,686	59,680	15,859	8,200	8,260	0,063	0,044	0,041	1,831	2,377	3,283
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/03	1981	1985	61,731	50,686	59,680	16,752	8,793	7,620	0,042	0,029	0,029	1,917	2,580	3,472
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/04	1986	1990	61,652	49,112	52,052	9,087	4,956	4,292	0,030	0,020	0,020	2,122	2,757	3,524
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro I	1991	1996	57,521	48,522	51,518	1,765	1,372	1,765	0,003	0,002	0,002	0,273	0,281	0,458
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro II	1997	2000	56,324	47,687	48,786	0,659	0,575	0,749	0,003	0,002	0,002	0,154	0,154	0,181
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro III	2001	2005	58,259	49,897	53,092	0,519	0,691	1,148	0,001	0,001	0,001	0,076	0,060	0,052
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro IV	2006	2010	60,486	52,793	55,293	0,195	0,287	0,529	0,001	0,001	0,001	0,054	0,030	0,019
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro V	2011	2014	60,486	52,793	55,293	0,195	0,287	0,529	0,001	0,001	0,001	0,041	0,023	0,014
Passenger Cars	Gasoline >2,0 l	PRE ECE	0	1969	96,536	80,000	88,267	27,505	19,333	15,520	0,063	0,044	0,041	2,860	4,090	5,500
Passenger Cars	Gasoline >2,0 l	ECE 15/00-01	1970	1978	73,798	57,090	66,300	18,966	14,480	18,620	0,063	0,044	0,041	2,860	4,090	5,500
Passenger Cars	Gasoline >2,0 l	ECE 15/02	1979	1980	75,270	63,260	70,700	15,859	8,200	8,260	0,063	0,044	0,041	2,066	2,675	3,680
Passenger Cars	Gasoline >2,0 l	ECE 15/03	1981	1985	75,270	63,260	70,700	16,752	8,793	7,620	0,042	0,029	0,029	2,806	3,441	4,604
Passenger Cars	Gasoline >2,0 l	ECE 15/04	1986	1990	71,055	58,080	69,900	9,087	4,956	4,292	0,030	0,020	0,020	2,293	2,750	3,687
Passenger Cars	Gasoline >2,0 l	Euro I	1991	1996	74,616	61,902	65,020	1,765	1,372	1,765	0,003	0,002	0,002	0,273	0,281	0,458
Passenger Cars	Gasoline >2,0 l	Euro II	1997	2000	76,837	65,226	66,732	0,659	0,575	0,749	0,003	0,002	0,002	0,154	0,154	0,181
Passenger Cars	Gasoline >2,0 l	Euro III	2001	2005	70,798	57,424	56,826	0,519	0,691	1,148	0,001	0,001	0,001	0,076	0,060	0,052
Passenger Cars	Gasoline >2,0 l	Euro IV	2006	2010	86,099	67,877	65,859	0,195	0,287	0,529	0,001	0,001	0,001	0,054	0,030	0,019
Passenger Cars	Gasoline >2,0 l	Euro V	2011	2014	86,099	67,877	65,859	0,195	0,287	0,529	0,001	0,001	0,001	0,041	0,023	0,014
Passenger Cars	Diesel <2,0 l	Conventional	0	1990	57,529	41,209	50,089	0,651	0,472	0,384	0,199	0,132	0,170	0,520	0,433	0,528
Passenger Cars	Diesel <2,0 l	Euro I	1991	1996	47,836	42,807	48,388	0,419	0,215	0,208	0,057	0,062	0,107	0,603	0,562	0,663
Passenger Cars	Diesel <2,0 l	Euro II	1997	2000	50,442	44,117	48,779	0,343	0,110	0,035	0,047	0,039	0,050	0,651	0,555	0,665

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Passenger Cars	Diesel <2,0 l	Euro III	2001	2005	48,920	43,427	45,585	0,099	0,041	0,012	0,029	0,030	0,045	0,716	0,665	0,750
Passenger Cars	Diesel <2,0 l	Euro IV	2006	2010	48,920	43,427	45,585	0,083	0,034	0,021	0,029	0,024	0,026	0,539	0,424	0,576
Passenger Cars	Diesel <2,0 l	Euro V	2011	2014	48,920	43,427	45,585	0,083	0,034	0,021	0,006	0,005	0,005	0,388	0,305	0,415
Passenger Cars	Diesel >2,0 l	Conventional	0	1990	57,529	41,209	50,089	0,651	0,472	0,384	0,199	0,132	0,170	0,824	0,723	0,861
Passenger Cars	Diesel >2,0 l	Euro I	1991	1996	65,267	58,299	64,360	0,419	0,215	0,208	0,057	0,062	0,107	0,603	0,562	0,663
Passenger Cars	Diesel >2,0 l	Euro II	1997	2000	65,267	58,299	64,360	0,343	0,110	0,035	0,047	0,039	0,050	0,651	0,555	0,665
Passenger Cars	Diesel >2,0 l	Euro III	2001	2005	65,267	58,299	64,360	0,099	0,041	0,012	0,029	0,030	0,045	0,716	0,665	0,750
Passenger Cars	Diesel >2,0 l	Euro IV	2006	2010	65,267	58,299	64,360	0,083	0,034	0,021	0,029	0,024	0,026	0,539	0,424	0,576
Passenger Cars	Diesel >2,0 l	Euro V	2011	2014	65,267	58,299	64,360	0,083	0,034	0,021	0,006	0,005	0,005	0,388	0,305	0,415
Passenger Cars	LPG cars	Conventional	0	1990	59,000	45,000	54,000	2,043	2,373	9,723	0,040	0,030	0,025	2,203	2,584	2,861
Passenger Cars	LPG cars	Euro I	1991	1996	49,145	45,155	54,125	1,310	1,445	3,560	0,040	0,030	0,025	0,340	0,283	0,298
Passenger Cars	LPG cars	Euro II	1997	2000	49,145	45,155	54,125	0,891	0,982	2,421	0,040	0,030	0,025	0,122	0,102	0,107
Passenger Cars	LPG cars	Euro III	2001	2005	49,145	45,155	54,125	0,733	0,809	1,993	0,040	0,030	0,025	0,082	0,068	0,071
Passenger Cars	LPG cars	Euro IV	2006	2010	49,145	45,155	54,125	0,445	0,491	1,210	0,040	0,030	0,025	0,044	0,037	0,039
Light Duty Vehicles	Gasoline <3,5t	Conventional	0	1994	82,270	59,883	56,470	14,925	6,075	7,389	0,040	0,040	0,040	2,671	3,118	3,387
Light Duty Vehicles	Gasoline <3,5t	Euro I	1995	1998	96,450	70,388	66,450	4,187	0,862	1,087	0,003	0,002	0,002	0,427	0,400	0,429
Light Duty Vehicles	Gasoline <3,5t	Euro II	1999	2001	96,450	70,388	66,450	2,554	0,526	0,663	0,003	0,002	0,002	0,145	0,136	0,146
Light Duty Vehicles	Gasoline <3,5t	Euro III	2002	2006	96,450	70,388	66,450	2,177	0,448	0,565	0,001	0,001	0,001	0,090	0,084	0,090
Light Duty Vehicles	Gasoline <3,5t	Euro IV	2007	2011	96,450	70,388	66,450	1,172	0,241	0,304	0,001	0,001	0,001	0,043	0,040	0,043
Light Duty Vehicles	Diesel <3,5t	Conventional	0	1994	76,718	65,934	72,142	1,124	1,009	1,060	0,285	0,303	0,322	1,673	0,843	0,834
Light Duty Vehicles	Diesel <3,5t	Euro I	1995	1998	68,860	58,185	63,660	0,393	0,328	0,423	0,070	0,066	0,090	1,138	0,975	1,022
Light Duty Vehicles	Diesel <3,5t	Euro II	1999	2001	68,860	58,185	63,660	0,393	0,328	0,423	0,070	0,066	0,090	1,138	0,975	1,022
Light Duty Vehicles	Diesel <3,5t	Euro III	2002	2006	68,860	58,185	63,660	0,322	0,269	0,347	0,047	0,044	0,061	0,956	0,819	0,859
Light Duty Vehicles	Diesel <3,5t	Euro IV	2007	2011	68,860	58,185	63,660	0,255	0,213	0,275	0,024	0,023	0,032	0,774	0,663	0,695
Light Duty Vehicles	Diesel <3,5t	Euro V	2012	2015	68,860	58,185	63,660	0,255	0,213	0,275	0,001	0,001	0,002	0,558	0,478	0,501
Light Duty Vehicles	LPG <3,5t	Conventional	0	1994	88,500	67,500	81,000	3,064	3,559	14,584	0,060	0,045	0,038	3,305	3,876	4,291
Light Duty Vehicles	LPG <3,5t	Euro II	1999	2001	73,718	67,733	81,188	1,336	1,474	3,631	0,060	0,045	0,038	0,183	0,153	0,161
Light Duty Vehicles	LPG <3,5t	Euro III	2002	2006	73,718	67,733	81,188	1,100	1,214	2,990	0,060	0,045	0,038	0,122	0,102	0,107
Light Duty Vehicles	LPG <3,5t	Euro IV	2007	2011	73,718	67,733	81,188	0,668	0,737	1,815	0,060	0,045	0,038	0,066	0,055	0,058
Heavy Duty Vehicles	Gasoline >3,5t	Conventional	0	9999	225,000	150,000	165,000	70,000	55,000	55,000	0,400	0,400	0,400	4,500	7,500	7,500
Heavy Duty Vehicles	Diesel RT 3,5 - 7,5t	Conventional	0	1993	125,002	110,985	112,984	2,060	1,509	1,351	0,321	0,240	0,216	4,211	4,104	4,476
Heavy Duty Vehicles	Diesel RT 3,5 - 7,5t	Euro I	1994	1996	100,036	91,682	104,222	0,668	0,501	0,546	0,126	0,095	0,090	2,939	2,938	3,316
Heavy Duty Vehicles	Diesel RT 3,5 - 7,5t	Euro II	1997	2001	94,988	88,592	101,003	0,534	0,466	0,461	0,059	0,053	0,061	3,223	3,118	3,414
Heavy Duty Vehicles	Diesel RT 3,5 - 7,5t	Euro III	2002	2006	101,379	92,883	105,924	0,660	0,481	0,452	0,067	0,048	0,041	2,499	2,300	2,498
Heavy Duty Vehicles	Diesel RT 3,5 - 7,5t	Euro IV	2007	2009	98,559	92,910	106,610	0,342	0,270	0,258	0,015	0,013	0,014	1,707	1,645	1,801
Heavy Duty Vehicles	Diesel RT 3,5 - 7,5t	Euro V	2010	2013	99,641	93,536	106,995	0,344	0,270	0,259	0,015	0,013	0,014	1,012	0,972	1,062

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Heavy Duty Vehicles	Diesel RT 7,5 - 12t	Conventional	0	1993	183,253	153,117	150,068	2,358	1,698	1,525	0,330	0,236	0,207	7,928	7,236	7,499
Heavy Duty Vehicles	Diesel RT 7,5 - 12t	Euro I	1994	1996	155,870	135,518	136,666	1,086	0,817	0,766	0,201	0,144	0,131	4,729	4,306	4,464
Heavy Duty Vehicles	Diesel RT 7,5 - 12t	Euro II	1997	2001	148,625	131,263	133,537	0,868	0,727	0,717	0,094	0,080	0,093	5,152	4,593	4,682
Heavy Duty Vehicles	Diesel RT 7,5 - 12t	Euro III	2002	2006	157,573	137,771	138,996	1,084	0,771	0,733	0,104	0,073	0,063	3,997	3,536	3,485
Heavy Duty Vehicles	Diesel RT 7,5 - 12t	Euro IV	2007	2009	151,450	136,152	138,554	0,553	0,418	0,369	0,023	0,019	0,019	2,728	2,512	2,488
Heavy Duty Vehicles	Diesel RT 7,5 - 12t	Euro V	2010	2013	153,617	137,425	139,289	0,560	0,421	0,374	0,023	0,019	0,019	1,647	1,483	1,468
Heavy Duty Vehicles	Diesel RT 12 - 14 t	Conventional	0	1993	198,513	163,310	159,212	2,546	1,876	1,693	0,351	0,254	0,233	8,826	7,718	7,748
Heavy Duty Vehicles	Diesel RT 12 - 14 t	Euro I	1994	1996	170,171	144,307	143,334	1,200	0,918	0,866	0,218	0,159	0,147	5,321	4,638	4,638
Heavy Duty Vehicles	Diesel RT 12 - 14 t	Euro II	1997	2001	163,223	140,030	139,590	0,985	0,820	0,804	0,103	0,087	0,103	5,815	4,975	4,889
Heavy Duty Vehicles	Diesel RT 12 - 14 t	Euro III	2002	2006	172,146	146,082	144,611	1,176	0,873	0,835	0,109	0,078	0,071	4,745	3,881	3,702
Heavy Duty Vehicles	Diesel RT 12 - 14 t	Euro IV	2007	2009	163,114	142,925	143,274	0,599	0,448	0,410	0,024	0,020	0,020	3,208	2,754	2,620
Heavy Duty Vehicles	Diesel RT 12 - 14 t	Euro V	2010	2013	165,111	144,096	144,035	0,606	0,452	0,413	0,025	0,020	0,020	1,909	1,634	1,552
Heavy Duty Vehicles	Diesel RT 14 - 20t	Conventional	0	1993	261,662	205,735	193,152	3,512	2,514	2,221	0,483	0,341	0,298	11,287	9,455	9,120
Heavy Duty Vehicles	Diesel RT 14 - 20t	Euro I	1994	1996	212,834	172,142	164,411	1,612	1,206	1,117	0,298	0,209	0,181	6,721	5,601	5,385
Heavy Duty Vehicles	Diesel RT 14 - 20t	Euro II	1997	2001	204,313	167,263	160,324	1,267	1,025	1,002	0,129	0,105	0,122	7,473	6,118	5,804
Heavy Duty Vehicles	Diesel RT 14 - 20t	Euro III	2002	2006	215,351	173,802	164,914	1,601	1,150	1,096	0,153	0,106	0,090	6,139	4,859	4,431
Heavy Duty Vehicles	Diesel RT 14 - 20t	Euro IV	2007	2009	201,093	168,074	161,976	0,829	0,602	0,523	0,031	0,024	0,023	4,079	3,400	3,171
Heavy Duty Vehicles	Diesel RT 14 - 20t	Euro V	2010	2013	205,393	169,743	162,354	0,869	0,625	0,536	0,032	0,025	0,023	2,460	2,028	1,883
Heavy Duty Vehicles	Diesel RT 20 - 26t	Conventional	0	1993	315,898	243,280	222,355	2,558	1,885	1,712	0,482	0,353	0,319	12,251	9,862	9,114
Heavy Duty Vehicles	Diesel RT 20 - 26t	Euro I	1994	1996	269,815	211,940	195,827	2,068	1,563	1,437	0,383	0,264	0,231	8,634	6,952	6,468
Heavy Duty Vehicles	Diesel RT 20 - 26t	Euro II	1997	2001	261,049	207,213	191,812	1,620	1,285	1,399	0,172	0,137	0,157	9,465	7,549	6,947
Heavy Duty Vehicles	Diesel RT 20 - 26t	Euro III	2002	2006	272,733	213,630	195,690	2,025	1,487	1,403	0,189	0,130	0,113	7,649	6,024	5,545
Heavy Duty Vehicles	Diesel RT 20 - 26t	Euro IV	2007	2009	257,598	207,458	192,565	1,003	0,728	0,628	0,041	0,031	0,028	5,146	4,223	3,967
Heavy Duty Vehicles	Diesel RT 20 - 26t	Euro V	2010	2013	260,560	209,253	193,919	1,015	0,735	0,634	0,041	0,031	0,028	3,062	2,508	2,353
Heavy Duty Vehicles	Diesel RT 26 - 28t	Conventional	0	1993	333,975	257,930	233,499	2,703	1,987	1,810	0,512	0,375	0,336	12,868	10,379	9,526
Heavy Duty Vehicles	Diesel RT 26 - 28t	Euro II	1997	2001	276,892	220,156	201,909	1,682	1,346	1,457	0,185	0,148	0,167	9,876	7,848	7,164
Heavy Duty Vehicles	Diesel RT 26 - 28t	Euro III	2002	2006	289,328	227,449	206,788	2,121	1,582	1,481	0,201	0,141	0,118	7,733	6,089	5,633
Heavy Duty Vehicles	Diesel RT 26 - 28t	Euro IV	2007	2009	277,178	222,906	203,989	1,044	0,752	0,640	0,044	0,033	0,029	5,258	4,284	4,029
Heavy Duty Vehicles	Diesel RT 26 - 28t	Euro V	2010	2013	280,496	224,942	205,435	1,056	0,760	0,647	0,044	0,033	0,029	3,127	2,544	2,388
Heavy Duty Vehicles	Diesel RT 28 - 32t	Conventional	0	1993	369,813	292,229	265,715	2,928	2,149	2,047	0,567	0,415	0,376	14,515	11,942	11,008
Heavy Duty Vehicles	Diesel RT 28 - 32t	Euro I	1994	1996	324,707	259,936	238,178	2,377	1,862	1,795	0,436	0,314	0,281	10,453	8,509	7,843
Heavy Duty Vehicles	Diesel RT 28 - 32t	Euro II	1997	2001	313,359	251,467	240,101	1,930	1,574	1,563	0,211	0,172	0,195	11,232	9,043	8,280
Heavy Duty Vehicles	Diesel RT 28 - 32t	Euro III	2002	2006	327,617	262,877	239,852	2,325	1,732	1,685	0,214	0,153	0,135	8,883	7,017	6,445
Heavy Duty Vehicles	Diesel RT 28 - 32t	Euro IV	2007	2009	316,735	259,706	237,679	1,145	0,834	0,714	0,049	0,038	0,034	5,978	5,101	4,533
Heavy Duty Vehicles	Diesel RT 28 - 32t	Euro V	2010	2013	320,475	262,095	239,548	1,159	0,844	0,722	0,049	0,038	0,034	3,554	3,030	2,690
Heavy Duty Vehicles	Diesel RT >32t	Euro I	1994	1996	328,394	256,124	232,416	2,482	1,894	1,795	0,453	0,317	0,286	10,614	8,446	7,666

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Heavy Duty Vehicles	Diesel RT >32t	Euro III	2002	2006	330,977	257,873	232,502	2,398	1,789	1,725	0,219	0,153	0,135	9,225	7,224	6,550
Heavy Duty Vehicles	Diesel RT >32t	Euro V	2010	2013	319,806	254,559	231,118	1,166	0,847	0,729	0,049	0,037	0,033	3,735	3,012	2,790
Heavy Duty Vehicles	Diesel TT/AT 28 - 34t	Conventional	0	1993	332,114	254,391	227,288	2,560	1,899	1,804	0,488	0,361	0,339	13,305	10,460	9,286
Heavy Duty Vehicles	Diesel TT/AT 28 - 34t	Euro I	1994	1996	297,033	229,431	205,352	2,173	1,665	1,602	0,380	0,277	0,261	9,509	7,408	6,570
Heavy Duty Vehicles	Diesel TT/AT 28 - 34t	Euro II	1997	2001	280,137	219,605	203,132	1,746	1,372	1,500	0,191	0,152	0,174	10,046	7,771	6,867
Heavy Duty Vehicles	Diesel TT/AT 28 - 34t	Euro III	2002	2006	294,936	228,574	203,723	2,067	1,559	1,515	0,184	0,132	0,120	8,110	6,154	5,397
Heavy Duty Vehicles	Diesel TT/AT 28 - 34t	Euro IV	2007	2009	283,202	224,159	200,624	0,990	0,709	0,618	0,043	0,031	0,028	5,531	4,329	3,837
Heavy Duty Vehicles	Diesel TT/AT 28 - 34t	Euro V	2010	2013	286,144	226,034	202,156	1,002	0,717	0,625	0,043	0,032	0,028	3,297	2,575	2,277
Heavy Duty Vehicles	Diesel TT/AT 34 - 40t	Conventional	0	1993	385,216	290,623	255,748	3,006	2,216	2,091	0,579	0,419	0,384	15,378	11,908	10,419
Heavy Duty Vehicles	Diesel TT/AT 34 - 40t	Euro I	1994	1996	338,164	257,767	227,915	2,561	1,946	1,861	0,464	0,324	0,293	10,891	8,408	7,387
Heavy Duty Vehicles	Diesel TT/AT 34 - 40t	Euro II	1997	2001	329,707	253,289	223,868	2,056	1,607	1,775	0,227	0,177	0,201	11,695	8,978	7,885
Heavy Duty Vehicles	Diesel TT/AT 34 - 40t	Euro III	2002	2006	341,490	259,512	227,377	2,453	1,826	1,775	0,223	0,155	0,136	9,414	7,197	6,354
Heavy Duty Vehicles	Diesel TT/AT 34 - 40t	Euro IV	2007	2009	327,133	254,126	224,236	1,157	0,830	0,704	0,050	0,036	0,032	6,398	5,061	4,523
Heavy Duty Vehicles	Diesel TT/AT 34 - 40t	Euro V	2010	2013	330,656	256,284	225,882	1,168	0,837	0,715	0,050	0,037	0,032	3,814	3,008	2,681
Heavy Duty Vehicles	Diesel TT/AT 40 - 50t	Conventional	0	1993	427,609	323,566	283,490	3,242	2,400	2,283	0,622	0,462	0,425	17,311	13,363	11,617
Heavy Duty Vehicles	Diesel TT/AT 40 - 50t	Euro I	1994	1996	376,029	287,195	252,542	2,823	2,135	2,079	0,500	0,358	0,333	12,142	9,377	8,189
Heavy Duty Vehicles	Diesel TT/AT 40 - 50t	Euro II	1997	2001	364,063	281,631	253,871	2,313	1,826	1,823	0,257	0,201	0,227	12,955	9,936	8,683
Heavy Duty Vehicles	Diesel TT/AT 40 - 50t	Euro III	2002	2006	380,024	289,287	252,570	2,675	1,999	1,959	0,240	0,170	0,146	10,432	7,969	6,995
Heavy Duty Vehicles	Diesel TT/AT 40 - 50t	Euro IV	2007	2009	367,275	285,007	249,788	1,241	0,894	0,759	0,054	0,040	0,035	7,035	5,657	4,952
Heavy Duty Vehicles	Diesel TT/AT 40 - 50t	Euro V	2010	2013	371,248	287,356	251,512	1,256	0,902	0,765	0,055	0,040	0,035	4,187	3,365	2,944
Heavy Duty Vehicles	Diesel TT/AT 50 - 60t	Euro II	1997	2001	439,443	338,240	299,997	2,783	2,192	2,191	0,317	0,246	0,275	15,566	11,836	10,222
Heavy Duty Vehicles	Diesel TT/AT >60t	Euro V	2010	2013	452,449	345,848	298,811	1,461	1,048	0,886	0,065	0,047	0,041	5,049	4,014	3,437
Buses	Gasoline Urban Buses	Conventional	0	9999	225,000	150,000	165,000	70,000	55,000	55,000	0,400	0,400	0,400	4,500	7,500	7,500
Buses	Diesel Urban Buses <15t	Conventional	0	1993	265,880	211,064	197,424	4,479	3,144	2,830	0,729	0,490	0,413	9,347	7,678	7,133
Buses	Diesel Urban Buses <15t	Euro I	1994	1996	214,880	174,564	162,024	1,568	1,120	0,981	0,261	0,199	0,178	6,945	5,531	4,861
Buses	Diesel Urban Buses <15t	Euro II	1997	2001	207,395	170,373	158,652	1,391	0,958	0,806	0,129	0,107	0,103	7,552	5,971	5,224
Buses	Diesel Urban Buses <15t	Euro III	2002	2006	219,770	179,899	167,027	1,509	1,028	0,926	0,130	0,100	0,093	6,425	4,515	3,631
Buses	Diesel Urban Buses <15t	Euro IV	2007	2009	204,146	174,431	172,127	0,800	0,542	0,422	0,032	0,025	0,022	4,076	3,101	2,593
Buses	Diesel Urban Buses <15t	Euro V	2010	2013	207,620	176,864	174,491	0,813	0,551	0,430	0,032	0,025	0,023	2,432	1,845	1,545
Buses	Diesel Urban Buses 15 - 18t	Conventional	0	1993	338,177	261,819	230,080	4,720	3,242	2,606	0,656	0,439	0,351	15,108	12,139	10,803
Buses	Diesel Urban Buses 15 - 18t	Euro I	1994	1996	288,515	228,326	202,771	2,204	1,612	1,330	0,359	0,258	0,226	9,289	7,392	6,426
Buses	Diesel Urban Buses 15 - 18t	Euro II	1997	2001	279,657	224,821	202,070	1,892	1,310	1,120	0,179	0,146	0,137	9,989	7,828	6,822
Buses	Diesel Urban Buses 15 - 18t	Euro III	2002	2006	293,115	235,088	211,025	2,070	1,382	1,257	0,174	0,132	0,115	8,427	6,044	4,919
Buses	Diesel Urban Buses 15 - 18t	Euro IV	2007	2009	276,404	230,306	217,637	1,045	0,709	0,556	0,044	0,033	0,028	5,452	4,181	3,521
Buses	Diesel Urban Buses 15 - 18t	Euro V	2010	2013	280,396	232,974	220,038	1,057	0,716	0,563	0,044	0,033	0,029	3,250	2,486	2,089
Buses	Diesel Urban Buses >18t	Conventional	0	1993	424,462	330,433	285,157	6,145	4,310	3,420	0,833	0,575	0,455	19,310	15,492	13,433

Continued

Buses	Diesel Urban Buses >18t	Euro I	1994	1996	369,176	292,254	253,780	2,882	2,132	1,965	0,451	0,336	0,311	11,840	9,361	8,043
Buses	Diesel Urban Buses >18t	Euro II	1997	2001	358,097	288,482	265,154	2,541	1,716	1,467	0,241	0,194	0,178	12,472	9,751	8,334
Buses	Diesel Urban Buses >18t	Euro III	2002	2006	373,469	299,269	262,705	2,691	1,778	1,703	0,209	0,151	0,142	10,561	7,685	6,305
Buses	Diesel Urban Buses >18t	Euro IV	2007	2009	359,379	300,406	272,408	1,287	0,869	0,664	0,054	0,039	0,032	7,106	5,505	4,635
Buses	Diesel Urban Buses >18t	Euro V	2010	2013	363,797	303,565	275,335	1,297	0,877	0,671	0,054	0,039	0,033	4,234	3,275	2,755
Buses	Gasoline Coaches	Conventional	0	9999	225,000	150,000	165,000	70,000	55,000	55,000	0,400	0,400	0,400	4,500	7,500	7,500
Buses	Diesel Coaches <15t	Conventional	0	1993	306,332	225,195	199,049	2,712	1,738	1,372	0,490	0,328	0,269	11,324	8,822	8,156
Buses	Diesel Coaches <15t	Euro I	1994	1996	280,973	207,851	184,178	2,199	1,466	1,186	0,395	0,260	0,209	8,768	6,699	6,147
Buses	Diesel Coaches <15t	Euro II	1997	2001	279,483	208,488	184,973	1,775	1,203	1,092	0,186	0,137	0,120	10,033	7,549	6,840
Buses	Diesel Coaches <15t	Euro III	2002	2006	303,872	224,218	197,656	2,308	1,464	1,283	0,223	0,145	0,115	8,591	6,046	5,368
Buses	Diesel Coaches <15t	Euro IV	2007	2009	290,989	221,962	197,681	1,241	0,813	0,689	0,048	0,034	0,030	5,666	4,225	3,842
Buses	Diesel Coaches <15t	Euro V	2010	2013	298,215	226,393	200,893	1,288	0,842	0,696	0,049	0,034	0,030	3,434	2,544	2,291
Buses	Diesel Coaches 15 - 18t	Conventional	0	1993	306,332	225,195	199,049	2,712	1,738	1,372	0,490	0,328	0,269	11,324	8,822	8,156
Buses	Diesel Coaches 15 - 18t	Euro I	1994	1996	280,973	207,851	184,178	2,199	1,466	1,186	0,395	0,260	0,209	8,768	6,699	6,147
Buses	Diesel Coaches 15 - 18t	Euro II	1997	2001	279,483	208,488	184,973	1,775	1,203	1,092	0,186	0,137	0,120	10,033	7,549	6,840
Buses	Diesel Coaches 15 - 18t	Euro III	2002	2006	303,872	224,218	197,656	2,308	1,464	1,283	0,223	0,145	0,115	8,591	6,046	5,368
Buses	Diesel Coaches 15 - 18t	Euro IV	2007	2009	290,989	221,962	197,681	1,241	0,813	0,689	0,048	0,034	0,030	5,666	4,225	3,842
Buses	Diesel Coaches 15 - 18t	Euro V	2010	2013	298,215	226,393	200,893	1,288	0,842	0,696	0,049	0,034	0,030	3,434	2,544	2,291
Buses	Diesel Coaches >18t	Conventional	0	1993	371,932	272,817	240,539	3,104	2,042	1,732	0,572	0,388	0,331	14,084	10,772	9,735
Buses	Diesel Coaches >18t	Euro I	1994	1996	329,598	243,565	215,080	2,511	1,722	1,458	0,452	0,302	0,246	10,737	8,049	7,206
Buses	Diesel Coaches >18t	Euro II	1997	2001	323,939	241,571	213,608	2,031	1,395	1,290	0,214	0,161	0,143	11,883	8,817	7,837
Buses	Diesel Coaches >18t	Euro III	2002	2006	335,657	242,331	211,644	2,557	1,669	1,439	0,242	0,156	0,126	9,681	6,781	5,889
Buses	Diesel Coaches >18t	Euro IV	2007	2009	319,737	238,136	211,184	1,328	0,875	0,742	0,052	0,036	0,032	6,428	4,728	4,226
Buses	Diesel Coaches >18t	Euro V	2010	2013	328,400	243,537	215,269	1,363	0,896	0,758	0,053	0,037	0,032	3,881	2,845	2,536
Mopeds	<50 cm³	Conventional	0	1999	25,000	25,000	0,000	13,800	13,800	0,000	0,188	0,188	0,000	0,020	0,020	0,000
Mopeds	<50 cm³	Euro I	2000	2003	15,000	15,000	0,000	5,600	5,600	0,000	0,076	0,076	0,000	0,020	0,020	0,000
Mopeds	<50 cm³	Euro II	2004	9999	12,080	12,080	0,000	1,300	1,300	0,000	0,038	0,038	0,000	0,260	0,260	0,000
Motorcycles	2-stroke >50 cm³	Conventional	0	1999	27,115	28,317	39,640	15,605	19,285	28,470	0,200	0,200	0,200	0,029	0,030	0,035
Motorcycles	2-stroke >50 cm³	Euro I	2000	2003	27,115	28,317	39,640	10,315	12,786	18,933	0,080	0,080	0,080	0,029	0,030	0,035
Motorcycles	2-stroke >50 cm³	Euro II	2004	2006	24,892	25,627	35,438	8,146	10,067	14,890	0,040	0,040	0,040	0,040	0,050	0,060
Motorcycles	2-stroke >50 cm³	Euro III	2007	9999	24,892	25,627	35,438	4,510	5,593	8,342	0,012	0,012	0,012	0,048	0,058	0,069
Motorcycles	4-stroke <250 cm³	Conventional	0	1999	24,800	27,499	36,055	15,258	17,209	24,960	0,020	0,020	0,020	0,237	0,428	0,655
Motorcycles	4-stroke <250 cm³	Euro I	2000	2003	27,015	30,386	40,330	10,391	14,456	24,910	0,020	0,020	0,020	0,304	0,424	0,567
Motorcycles	4-stroke <250 cm³	Euro II	2004	2006	22,260	25,160	33,756	3,708	5,765	9,135	0,005	0,005	0,005	0,323	0,447	0,598
Motorcycles	4-stroke <250 cm³	Euro III	2007	9999	19,262	20,359	25,932	2,060	3,201	5,092	0,005	0,005	0,005	0,253	0,382	0,612
Motorcycles	4-stroke 250 - 750 cm³	Conventional	0	1999	26,648	23,766	26,620	20,461	19,486	22,990	0,020	0,020	0,020	0,196	0,300	0,548

Continued																
Motorcycles	4-stroke 250 - 750 cm³	Euro I	2000	2003	37,374	35,472	41,400	10,599	9,003	10,460	0,020	0,020	0,020	0,258	0,400	0,610
Motorcycles	4-stroke 250 - 750 cm³	Euro II	2004	2006	34,197	33,450	41,276	2,230	2,436	6,092	0,005	0,005	0,005	0,257	0,390	0,577
Motorcycles	4-stroke 250 - 750 cm³	Euro III	2007	9999	30,983	30,719	38,129	1,228	1,345	3,357	0,005	0,005	0,005	0,076	0,132	0,265
Motorcycles	4-stroke >750 cm³	Conventional	0	1999	35,731	35,542	43,748	20,461	19,486	22,990	0,020	0,020	0,020	0,019	0,030	0,086
Motorcycles	4-stroke >750 cm³	Euro I	2000	2003	43,101	41,041	47,500	10,599	9,003	10,460	0,020	0,020	0,020	0,125	0,178	0,392
Motorcycles	4-stroke >750 cm³	Euro II	2004	2006	42,110	38,004	41,895	2,230	2,436	6,092	0,005	0,005	0,005	0,143	0,244	0,459
Motorcycles	4-stroke >750 cm³	Euro III	2007	9999	40,343	37,470	43,083	1,228	1,345	3,357	0,005	0,005	0,005	0,104	0,200	0,484

Sector	Subsector	Tech 2	FYear	LYear	CH_4u	CH_4r	CH_4h	N_2Ou	N_2Or	N_2Oh	NH_3u	NH_3r	NH_3h	VOCu	VOCr	VOCh
Passenger Cars	Gasoline <1,4 l	PRE ECE	0	1969	0,092	0,029	0,026	0,010	0,007	0,007	0,002	0,002	0,002	2,354	1,597	1,247
Passenger Cars	Gasoline <1,4 l	ECE 15/00-01	1970	1978	0,092	0,029	0,026	0,010	0,007	0,007	0,002	0,002	0,002	1,862	1,256	1,121
Passenger Cars	Gasoline <1,4 l	ECE 15/02	1979	1980	0,092	0,029	0,026	0,010	0,007	0,007	0,002	0,002	0,002	1,849	1,061	0,950
Passenger Cars	Gasoline <1,4 l	ECE 15/03	1981	1985	0,092	0,029	0,026	0,010	0,007	0,007	0,002	0,002	0,002	1,849	1,061	0,950
Passenger Cars	Gasoline <1,4 l	ECE 15/04	1986	1990	0,092	0,029	0,026	0,010	0,007	0,007	0,002	0,002	0,002	1,480	0,895	0,698
Passenger Cars	Gasoline <1,4 l	Euro I	1991	1996	0,026	0,016	0,014	0,026	0,011	0,005	0,070	0,133	0,074	0,177	0,121	0,111
Passenger Cars	Gasoline <1,4 l	Euro II	1997	2000	0,017	0,013	0,011	0,013	0,005	0,003	0,177	0,150	0,084	0,071	0,047	0,042
Passenger Cars	Gasoline <1,4 l	Euro III	2001	2005	0,003	0,002	0,004	0,001	0,000	0,000	0,002	0,030	0,065	0,015	0,015	0,025
Passenger Cars	Gasoline <1,4 l	Euro IV	2006	2010	0,002	0,002	0,000	0,002	0,000	0,000	0,002	0,029	0,065	0,012	0,014	0,017
Passenger Cars	Gasoline <1,4 l	Euro V	2011	2014	0,002	0,002	0,000	0,002	0,000	0,000	0,002	0,029	0,065	0,012	0,014	0,017
Passenger Cars	Gasoline 1,4 - 2,0 l	PRE ECE	0	1969	0,092	0,029	0,026	0,010	0,007	0,007	0,002	0,002	0,002	2,354	1,597	1,247
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/00-01	1970	1978	0,092	0,029	0,026	0,010	0,007	0,007	0,002	0,002	0,002	1,862	1,256	1,121
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/02	1979	1980	0,092	0,029	0,026	0,010	0,007	0,007	0,002	0,002	0,002	1,849	1,061	0,950
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/03	1981	1985	0,092	0,029	0,026	0,010	0,007	0,007	0,002	0,002	0,002	1,849	1,061	0,950
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/04	1986	1990	0,092	0,029	0,026	0,010	0,007	0,007	0,002	0,002	0,002	1,480	0,895	0,698
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro I	1991	1996	0,026	0,016	0,014	0,026	0,011	0,005	0,070	0,133	0,074	0,177	0,121	0,111
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro II	1997	2000	0,017	0,013	0,011	0,013	0,005	0,003	0,186	0,150	0,084	0,071	0,047	0,042
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro III	2001	2005	0,003	0,002	0,004	0,001	0,000	0,000	0,002	0,030	0,065	0,015	0,015	0,025
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro IV	2006	2010	0,002	0,002	0,000	0,002	0,000	0,000	0,002	0,029	0,065	0,012	0,014	0,017
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro V	2011	2014	0,002	0,002	0,000	0,002	0,000	0,000	0,002	0,029	0,065	0,012	0,014	0,017
Passenger Cars	Gasoline >2,0 l	PRE ECE	0	1969	0,092	0,029	0,026	0,010	0,007	0,007	0,002	0,002	0,002	2,354	1,597	1,247
Passenger Cars	Gasoline >2,0 l	ECE 15/00-01	1970	1978	0,092	0,029	0,026	0,010	0,007	0,007	0,002	0,002	0,002	1,862	1,256	1,121
Passenger Cars	Gasoline >2,0 l	ECE 15/02	1979	1980	0,092	0,029	0,026	0,010	0,007	0,007	0,002	0,002	0,002	1,849	1,061	0,950
Passenger Cars	Gasoline >2,0 l	ECE 15/03	1981	1985	0,092	0,029	0,026	0,010	0,007	0,007	0,002	0,002	0,002	1,849	1,061	0,950
Passenger Cars	Gasoline >2,0 l	ECE 15/04	1986	1990	0,092	0,029	0,026	0,010	0,007	0,007	0,002	0,002	0,002	1,480	0,895	0,698
Passenger Cars	Gasoline >2,0 l	Euro I	1991	1996	0,026	0,016	0,014	0,026	0,011	0,005	0,070	0,133	0,074	0,177	0,121	0,111

Continued

Passenger Cars	Gasoline >2,0 l	Euro II	1997	2000	0,017	0,013	0,011	0,013	0,005	0,003	0,189	0,150	0,084	0,071	0,047	0,042
Passenger Cars	Gasoline >2,0 l	Euro III	2001	2005	0,003	0,002	0,004	0,002	0,000	0,000	0,002	0,030	0,065	0,015	0,015	0,025
Passenger Cars	Gasoline >2,0 l	Euro IV	2006	2010	0,002	0,002	0,000	0,002	0,000	0,000	0,002	0,029	0,065	0,012	0,014	0,017
Passenger Cars	Gasoline >2,0 l	Euro V	2011	2014	0,002	0,002	0,000	0,002	0,000	0,000	0,002	0,029	0,065	0,012	0,014	0,017
Passenger Cars	Diesel <2,0 l	Conventional	0	1990	0,028	0,012	0,008	0,000	0,000	0,000	0,001	0,001	0,001	0,145	0,086	0,062
Passenger Cars	Diesel <2,0 l	Euro I	1991	1996	0,011	0,009	0,003	0,002	0,004	0,004	0,001	0,001	0,001	0,053	0,031	0,026
Passenger Cars	Diesel <2,0 l	Euro II	1997	2000	0,007	0,003	0,002	0,004	0,006	0,006	0,001	0,001	0,001	0,034	0,021	0,015
Passenger Cars	Diesel <2,0 l	Euro III	2001	2005	0,003	0,000	0,000	0,009	0,004	0,004	0,001	0,001	0,001	0,018	0,011	0,009
Passenger Cars	Diesel <2,0 l	Euro IV	2006	2010	0,000	0,000	0,000	0,009	0,004	0,004	0,001	0,001	0,001	0,011	0,006	0,006
Passenger Cars	Diesel <2,0 l	Euro V	2011	2014	0,000	0,000	0,000	0,009	0,004	0,004	0,001	0,001	0,001	0,011	0,006	0,006
Passenger Cars	Diesel >2,0 l	Conventional	0	1990	0,028	0,012	0,008	0,000	0,000	0,000	0,001	0,001	0,001	0,145	0,086	0,062
Passenger Cars	Diesel >2,0 l	Euro I	1991	1996	0,011	0,009	0,003	0,002	0,004	0,004	0,001	0,001	0,001	0,080	0,046	0,034
Passenger Cars	Diesel >2,0 l	Euro II	1997	2000	0,007	0,003	0,002	0,004	0,006	0,006	0,001	0,001	0,001	0,098	0,058	0,038
Passenger Cars	Diesel >2,0 l	Euro III	2001	2005	0,003	0,000	0,000	0,009	0,004	0,004	0,001	0,001	0,001	0,038	0,017	0,012
Passenger Cars	Diesel >2,0 l	Euro IV	2006	2010	0,000	0,000	0,000	0,009	0,004	0,004	0,001	0,001	0,001	0,011	0,006	0,006
Passenger Cars	Diesel >2,0 l	Euro V	2011	2014	0,000	0,000	0,000	0,009	0,004	0,004	0,001	0,001	0,001	0,011	0,006	0,006
Passenger Cars	LPG cars	Conventional	0	1990	0,080	0,035	0,025	0,000	0,000	0,000	0,000	0,000	0,000	1,082	0,667	0,490
Passenger Cars	LPG cars	Euro I	1991	1996	0,080	0,035	0,025	0,021	0,013	0,008	0,000	0,000	0,000	0,239	0,071	0,083
Passenger Cars	LPG cars	Euro II	1997	2000	0,019	0,008	0,006	0,013	0,003	0,002	0,000	0,000	0,000	0,050	0,015	0,017
Passenger Cars	LPG cars	Euro III	2001	2005	0,013	0,006	0,004	0,005	0,002	0,001	0,000	0,000	0,000	0,036	0,011	0,012
Passenger Cars	LPG cars	Euro IV	2006	2010	0,004	0,002	0,001	0,005	0,002	0,001	0,000	0,000	0,000	0,007	0,002	0,002
Light Duty Vehicles	Gasoline <3,5t	Conventional	0	1994	0,150	0,040	0,025	0,010	0,007	0,007	0,002	0,002	0,002	1,877	0,729	0,446
Light Duty Vehicles	Gasoline <3,5t	Euro I	1995	1998	0,026	0,016	0,014	0,044	0,026	0,013	0,070	0,133	0,074	0,220	0,109	0,078
Light Duty Vehicles	Gasoline <3,5t	Euro II	1999	2001	0,017	0,013	0,011	0,027	0,016	0,009	0,178	0,150	0,084	0,053	0,026	0,019
Light Duty Vehicles	Gasoline <3,5t	Euro III	2002	2006	0,003	0,002	0,004	0,007	0,001	0,001	0,002	0,030	0,065	0,031	0,015	0,011
Light Duty Vehicles	Gasoline <3,5t	Euro IV	2007	2011	0,002	0,002	0,000	0,001	0,000	0,000	0,002	0,029	0,065	0,013	0,007	0,005
Light Duty Vehicles	Diesel <3,5t	Conventional	0	1994	0,028	0,012	0,008	0,000	0,000	0,000	0,001	0,001	0,001	0,131	0,106	0,101
Light Duty Vehicles	Diesel <3,5t	Euro I	1995	1998	0,011	0,009	0,003	0,002	0,004	0,004	0,001	0,001	0,001	0,131	0,106	0,101
Light Duty Vehicles	Diesel <3,5t	Euro II	1999	2001	0,007	0,003	0,002	0,004	0,006	0,006	0,001	0,001	0,001	0,131	0,106	0,101
Light Duty Vehicles	Diesel <3,5t	Euro III	2002	2006	0,003	0,000	0,000	0,009	0,004	0,004	0,001	0,001	0,001	0,081	0,065	0,063
Light Duty Vehicles	Diesel <3,5t	Euro IV	2007	2011	0,000	0,000	0,000	0,009	0,004	0,004	0,001	0,001	0,001	0,030	0,024	0,023
Light Duty Vehicles	Diesel <3,5t	Euro V	2012	2015	0,000	0,000	0,000	0,009	0,004	0,004	0,001	0,001	0,001	0,030	0,024	0,023
Light Duty Vehicles	LPG <3,5t	Conventional	0	1994	0,120	0,053	0,038	0,000	0,000	0,000	0,000	0,000	0,000	1,623	1,000	0,735
Light Duty Vehicles	LPG <3,5t	Euro II	1999	2001	0,029	0,013	0,009	0,020	0,005	0,003	0,000	0,000	0,000	0,075	0,022	0,026
Light Duty Vehicles	LPG <3,5t	Euro III	2002	2006	0,019	0,008	0,006	0,008	0,003	0,002	0,000	0,000	0,000	0,054	0,016	0,019
Light Duty Vehicles	LPG <3,5t	Euro IV	2007	2011	0,006	0,003	0,002	0,008	0,003	0,002	0,000	0,000	0,000	0,011	0,003	0,004

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Heavy Duty Vehicles	Gasoline >3,5t	Conventional	0	9999	0,140	0,110	0,070	0,006	0,006	0,006	0,002	0,002	0,002	7,000	5,500	3,500
Heavy Duty Vehicles	Diesel RT 3,5 - 7,5t	Conventional	0	1993	0,085	0,023	0,020	0,030	0,030	0,030	0,003	0,003	0,003	1,298	0,789	0,576
Heavy Duty Vehicles	Diesel RT 3,5 - 7,5t	Euro I	1994	1996	0,085	0,023	0,020	0,030	0,030	0,030	0,003	0,003	0,003	0,253	0,167	0,130
Heavy Duty Vehicles	Diesel RT 3,5 - 7,5t	Euro II	1997	2001	0,054	0,020	0,019	0,030	0,030	0,030	0,003	0,003	0,003	0,171	0,111	0,086
Heavy Duty Vehicles	Diesel RT 3,5 - 7,5t	Euro III	2002	2006	0,048	0,021	0,018	0,030	0,030	0,030	0,003	0,003	0,003	0,162	0,102	0,077
Heavy Duty Vehicles	Diesel RT 3,5 - 7,5t	Euro IV	2007	2009	0,003	0,002	0,001	0,030	0,030	0,030	0,003	0,003	0,003	0,022	0,017	0,017
Heavy Duty Vehicles	Diesel RT 3,5 - 7,5t	Euro V	2010	2013	0,003	0,002	0,001	0,030	0,030	0,030	0,003	0,003	0,003	0,022	0,017	0,017
Heavy Duty Vehicles	Diesel RT 7,5 - 12t	Conventional	0	1993	0,085	0,023	0,020	0,030	0,030	0,030	0,003	0,003	0,003	0,957	0,589	0,449
Heavy Duty Vehicles	Diesel RT 7,5 - 12t	Euro I	1994	1996	0,085	0,023	0,020	0,030	0,030	0,030	0,003	0,003	0,003	0,389	0,258	0,208
Heavy Duty Vehicles	Diesel RT 7,5 - 12t	Euro II	1997	2001	0,054	0,020	0,019	0,030	0,030	0,030	0,003	0,003	0,003	0,263	0,172	0,137
Heavy Duty Vehicles	Diesel RT 7,5 - 12t	Euro III	2002	2006	0,048	0,021	0,018	0,030	0,030	0,030	0,003	0,003	0,003	0,252	0,157	0,120
Heavy Duty Vehicles	Diesel RT 7,5 - 12t	Euro IV	2007	2009	0,003	0,002	0,001	0,030	0,030	0,030	0,003	0,003	0,003	0,035	0,025	0,022
Heavy Duty Vehicles	Diesel RT 7,5 - 12t	Euro V	2010	2013	0,003	0,002	0,001	0,030	0,030	0,030	0,003	0,003	0,003	0,035	0,026	0,022
Heavy Duty Vehicles	Diesel RT 12 - 14 t	Conventional	0	1993	0,085	0,023	0,020	0,030	0,030	0,030	0,003	0,003	0,003	1,012	0,646	0,509
Heavy Duty Vehicles	Diesel RT 12 - 14 t	Euro I	1994	1996	0,085	0,023	0,020	0,030	0,030	0,030	0,003	0,003	0,003	0,429	0,279	0,229
Heavy Duty Vehicles	Diesel RT 12 - 14 t	Euro II	1997	2001	0,054	0,020	0,019	0,030	0,030	0,030	0,003	0,003	0,003	0,281	0,186	0,150
Heavy Duty Vehicles	Diesel RT 12 - 14 t	Euro III	2002	2006	0,048	0,021	0,018	0,030	0,030	0,030	0,003	0,003	0,003	0,260	0,168	0,134
Heavy Duty Vehicles	Diesel RT 12 - 14 t	Euro IV	2007	2009	0,003	0,002	0,001	0,030	0,030	0,030	0,003	0,003	0,003	0,034	0,025	0,024
Heavy Duty Vehicles	Diesel RT 12 - 14 t	Euro V	2010	2013	0,003	0,002	0,001	0,030	0,030	0,030	0,003	0,003	0,003	0,034	0,025	0,024
Heavy Duty Vehicles	Diesel RT 14 - 20t	Conventional	0	1993	0,175	0,080	0,070	0,030	0,030	0,030	0,003	0,003	0,003	1,510	0,971	0,768
Heavy Duty Vehicles	Diesel RT 14 - 20t	Euro I	1994	1996	0,175	0,080	0,070	0,030	0,030	0,030	0,003	0,003	0,003	0,606	0,403	0,325
Heavy Duty Vehicles	Diesel RT 14 - 20t	Euro II	1997	2001	0,112	0,070	0,065	0,030	0,030	0,030	0,003	0,003	0,003	0,409	0,267	0,213
Heavy Duty Vehicles	Diesel RT 14 - 20t	Euro III	2002	2006	0,098	0,074	0,064	0,030	0,030	0,030	0,003	0,003	0,003	0,378	0,243	0,196
Heavy Duty Vehicles	Diesel RT 14 - 20t	Euro IV	2007	2009	0,005	0,006	0,004	0,030	0,030	0,030	0,003	0,003	0,003	0,046	0,032	0,028
Heavy Duty Vehicles	Diesel RT 14 - 20t	Euro V	2010	2013	0,005	0,006	0,004	0,030	0,030	0,030	0,003	0,003	0,003	0,047	0,033	0,029
Heavy Duty Vehicles	Diesel RT 20 - 26t	Conventional	0	1993	0,175	0,080	0,070	0,030	0,030	0,030	0,003	0,003	0,003	0,819	0,517	0,406
Heavy Duty Vehicles	Diesel RT 20 - 26t	Euro I	1994	1996	0,175	0,080	0,070	0,030	0,030	0,030	0,003	0,003	0,003	0,728	0,476	0,380
Heavy Duty Vehicles	Diesel RT 20 - 26t	Euro II	1997	2001	0,112	0,070	0,065	0,030	0,030	0,030	0,003	0,003	0,003	0,489	0,314	0,248
Heavy Duty Vehicles	Diesel RT 20 - 26t	Euro III	2002	2006	0,098	0,074	0,064	0,030	0,030	0,030	0,003	0,003	0,003	0,453	0,287	0,225
Heavy Duty Vehicles	Diesel RT 20 - 26t	Euro IV	2007	2009	0,005	0,006	0,004	0,030	0,030	0,030	0,003	0,003	0,003	0,059	0,040	0,035
Heavy Duty Vehicles	Diesel RT 20 - 26t	Euro V	2010	2013	0,005	0,006	0,004	0,030	0,030	0,030	0,003	0,003	0,003	0,059	0,041	0,035
Heavy Duty Vehicles	Diesel RT 26 - 28t	Conventional	0	1993	0,175	0,080	0,070	0,030	0,030	0,030	0,003	0,003	0,003	0,842	0,541	0,430
Heavy Duty Vehicles	Diesel RT 26 - 28t	Euro II	1997	2001	0,112	0,070	0,065	0,030	0,030	0,030	0,003	0,003	0,003	0,499	0,327	0,262
Heavy Duty Vehicles	Diesel RT 26 - 28t	Euro III	2002	2006	0,098	0,074	0,064	0,030	0,030	0,030	0,003	0,003	0,003	0,467	0,304	0,243
Heavy Duty Vehicles	Diesel RT 26 - 28t	Euro IV	2007	2009	0,005	0,006	0,004	0,030	0,030	0,030	0,003	0,003	0,003	0,064	0,045	0,037
Heavy Duty Vehicles	Diesel RT 26 - 28t	Euro V	2010	2013	0,005	0,006	0,004	0,030	0,030	0,030	0,003	0,003	0,003	0,065	0,045	0,037

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Heavy Duty Vehicles	Diesel RT 28 - 32t	Conventional	0	1993	0,175	0,080	0,070	0,030	0,030	0,030	0,003	0,003	0,003	0,874	0,560	0,444
Heavy Duty Vehicles	Diesel RT 28 - 32t	Euro I	1994	1996	0,175	0,080	0,070	0,030	0,030	0,030	0,003	0,003	0,003	0,778	0,518	0,419
Heavy Duty Vehicles	Diesel RT 28 - 32t	Euro II	1997	2001	0,112	0,070	0,065	0,030	0,030	0,030	0,003	0,003	0,003	0,523	0,344	0,276
Heavy Duty Vehicles	Diesel RT 28 - 32t	Euro III	2002	2006	0,098	0,074	0,064	0,030	0,030	0,030	0,003	0,003	0,003	0,491	0,317	0,252
Heavy Duty Vehicles	Diesel RT 28 - 32t	Euro IV	2007	2009	0,005	0,006	0,004	0,030	0,030	0,030	0,003	0,003	0,003	0,070	0,051	0,043
Heavy Duty Vehicles	Diesel RT 28 - 32t	Euro V	2010	2013	0,005	0,006	0,004	0,030	0,030	0,030	0,003	0,003	0,003	0,071	0,051	0,043
Heavy Duty Vehicles	Diesel RT >32t	Euro I	1994	1996	0,175	0,080	0,070	0,030	0,030	0,030	0,003	0,003	0,003	0,812	0,527	0,419
Heavy Duty Vehicles	Diesel RT >32t	Euro III	2002	2006	0,098	0,074	0,064	0,030	0,030	0,030	0,003	0,003	0,003	0,496	0,316	0,249
Heavy Duty Vehicles	Diesel RT >32t	Euro V	2010	2013	0,005	0,006	0,004	0,030	0,030	0,030	0,003	0,003	0,003	0,070	0,049	0,041
Heavy Duty Vehicles	Diesel TT/AT 28 - 34t	Conventional	0	1993	0,175	0,080	0,070	0,030	0,030	0,030	0,003	0,003	0,003	0,736	0,476	0,380
Heavy Duty Vehicles	Diesel TT/AT 28 - 34t	Euro I	1994	1996	0,175	0,080	0,070	0,030	0,030	0,030	0,003	0,003	0,003	0,678	0,450	0,363
Heavy Duty Vehicles	Diesel TT/AT 28 - 34t	Euro II	1997	2001	0,112	0,070	0,065	0,030	0,030	0,030	0,003	0,003	0,003	0,450	0,296	0,238
Heavy Duty Vehicles	Diesel TT/AT 28 - 34t	Euro III	2002	2006	0,098	0,074	0,064	0,030	0,030	0,030	0,003	0,003	0,003	0,415	0,269	0,215
Heavy Duty Vehicles	Diesel TT/AT 28 - 34t	Euro IV	2007	2009	0,005	0,006	0,004	0,030	0,030	0,030	0,003	0,003	0,003	0,059	0,041	0,036
Heavy Duty Vehicles	Diesel TT/AT 28 - 34t	Euro V	2010	2013	0,005	0,006	0,004	0,030	0,030	0,030	0,003	0,003	0,003	0,060	0,042	0,036
Heavy Duty Vehicles	Diesel TT/AT 34 - 40t	Conventional	0	1993	0,175	0,080	0,070	0,030	0,030	0,030	0,003	0,003	0,003	0,877	0,555	0,438
Heavy Duty Vehicles	Diesel TT/AT 34 - 40t	Euro I	1994	1996	0,175	0,080	0,070	0,030	0,030	0,030	0,003	0,003	0,003	0,805	0,524	0,420
Heavy Duty Vehicles	Diesel TT/AT 34 - 40t	Euro II	1997	2001	0,112	0,070	0,065	0,030	0,030	0,030	0,003	0,003	0,003	0,538	0,343	0,270
Heavy Duty Vehicles	Diesel TT/AT 34 - 40t	Euro III	2002	2006	0,098	0,074	0,064	0,030	0,030	0,030	0,003	0,003	0,003	0,494	0,312	0,244
Heavy Duty Vehicles	Diesel TT/AT 34 - 40t	Euro IV	2007	2009	0,005	0,006	0,004	0,030	0,030	0,030	0,003	0,003	0,003	0,071	0,048	0,041
Heavy Duty Vehicles	Diesel TT/AT 34 - 40t	Euro V	2010	2013	0,005	0,006	0,004	0,030	0,030	0,030	0,003	0,003	0,003	0,072	0,049	0,041
Heavy Duty Vehicles	Diesel TT/AT 40 - 50t	Conventional	0	1993	0,175	0,080	0,070	0,030	0,030	0,030	0,003	0,003	0,003	0,901	0,570	0,450
Heavy Duty Vehicles	Diesel TT/AT 40 - 50t	Euro I	1994	1996	0,175	0,080	0,070	0,030	0,030	0,030	0,003	0,003	0,003	0,844	0,546	0,433
Heavy Duty Vehicles	Diesel TT/AT 40 - 50t	Euro II	1997	2001	0,112	0,070	0,065	0,030	0,030	0,030	0,003	0,003	0,003	0,558	0,358	0,282
Heavy Duty Vehicles	Diesel TT/AT 40 - 50t	Euro III	2002	2006	0,098	0,074	0,064	0,030	0,030	0,030	0,003	0,003	0,003	0,510	0,323	0,253
Heavy Duty Vehicles	Diesel TT/AT 40 - 50t	Euro IV	2007	2009	0,005	0,006	0,004	0,030	0,030	0,030	0,003	0,003	0,003	0,077	0,053	0,045
Heavy Duty Vehicles	Diesel TT/AT 40 - 50t	Euro V	2010	2013	0,005	0,006	0,004	0,030	0,030	0,030	0,003	0,003	0,003	0,078	0,053	0,045
Heavy Duty Vehicles	Diesel TT/AT 50 - 60t	Euro II	1997	2001	0,112	0,070	0,065	0,030	0,030	0,030	0,003	0,003	0,003	0,626	0,406	0,323
Heavy Duty Vehicles	Diesel TT/AT >60t	Euro V	2010	2013	0,005	0,006	0,004	0,030	0,030	0,030	0,003	0,003	0,003	0,091	0,063	0,054
Buses	Gasoline Urban Buses	Conventional	0	9999	0,140	0,110	0,070	0,006	0,006	0,006	0,002	0,002	0,002	7,000	5,500	3,500
Buses	Diesel Urban Buses <15t	Conventional	0	1993	0,175	0,080	0,070	0,030	0,030	0,030	0,003	0,003	0,003	2,628	1,738	1,490
Buses	Diesel Urban Buses <15t	Euro I	1994	1996	0,175	0,080	0,070	0,030	0,030	0,030	0,003	0,003	0,003	0,507	0,364	0,312
Buses	Diesel Urban Buses <15t	Euro II	1997	2001	0,114	0,052	0,046	0,030	0,030	0,030	0,003	0,003	0,003	0,350	0,245	0,209
Buses	Diesel Urban Buses <15t	Euro III	2002	2006	0,103	0,047	0,041	0,030	0,030	0,030	0,003	0,003	0,003	0,318	0,220	0,199
Buses	Diesel Urban Buses <15t	Euro IV	2007	2009	0,005	0,002	0,002	0,030	0,030	0,030	0,003	0,003	0,003	0,043	0,034	0,032
Buses	Diesel Urban Buses <15t	Euro V	2010	2013	0,005	0,002	0,002	0,030	0,030	0,030	0,003	0,003	0,003	0,044	0,034	0,033

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Buses	Diesel Urban Buses 15 - 18t	Conventional	0	1993	0,175	0,080	0,070	0,030	0,030	0,030	0,003	0,003	0,003	1,602	0,977	0,762
Buses	Diesel Urban Buses 15 - 18t	Euro I	1994	1996	0,175	0,080	0,070	0,030	0,030	0,030	0,003	0,003	0,003	0,659	0,431	0,351
Buses	Diesel Urban Buses 15 - 18t	Euro II	1997	2001	0,114	0,052	0,046	0,030	0,030	0,030	0,003	0,003	0,003	0,451	0,296	0,248
Buses	Diesel Urban Buses 15 - 18t	Euro III	2002	2006	0,103	0,047	0,041	0,030	0,030	0,030	0,003	0,003	0,003	0,416	0,269	0,232
Buses	Diesel Urban Buses 15 - 18t	Euro IV	2007	2009	0,005	0,002	0,002	0,030	0,030	0,030	0,003	0,003	0,003	0,061	0,045	0,040
Buses	Diesel Urban Buses 15 - 18t	Euro V	2010	2013	0,005	0,002	0,002	0,030	0,030	0,030	0,003	0,003	0,003	0,061	0,046	0,040
Buses	Diesel Urban Buses >18t	Conventional	0	1993	0,175	0,080	0,070	0,030	0,030	0,030	0,003	0,003	0,003	1,666	1,018	0,791
Buses	Diesel Urban Buses >18t	Euro I	1994	1996	0,175	0,080	0,070	0,030	0,030	0,030	0,003	0,003	0,003	0,720	0,477	0,386
Buses	Diesel Urban Buses >18t	Euro II	1997	2001	0,114	0,052	0,046	0,030	0,030	0,030	0,003	0,003	0,003	0,491	0,332	0,263
Buses	Diesel Urban Buses >18t	Euro III	2002	2006	0,103	0,047	0,041	0,030	0,030	0,030	0,003	0,003	0,003	0,446	0,291	0,241
Buses	Diesel Urban Buses >18t	Euro IV	2007	2009	0,005	0,002	0,002	0,030	0,030	0,030	0,003	0,003	0,003	0,074	0,055	0,047
Buses	Diesel Urban Buses >18t	Euro V	2010	2013	0,005	0,002	0,002	0,030	0,030	0,030	0,003	0,003	0,003	0,075	0,056	0,048
Buses	Gasoline Coaches	Conventional	0	9999	0,140	0,110	0,070	0,006	0,006	0,006	0,002	0,002	0,002	7,000	5,500	3,500
Buses	Diesel Coaches <15t	Conventional	0	1993	0,175	0,080	0,070	0,030	0,030	0,030	0,003	0,003	0,003	0,907	0,533	0,393
Buses	Diesel Coaches <15t	Euro I	1994	1996	0,175	0,080	0,070	0,030	0,030	0,030	0,003	0,003	0,003	0,830	0,516	0,397
Buses	Diesel Coaches <15t	Euro II	1997	2001	0,114	0,052	0,046	0,030	0,030	0,030	0,003	0,003	0,003	0,586	0,359	0,272
Buses	Diesel Coaches <15t	Euro III	2002	2006	0,103	0,047	0,041	0,030	0,030	0,030	0,003	0,003	0,003	0,577	0,351	0,271
Buses	Diesel Coaches <15t	Euro IV	2007	2009	0,005	0,002	0,002	0,030	0,030	0,030	0,003	0,003	0,003	0,072	0,048	0,039
Buses	Diesel Coaches <15t	Euro V	2010	2013	0,005	0,002	0,002	0,030	0,030	0,030	0,003	0,003	0,003	0,074	0,049	0,039
Buses	Diesel Coaches 15 - 18t	Conventional	0	1993	0,175	0,080	0,070	0,030	0,030	0,030	0,003	0,003	0,003	0,907	0,533	0,393
Buses	Diesel Coaches 15 - 18t	Euro I	1994	1996	0,175	0,080	0,070	0,030	0,030	0,030	0,003	0,003	0,003	0,830	0,516	0,397
Buses	Diesel Coaches 15 - 18t	Euro II	1997	2001	0,114	0,052	0,046	0,030	0,030	0,030	0,003	0,003	0,003	0,586	0,359	0,272
Buses	Diesel Coaches 15 - 18t	Euro III	2002	2006	0,103	0,047	0,041	0,030	0,030	0,030	0,003	0,003	0,003	0,577	0,351	0,271
Buses	Diesel Coaches 15 - 18t	Euro IV	2007	2009	0,005	0,002	0,002	0,030	0,030	0,030	0,003	0,003	0,003	0,072	0,048	0,039
Buses	Diesel Coaches 15 - 18t	Euro V	2010	2013	0,005	0,002	0,002	0,030	0,030	0,030	0,003	0,003	0,003	0,074	0,049	0,039
Buses	Diesel Coaches >18t	Conventional	0	1993	0,175	0,080	0,070	0,030	0,030	0,030	0,003	0,003	0,003	1,013	0,623	0,482
Buses	Diesel Coaches >18t	Euro I	1994	1996	0,175	0,080	0,070	0,030	0,030	0,030	0,003	0,003	0,003	0,915	0,581	0,457
Buses	Diesel Coaches >18t	Euro II	1997	2001	0,114	0,052	0,046	0,030	0,030	0,030	0,003	0,003	0,003	0,630	0,392	0,305
Buses	Diesel Coaches >18t	Euro III	2002	2006	0,103	0,047	0,041	0,030	0,030	0,030	0,003	0,003	0,003	0,608	0,371	0,286
Buses	Diesel Coaches >18t	Euro IV	2007	2009	0,005	0,002	0,002	0,030	0,030	0,030	0,003	0,003	0,003	0,076	0,050	0,042
Buses	Diesel Coaches >18t	Euro V	2010	2013	0,005	0,002	0,002	0,030	0,030	0,030	0,003	0,003	0,003	0,078	0,051	0,042
Mopeds	<50 cm^3	Conventional	0	1999	0,219	0,219	0,000	0,001	0,001	0,001	0,001	0,001	0,001	13,910	13,910	0,000
Mopeds	<50 cm^3	Euro I	2000	2003	0,044	0,044	0,000	0,001	0,001	0,001	0,001	0,001	0,001	2,730	2,730	0,000
Mopeds	<50 cm^3	Euro II	2004	9999	0,024	0,024	0,000	0,001	0,001	0,001	0,001	0,001	0,001	1,560	1,560	0,000
Motorcycles	2-stroke >50 cm^3	Conventional	0	1999	0,150	0,150	0,150	0,002	0,002	0,002	0,002	0,002	0,002	8,393	7,078	9,800
Motorcycles	2-stroke >50 cm^3	Euro I	2000	2003	0,099	0,107	0,098	0,002	0,002	0,002	0,002	0,002	0,002	8,393	7,078	9,800

Continued																	
Motorcycles	2-stroke >50 cm³	Euro II	2004	2006	0,030	0,032	0,030	0,002	0,002	0,002	0,002	0,002	0,002	2,593	2,569	4,155
Motorcycles	2-stroke >50 cm³	Euro III	2007	9999	0,012	0,014	0,012	0,002	0,002	0,002	0,002	0,002	0,002	1,385	1,380	2,244
Motorcycles	4-stroke <250 cm³	Conventional	0	1999	0,200	0,200	0,200	0,002	0,002	0,002	0,002	0,002	0,002	0,128	0,104	0,138
Motorcycles	4-stroke <250 cm³	Euro I	2000	2003	0,142	0,144	0,132	0,002	0,002	0,002	0,002	0,002	0,002	1,242	0,866	0,976
Motorcycles	4-stroke <250 cm³	Euro II	2004	2006	0,136	0,092	0,092	0,002	0,002	0,002	0,002	0,002	0,002	1,042	0,843	0,965
Motorcycles	4-stroke <250 cm³	Euro III	2007	9999	0,082	0,032	0,028	0,002	0,002	0,002	0,002	0,002	0,002	0,456	0,441	0,511
Motorcycles	4-stroke 250 - 750 cm³	Conventional	0	1999	0,200	0,200	0,200	0,002	0,002	0,002	0,002	0,002	0,002	0,545	0,487	0,361
Motorcycles	4-stroke 250 - 750 cm³	Euro I	2000	2003	0,148	0,174	0,156	0,002	0,002	0,002	0,002	0,002	0,002	2,390	1,522	1,079
Motorcycles	4-stroke 250 - 750 cm³	Euro II	2004	2006	0,156	0,120	0,122	0,002	0,002	0,002	0,002	0,002	0,002	1,326	0,925	0,828
Motorcycles	4-stroke 250 - 750 cm³	Euro III	2007	9999	0,094	0,042	0,036	0,002	0,002	0,002	0,002	0,002	0,002	0,598	0,499	0,615
Motorcycles	4-stroke >750 cm³	Conventional	0	1999	0,200	0,200	0,200	0,002	0,002	0,002	0,002	0,002	0,002	0,392	0,337	0,556
Motorcycles	4-stroke >750 cm³	Euro I	2000	2003	0,092	0,092	0,154	0,002	0,002	0,002	0,002	0,002	0,002	2,495	1,643	1,554
Motorcycles	4-stroke >750 cm³	Euro II	2004	2006	0,084	0,062	0,102	0,002	0,002	0,002	0,002	0,002	0,002	1,088	0,674	0,656
Motorcycles	4-stroke >750 cm³	Euro III	2007	9999	0,050	0,022	0,030	0,002	0,002	0,002	0,002	0,002	0,002	0,384	0,309	0,416

Annex 2B-5: Reduction factors

Sector	Subsector	Tech 2	FYear	LYear	FCuR	FCrR	FChR	COuR	COrR	COhR	PMuR	PMrR	PMhR	NOxuR	NOxrR	NOxhR	VOCuR	VOCrR	VOChR
Passenger Cars	Gasoline <1,4 l	PRE ECE	0	1969	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Passenger Cars	Gasoline <1,4 l	ECE 15/00-01	1970	1978	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Passenger Cars	Gasoline <1,4 l	ECE 15/02	1979	1980	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Passenger Cars	Gasoline <1,4 l	ECE 15/03	1981	1985	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Passenger Cars	Gasoline <1,4 l	ECE 15/04	1986	1990	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Passenger Cars	Gasoline <1,4 l	Euro I	1991	1996	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Passenger Cars	Gasoline <1,4 l	Euro II	1997	2000	1,93	5,83	4,43	62,65	58,10	57,55	0,00	0,00	0,00	43,59	45,20	60,45	60,19	61,27	62,09
Passenger Cars	Gasoline <1,4 l	Euro III	2001	2005	-2,72	-0,72	1,59	70,59	49,62	34,95	60,25	54,57	37,37	72,16	78,49	88,69	91,74	87,53	77,02
Passenger Cars	Gasoline <1,4 l	Euro IV	2006	2010	-5,57	-5,34	-4,84	88,95	79,10	70,06	60,25	54,57	37,37	80,12	89,24	95,86	93,34	88,71	84,51
Passenger Cars	Gasoline <1,4 l	Euro V	2011	2014	-5,57	-5,34	-4,84	88,95	79,10	70,06	60,25	54,57	37,37	85,09	91,93	96,90	93,34	88,71	84,51
Passenger Cars	Gasoline 1,4 - 2,0 l	PRE ECE	0	1969	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/00-01	1970	1978	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/02	1979	1980	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/03	1981	1985	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/04	1986	1990	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro I	1991	1996	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro II	1997	2000	2,08	1,72	5,30	62,65	58,10	57,55	0,00	0,00	0,00	43,59	45,20	60,45	60,19	61,27	62,09
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro III	2001	2005	-1,28	-2,83	-3,05	70,59	49,62	34,95	60,25	54,57	37,37	72,16	78,49	88,69	91,74	87,53	77,02
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro IV	2006	2010	-5,15	-8,80	-7,33	88,95	79,10	70,06	60,25	54,57	37,37	80,12	89,24	95,86	93,34	88,71	84,51
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro V	2011	2014	-5,15	-8,80	-7,33	88,95	79,10	70,06	60,25	54,57	37,37	85,09	91,93	96,90	93,34	88,71	84,51
Passenger Cars	Gasoline >2,0 l	PRE ECE	0	1969	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Passenger Cars	Gasoline >2,0 l	ECE 15/00-01	1970	1978	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Passenger Cars	Gasoline >2,0 l	ECE 15/02	1979	1980	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Passenger Cars	Gasoline >2,0 l	ECE 15/03	1981	1985	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Passenger Cars	Gasoline >2,0 l	ECE 15/04	1986	1990	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Passenger Cars	Gasoline >2,0 l	Euro I	1991	1996	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Passenger Cars	Gasoline >2,0 l	Euro II	1997	2000	-2,98	-5,37	-2,63	62,65	58,10	57,55	0,00	0,00	0,00	43,59	45,20	60,45	60,19	61,27	62,09
Passenger Cars	Gasoline >2,0 l	Euro III	2001	2005	5,12	7,23	12,60	70,59	49,62	34,95	60,25	54,57	37,37	72,16	78,49	88,69	91,74	87,53	77,02
Passenger Cars	Gasoline >2,0 l	Euro IV	2006	2010	-15,39	-9,65	-1,29	88,95	79,10	70,06	60,25	54,57	37,37	80,12	89,24	95,86	93,34	88,71	84,51
Passenger Cars	Gasoline >2,0 l	Euro V	2011	2014	-15,39	-9,65	-1,29	88,95	79,10	70,06	60,25	54,57	37,37	85,09	91,93	96,90	93,34	88,71	84,51
Passenger Cars	Diesel <2,0 l	Conventional	0	1990	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Passenger Cars	Diesel <2,0 l	Euro I	1991	1996	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Passenger Cars	Diesel <2,0 l	Euro II	1997	2000	-5,45	-3,06	-0,81	18,08	48,77	83,05	17,92	36,92	53,22	-7,94	1,18	-0,20	34,81	33,43	41,61

Continued

Passenger Cars	Diesel <2,0 l	Euro III	2001	2005	-2,27	-1,45	5,79	76,38	81,12	94,30	48,53	51,90	58,32	-18,71	-18,46	-12,98	65,94	63,35	66,25
Passenger Cars	Diesel <2,0 l	Euro IV	2006	2010	-2,27	-1,45	5,79	80,09	84,22	89,72	49,02	60,57	75,83	10,60	24,53	13,19	79,38	79,24	77,57
Passenger Cars	Diesel <2,0 l	Euro V	2011	2014	-2,27	-1,45	5,79	80,09	84,22	89,72	89,80	92,11	95,17	35,63	45,66	37,49	79,38	79,24	77,57
Passenger Cars	Diesel >2,0 l	Conventional	0	1990	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Passenger Cars	Diesel >2,0 l	Euro I	1991	1996	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Passenger Cars	Diesel >2,0 l	Euro II	1997	2000	0,00	0,00	0,00	18,08	48,77	83,05	17,92	36,92	53,22	-7,94	1,18	-0,20	-22,14	-25,38	-11,51
Passenger Cars	Diesel >2,0 l	Euro III	2001	2005	0,00	0,00	0,00	76,38	81,12	94,30	48,53	51,90	58,32	-18,71	-18,46	-12,98	52,23	62,67	63,93
Passenger Cars	Diesel >2,0 l	Euro IV	2006	2010	0,00	0,00	0,00	80,09	84,22	89,72	49,02	60,57	75,83	10,60	24,53	13,19	86,39	86,10	83,20
Passenger Cars	Diesel >2,0 l	Euro V	2011	2014	0,00	0,00	0,00	80,09	84,22	89,72	89,80	92,11	95,17	35,63	45,66	37,49	86,39	86,10	83,20
Passenger Cars	LPG cars	Conventional	0	1990	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Passenger Cars	LPG cars	Euro I	1991	1996	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Passenger Cars	LPG cars	Euro II	1997	2000	0,00	0,00	0,00	32,00	32,00	32,00	0,00	0,00	0,00	64,00	64,00	64,00	79,00	79,00	79,00
Passenger Cars	LPG cars	Euro III	2001	2005	0,00	0,00	0,00	44,00	44,00	44,00	0,00	0,00	0,00	76,00	76,00	76,00	85,00	85,00	85,00
Passenger Cars	LPG cars	Euro IV	2006	2010	0,00	0,00	0,00	66,00	66,00	66,00	0,00	0,00	0,00	87,00	87,00	87,00	97,00	97,00	97,00
Passenger Cars	Electric cars	Conventional	0	9999	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Light Duty Vehicles	Gasoline <3,5t	Conventional	0	1994	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Light Duty Vehicles	Gasoline <3,5t	Euro I	1995	1998	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Light Duty Vehicles	Gasoline <3,5t	Euro II	1999	2001	0,00	0,00	0,00	39,00	39,00	39,00	0,00	0,00	0,00	66,00	66,00	66,00	76,00	76,00	76,00
Light Duty Vehicles	Gasoline <3,5t	Euro III	2002	2006	0,00	0,00	0,00	48,00	48,00	48,00	60,25	54,57	37,37	79,00	79,00	79,00	86,00	86,00	86,00
Light Duty Vehicles	Gasoline <3,5t	Euro IV	2007	2011	0,00	0,00	0,00	72,00	72,00	72,00	60,25	54,57	37,37	90,00	90,00	90,00	94,00	94,00	94,00
Light Duty Vehicles	Diesel <3,5t	Conventional	0	1994	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Light Duty Vehicles	Diesel <3,5t	Euro I	1995	1998	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Light Duty Vehicles	Diesel <3,5t	Euro II	1999	2001	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Light Duty Vehicles	Diesel <3,5t	Euro III	2002	2006	0,00	0,00	0,00	18,00	18,00	18,00	33,00	33,00	33,00	16,00	16,00	16,00	38,00	38,00	38,00
Light Duty Vehicles	Diesel <3,5t	Euro IV	2007	2011	0,00	0,00	0,00	35,00	35,00	35,00	65,00	65,00	65,00	32,00	32,00	32,00	77,00	77,00	77,00
Light Duty Vehicles	Diesel <3,5t	Euro V	2012	2015	0,00	0,00	0,00	35,00	35,00	35,00	98,25	98,25	98,25	51,00	51,00	51,00	77,00	77,00	77,00
Light Duty Vehicles	LPG <3,5t	Conventional	0	1994	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Light Duty Vehicles	LPG <3,5t	Euro II	1999	2001	0,00	0,00	0,00	32,00	32,00	32,00	0,00	0,00	0,00	64,00	64,00	64,00	79,00	79,00	79,00
Light Duty Vehicles	LPG <3,5t	Euro III	2002	2006	0,00	0,00	0,00	44,00	44,00	44,00	0,00	0,00	0,00	76,00	76,00	76,00	85,00	85,00	85,00
Light Duty Vehicles	LPG <3,5t	Euro IV	2007	2011	0,00	0,00	0,00	66,00	66,00	66,00	0,00	0,00	0,00	87,00	87,00	87,00	97,00	97,00	97,00
Light Duty Vehicles	Electric <3,5t	Conventional	0	9999	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Heavy Duty Vehicles	Gasoline >3,5t	Conventional	0	9999	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Heavy Duty Vehicles	Diesel RT 3,5 - 7,5t	Conventional	0	1993	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Heavy Duty Vehicles	Diesel RT 3,5 - 7,5t	Euro I	1994	1996	19,97	17,39	7,76	67,55	66,82	59,55	60,69	60,33	58,47	30,21	28,42	25,92	80,53	78,89	77,38
Heavy Duty Vehicles	Diesel RT 3,5 - 7,5t	Euro II	1997	2001	24,01	20,18	10,60	74,08	69,13	65,86	81,61	77,85	71,87	23,47	24,02	23,73	86,86	85,98	85,16
Heavy Duty Vehicles	Diesel RT 3,5 - 7,5t	Euro III	2002	2006	18,90	16,31	6,25	67,98	68,13	66,52	79,28	80,07	80,84	40,66	43,96	44,20	87,56	87,06	86,71

Continued

Heavy Duty Vehicles	Diesel RT 3,5 - 7,5t	Euro IV	2007	2009	21,15	16,29	5,64	83,37	82,11	80,91	95,44	94,65	93,58	59,45	59,91	59,77	98,28	97,79	97,11
Heavy Duty Vehicles	Diesel RT 3,5 - 7,5t	Euro V	2010	2013	20,29	15,72	5,30	83,30	82,11	80,82	95,45	94,62	93,60	75,97	76,32	76,28	98,27	97,79	97,13
Heavy Duty Vehicles	Diesel RT 7,5 - 12t	Conventional	0	1993	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Heavy Duty Vehicles	Diesel RT 7,5 - 12t	Euro I	1994	1996	14,94	11,49	8,93	53,96	51,87	49,75	39,18	39,03	36,52	40,35	40,49	40,47	59,34	56,17	53,69
Heavy Duty Vehicles	Diesel RT 7,5 - 12t	Euro II	1997	2001	18,90	14,27	11,02	63,18	57,16	53,02	71,53	66,12	55,10	35,02	36,53	37,57	72,55	70,85	69,48
Heavy Duty Vehicles	Diesel RT 7,5 - 12t	Euro III	2002	2006	14,01	10,02	7,38	54,03	54,57	51,94	68,40	69,00	69,32	49,58	51,13	53,53	73,67	73,28	73,21
Heavy Duty Vehicles	Diesel RT 7,5 - 12t	Euro IV	2007	2009	17,35	11,08	7,67	76,57	75,39	75,78	93,10	92,09	90,79	65,60	65,29	66,82	96,38	95,67	95,13
Heavy Duty Vehicles	Diesel RT 7,5 - 12t	Euro V	2010	2013	16,17	10,25	7,18	76,27	75,18	75,47	93,04	92,07	90,83	79,22	79,51	80,43	96,34	95,66	95,14
Heavy Duty Vehicles	Diesel RT 12 - 14 t	Conventional	0	1993	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Heavy Duty Vehicles	Diesel RT 12 - 14 t	Euro I	1994	1996	14,28	11,64	9,97	52,86	51,03	48,87	37,82	37,42	37,06	39,71	39,91	40,14	57,63	56,88	54,97
Heavy Duty Vehicles	Diesel RT 12 - 14 t	Euro II	1997	2001	17,78	14,26	12,32	61,29	56,29	52,49	70,72	65,68	55,94	34,11	35,54	36,90	72,19	71,22	70,63
Heavy Duty Vehicles	Diesel RT 12 - 14 t	Euro III	2002	2006	13,28	10,55	9,17	53,81	53,44	50,67	68,93	69,17	69,39	46,23	49,71	52,23	74,33	74,00	73,71
Heavy Duty Vehicles	Diesel RT 12 - 14 t	Euro IV	2007	2009	17,83	12,48	10,01	76,48	76,13	75,80	93,03	92,25	91,58	63,65	64,32	66,18	96,64	96,09	95,32
Heavy Duty Vehicles	Diesel RT 12 - 14 t	Euro V	2010	2013	16,83	11,77	9,53	76,18	75,91	75,63	92,99	92,24	91,61	78,37	78,82	79,97	96,61	96,08	95,34
Heavy Duty Vehicles	Diesel RT 14 - 20t	Conventional	0	1993	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Heavy Duty Vehicles	Diesel RT 14 - 20t	Euro I	1994	1996	18,66	16,33	14,88	54,10	52,05	49,69	38,29	38,82	39,43	40,46	40,76	40,96	59,89	58,50	57,65
Heavy Duty Vehicles	Diesel RT 14 - 20t	Euro II	1997	2001	21,92	18,70	17,00	63,94	59,22	54,89	73,27	69,36	59,06	33,79	35,29	36,36	72,92	72,50	72,28
Heavy Duty Vehicles	Diesel RT 14 - 20t	Euro III	2002	2006	17,70	15,52	14,62	54,42	54,24	50,66	68,29	69,01	69,76	45,61	48,61	51,42	74,94	75,03	74,44
Heavy Duty Vehicles	Diesel RT 14 - 20t	Euro IV	2007	2009	23,15	18,31	16,14	76,40	76,04	76,43	93,48	92,87	92,25	63,86	64,05	65,23	96,97	96,70	96,31
Heavy Duty Vehicles	Diesel RT 14 - 20t	Euro V	2010	2013	21,50	17,49	15,95	75,25	75,14	75,86	93,36	92,81	92,21	78,21	78,55	79,35	96,86	96,61	96,25
Heavy Duty Vehicles	Diesel RT 20 - 26t	Conventional	0	1993	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Heavy Duty Vehicles	Diesel RT 20 - 26t	Euro I	1994	1996	14,59	12,88	11,93	19,16	17,09	16,07	20,49	25,29	27,75	29,52	29,51	29,03	11,17	8,06	6,45
Heavy Duty Vehicles	Diesel RT 20 - 26t	Euro II	1997	2001	17,36	14,83	13,74	36,69	31,82	18,28	64,44	61,13	50,94	22,74	23,45	23,78	40,30	39,31	39,01
Heavy Duty Vehicles	Diesel RT 20 - 26t	Euro III	2002	2006	13,66	12,19	11,99	20,84	21,10	18,05	60,89	63,32	64,58	37,56	38,91	39,16	44,75	44,58	44,64
Heavy Duty Vehicles	Diesel RT 20 - 26t	Euro IV	2007	2009	18,46	14,72	13,40	60,80	61,35	63,31	91,59	91,35	91,18	58,00	57,18	56,47	92,84	92,20	91,51
Heavy Duty Vehicles	Diesel RT 20 - 26t	Euro V	2010	2013	17,52	13,99	12,79	60,33	61,00	62,95	91,54	91,32	91,17	75,01	74,57	74,18	92,77	92,15	91,47
Heavy Duty Vehicles	Diesel RT 26 - 28t	Conventional	0	1993	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Heavy Duty Vehicles	Diesel RT 26 - 28t	Euro II	1997	2001	17,09	14,65	13,53	37,76	32,22	19,50	63,87	60,48	50,30	23,25	24,39	24,79	40,81	39,59	39,01
Heavy Duty Vehicles	Diesel RT 26 - 28t	Euro III	2002	2006	13,37	11,82	11,44	21,52	20,38	18,17	60,68	62,36	64,94	39,91	41,33	40,87	44,52	43,89	43,54
Heavy Duty Vehicles	Diesel RT 26 - 28t	Euro IV	2007	2009	17,01	13,58	12,64	61,39	62,14	64,62	91,49	91,19	91,37	59,14	58,72	57,71	92,39	91,72	91,36
Heavy Duty Vehicles	Diesel RT 26 - 28t	Euro V	2010	2013	16,01	12,79	12,02	60,92	61,74	64,28	91,43	91,15	91,35	75,70	75,49	74,93	92,31	91,66	91,32
Heavy Duty Vehicles	Diesel RT 28 - 32t	Conventional	0	1993	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Heavy Duty Vehicles	Diesel RT 28 - 32t	Euro I	1994	1996	12,20	11,05	10,36	18,82	13,37	12,31	23,04	24,44	25,14	27,98	28,75	28,76	10,90	7,44	5,56
Heavy Duty Vehicles	Diesel RT 28 - 32t	Euro II	1997	2001	15,27	13,95	9,64	34,08	26,77	23,67	62,75	58,53	48,13	22,62	24,28	24,79	40,10	38,55	37,82
Heavy Duty Vehicles	Diesel RT 28 - 32t	Euro III	2002	2006	11,41	10,04	9,73	20,60	19,39	17,71	62,16	63,07	64,05	38,80	41,24	41,46	43,86	43,33	43,19
Heavy Duty Vehicles	Diesel RT 28 - 32t	Euro IV	2007	2009	14,35	11,13	10,55	60,90	61,17	65,11	91,34	90,97	90,96	58,81	57,29	58,82	91,98	90,92	90,30

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Heavy Duty Vehicles	Diesel RT 28 - 32t	Euro V	2010	2013	13,34	10,31	9,85	60,41	60,74	64,74	91,27	90,91	90,93	75,51	74,62	75,57	91,91	90,86	90,25
Heavy Duty Vehicles	Diesel RT >32t	Euro I	1994	1996	12,62	11,53	10,93	16,13	13,50	12,48	20,12	23,79	25,25	28,73	28,95	28,74	8,76	5,59	4,01
Heavy Duty Vehicles	Diesel RT >32t	Euro III	2002	2006	11,93	10,92	10,90	18,97	18,29	15,90	61,41	63,24	64,69	38,06	39,23	39,11	44,27	43,43	42,99
Heavy Duty Vehicles	Diesel RT >32t	Euro V	2010	2013	14,90	12,07	11,43	60,60	61,33	64,46	91,29	91,12	91,26	74,92	74,66	74,06	92,09	91,27	90,50
Heavy Duty Vehicles	Diesel TT/AT 28 - 34t	Conventional	0	1993	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Heavy Duty Vehicles	Diesel TT/AT 28 - 34t	Euro I	1994	1996	10,56	9,81	9,65	15,13	12,34	11,18	22,12	23,23	22,95	28,53	29,18	29,25	7,82	5,31	4,45
Heavy Duty Vehicles	Diesel TT/AT 28 - 34t	Euro II	1997	2001	15,65	13,67	10,63	31,82	27,73	16,83	60,81	57,94	48,69	24,49	25,71	26,04	38,86	37,80	37,36
Heavy Duty Vehicles	Diesel TT/AT 28 - 34t	Euro III	2002	2006	11,19	10,15	10,37	19,25	17,89	15,99	62,26	63,46	64,44	39,05	41,17	41,88	43,54	43,44	43,48
Heavy Duty Vehicles	Diesel TT/AT 28 - 34t	Euro IV	2007	2009	14,73	11,88	11,73	61,31	62,64	65,74	91,27	91,29	91,77	58,43	58,62	58,68	91,95	91,29	90,55
Heavy Duty Vehicles	Diesel TT/AT 28 - 34t	Euro V	2010	2013	13,84	11,15	11,06	60,85	62,25	65,37	91,19	91,23	91,73	75,22	75,38	75,48	91,88	91,23	90,51
Heavy Duty Vehicles	Diesel TT/AT 34 - 40t	Conventional	0	1993	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Heavy Duty Vehicles	Diesel TT/AT 34 - 40t	Euro I	1994	1996	12,21	11,31	10,88	14,79	12,18	10,98	19,78	22,63	23,62	29,18	29,40	29,10	8,18	5,48	4,19
Heavy Duty Vehicles	Diesel TT/AT 34 - 40t	Euro II	1997	2001	14,41	12,85	12,47	31,60	27,45	15,10	60,77	57,68	47,54	23,95	24,61	24,32	38,67	38,17	38,36
Heavy Duty Vehicles	Diesel TT/AT 34 - 40t	Euro III	2002	2006	11,35	10,70	11,09	18,41	17,61	15,12	61,53	63,00	64,68	38,79	39,57	39,01	43,62	43,84	44,36
Heavy Duty Vehicles	Diesel TT/AT 34 - 40t	Euro IV	2007	2009	15,08	12,56	12,32	61,51	62,53	66,34	91,40	91,31	91,63	58,39	57,50	56,59	91,92	91,32	90,66
Heavy Duty Vehicles	Diesel TT/AT 34 - 40t	Euro V	2010	2013	14,16	11,82	11,68	61,16	62,20	65,81	91,32	91,25	91,60	75,20	74,74	74,26	91,84	91,26	90,62
Heavy Duty Vehicles	Diesel TT/AT 40 - 50t	Conventional	0	1993	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Heavy Duty Vehicles	Diesel TT/AT 40 - 50t	Euro I	1994	1996	12,06	11,24	10,92	12,93	11,05	8,95	19,65	22,36	21,85	29,86	29,82	29,51	6,26	4,20	3,76
Heavy Duty Vehicles	Diesel TT/AT 40 - 50t	Euro II	1997	2001	14,86	12,96	10,45	28,66	23,92	20,16	58,75	56,55	46,55	25,17	25,64	25,26	38,00	37,21	37,26
Heavy Duty Vehicles	Diesel TT/AT 40 - 50t	Euro III	2002	2006	11,13	10,59	10,91	17,51	16,69	14,19	61,42	63,23	65,66	39,74	40,37	39,79	43,37	43,37	43,77
Heavy Duty Vehicles	Diesel TT/AT 40 - 50t	Euro IV	2007	2009	14,11	11,92	11,89	61,73	62,77	66,78	91,26	91,37	91,76	59,36	57,67	57,38	91,47	90,74	89,97
Heavy Duty Vehicles	Diesel TT/AT 40 - 50t	Euro V	2010	2013	13,18	11,19	11,28	61,26	62,40	66,49	91,17	91,30	91,72	75,82	74,82	74,66	91,38	90,68	89,95
Heavy Duty Vehicles	Diesel TT/AT 50 - 60t	Euro II	1997	2001	15,12	13,22	11,08	27,35	21,99	18,67	57,33	55,25	45,19	26,42	26,84	26,77	38,07	36,01	34,82
Heavy Duty Vehicles	Diesel TT/AT >60t	Euro V	2010	2013	12,61	11,26	11,43	61,84	62,71	67,11	91,30	91,46	91,83	76,14	75,19	75,38	90,98	90,11	89,20
Buses	Gasoline Urban Buses	Conventional	0	9999	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Buses	Diesel Urban Buses <15t	Conventional	0	1993	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Buses	Diesel Urban Buses <15t	Euro I	1994	1996	19,18	17,29	17,93	64,98	64,38	65,34	64,18	59,36	56,81	25,70	27,96	31,85	80,69	79,04	79,08
Buses	Diesel Urban Buses <15t	Euro II	1997	2001	22,00	19,28	19,64	68,95	69,53	71,53	82,28	78,21	74,97	19,20	22,23	26,76	86,68	85,91	86,00
Buses	Diesel Urban Buses <15t	Euro III	2002	2006	17,34	14,77	15,40	66,31	67,30	67,27	82,14	79,67	77,43	31,27	41,19	49,10	87,89	87,33	86,64
Buses	Diesel Urban Buses <15t	Euro IV	2007	2009	23,22	17,36	12,81	82,13	82,75	85,07	95,64	94,92	94,57	56,39	59,61	63,64	98,36	98,06	97,83
Buses	Diesel Urban Buses <15t	Euro V	2010	2013	21,91	16,20	11,62	81,85	82,49	84,81	95,57	94,91	94,51	73,98	75,97	78,34	98,34	98,04	97,80
Buses	Diesel Urban Buses 15 - 18t	Conventional	0	1993	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Buses	Diesel Urban Buses 15 - 18t	Euro I	1994	1996	14,69	12,79	11,87	53,30	50,29	48,97	45,25	41,27	35,52	38,51	39,11	40,52	58,83	55,91	53,90
Buses	Diesel Urban Buses 15 - 18t	Euro II	1997	2001	17,30	14,13	12,17	59,92	59,59	57,00	72,71	66,78	60,84	33,88	35,52	36,86	71,87	69,67	67,40
Buses	Diesel Urban Buses 15 - 18t	Euro III	2002	2006	13,33	10,21	8,28	56,14	57,37	51,77	73,49	70,02	67,33	44,22	50,21	54,47	74,05	72,45	69,52
Buses	Diesel Urban Buses 15 - 18t	Euro IV	2007	2009	18,27	12,04	5,41	77,87	78,14	78,66	93,34	92,51	91,91	63,91	65,56	67,41	96,21	95,37	94,76

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Buses	Diesel Urban Buses 15 - 18t	Euro V	2010	2013	17,09	11,02	4,36	77,61	77,91	78,39	93,29	92,44	91,82	78,49	79,52	80,66	96,18	95,33	94,71
Buses	Diesel Urban Buses >18t	Conventional	0	1993	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Buses	Diesel Urban Buses >18t	Euro I	1994	1996	13,02	11,55	11,00	53,10	50,54	42,55	45,84	41,58	31,51	38,69	39,58	40,12	56,81	53,19	51,17
Buses	Diesel Urban Buses >18t	Euro II	1997	2001	15,64	12,70	7,01	58,65	60,18	57,11	71,05	66,18	60,82	35,41	37,06	37,96	70,55	67,39	66,73
Buses	Diesel Urban Buses >18t	Euro III	2002	2006	12,01	9,43	7,87	56,20	58,74	50,21	74,88	73,79	68,82	45,31	50,39	53,06	73,26	71,41	69,52
Buses	Diesel Urban Buses >18t	Euro IV	2007	2009	15,33	9,09	4,47	79,06	79,83	80,58	93,56	93,24	92,92	63,20	64,47	65,49	95,53	94,57	94,05
Buses	Diesel Urban Buses >18t	Euro V	2010	2013	14,29	8,13	3,44	78,89	79,66	80,38	93,49	93,15	92,82	78,07	78,86	79,49	95,49	94,52	93,98
Buses	Gasoline Coaches	Conventional	0	9999	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Buses	Diesel Coaches <15t	Conventional	0	1993	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Buses	Diesel Coaches <15t	Euro I	1994	1996	8,28	7,70	7,47	18,93	15,68	13,60	19,31	20,59	22,44	22,57	24,07	24,64	8,47	3,14	-1,19
Buses	Diesel Coaches <15t	Euro II	1997	2001	8,76	7,42	7,07	34,56	30,80	20,45	62,13	58,30	55,34	11,40	14,43	16,14	35,38	32,63	30,64
Buses	Diesel Coaches <15t	Euro III	2002	2006	0,80	0,43	0,70	14,91	15,75	6,50	54,54	55,87	57,10	24,13	31,47	34,19	36,41	34,05	30,99
Buses	Diesel Coaches <15t	Euro IV	2007	2009	5,01	1,44	0,69	54,25	53,24	49,77	90,25	89,66	88,99	49,96	52,11	52,89	92,04	91,07	90,12
Buses	Diesel Coaches <15t	Euro V	2010	2013	2,65	-0,53	-0,93	52,50	51,58	49,26	90,05	89,49	88,84	69,67	71,16	71,91	91,83	90,88	89,96
Buses	Diesel Coaches 15 - 18t	Conventional	0	1993	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Buses	Diesel Coaches 15 - 18t	Euro I	1994	1996	8,28	7,70	7,47	18,93	15,68	13,60	19,31	20,59	22,44	22,57	24,07	24,64	8,47	3,14	-1,19
Buses	Diesel Coaches 15 - 18t	Euro II	1997	2001	8,76	7,42	7,07	34,56	30,80	20,45	62,13	58,30	55,34	11,40	14,43	16,14	35,38	32,63	30,64
Buses	Diesel Coaches 15 - 18t	Euro III	2002	2006	0,80	0,43	0,70	14,91	15,75	6,50	54,54	55,87	57,10	24,13	31,47	34,19	36,41	34,05	30,99
Buses	Diesel Coaches 15 - 18t	Euro IV	2007	2009	5,01	1,44	0,69	54,25	53,24	49,77	90,25	89,66	88,99	49,96	52,11	52,89	92,04	91,07	90,12
Buses	Diesel Coaches 15 - 18t	Euro V	2010	2013	2,65	-0,53	-0,93	52,50	51,58	49,26	90,05	89,49	88,84	69,67	71,16	71,91	91,83	90,88	89,96
Buses	Diesel Coaches >18t	Conventional	0	1993	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Buses	Diesel Coaches >18t	Euro I	1994	1996	11,38	10,72	10,58	19,11	15,65	15,87	21,00	21,97	25,46	23,77	25,28	25,99	9,71	6,78	5,13
Buses	Diesel Coaches >18t	Euro II	1997	2001	12,90	11,45	11,20	34,56	31,66	25,53	62,65	58,54	56,71	15,63	18,15	19,50	37,83	37,12	36,81
Buses	Diesel Coaches >18t	Euro III	2002	2006	9,75	11,17	12,01	17,62	18,24	16,92	57,74	59,71	61,98	31,26	37,05	39,51	39,99	40,51	40,69
Buses	Diesel Coaches >18t	Euro IV	2007	2009	14,03	12,71	12,20	57,22	57,13	57,19	90,88	90,59	90,41	54,36	56,11	56,59	92,52	91,99	91,37
Buses	Diesel Coaches >18t	Euro V	2010	2013	11,70	10,73	10,51	56,10	56,11	56,24	90,69	90,43	90,28	72,44	73,59	73,96	92,33	91,84	91,19
Mopeds	<50 cm^3	Conventional	0	1999	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Mopeds	<50 cm^3	Euro I	2000	2003	40,00	40,00	0,00	59,42	59,42	0,00	59,84	59,84	0,00	0,00	0,00	0,00	80,37	80,37	0,00
Mopeds	<50 cm^3	Euro II	2004	9999	51,68	51,68	0,00	90,58	90,58	0,00	80,00	80,00	0,00	-1200,00	-1200,00	0,00	88,79	88,79	0,00
Motorcycles	2-stroke >50 cm^3	Conventional	0	1999	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Motorcycles	2-stroke >50 cm^3	Euro I	2000	2003	0,00	0,00	0,00	33,90	33,70	33,50	60,00	60,00	60,00	0,00	0,00	0,00	0,00	0,00	0,00
Motorcycles	2-stroke >50 cm^3	Euro II	2004	2006	8,20	9,50	10,60	47,80	47,80	47,70	80,00	80,00	80,00	-38,70	-68,10	-70,70	69,10	63,70	57,60
Motorcycles	2-stroke >50 cm^3	Euro III	2007	9999	8,20	9,50	10,60	71,10	71,00	70,70	94,00	94,00	94,00	-64,90	-93,70	-98,30	83,50	80,50	77,10
Motorcycles	4-stroke <250 cm^3	Conventional	0	1999	8,20	9,50	10,60	0,00	0,00	0,00	0,00	0,00	0,00	22,10	-0,90	-15,50	89,70	88,00	85,90
Motorcycles	4-stroke <250 cm^3	Euro I	2000	2003	0,00	0,00	0,00	31,90	16,00	0,20	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Motorcycles	4-stroke <250 cm^3	Euro II	2004	2006	17,60	17,20	16,30	75,70	66,50	63,40	75,00	75,00	75,00	-6,10	-5,40	-5,50	16,10	2,60	1,10

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Motorcycles	4-stroke <250 cm³	Euro III	2007	9999	28,70	33,00	35,70	86,50	81,40	79,60	75,00	75,00	75,00	16,90	9,90	-7,90	63,30	49,10	47,60
Motorcycles	4-stroke 250 - 750 cm³	Conventional	0	1999	28,70	33,00	35,70	0,00	0,00	0,00	0,00	0,00	0,00	24,10	24,90	10,10	77,20	68,00	66,50
Motorcycles	4-stroke 250 - 750 cm³	Euro I	2000	2003	0,00	0,00	0,00	48,20	53,80	54,50	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Motorcycles	4-stroke 250 - 750 cm³	Euro II	2004	2006	8,50	5,70	0,30	89,10	87,50	73,50	75,00	75,00	75,00	0,20	2,50	5,40	44,50	39,20	23,30
Motorcycles	4-stroke 250 - 750 cm³	Euro III	2007	9999	17,10	13,40	7,90	94,00	93,10	85,40	75,00	75,00	75,00	70,40	67,00	56,50	75,00	67,20	43,00
Motorcycles	4-stroke >750 cm³	Conventional	0	1999	17,10	13,40	7,90	0,00	0,00	0,00	0,00	0,00	0,00	85,00	83,20	78,10	84,30	79,50	64,20
Motorcycles	4-stroke >750 cm³	Euro I	2000	2003	0,00	0,00	0,00	48,20	53,80	54,50	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Motorcycles	4-stroke >750 cm³	Euro II	2004	2006	2,30	7,40	11,80	89,10	87,50	73,50	75,00	75,00	75,00	-14,20	-37,30	-17,00	56,40	59,00	57,80
Motorcycles	4-stroke >750 cm³	Euro III	2007	9999	6,40	8,70	9,30	94,00	93,10	85,40	75,00	75,00	75,00	16,90	-12,40	-23,50	84,60	81,20	73,20

Annex 2B-6: Deterioration factors in 2011

Sector	Subsector	Tech 2	FYear	LYear	COU	COR	COH	NOxU	NOxR	NOxH	VOCU	VOCR	VOCH
Passenger Cars	Gasoline <1,4 l	PRE ECE	0	1969	1	1	1	1	1	1	1	1	1
Passenger Cars	Gasoline <1,4 l	ECE 15/00-01	1970	1978	1	1	1	1	1	1	1	1	1
Passenger Cars	Gasoline <1,4 l	ECE 15/02	1979	1980	1	1	1	1	1	1	1	1	1
Passenger Cars	Gasoline <1,4 l	ECE 15/03	1981	1985	1	1	1	1	1	1	1	1	1
Passenger Cars	Gasoline <1,4 l	ECE 15/04	1986	1990	1	1	1	1	1	1	1	1	1
Passenger Cars	Gasoline <1,4 l	Euro I	1991	1996	2,456763636	2,5358	2,5358	2,050882	1,888	1,888	1,862736	1,5974	1,5974
Passenger Cars	Gasoline <1,4 l	Euro II	1997	2000	2,456763636	2,5358	2,5358	2,050882	1,888	1,888	1,862736	1,5974	1,5974
Passenger Cars	Gasoline <1,4 l	Euro III	2001	2005	1,384318573	1,132988542	1,132988542	1	1	1	1,154808	1	1
Passenger Cars	Gasoline <1,4 l	Euro IV	2006	2010	1,076149046	1,028817851	1,028817851	1	1	1	1,030857	1	1
Passenger Cars	Gasoline <1,4 l	Euro V	2011	2014	0,891587177	0,966430314	0,966430314	1	1	1	0,956623	1	1
Passenger Cars	Gasoline 1,4 - 2,0 l	PRE ECE	0	1969	1	1	1	1	1	1	1	1	1
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/00-01	1970	1978	1	1	1	1	1	1	1	1	1
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/02	1979	1980	1	1	1	1	1	1	1	1	1
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/03	1981	1985	1	1	1	1	1	1	1	1	1
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/04	1986	1990	1	1	1	1	1	1	1	1	1
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro I	1991	1996	1,848646364	1,76984	1,76984	2,050882	1,888	1,888	1,891659	1,7868	1,7868
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro II	1997	2000	1,848646364	1,76984	1,76984	2,050882	1,888	1,888	1,891659	1,7868	1,7868
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro III	2001	2005	1,177505134	1	1	1,264566	1	1	1	1	1
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro IV	2006	2010	1,079691883	1	1	1,118542	1	1	1	1	1
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro V	2011	2014	0,989494671	1	1	0,983888	1	1	1	1	1
Passenger Cars	Gasoline >2,0 l	PRE ECE	0	1969	1	1	1	1	1	1	1	1	1
Passenger Cars	Gasoline >2,0 l	ECE 15/00-01	1970	1978	1	1	1	1	1	1	1	1	1
Passenger Cars	Gasoline >2,0 l	ECE 15/02	1979	1980	1	1	1	1	1	1	1	1	1
Passenger Cars	Gasoline >2,0 l	ECE 15/03	1981	1985	1	1	1	1	1	1	1	1	1
Passenger Cars	Gasoline >2,0 l	ECE 15/04	1986	1990	1	1	1	1	1	1	1	1	1
Passenger Cars	Gasoline >2,0 l	Euro I	1991	1996	1,446653636	1,19748	1,19748	2,050882	1,888	1,888	1,677461	1,45388	1,45388
Passenger Cars	Gasoline >2,0 l	Euro II	1997	2000	1,446653636	1,19748	1,19748	2,050882	1,888	1,888	1,677461	1,45388	1,45388
Passenger Cars	Gasoline >2,0 l	Euro III	2001	2005	1,187222357	1	1	1,279072	1	1	1	1	1
Passenger Cars	Gasoline >2,0 l	Euro IV	2006	2010	1,099960425	1	1	1,148801	1	1	1	1	1
Passenger Cars	Gasoline >2,0 l	Euro V	2011	2014	0,991097312	1	1	0,986281	1	1	1	1	1
Light Duty Vehicles	Gasoline <3,5t	Conventional	0	1994	1	1	1	1	1	1	1	1	1
Light Duty Vehicles	Gasoline <3,5t	Euro I	1995	1998	2,456763636	2,5358	2,5358	2,050882	1,888	1,888	1,862736	1,5974	1,5974
Light Duty Vehicles	Gasoline <3,5t	Euro II	1999	2001	2,456763636	2,5358	2,5358	2,050882	1,888	1,888	1,862736	1,5974	1,5974

Continued														
Light Duty Vehicles	Gasoline <3,5t	Euro III	2002	2006	1,152364534	1	1	1,227034	1	1	1	1	1
Light Duty Vehicles	Gasoline <3,5t	Euro IV	2007	2011	1,075283894	1	1	1,111961	1	1	1	1	1

Annex 2B-7: Final fuel consumption factors (MJ/km) and emission factors (g/km) in 2011

Sector	Subsector	Tech 2	Milu	Milr	Milh	FCu_MJ	FCr_MJ	FCh_MJ	FCu_g	FCr_g	FCh_g	CO2_u	CO2_r	CO2_h	NOx_u	NOX_r	NOx_h
Passenger Cars	Gasoline <1,4 l	PRE ECE	7226	18019	10516	4,445	2,497	2,849	104	58	66	313	176	201	2,114	2,137	2,097
Passenger Cars	Gasoline <1,4 l	ECE 15/00-01	5244	13076	7631	3,836	2,019	2,206	89	47	51	270	142	156	2,114	2,137	2,097
Passenger Cars	Gasoline <1,4 l	ECE 15/02	772	1925	1124	3,507	2,051	2,325	82	48	54	247	145	164	1,851	2,179	3,015
Passenger Cars	Gasoline <1,4 l	ECE 15/03	5527	13783	8044	3,507	2,051	2,325	82	48	54	247	145	164	1,920	2,335	3,396
Passenger Cars	Gasoline <1,4 l	ECE 15/04	27452	68456	39953	3,386	1,972	2,166	79	46	51	239	139	153	1,933	2,166	2,759
Passenger Cars	Gasoline <1,4 l	Euro I	188606	470320	274492	3,122	1,905	2,091	73	44	49	220	134	147	1,182	0,550	0,896
Passenger Cars	Gasoline <1,4 l	Euro II	249131	621248	362578	3,080	1,794	1,998	72	42	47	217	126	141	0,761	0,302	0,354
Passenger Cars	Gasoline <1,4 l	Euro III	347537	866640	505796	3,180	1,918	2,058	74	45	48	224	135	145	0,271	0,063	0,054
Passenger Cars	Gasoline <1,4 l	Euro IV	697740	1739928	1015472	2,800	1,616	1,766	65	38	41	197	114	124	0,165	0,031	0,020
Passenger Cars	Gasoline <1,4 l	Euro V	110936	276638	161454	2,718	1,544	1,687	63	36	39	192	109	119	0,150	0,024	0,015
Passenger Cars	Gasoline 1,4 - 2,0 l	PRE ECE	14891	37132	21671	5,221	3,042	3,468	122	71	81	368	214	244	2,474	2,781	3,244
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/00-01	8829	22016	12849	4,464	2,320	2,738	104	54	64	315	164	193	2,474	2,781	3,244
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/02	1303	3250	1897	4,065	2,301	2,710	95	54	63	287	162	191	2,093	2,464	3,403
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/03	9443	23548	13743	4,065	2,301	2,710	95	54	63	287	162	191	2,191	2,674	3,599
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/04	49342	123043	71812	4,060	2,230	2,363	95	52	55	286	157	167	2,426	2,857	3,653
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro I	478006	1191986	695677	3,788	2,203	2,339	88	51	55	267	155	165	1,165	0,550	0,896
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro II	814147	2030208	1184888	3,734	2,165	2,215	87	51	52	263	153	156	0,749	0,302	0,354
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro III	779645	1944170	1134674	3,822	2,265	2,410	89	53	56	269	160	170	0,287	0,063	0,054
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro IV	571222	1424435	831341	3,708	2,209	2,314	87	52	54	261	156	163	0,168	0,031	0,020
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro V	31702	79055	46139	3,578	2,096	2,195	83	49	51	252	148	155	0,147	0,024	0,015
Passenger Cars	Gasoline >2,0 l	PRE ECE	5578	13911	8119	6,358	3,632	4,007	148	85	94	448	256	283	3,269	4,239	5,701
Passenger Cars	Gasoline >2,0 l	ECE 15/00-01	4202	10479	6116	4,860	2,592	3,010	113	60	70	343	183	212	3,269	4,239	5,701
Passenger Cars	Gasoline >2,0 l	ECE 15/02	489	1220	712	4,957	2,872	3,210	116	67	75	349	202	226	2,362	2,773	3,815
Passenger Cars	Gasoline >2,0 l	ECE 15/03	1625	4051	2364	4,957	2,872	3,210	116	67	75	349	202	226	3,208	3,566	4,772
Passenger Cars	Gasoline >2,0 l	ECE 15/04	6217	15502	9047	4,680	2,637	3,174	109	62	74	330	186	224	2,621	2,851	3,822
Passenger Cars	Gasoline >2,0 l	Euro I	31085	77516	45240	4,914	2,810	2,952	115	66	69	346	198	208	1,023	0,550	0,896
Passenger Cars	Gasoline >2,0 l	Euro II	62981	157053	91660	5,015	2,961	3,030	117	69	71	354	209	214	0,646	0,302	0,354
Passenger Cars	Gasoline >2,0 l	Euro III	121356	302620	176618	4,741	2,607	2,580	111	61	60	334	184	182	0,242	0,063	0,054
Passenger Cars	Gasoline >2,0 l	Euro IV	84898	211707	123558	5,702	3,292	3,194	133	77	75	402	232	225	0,144	0,031	0,020
Passenger Cars	Gasoline >2,0 l	Euro V	1927	4806	2805	5,619	3,226	3,130	131	75	73	396	227	221	0,121	0,024	0,015
Passenger Cars	Diesel <2,0 l	Euro I	64246	160208	93502	2,738	1,867	2,111	64	44	50	196	134	151	0,751	0,574	0,678
Passenger Cars	Diesel <2,0 l	Euro II	166280	414645	241999	2,887	1,925	2,128	68	45	50	207	138	152	0,810	0,567	0,679
Passenger Cars	Diesel <2,0 l	Euro III	724217	1805953	1054006	2,800	1,894	1,989	66	45	47	200	136	142	0,891	0,680	0,766

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Passenger Cars	Diesel <2,0 l	Euro IV	873969	2179383	1271951	2,597	1,714	1,800	61	40	42	186	123	129	0,671	0,433	0,588
Passenger Cars	Diesel <2,0 l	Euro V	1251651	3121196	1821619	2,507	1,635	1,716	59	38	40	179	117	123	0,483	0,312	0,424
Passenger Cars	Diesel <2,0 l	Conventional	33257	82932	48401	3,292	1,798	2,185	77	42	51	236	129	156	0,647	0,442	0,539
Passenger Cars	Diesel >2,0 l	Euro I	19780	49324	28787	3,735	2,543	2,808	88	60	66	267	182	201	0,751	0,574	0,678
Passenger Cars	Diesel >2,0 l	Euro II	65483	163294	95303	3,735	2,543	2,808	88	60	66	267	182	201	0,810	0,567	0,679
Passenger Cars	Diesel >2,0 l	Euro III	180362	449762	262494	3,735	2,543	2,808	88	60	66	267	182	201	0,891	0,680	0,766
Passenger Cars	Diesel >2,0 l	Euro IV	151919	378836	221099	4,040	2,816	3,108	95	66	73	289	201	222	0,671	0,433	0,588
Passenger Cars	Diesel >2,0 l	Euro V	161222	402033	234638	3,723	2,532	2,796	88	60	66	266	181	200	0,483	0,312	0,424
Passenger Cars	Diesel >2,0 l	Conventional	6285	15672	9147	3,292	1,798	2,185	77	42	51	236	129	156	1,026	0,738	0,880
Passenger Cars	LPG cars	Euro I	8	19	11	3,399	2,153	2,581	74	47	56	214	136	163	0,324	0,293	0,309
Passenger Cars	LPG cars	Euro II	16	41	24	3,399	2,153	2,581	74	47	56	214	136	163	0,107	0,106	0,111
Passenger Cars	LPG cars	Euro III	14	34	20	3,399	2,153	2,581	74	47	56	214	136	163	0,076	0,070	0,074
Passenger Cars	LPG cars	Euro IV	20	50	29	3,399	2,153	2,581	74	47	56	214	136	163	0,041	0,038	0,040
Passenger Cars	LPG cars	Conventional	15	37	21	4,081	2,146	2,575	89	47	56	257	135	162	2,102	2,679	2,965
Light Duty Vehicles	Gasoline <3,5t	Conventional	9054	20695	11463	5,283	2,719	2,564	123	63	60	372	192	181	3,030	3,232	3,510
Light Duty Vehicles	Gasoline <3,5t	Euro I	26590	60777	33666	6,194	3,196	3,017	145	75	70	437	225	213	1,543	0,783	0,840
Light Duty Vehicles	Gasoline <3,5t	Euro II	23109	52820	29259	6,194	3,196	3,017	145	75	70	437	225	213	0,766	0,266	0,286
Light Duty Vehicles	Gasoline <3,5t	Euro III	54586	124768	69112	6,194	3,196	3,017	145	75	70	437	225	213	0,317	0,087	0,093
Light Duty Vehicles	Gasoline <3,5t	Euro IV	17570	40159	22245	6,194	3,196	3,017	145	75	70	437	225	213	0,164	0,041	0,044
Light Duty Vehicles	Diesel <3,5t	Conventional	32585	74479	41256	4,307	2,876	3,147	101	68	74	308	206	225	2,053	0,861	0,852
Light Duty Vehicles	Diesel <3,5t	Euro I	147269	336613	186459	3,866	2,538	2,777	91	60	65	277	182	199	1,397	0,996	1,044
Light Duty Vehicles	Diesel <3,5t	Euro II	182831	417898	231485	3,866	2,538	2,777	91	60	65	277	182	199	1,397	0,996	1,044
Light Duty Vehicles	Diesel <3,5t	Euro III	776968	1775920	983731	3,866	2,538	2,777	91	60	65	277	182	199	1,173	0,837	0,877
Light Duty Vehicles	Diesel <3,5t	Euro IV	512449	1171308	648820	3,866	2,538	2,777	91	60	65	277	182	199	0,950	0,678	0,710
Light Duty Vehicles	Diesel <3,5t	Euro V	245886	562023	311320	3,866	2,538	2,777	91	60	65	277	182	199	0,684	0,488	0,512
Light Duty Vehicles	LPG <3,5t	Conventional	7	16	9	5,969	3,218	3,862	130	70	84	377	203	244	3,175	4,018	4,448
Light Duty Vehicles	LPG <3,5t	Euro II	9	20	11	4,972	3,230	3,871	108	70	84	314	204	244	0,178	0,158	0,167
Light Duty Vehicles	LPG <3,5t	Euro III	37	85	47	4,972	3,230	3,871	108	70	84	314	204	244	0,120	0,106	0,111
Light Duty Vehicles	LPG <3,5t	Euro IV	24	54	30	4,972	3,230	3,871	108	70	84	314	204	244	0,062	0,057	0,060
Heavy Duty Vehicles	Gasoline >3,5t	Conventional	733	2793	1393	10,215	6,810	7,491	238	159	175	720	480	528	4,664	7,774	7,774
Heavy Duty Vehicles	Diesel RT 3,5 - 7,5t	Conventional	381	1453	725	5,453	4,842	4,929	128	114	116	390	346	353	4,302	4,193	4,572
Heavy Duty Vehicles	Diesel RT 3,5 - 7,5t	Euro I	261	996	497	4,364	4,000	4,547	103	94	107	312	286	325	3,002	3,001	3,387
Heavy Duty Vehicles	Diesel RT 3,5 - 7,5t	Euro II	1712	6521	3253	4,144	3,865	4,406	97	91	104	296	276	315	3,292	3,185	3,487
Heavy Duty Vehicles	Diesel RT 3,5 - 7,5t	Euro III	4144	15789	7877	4,423	4,052	4,621	104	95	109	316	290	331	2,553	2,350	2,552
Heavy Duty Vehicles	Diesel RT 3,5 - 7,5t	Euro IV	4650	17717	8839	4,300	4,053	4,651	101	95	109	308	290	333	1,744	1,681	1,840
Heavy Duty Vehicles	Diesel RT 3,5 - 7,5t	Euro V	1400	5334	2661	4,165	3,894	4,458	98	92	105	298	279	319	1,992	0,840	0,462

Continued																	
Heavy Duty Vehicles	Diesel RT 7,5 - 12t	Conventional	1016	3873	1932	7,994	6,680	6,547	188	157	154	572	478	468	8,100	7,393	7,661
Heavy Duty Vehicles	Diesel RT 7,5 - 12t	Euro I	831	3167	1580	6,800	5,912	5,962	160	139	140	486	423	427	4,832	4,399	4,561
Heavy Duty Vehicles	Diesel RT 7,5 - 12t	Euro II	2666	10158	5068	6,484	5,726	5,825	153	135	137	464	410	417	5,263	4,692	4,783
Heavy Duty Vehicles	Diesel RT 7,5 - 12t	Euro III	6490	24729	12337	6,874	6,010	6,064	162	141	143	492	430	434	4,084	3,613	3,560
Heavy Duty Vehicles	Diesel RT 7,5 - 12t	Euro IV	5359	20417	10186	6,607	5,939	6,044	155	140	142	473	425	432	2,787	2,566	2,542
Heavy Duty Vehicles	Diesel RT 7,5 - 12t	Euro V	4171	15892	7928	6,455	5,751	5,826	152	135	137	462	411	417	3,176	1,435	0,797
Heavy Duty Vehicles	Diesel RT 12 - 14 t	Conventional	140	535	267	8,660	7,124	6,945	204	168	163	620	510	497	9,017	7,885	7,916
Heavy Duty Vehicles	Diesel RT 12 - 14 t	Euro I	101	385	192	7,423	6,295	6,253	175	148	147	531	450	447	5,436	4,738	4,739
Heavy Duty Vehicles	Diesel RT 12 - 14 t	Euro II	300	1142	570	7,120	6,109	6,089	168	144	143	509	437	436	5,941	5,082	4,995
Heavy Duty Vehicles	Diesel RT 12 - 14 t	Euro III	300	1143	570	7,510	6,373	6,308	177	150	148	537	456	451	4,848	3,965	3,782
Heavy Duty Vehicles	Diesel RT 12 - 14 t	Euro IV	315	1201	599	7,116	6,235	6,250	167	147	147	509	446	447	3,278	2,813	2,677
Heavy Duty Vehicles	Diesel RT 12 - 14 t	Euro V	282	1073	535	6,976	6,050	6,017	164	142	142	499	433	431	3,554	1,617	0,900
Heavy Duty Vehicles	Diesel RT 14 - 20t	Conventional	522	1989	992	11,415	8,975	8,426	269	211	198	817	642	603	11,531	9,660	9,318
Heavy Duty Vehicles	Diesel RT 14 - 20t	Euro I	545	2075	1035	9,285	7,509	7,172	218	177	169	664	537	513	6,866	5,722	5,501
Heavy Duty Vehicles	Diesel RT 14 - 20t	Euro II	2838	10814	5395	8,913	7,297	6,994	210	172	165	638	522	500	7,634	6,251	5,930
Heavy Duty Vehicles	Diesel RT 14 - 20t	Euro III	7541	28731	14334	9,394	7,582	7,194	221	178	169	672	542	515	6,272	4,964	4,527
Heavy Duty Vehicles	Diesel RT 14 - 20t	Euro IV	6865	26157	13049	8,772	7,332	7,066	206	172	166	628	525	506	4,167	3,473	3,240
Heavy Duty Vehicles	Diesel RT 14 - 20t	Euro V	6688	25483	12713	8,756	7,195	6,853	206	169	161	626	515	490	4,874	2,704	1,709
Heavy Duty Vehicles	Diesel RT 20 - 26t	Conventional	359	1369	683	13,781	10,613	9,700	324	250	228	986	759	694	12,516	10,075	9,311
Heavy Duty Vehicles	Diesel RT 20 - 26t	Euro I	708	2699	1347	11,770	9,246	8,543	277	218	201	842	661	611	8,821	7,102	6,608
Heavy Duty Vehicles	Diesel RT 20 - 26t	Euro II	4202	16011	7988	11,388	9,039	8,368	268	213	197	815	647	599	9,670	7,712	7,097
Heavy Duty Vehicles	Diesel RT 20 - 26t	Euro III	13415	51113	25500	11,898	9,319	8,537	280	219	201	851	667	611	7,814	6,155	5,665
Heavy Duty Vehicles	Diesel RT 20 - 26t	Euro IV	11990	45686	22792	11,237	9,050	8,400	264	213	198	804	647	601	5,257	4,314	4,053
Heavy Duty Vehicles	Diesel RT 20 - 26t	Euro V	11488	43770	21837	11,036	8,816	8,145	260	207	192	790	631	583	5,963	2,979	1,659
Heavy Duty Vehicles	Diesel RT 26 - 28t	Conventional	5	20	10	14,569	11,252	10,186	343	265	240	1042	805	729	13,147	10,604	9,732
Heavy Duty Vehicles	Diesel RT 26 - 28t	Euro II	6	24	12	12,079	9,604	8,808	284	226	207	864	687	630	10,090	8,018	7,319
Heavy Duty Vehicles	Diesel RT 26 - 28t	Euro III	25	94	47	12,622	9,922	9,021	297	233	212	903	710	645	7,900	6,221	5,755
Heavy Duty Vehicles	Diesel RT 26 - 28t	Euro IV	13	50	25	12,092	9,724	8,899	284	229	209	865	696	637	5,371	4,377	4,116
Heavy Duty Vehicles	Diesel RT 26 - 28t	Euro V	20	76	38	11,717	9,351	8,518	276	220	200	838	669	609	6,696	3,069	1,457
Heavy Duty Vehicles	Diesel RT 28 - 32t	Conventional	17	64	32	16,133	12,748	11,591	380	300	273	1154	912	829	14,829	12,201	11,247
Heavy Duty Vehicles	Diesel RT 28 - 32t	Euro I	68	260	130	14,165	11,339	10,390	333	267	244	1013	811	743	10,679	8,693	8,013
Heavy Duty Vehicles	Diesel RT 28 - 32t	Euro II	1534	5843	2915	13,670	10,970	10,474	322	258	246	978	785	749	11,475	9,238	8,459
Heavy Duty Vehicles	Diesel RT 28 - 32t	Euro III	8322	31710	15820	14,292	11,468	10,463	336	270	246	1022	820	749	9,076	7,169	6,584
Heavy Duty Vehicles	Diesel RT 28 - 32t	Euro IV	8870	33795	16860	13,817	11,329	10,368	325	267	244	989	811	742	6,107	5,211	4,631
Heavy Duty Vehicles	Diesel RT 28 - 32t	Euro V	6352	24201	12074	13,370	10,884	9,930	315	256	234	957	779	710	6,625	2,742	1,421
Heavy Duty Vehicles	Diesel RT >32t	Euro I	3	10	5	14,326	11,173	10,139	337	263	239	1025	799	725	10,843	8,628	7,832

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Heavy Duty Vehicles	Diesel RT >32t	Euro III	25	97	48	14,438	11,249	10,143	340	265	239	1033	805	726	9,424	7,380	6,692
Heavy Duty Vehicles	Diesel RT >32t	Euro V	39	148	74	13,430	10,627	9,620	316	250	226	961	760	688	6,790	2,899	1,554
Heavy Duty Vehicles	Diesel TT/AT 28 - 34t	Conventional	185	1863	2460	14,488	11,097	9,915	341	261	233	1037	794	709	13,592	10,687	9,486
Heavy Duty Vehicles	Diesel TT/AT 28 - 34t	Euro I	187	1879	2481	12,958	10,009	8,958	305	235	211	927	716	641	9,714	7,568	6,712
Heavy Duty Vehicles	Diesel TT/AT 28 - 34t	Euro II	973	9774	12908	12,221	9,580	8,861	287	225	208	874	685	634	10,263	7,939	7,016
Heavy Duty Vehicles	Diesel TT/AT 28 - 34t	Euro III	2573	25852	34141	12,866	9,971	8,887	303	235	209	920	713	636	8,285	6,287	5,514
Heavy Duty Vehicles	Diesel TT/AT 28 - 34t	Euro IV	2360	23716	31320	12,354	9,779	8,752	291	230	206	884	700	626	5,651	4,422	3,920
Heavy Duty Vehicles	Diesel TT/AT 28 - 34t	Euro V	2268	22786	30092	12,087	9,500	8,465	284	223	199	865	680	606	5,420	2,547	1,542
Heavy Duty Vehicles	Diesel TT/AT 34 - 40t	Conventional	246	2473	3266	16,805	12,678	11,157	395	298	262	1202	907	798	15,711	12,166	10,644
Heavy Duty Vehicles	Diesel TT/AT 34 - 40t	Euro I	391	3929	5189	14,752	11,245	9,943	347	265	234	1055	804	711	11,126	8,590	7,547
Heavy Duty Vehicles	Diesel TT/AT 34 - 40t	Euro II	2223	22333	29494	14,383	11,049	9,766	338	260	230	1029	791	699	11,948	9,172	8,056
Heavy Duty Vehicles	Diesel TT/AT 34 - 40t	Euro III	8657	86984	114874	14,897	11,321	9,919	350	266	233	1066	810	710	9,617	7,352	6,492
Heavy Duty Vehicles	Diesel TT/AT 34 - 40t	Euro IV	8015	80531	106352	14,271	11,086	9,782	336	261	230	1021	793	700	6,537	5,170	4,621
Heavy Duty Vehicles	Diesel TT/AT 34 - 40t	Euro V	14457	145260	191836	13,980	10,783	9,478	329	254	223	1000	771	678	6,246	2,929	1,776
Heavy Duty Vehicles	Diesel TT/AT 40 - 50t	Conventional	71	715	944	18,654	14,115	12,367	439	332	291	1335	1010	885	17,686	13,652	11,869
Heavy Duty Vehicles	Diesel TT/AT 40 - 50t	Euro I	182	1829	2415	16,404	12,529	11,017	386	295	259	1174	896	788	12,405	9,580	8,366
Heavy Duty Vehicles	Diesel TT/AT 40 - 50t	Euro II	1456	14630	19321	15,882	12,286	11,075	374	289	261	1136	879	792	13,235	10,151	8,870
Heavy Duty Vehicles	Diesel TT/AT 40 - 50t	Euro III	14049	141160	186422	16,578	12,620	11,018	390	297	259	1186	903	788	10,657	8,141	7,146
Heavy Duty Vehicles	Diesel TT/AT 40 - 50t	Euro IV	20035	201304	265850	16,022	12,433	10,897	377	292	256	1146	889	780	7,187	5,779	5,059
Heavy Duty Vehicles	Diesel TT/AT 40 - 50t	Euro V	19846	199403	263339	15,590	12,003	10,477	367	282	246	1115	859	750	6,496	2,722	1,558
Heavy Duty Vehicles	Diesel TT/AT 50 - 60t	Euro II	3	29	39	19,170	14,755	13,087	451	347	308	1371	1056	936	15,903	12,092	10,444
Heavy Duty Vehicles	Diesel TT/AT >60t	Euro V	4	38	50	18,998	14,464	12,473	447	340	293	1359	1035	892	6,700	2,847	1,804
Buses	Gasoline Urban Buses	Conventional	124	124	18	10,215	6,810	7,491	238	159	175	720	480	528	4,664	7,774	7,774
Buses	Diesel Urban Buses <15t	Conventional	227	226	34	11,599	9,207	8,612	273	217	203	830	659	616	9,549	7,844	7,287
Buses	Diesel Urban Buses <15t	Euro I	338	338	50	9,374	7,615	7,068	221	179	166	671	545	506	7,095	5,650	4,967
Buses	Diesel Urban Buses <15t	Euro II	2762	2760	411	9,047	7,432	6,921	213	175	163	647	532	495	7,716	6,100	5,337
Buses	Diesel Urban Buses <15t	Euro III	14595	14584	2171	9,587	7,848	7,286	226	185	171	686	561	521	6,564	4,613	3,709
Buses	Diesel Urban Buses <15t	Euro IV	26608	26589	3958	8,906	7,609	7,509	210	179	177	637	544	537	4,164	3,168	2,649
Buses	Diesel Urban Buses <15t	Euro V	14577	14566	2169	8,653	7,472	7,100	204	176	167	619	535	508	4,945	2,734	1,975
Buses	Diesel Urban Buses 15 - 18t	Conventional	3502	3500	521	14,753	11,422	10,037	347	269	236	1055	817	718	15,434	12,402	11,037
Buses	Diesel Urban Buses 15 - 18t	Euro I	4040	4037	601	12,586	9,960	8,846	296	234	208	900	713	633	9,490	7,552	6,565
Buses	Diesel Urban Buses 15 - 18t	Euro II	19324	19310	2875	12,200	9,808	8,815	287	231	207	873	702	631	10,206	7,997	6,969
Buses	Diesel Urban Buses 15 - 18t	Euro III	40850	40821	6077	12,787	10,255	9,206	301	241	217	915	734	659	8,609	6,175	5,026
Buses	Diesel Urban Buses 15 - 18t	Euro IV	36836	36810	5480	12,058	10,047	9,494	284	236	223	863	719	679	5,570	4,271	3,597
Buses	Diesel Urban Buses 15 - 18t	Euro V	20987	20972	3122	11,679	9,675	9,149	275	228	215	836	692	655	6,217	2,856	2,202
Buses	Diesel Urban Buses >18t	Conventional	35	35	5	18,517	14,415	12,440	436	339	293	1325	1031	890	19,728	15,827	13,723

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Buses	Diesel Urban Buses >18t	Euro I	21	21	3	16,105	12,749	11,071	379	300	260	1152	912	792	12,096	9,563	8,217
Buses	Diesel Urban Buses >18t	Euro II	3460	3458	515	15,622	12,585	11,567	367	296	272	1118	900	828	12,742	9,962	8,514
Buses	Diesel Urban Buses >18t	Euro III	15940	15929	2371	16,292	13,055	11,460	383	307	270	1166	934	820	10,789	7,851	6,442
Buses	Diesel Urban Buses >18t	Euro IV	18975	18961	2823	15,677	13,105	11,883	369	308	280	1122	938	850	7,260	5,624	4,736
Buses	Diesel Urban Buses >18t	Euro V	8703	8697	1295	15,157	12,644	11,486	357	297	270	1084	905	822	5,643	2,677	1,954
Buses	Gasoline Coaches	Conventional	2451	4517	1509	10,215	6,810	7,491	238	159	175	720	480	528	4,664	7,774	7,774
Buses	Diesel Coaches <15t	Conventional	5496	10128	3383	13,363	9,824	8,683	314	231	204	956	703	621	11,569	9,013	8,333
Buses	Diesel Coaches <15t	Euro I	3137	5781	1931	12,257	9,067	8,035	288	213	189	877	649	575	8,958	6,844	6,280
Buses	Diesel Coaches <15t	Euro II	12674	23358	7801	12,192	9,095	8,069	287	214	190	872	651	577	10,250	7,712	6,988
Buses	Diesel Coaches <15t	Euro III	12357	22773	7606	13,256	9,781	8,622	312	230	203	948	700	617	8,777	6,177	5,484
Buses	Diesel Coaches <15t	Euro IV	8847	16304	5445	12,694	9,683	8,624	299	228	203	908	693	617	5,789	4,316	3,926
Buses	Diesel Coaches <15t	Euro V	3246	5983	1998	12,403	9,384	8,321	292	221	196	887	671	595	8,093	4,032	2,524
Buses	Diesel Coaches 15 - 18t	Conventional	2590	4774	1594	13,363	9,824	8,683	314	231	204	956	703	621	11,569	9,013	8,333
Buses	Diesel Coaches 15 - 18t	Euro I	1442	2657	887	12,257	9,067	8,035	288	213	189	877	649	575	8,958	6,844	6,280
Buses	Diesel Coaches 15 - 18t	Euro II	3083	5681	1898	12,192	9,095	8,069	287	214	190	872	651	577	10,250	7,712	6,988
Buses	Diesel Coaches 15 - 18t	Euro III	1574	2902	969	13,256	9,781	8,622	312	230	203	948	700	617	8,777	6,177	5,484
Buses	Diesel Coaches 15 - 18t	Euro IV	1198	2209	738	12,694	9,683	8,624	299	228	203	908	693	617	5,789	4,316	3,926
Buses	Diesel Coaches 15 - 18t	Euro V	893	1645	549	12,403	9,384	8,321	292	221	196	887	671	595	8,093	4,032	2,524
Buses	Diesel Coaches >18t	Conventional	382	705	235	16,225	11,901	10,493	382	280	247	1161	851	751	14,389	11,005	9,946
Buses	Diesel Coaches >18t	Euro I	391	721	241	14,378	10,625	9,383	338	250	221	1029	760	671	10,969	8,223	7,361
Buses	Diesel Coaches >18t	Euro II	2640	4865	1625	14,131	10,538	9,318	332	248	219	1011	754	667	12,140	9,008	8,007
Buses	Diesel Coaches >18t	Euro III	7320	13491	4506	14,643	10,571	9,233	344	249	217	1048	756	661	9,890	6,928	6,016
Buses	Diesel Coaches >18t	Euro IV	5697	10500	3507	13,948	10,388	9,213	328	244	217	998	743	659	6,567	4,831	4,317
Buses	Diesel Coaches >18t	Euro V	1777	3274	1094	13,711	10,132	8,939	323	238	210	981	725	640	8,659	4,253	2,652
Mopeds	<50 cm^3	Conventional	46500	31000	0	1,135	1,135		26	26		80	80		0,021	0,021	
Mopeds	<50 cm^3	Euro I	24959	16640	0	0,681	0,681		16	16		48	48		0,021	0,021	
Mopeds	<50 cm^3	Euro II	62232	41488	0	0,548	0,548		13	13		39	39		0,270	0,270	
Motorcycles	2-stroke >50 cm^3	Conventional	11370	9757	3675	1,231	1,286	1,800	29	30	42	87	91	127	0,030	0,031	0,036
Motorcycles	2-stroke >50 cm^3	Euro I	2147	1843	694	1,231	1,286	1,800	29	30	42	87	91	127	0,030	0,031	0,036
Motorcycles	2-stroke >50 cm^3	Euro II	2830	2428	915	1,130	1,163	1,609	26	27	38	80	82	113	0,042	0,052	0,062
Motorcycles	2-stroke >50 cm^3	Euro III	4218	3620	1363	1,130	1,163	1,609	26	27	38	80	82	113	0,050	0,060	0,072
Motorcycles	4-stroke <250 cm^3	Conventional	21662	18589	7002	1,126	1,248	1,637	26	29	38	79	88	115	0,245	0,443	0,679
Motorcycles	4-stroke <250 cm^3	Euro I	4091	3511	1322	1,227	1,380	1,831	29	32	43	86	97	129	0,315	0,439	0,588
Motorcycles	4-stroke <250 cm^3	Euro II	5391	4626	1743	1,011	1,142	1,533	24	27	36	71	81	108	0,334	0,463	0,620
Motorcycles	4-stroke <250 cm^3	Euro III	8037	6897	2598	0,874	0,924	1,177	20	22	27	62	65	83	0,262	0,396	0,634
Motorcycles	4-stroke 250 - 750 cm^3	Conventional	59572	51121	19255	1,210	1,079	1,209	28	25	28	85	76	85	0,203	0,311	0,568

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Motorcycles	4-stroke 250 - 750 cm³	Euro I	11251	9655	3637	1,697	1,610	1,880	40	38	44	120	114	133	0,267	0,415	0,632
Motorcycles	4-stroke 250 - 750 cm³	Euro II	14826	12723	4792	1,553	1,519	1,874	36	35	44	109	107	132	0,267	0,404	0,598
Motorcycles	4-stroke 250 - 750 cm³	Euro III	22102	18967	7144	1,407	1,395	1,731	33	33	40	99	98	122	0,079	0,137	0,275
Motorcycles	4-stroke >750 cm³	Conventional	27078	23237	8752	1,622	1,614	1,986	38	38	46	114	114	140	0,019	0,031	0,089
Motorcycles	4-stroke >750 cm³	Euro I	5114	4389	1653	1,957	1,863	2,157	46	43	50	138	131	152	0,130	0,185	0,406
Motorcycles	4-stroke >750 cm³	Euro II	6739	5783	2178	1,912	1,725	1,902	45	40	44	135	122	134	0,148	0,253	0,475
Motorcycles	4-stroke >750 cm³	Euro III	10046	8621	3247	1,832	1,701	1,956	43	40	46	129	120	138	0,108	0,207	0,502

Sector	Subsector	Tech 2	CO_u	CO_r	CO_h	VOC_u	VOC_r	VOC_h	TSP_u	TSP_r	TSP_h	CH4_u	CH4_r	CH4_h	NMVOC_u	NMVOC_r	NMVOC_h	N2O_u	N2O_r	N2O_h
Passenger Cars	Gasoline <1,4 l	PRE ECE	91,966	20,039	16,087	10,722	2,071	1,332	0,065	0,046	0,042	0,224	0,030	0,027	10,498	2,041	1,305	0,010	0,007	0,007
Passenger Cars	Gasoline <1,4 l	ECE 15/00-01	63,415	15,009	19,301	9,267	1,701	1,200	0,065	0,046	0,042	0,224	0,030	0,027	9,042	1,670	1,173	0,010	0,007	0,007
Passenger Cars	Gasoline <1,4 l	ECE 15/02	53,027	8,500	8,562	9,118	1,488	1,022	0,065	0,046	0,042	0,224	0,030	0,027	8,894	1,458	0,995	0,010	0,007	0,007
Passenger Cars	Gasoline <1,4 l	ECE 15/03	56,012	9,114	7,899	9,034	1,481	1,021	0,044	0,030	0,030	0,224	0,030	0,027	8,810	1,451	0,994	0,010	0,007	0,007
Passenger Cars	Gasoline <1,4 l	ECE 15/04	30,383	5,137	4,448	8,021	1,303	0,759	0,031	0,021	0,021	0,224	0,030	0,027	7,796	1,273	0,732	0,010	0,007	0,007
Passenger Cars	Gasoline <1,4 l	Euro I	26,268	3,605	4,640	2,510	0,212	0,184	0,003	0,002	0,002	0,049	0,017	0,015	2,460	0,195	0,170	0,018	0,011	0,006
Passenger Cars	Gasoline <1,4 l	Euro II	17,356	1,511	1,970	1,394	0,088	0,071	0,003	0,002	0,002	0,069	0,013	0,011	1,326	0,074	0,059	0,013	0,005	0,003
Passenger Cars	Gasoline <1,4 l	Euro III	14,244	0,811	1,349	0,774	0,025	0,027	0,001	0,001	0,001	0,033	0,002	0,004	0,741	0,023	0,023	0,004	0,000	0,000
Passenger Cars	Gasoline <1,4 l	Euro IV	4,137	0,306	0,564	0,474	0,023	0,019	0,001	0,001	0,001	0,014	0,002	0,000	0,460	0,020	0,019	0,003	0,000	0,000
Passenger Cars	Gasoline <1,4 l	Euro V	4,099	0,287	0,529	0,532	0,028	0,019	0,001	0,001	0,001	0,014	0,002	0,000	0,518	0,026	0,019	0,003	0,000	0,000
Passenger Cars	Gasoline 1,4 - 2,0 l	PRE ECE	91,966	20,039	16,087	10,535	2,054	1,331	0,065	0,046	0,042	0,224	0,030	0,027	10,311	2,024	1,304	0,010	0,007	0,007
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/00-01	63,415	15,009	19,301	9,124	1,688	1,199	0,065	0,046	0,042	0,224	0,030	0,027	8,899	1,658	1,172	0,010	0,007	0,007
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/02	53,027	8,500	8,562	8,992	1,477	1,021	0,065	0,046	0,042	0,224	0,030	0,027	8,768	1,447	0,994	0,010	0,007	0,007
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/03	56,012	9,114	7,899	8,931	1,471	1,020	0,044	0,030	0,030	0,224	0,030	0,027	8,707	1,441	0,993	0,010	0,007	0,007
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/04	30,383	5,137	4,448	7,925	1,294	0,758	0,031	0,021	0,021	0,224	0,030	0,027	7,701	1,264	0,731	0,010	0,007	0,007
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro I	19,161	2,516	3,239	2,773	0,234	0,206	0,003	0,002	0,002	0,049	0,017	0,015	2,723	0,217	0,192	0,018	0,011	0,006
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro II	12,624	1,054	1,375	1,535	0,096	0,079	0,003	0,002	0,002	0,069	0,013	0,011	1,466	0,082	0,067	0,013	0,005	0,003
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro III	10,416	0,716	1,190	0,846	0,024	0,027	0,001	0,001	0,001	0,033	0,002	0,004	0,813	0,021	0,023	0,004	0,000	0,000
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro IV	3,058	0,297	0,548	0,512	0,021	0,018	0,001	0,001	0,001	0,014	0,002	0,000	0,498	0,019	0,018	0,003	0,000	0,000
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro V	3,040	0,297	0,548	0,559	0,026	0,019	0,001	0,001	0,001	0,014	0,002	0,000	0,545	0,024	0,019	0,003	0,000	0,000
Passenger Cars	Gasoline >2,0 l	PRE ECE	91,966	20,039	16,087	10,444	2,046	1,330	0,065	0,046	0,042	0,224	0,030	0,027	10,220	2,016	1,303	0,010	0,007	0,007
Passenger Cars	Gasoline >2,0 l	ECE 15/00-01	63,415	15,009	19,301	9,055	1,682	1,198	0,065	0,046	0,042	0,224	0,030	0,027	8,831	1,652	1,172	0,010	0,007	0,007
Passenger Cars	Gasoline >2,0 l	ECE 15/02	53,027	8,500	8,562	8,930	1,471	1,020	0,065	0,046	0,042	0,224	0,030	0,027	8,706	1,441	0,993	0,010	0,007	0,007
Passenger Cars	Gasoline >2,0 l	ECE 15/03	56,012	9,114	7,899	8,885	1,467	1,020	0,044	0,030	0,030	0,224	0,030	0,027	8,661	1,437	0,993	0,010	0,007	0,007
Passenger Cars	Gasoline >2,0 l	ECE 15/04	30,383	5,137	4,448	7,877	1,290	0,758	0,031	0,021	0,021	0,224	0,030	0,027	7,652	1,260	0,731	0,010	0,007	0,007
Passenger Cars	Gasoline >2,0 l	Euro I	13,324	1,702	2,191	1,922	0,191	0,168	0,003	0,002	0,002	0,049	0,017	0,015	1,872	0,175	0,153	0,018	0,011	0,006

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Passenger Cars	Gasoline >2,0 l	Euro II	8,676	0,713	0,930	1,061	0,079	0,064	0,003	0,002	0,002	0,069	0,013	0,011	0,992	0,065	0,053	0,013	0,005	0,003
Passenger Cars	Gasoline >2,0 l	Euro III	7,259	0,716	1,190	0,582	0,023	0,027	0,001	0,001	0,001	0,033	0,002	0,004	0,549	0,021	0,023	0,004	0,000	0,000
Passenger Cars	Gasoline >2,0 l	Euro IV	2,144	0,297	0,548	0,361	0,021	0,018	0,001	0,001	0,001	0,014	0,002	0,000	0,347	0,019	0,018	0,003	0,000	0,000
Passenger Cars	Gasoline >2,0 l	Euro V	2,122	0,297	0,548	0,403	0,025	0,019	0,001	0,001	0,001	0,014	0,002	0,000	0,389	0,023	0,019	0,003	0,000	0,000
Passenger Cars	Diesel <2,0 l	Euro I	0,746	0,220	0,212	0,137	0,032	0,026	0,142	0,063	0,109	0,019	0,009	0,003	0,118	0,022	0,023	0,002	0,004	0,004
Passenger Cars	Diesel <2,0 l	Euro II	0,611	0,113	0,036	0,089	0,021	0,015	0,117	0,040	0,051	0,006	0,003	0,002	0,083	0,018	0,013	0,003	0,006	0,006
Passenger Cars	Diesel <2,0 l	Euro III	0,176	0,042	0,012	0,047	0,012	0,009	0,073	0,030	0,046	0,003	0,000	0,000	0,044	0,012	0,009	0,016	0,004	0,004
Passenger Cars	Diesel <2,0 l	Euro IV	0,148	0,035	0,022	0,028	0,007	0,006	0,073	0,025	0,026	0,000	0,000	0,000	0,028	0,007	0,006	0,016	0,004	0,004
Passenger Cars	Diesel <2,0 l	Euro V	0,148	0,035	0,022	0,028	0,007	0,006	0,015	0,005	0,005	0,000	0,000	0,000	0,028	0,007	0,006	0,016	0,004	0,004
Passenger Cars	Diesel <2,0 l	Conventional	1,158	0,482	0,393	0,378	0,088	0,063	0,497	0,135	0,174	0,022	0,012	0,008	0,356	0,076	0,055	0,000	0,000	0,000
Passenger Cars	Diesel >2,0 l	Euro I	0,746	0,220	0,212	0,208	0,047	0,035	0,142	0,063	0,109	0,019	0,009	0,003	0,189	0,038	0,032	0,002	0,004	0,004
Passenger Cars	Diesel >2,0 l	Euro II	0,611	0,113	0,036	0,254	0,059	0,039	0,117	0,040	0,051	0,006	0,003	0,002	0,248	0,056	0,037	0,003	0,006	0,006
Passenger Cars	Diesel >2,0 l	Euro III	0,176	0,042	0,012	0,099	0,018	0,013	0,073	0,030	0,046	0,003	0,000	0,000	0,096	0,018	0,013	0,016	0,004	0,004
Passenger Cars	Diesel >2,0 l	Euro IV	0,148	0,035	0,022	0,028	0,007	0,006	0,073	0,025	0,026	0,000	0,000	0,000	0,028	0,007	0,006	0,016	0,004	0,004
Passenger Cars	Diesel >2,0 l	Euro V	0,148	0,035	0,022	0,028	0,007	0,006	0,015	0,005	0,005	0,000	0,000	0,000	0,028	0,007	0,006	0,016	0,004	0,004
Passenger Cars	Diesel >2,0 l	Conventional	1,158	0,482	0,393	0,378	0,088	0,063	0,497	0,135	0,174	0,022	0,012	0,008	0,356	0,076	0,055	0,000	0,000	0,000
Passenger Cars	LPG cars	Euro I	4,318	1,498	3,690	0,457	0,074	0,086	0,041	0,031	0,026	0,083	0,036	0,026	0,374	0,037	0,060	0,042	0,013	0,008
Passenger Cars	LPG cars	Euro II	3,054	1,018	2,509	0,169	0,015	0,018	0,041	0,031	0,026	0,020	0,009	0,006	0,149	0,007	0,012	0,022	0,003	0,002
Passenger Cars	LPG cars	Euro III	2,595	0,839	2,066	0,104	0,011	0,013	0,041	0,031	0,026	0,013	0,006	0,004	0,091	0,005	0,009	0,007	0,002	0,001
Passenger Cars	LPG cars	Euro IV	0,994	0,509	1,255	0,045	0,002	0,003	0,041	0,031	0,026	0,004	0,002	0,001	0,041	0,000	0,001	0,006	0,002	0,001
Passenger Cars	LPG cars	Conventional	6,734	2,460	10,078	2,069	0,691	0,508	0,041	0,031	0,026	0,083	0,036	0,026	1,986	0,655	0,482	0,000	0,000	0,000
Light Duty Vehicles	Gasoline <3,5t	Conventional	47,140	6,297	7,659	7,864	1,073	0,494	0,041	0,041	0,041	0,211	0,041	0,026	7,653	1,031	0,468	0,010	0,007	0,007
Light Duty Vehicles	Gasoline <3,5t	Euro I	33,962	2,266	2,857	2,243	0,190	0,130	0,003	0,002	0,002	0,048	0,017	0,015	2,195	0,173	0,115	0,049	0,027	0,014
Light Duty Vehicles	Gasoline <3,5t	Euro II	23,280	1,382	1,743	1,153	0,052	0,032	0,003	0,002	0,002	0,064	0,013	0,011	1,089	0,038	0,020	0,072	0,016	0,010
Light Duty Vehicles	Gasoline <3,5t	Euro III	17,046	0,465	0,586	0,660	0,023	0,012	0,001	0,001	0,001	0,031	0,002	0,004	0,629	0,021	0,008	0,011	0,001	0,001
Light Duty Vehicles	Gasoline <3,5t	Euro IV	5,501	0,250	0,315	0,396	0,014	0,006	0,001	0,001	0,001	0,013	0,002	0,000	0,383	0,012	0,006	0,004	0,000	0,000
Light Duty Vehicles	Diesel <3,5t	Conventional	1,932	1,031	1,083	0,323	0,108	0,103	0,678	0,310	0,329	0,022	0,012	0,008	0,300	0,096	0,095	0,000	0,000	0,000
Light Duty Vehicles	Diesel <3,5t	Euro I	0,675	0,335	0,432	0,323	0,108	0,103	0,166	0,067	0,092	0,019	0,009	0,003	0,304	0,099	0,100	0,002	0,004	0,004
Light Duty Vehicles	Diesel <3,5t	Euro II	0,675	0,335	0,432	0,323	0,108	0,103	0,166	0,067	0,092	0,006	0,003	0,002	0,317	0,105	0,101	0,003	0,006	0,006
Light Duty Vehicles	Diesel <3,5t	Euro III	0,554	0,275	0,355	0,200	0,067	0,064	0,111	0,045	0,062	0,003	0,000	0,000	0,197	0,067	0,064	0,016	0,004	0,004
Light Duty Vehicles	Diesel <3,5t	Euro IV	0,439	0,218	0,281	0,074	0,025	0,024	0,058	0,024	0,032	0,000	0,000	0,000	0,074	0,025	0,024	0,016	0,004	0,004
Light Duty Vehicles	Diesel <3,5t	Euro V	0,439	0,218	0,281	0,074	0,025	0,024	0,003	0,001	0,002	0,000	0,000	0,000	0,074	0,025	0,024	0,016	0,004	0,004
Light Duty Vehicles	LPG <3,5t	Conventional	9,546	3,690	15,118	2,990	1,037	0,761	0,062	0,047	0,039	0,124	0,054	0,039	2,866	0,982	0,723	0,000	0,000	0,000
Light Duty Vehicles	LPG <3,5t	Euro II	3,917	1,528	3,764	0,171	0,023	0,027	0,062	0,047	0,039	0,030	0,013	0,009	0,141	0,010	0,018	0,025	0,005	0,003
Light Duty Vehicles	LPG <3,5t	Euro III	1,875	1,258	3,100	0,108	0,017	0,019	0,062	0,047	0,039	0,020	0,009	0,006	0,088	0,008	0,013	0,009	0,003	0,002
Light Duty Vehicles	LPG <3,5t	Euro IV	1,427	0,764	1,882	0,063	0,003	0,004	0,062	0,047	0,039	0,006	0,003	0,002	0,057	0,001	0,002	0,009	0,003	0,002

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Heavy Duty Vehicles	Gasoline >3,5t	Conventional	72,559	57,010	57,010	7,256	5,701	3,628	0,415	0,415	0,415	0,145	0,114	0,073	7,111	5,587	3,555	0,006	0,006	0,006
Heavy Duty Vehicles	Diesel RT 3,5 - 7,5t	Conventional	2,104	1,541	1,380	1,326	0,806	0,589	0,328	0,246	0,220	0,087	0,023	0,020	1,240	0,783	0,568	0,031	0,031	0,031
Heavy Duty Vehicles	Diesel RT 3,5 - 7,5t	Euro I	0,683	0,512	0,558	0,258	0,170	0,133	0,129	0,097	0,091	0,087	0,023	0,020	0,171	0,147	0,113	0,031	0,031	0,031
Heavy Duty Vehicles	Diesel RT 3,5 - 7,5t	Euro II	0,545	0,476	0,471	0,174	0,113	0,087	0,055	0,050	0,057	0,056	0,020	0,019	0,119	0,093	0,068	0,031	0,031	0,031
Heavy Duty Vehicles	Diesel RT 3,5 - 7,5t	Euro III	0,674	0,491	0,462	0,165	0,104	0,078	0,064	0,046	0,040	0,049	0,022	0,019	0,116	0,083	0,060	0,031	0,031	0,031
Heavy Duty Vehicles	Diesel RT 3,5 - 7,5t	Euro IV	0,350	0,276	0,263	0,023	0,018	0,017	0,015	0,013	0,014	0,003	0,002	0,001	0,020	0,016	0,016	0,031	0,031	0,031
Heavy Duty Vehicles	Diesel RT 3,5 - 7,5t	Euro V	0,653	0,601	0,599	0,011	0,009	0,008	0,014	0,011	0,010	0,003	0,002	0,001	0,009	0,007	0,006	0,031	0,031	0,031
Heavy Duty Vehicles	Diesel RT 7,5 - 12t	Conventional	2,409	1,734	1,558	0,978	0,601	0,459	0,337	0,241	0,211	0,087	0,023	0,020	0,891	0,578	0,438	0,031	0,031	0,031
Heavy Duty Vehicles	Diesel RT 7,5 - 12t	Euro I	1,109	0,835	0,783	0,398	0,264	0,212	0,205	0,147	0,134	0,087	0,023	0,020	0,311	0,240	0,192	0,031	0,031	0,031
Heavy Duty Vehicles	Diesel RT 7,5 - 12t	Euro II	0,887	0,743	0,732	0,268	0,175	0,140	0,086	0,073	0,085	0,056	0,020	0,019	0,213	0,155	0,121	0,031	0,031	0,031
Heavy Duty Vehicles	Diesel RT 7,5 - 12t	Euro III	1,108	0,788	0,749	0,257	0,161	0,123	0,099	0,069	0,060	0,049	0,022	0,019	0,209	0,139	0,104	0,031	0,031	0,031
Heavy Duty Vehicles	Diesel RT 7,5 - 12t	Euro IV	0,565	0,427	0,377	0,035	0,026	0,022	0,023	0,019	0,019	0,003	0,002	0,001	0,033	0,024	0,021	0,031	0,031	0,031
Heavy Duty Vehicles	Diesel RT 7,5 - 12t	Euro V	1,023	0,836	0,787	0,020	0,014	0,012	0,025	0,017	0,015	0,003	0,002	0,001	0,017	0,013	0,011	0,031	0,031	0,031
Heavy Duty Vehicles	Diesel RT 12 - 14 t	Conventional	2,601	1,916	1,730	1,034	0,660	0,520	0,359	0,259	0,238	0,087	0,023	0,020	0,947	0,637	0,500	0,031	0,031	0,031
Heavy Duty Vehicles	Diesel RT 12 - 14 t	Euro I	1,226	0,938	0,884	0,438	0,285	0,234	0,223	0,162	0,150	0,087	0,023	0,020	0,351	0,261	0,214	0,031	0,031	0,031
Heavy Duty Vehicles	Diesel RT 12 - 14 t	Euro II	1,007	0,838	0,822	0,288	0,190	0,153	0,104	0,088	0,104	0,056	0,020	0,019	0,232	0,170	0,134	0,031	0,031	0,031
Heavy Duty Vehicles	Diesel RT 12 - 14 t	Euro III	1,202	0,892	0,853	0,265	0,172	0,137	0,105	0,075	0,069	0,049	0,022	0,019	0,217	0,150	0,118	0,031	0,031	0,031
Heavy Duty Vehicles	Diesel RT 12 - 14 t	Euro IV	0,612	0,457	0,419	0,035	0,026	0,024	0,025	0,020	0,020	0,003	0,002	0,001	0,032	0,024	0,023	0,031	0,031	0,031
Heavy Duty Vehicles	Diesel RT 12 - 14 t	Euro V	1,162	0,920	0,839	0,020	0,014	0,013	0,025	0,018	0,016	0,003	0,002	0,001	0,017	0,013	0,012	0,031	0,031	0,031
Heavy Duty Vehicles	Diesel RT 14 - 20t	Conventional	3,588	2,569	2,269	1,543	0,992	0,784	0,493	0,349	0,305	0,179	0,082	0,072	1,364	0,911	0,713	0,031	0,031	0,031
Heavy Duty Vehicles	Diesel RT 14 - 20t	Euro I	1,647	1,232	1,141	0,619	0,412	0,332	0,304	0,213	0,185	0,179	0,082	0,072	0,440	0,330	0,261	0,031	0,031	0,031
Heavy Duty Vehicles	Diesel RT 14 - 20t	Euro II	1,294	1,048	1,023	0,418	0,273	0,217	0,120	0,097	0,114	0,114	0,071	0,067	0,303	0,202	0,151	0,031	0,031	0,031
Heavy Duty Vehicles	Diesel RT 14 - 20t	Euro III	1,635	1,175	1,119	0,387	0,248	0,200	0,145	0,100	0,085	0,100	0,076	0,065	0,286	0,172	0,135	0,031	0,031	0,031
Heavy Duty Vehicles	Diesel RT 14 - 20t	Euro IV	0,847	0,615	0,535	0,047	0,033	0,029	0,032	0,025	0,024	0,005	0,006	0,004	0,041	0,027	0,025	0,031	0,031	0,031
Heavy Duty Vehicles	Diesel RT 14 - 20t	Euro V	1,399	1,055	0,925	0,032	0,022	0,020	0,033	0,022	0,019	0,005	0,006	0,004	0,026	0,017	0,015	0,031	0,031	0,031
Heavy Duty Vehicles	Diesel RT 20 - 26t	Conventional	2,614	1,926	1,749	0,837	0,528	0,415	0,493	0,361	0,326	0,179	0,082	0,072	0,658	0,447	0,344	0,031	0,031	0,031
Heavy Duty Vehicles	Diesel RT 20 - 26t	Euro I	2,113	1,596	1,468	0,743	0,486	0,388	0,392	0,270	0,236	0,179	0,082	0,072	0,565	0,404	0,317	0,031	0,031	0,031
Heavy Duty Vehicles	Diesel RT 20 - 26t	Euro II	1,655	1,313	1,429	0,500	0,321	0,253	0,163	0,130	0,149	0,114	0,071	0,067	0,385	0,250	0,187	0,031	0,031	0,031
Heavy Duty Vehicles	Diesel RT 20 - 26t	Euro III	2,069	1,519	1,433	0,462	0,293	0,230	0,175	0,120	0,105	0,100	0,076	0,065	0,362	0,217	0,165	0,031	0,031	0,031
Heavy Duty Vehicles	Diesel RT 20 - 26t	Euro IV	1,025	0,744	0,642	0,060	0,041	0,035	0,041	0,031	0,029	0,005	0,006	0,004	0,055	0,036	0,031	0,031	0,031	0,031
Heavy Duty Vehicles	Diesel RT 20 - 26t	Euro V	1,829	1,409	1,254	0,035	0,024	0,021	0,042	0,028	0,025	0,005	0,006	0,004	0,030	0,019	0,016	0,031	0,031	0,031
Heavy Duty Vehicles	Diesel RT 26 - 28t	Conventional	2,762	2,030	1,850	0,861	0,553	0,440	0,523	0,383	0,343	0,179	0,082	0,072	0,682	0,471	0,368	0,031	0,031	0,031
Heavy Duty Vehicles	Diesel RT 26 - 28t	Euro II	1,719	1,376	1,489	0,509	0,334	0,268	0,189	0,151	0,171	0,114	0,071	0,067	0,395	0,263	0,202	0,031	0,031	0,031
Heavy Duty Vehicles	Diesel RT 26 - 28t	Euro III	2,167	1,616	1,513	0,477	0,310	0,248	0,206	0,144	0,120	0,100	0,076	0,065	0,377	0,234	0,183	0,031	0,031	0,031
Heavy Duty Vehicles	Diesel RT 26 - 28t	Euro IV	1,066	0,768	0,654	0,065	0,046	0,038	0,045	0,034	0,030	0,005	0,006	0,004	0,060	0,040	0,034	0,031	0,031	0,031
Heavy Duty Vehicles	Diesel RT 26 - 28t	Euro V	2,052	1,564	1,388	0,031	0,022	0,018	0,047	0,030	0,025	0,005	0,006	0,004	0,026	0,016	0,014	0,031	0,031	0,031

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Heavy Duty Vehicles	Diesel RT 28 - 32t	Conventional	2,992	2,195	2,092	0,893	0,572	0,453	0,579	0,424	0,384	0,179	0,082	0,072	0,714	0,490	0,382	0,031	0,031	0,031
Heavy Duty Vehicles	Diesel RT 28 - 32t	Euro I	2,429	1,902	1,834	0,795	0,530	0,428	0,446	0,320	0,287	0,179	0,082	0,072	0,617	0,448	0,357	0,031	0,031	0,031
Heavy Duty Vehicles	Diesel RT 28 - 32t	Euro II	1,972	1,608	1,596	0,535	0,352	0,282	0,187	0,153	0,173	0,114	0,071	0,067	0,420	0,280	0,215	0,031	0,031	0,031
Heavy Duty Vehicles	Diesel RT 28 - 32t	Euro III	2,375	1,770	1,721	0,501	0,324	0,258	0,194	0,139	0,122	0,100	0,076	0,065	0,401	0,248	0,192	0,031	0,031	0,031
Heavy Duty Vehicles	Diesel RT 28 - 32t	Euro IV	1,170	0,852	0,730	0,072	0,052	0,044	0,050	0,038	0,035	0,005	0,006	0,004	0,066	0,046	0,040	0,031	0,031	0,031
Heavy Duty Vehicles	Diesel RT 28 - 32t	Euro V	2,362	1,786	1,560	0,034	0,024	0,021	0,053	0,035	0,030	0,005	0,006	0,004	0,029	0,019	0,016	0,031	0,031	0,031
Heavy Duty Vehicles	Diesel RT >32t	Euro I	2,536	1,935	1,834	0,829	0,538	0,428	0,463	0,324	0,292	0,179	0,082	0,072	0,650	0,456	0,357	0,031	0,031	0,031
Heavy Duty Vehicles	Diesel RT >32t	Euro III	2,450	1,828	1,763	0,506	0,323	0,254	0,224	0,156	0,138	0,100	0,076	0,065	0,406	0,246	0,189	0,031	0,031	0,031
Heavy Duty Vehicles	Diesel RT >32t	Euro V	2,397	1,829	1,637	0,035	0,024	0,020	0,052	0,035	0,030	0,005	0,006	0,004	0,029	0,018	0,016	0,031	0,031	0,031
Heavy Duty Vehicles	Diesel TT/AT 28 - 34t	Conventional	2,616	1,940	1,843	0,752	0,486	0,388	0,499	0,369	0,346	0,179	0,082	0,072	0,573	0,404	0,317	0,031	0,031	0,031
Heavy Duty Vehicles	Diesel TT/AT 28 - 34t	Euro I	2,220	1,701	1,637	0,693	0,460	0,371	0,388	0,283	0,267	0,179	0,082	0,072	0,514	0,378	0,299	0,031	0,031	0,031
Heavy Duty Vehicles	Diesel TT/AT 28 - 34t	Euro II	1,783	1,402	1,533	0,460	0,302	0,243	0,178	0,142	0,162	0,114	0,071	0,067	0,345	0,231	0,177	0,031	0,031	0,031
Heavy Duty Vehicles	Diesel TT/AT 28 - 34t	Euro III	2,112	1,593	1,548	0,424	0,275	0,219	0,174	0,124	0,114	0,100	0,076	0,065	0,324	0,199	0,154	0,031	0,031	0,031
Heavy Duty Vehicles	Diesel TT/AT 28 - 34t	Euro IV	1,012	0,725	0,631	0,060	0,042	0,037	0,044	0,032	0,028	0,005	0,006	0,004	0,055	0,037	0,032	0,031	0,031	0,031
Heavy Duty Vehicles	Diesel TT/AT 28 - 34t	Euro V	1,888	1,417	1,175	0,035	0,024	0,021	0,045	0,030	0,026	0,005	0,006	0,004	0,029	0,019	0,016	0,031	0,031	0,031
Heavy Duty Vehicles	Diesel TT/AT 34 - 40t	Conventional	3,071	2,264	2,136	0,896	0,567	0,447	0,591	0,428	0,392	0,179	0,082	0,072	0,717	0,485	0,376	0,031	0,031	0,031
Heavy Duty Vehicles	Diesel TT/AT 34 - 40t	Euro I	2,617	1,988	1,902	0,823	0,536	0,429	0,474	0,331	0,299	0,179	0,082	0,072	0,644	0,454	0,357	0,031	0,031	0,031
Heavy Duty Vehicles	Diesel TT/AT 34 - 40t	Euro II	2,101	1,642	1,813	0,549	0,351	0,276	0,216	0,168	0,191	0,114	0,071	0,067	0,435	0,279	0,209	0,031	0,031	0,031
Heavy Duty Vehicles	Diesel TT/AT 34 - 40t	Euro III	2,506	1,865	1,813	0,505	0,318	0,249	0,205	0,143	0,125	0,100	0,076	0,065	0,405	0,242	0,184	0,031	0,031	0,031
Heavy Duty Vehicles	Diesel TT/AT 34 - 40t	Euro IV	1,182	0,848	0,719	0,072	0,049	0,042	0,051	0,037	0,033	0,005	0,006	0,004	0,067	0,043	0,038	0,031	0,031	0,031
Heavy Duty Vehicles	Diesel TT/AT 34 - 40t	Euro V	2,173	1,674	1,419	0,041	0,028	0,024	0,053	0,036	0,030	0,005	0,006	0,004	0,036	0,022	0,019	0,031	0,031	0,031
Heavy Duty Vehicles	Diesel TT/AT 40 - 50t	Conventional	3,312	2,452	2,333	0,920	0,582	0,460	0,636	0,472	0,435	0,179	0,082	0,072	0,741	0,500	0,388	0,031	0,031	0,031
Heavy Duty Vehicles	Diesel TT/AT 40 - 50t	Euro I	2,884	2,181	2,124	0,862	0,558	0,442	0,511	0,366	0,340	0,179	0,082	0,072	0,684	0,476	0,371	0,031	0,031	0,031
Heavy Duty Vehicles	Diesel TT/AT 40 - 50t	Euro II	2,363	1,865	1,862	0,570	0,365	0,288	0,229	0,179	0,203	0,114	0,071	0,067	0,456	0,294	0,222	0,031	0,031	0,031
Heavy Duty Vehicles	Diesel TT/AT 40 - 50t	Euro III	2,732	2,043	2,002	0,521	0,330	0,258	0,214	0,151	0,130	0,100	0,076	0,065	0,421	0,254	0,193	0,031	0,031	0,031
Heavy Duty Vehicles	Diesel TT/AT 40 - 50t	Euro IV	1,267	0,913	0,775	0,078	0,054	0,046	0,056	0,041	0,036	0,005	0,006	0,004	0,073	0,048	0,042	0,031	0,031	0,031
Heavy Duty Vehicles	Diesel TT/AT 40 - 50t	Euro V	2,580	1,984	1,684	0,038	0,026	0,022	0,060	0,040	0,034	0,005	0,006	0,004	0,032	0,020	0,018	0,031	0,031	0,031
Heavy Duty Vehicles	Diesel TT/AT 50 - 60t	Euro II	2,843	2,240	2,239	0,640	0,415	0,330	0,324	0,251	0,281	0,114	0,071	0,067	0,525	0,344	0,264	0,031	0,031	0,031
Heavy Duty Vehicles	Diesel TT/AT >60t	Euro V	3,018	2,273	1,927	0,045	0,031	0,026	0,072	0,048	0,041	0,005	0,006	0,004	0,039	0,025	0,022	0,031	0,031	0,031
Buses	Gasoline Urban Buses	Conventional	72,559	57,010	57,010	7,256	5,701	3,628	0,415	0,415	0,415	0,145	0,114	0,073	7,111	5,587	3,555	0,006	0,006	0,006
Buses	Diesel Urban Buses <15t	Conventional	4,575	3,212	2,891	2,684	1,776	1,523	0,745	0,501	0,422	0,179	0,082	0,072	2,506	1,694	1,451	0,031	0,031	0,031
Buses	Diesel Urban Buses <15t	Euro I	1,602	1,144	1,002	0,518	0,372	0,319	0,181	0,138	0,124	0,179	0,082	0,072	0,340	0,290	0,247	0,031	0,031	0,031
Buses	Diesel Urban Buses <15t	Euro II	1,421	0,979	0,823	0,358	0,250	0,213	0,084	0,069	0,067	0,116	0,053	0,046	0,241	0,197	0,167	0,031	0,031	0,031
Buses	Diesel Urban Buses <15t	Euro III	1,542	1,050	0,946	0,325	0,225	0,203	0,100	0,077	0,072	0,105	0,048	0,042	0,220	0,177	0,161	0,031	0,031	0,031
Buses	Diesel Urban Buses <15t	Euro IV	0,818	0,554	0,432	0,044	0,034	0,033	0,032	0,025	0,023	0,005	0,002	0,002	0,039	0,032	0,031	0,031	0,031	0,031
Buses	Diesel Urban Buses <15t	Euro V	1,822	1,238	0,962	0,021	0,016	0,016	0,029	0,020	0,019	0,005	0,002	0,002	0,015	0,014	0,014	0,031	0,031	0,031

Continued

Buses	Diesel Urban Buses 15 - 18t	Conventional	4,822	3,312	2,662	1,636	0,998	0,778	0,671	0,449	0,359	0,179	0,082	0,072	1,457	0,917	0,707	0,031	0,031	0,031
Buses	Diesel Urban Buses 15 - 18t	Euro I	2,252	1,647	1,358	0,674	0,440	0,359	0,251	0,180	0,158	0,179	0,082	0,072	0,495	0,358	0,287	0,031	0,031	0,031
Buses	Diesel Urban Buses 15 - 18t	Euro II	1,933	1,338	1,145	0,460	0,303	0,254	0,127	0,103	0,097	0,116	0,053	0,046	0,344	0,250	0,207	0,031	0,031	0,031
Buses	Diesel Urban Buses 15 - 18t	Euro III	2,115	1,412	1,284	0,425	0,275	0,237	0,152	0,115	0,100	0,105	0,048	0,042	0,319	0,227	0,195	0,031	0,031	0,031
Buses	Diesel Urban Buses 15 - 18t	Euro IV	1,067	0,724	0,568	0,062	0,046	0,041	0,045	0,034	0,029	0,005	0,002	0,002	0,057	0,044	0,039	0,031	0,031	0,031
Buses	Diesel Urban Buses 15 - 18t	Euro V	2,448	1,636	1,247	0,028	0,021	0,019	0,043	0,028	0,026	0,005	0,002	0,002	0,023	0,019	0,017	0,031	0,031	0,031
Buses	Diesel Urban Buses >18t	Conventional	6,278	4,403	3,494	1,703	1,040	0,808	0,851	0,588	0,464	0,179	0,082	0,072	1,524	0,958	0,736	0,031	0,031	0,031
Buses	Diesel Urban Buses >18t	Euro I	2,945	2,178	2,007	0,735	0,487	0,394	0,461	0,343	0,318	0,179	0,082	0,072	0,556	0,405	0,323	0,031	0,031	0,031
Buses	Diesel Urban Buses >18t	Euro II	2,596	1,753	1,499	0,501	0,339	0,269	0,087	0,070	0,065	0,116	0,053	0,046	0,385	0,286	0,222	0,031	0,031	0,031
Buses	Diesel Urban Buses >18t	Euro III	2,750	1,817	1,740	0,455	0,297	0,246	0,179	0,129	0,121	0,105	0,048	0,042	0,350	0,249	0,204	0,031	0,031	0,031
Buses	Diesel Urban Buses >18t	Euro IV	1,315	0,888	0,679	0,076	0,056	0,048	0,055	0,040	0,033	0,005	0,002	0,002	0,071	0,054	0,046	0,031	0,031	0,031
Buses	Diesel Urban Buses >18t	Euro V	3,028	1,918	1,436	0,034	0,025	0,023	0,055	0,035	0,032	0,005	0,002	0,002	0,029	0,022	0,021	0,031	0,031	0,031
Buses	Gasoline Coaches	Conventional	72,559	57,010	57,010	7,256	5,701	3,628	0,415	0,415	0,415	0,145	0,114	0,073	7,111	5,587	3,555	0,006	0,006	0,006
Buses	Diesel Coaches <15t	Conventional	2,771	1,776	1,402	0,927	0,544	0,401	0,501	0,335	0,275	0,179	0,082	0,072	0,748	0,462	0,330	0,031	0,031	0,031
Buses	Diesel Coaches <15t	Euro I	2,246	1,497	1,212	0,848	0,527	0,406	0,404	0,266	0,213	0,179	0,082	0,072	0,669	0,445	0,334	0,031	0,031	0,031
Buses	Diesel Coaches <15t	Euro II	1,813	1,229	1,115	0,599	0,367	0,278	0,163	0,120	0,106	0,116	0,053	0,046	0,483	0,313	0,232	0,031	0,031	0,031
Buses	Diesel Coaches <15t	Euro III	2,358	1,496	1,311	0,589	0,359	0,277	0,191	0,124	0,099	0,105	0,048	0,042	0,484	0,311	0,235	0,031	0,031	0,031
Buses	Diesel Coaches <15t	Euro IV	1,268	0,830	0,704	0,074	0,049	0,040	0,049	0,035	0,030	0,005	0,002	0,002	0,068	0,046	0,037	0,031	0,031	0,031
Buses	Diesel Coaches <15t	Euro V	2,426	1,590	1,374	0,036	0,024	0,020	0,050	0,027	0,019	0,005	0,002	0,002	0,031	0,022	0,018	0,031	0,031	0,031
Buses	Diesel Coaches 15 - 18t	Conventional	2,771	1,776	1,402	0,927	0,544	0,401	0,501	0,335	0,275	0,179	0,082	0,072	0,748	0,462	0,330	0,031	0,031	0,031
Buses	Diesel Coaches 15 - 18t	Euro I	2,246	1,497	1,212	0,848	0,527	0,406	0,404	0,266	0,213	0,179	0,082	0,072	0,669	0,445	0,334	0,031	0,031	0,031
Buses	Diesel Coaches 15 - 18t	Euro II	1,813	1,229	1,115	0,599	0,367	0,278	0,166	0,122	0,107	0,116	0,053	0,046	0,483	0,313	0,232	0,031	0,031	0,031
Buses	Diesel Coaches 15 - 18t	Euro III	2,358	1,496	1,311	0,589	0,359	0,277	0,198	0,129	0,103	0,105	0,048	0,042	0,484	0,311	0,235	0,031	0,031	0,031
Buses	Diesel Coaches 15 - 18t	Euro IV	1,268	0,830	0,704	0,074	0,049	0,040	0,049	0,035	0,030	0,005	0,002	0,002	0,068	0,046	0,037	0,031	0,031	0,031
Buses	Diesel Coaches 15 - 18t	Euro V	2,426	1,590	1,374	0,036	0,024	0,020	0,050	0,027	0,019	0,005	0,002	0,002	0,031	0,022	0,018	0,031	0,031	0,031
Buses	Diesel Coaches >18t	Conventional	3,171	2,086	1,770	1,035	0,637	0,493	0,584	0,396	0,338	0,179	0,082	0,072	0,856	0,555	0,421	0,031	0,031	0,031
Buses	Diesel Coaches >18t	Euro I	2,565	1,759	1,489	0,934	0,594	0,467	0,462	0,309	0,252	0,179	0,082	0,072	0,756	0,512	0,396	0,031	0,031	0,031
Buses	Diesel Coaches >18t	Euro II	2,075	1,425	1,318	0,643	0,401	0,311	0,176	0,133	0,118	0,116	0,053	0,046	0,527	0,347	0,265	0,031	0,031	0,031
Buses	Diesel Coaches >18t	Euro III	2,612	1,705	1,470	0,621	0,379	0,292	0,194	0,125	0,101	0,105	0,048	0,042	0,516	0,331	0,250	0,031	0,031	0,031
Buses	Diesel Coaches >18t	Euro IV	1,356	0,894	0,758	0,077	0,051	0,043	0,053	0,037	0,032	0,005	0,002	0,002	0,072	0,049	0,040	0,031	0,031	0,031
Buses	Diesel Coaches >18t	Euro V	2,654	1,756	1,515	0,039	0,026	0,021	0,056	0,031	0,023	0,005	0,002	0,002	0,033	0,023	0,019	0,031	0,031	0,031
Mopeds	<50 cm³	Conventional	14,304	14,304		14,916	14,594		0,195	0,195		0,227	0,227		14,689	14,367		0,001	0,001	
Mopeds	<50 cm³	Euro I	5,805	5,805		3,304	2,997		0,078	0,078		0,045	0,045		3,259	2,951		0,001	0,001	
Mopeds	<50 cm³	Euro II	1,348	1,348		2,071	1,777		0,039	0,039		0,025	0,025		2,046	1,752		0,001	0,001	
Motorcycles	2-stroke >50 cm³	Conventional	16,175	19,990	29,511	9,689	7,593	10,196	0,207	0,207	0,207	0,155	0,155	0,155	9,533	7,437	10,040	0,002	0,002	0,002
Motorcycles	2-stroke >50 cm³	Euro I	10,692	13,253	19,625	9,574	7,563	10,192	0,083	0,083	0,083	0,103	0,110	0,101	9,471	7,453	10,091	0,002	0,002	0,002

Continued

Motorcycles	2-stroke >50 cm³	Euro II	8,444	10,435	15,434	3,541	2,884	4,340	0,041	0,041	0,041	0,031	0,033	0,031	3,510	2,851	4,309	0,002	0,002	0,002
Motorcycles	2-stroke >50 cm³	Euro III	4,675	5,797	8,647	2,282	1,650	2,359	0,012	0,012	0,012	0,012	0,014	0,012	2,270	1,636	2,346	0,002	0,002	0,002
Motorcycles	4-stroke <250 cm³	Conventional	15,816	17,838	25,872	1,122	0,364	0,180	0,021	0,021	0,021	0,207	0,207	0,207	0,914	0,156	-0,027	0,002	0,002	0,002
Motorcycles	4-stroke <250 cm³	Euro I	10,770	14,984	25,821	2,161	1,124	1,045	0,021	0,021	0,021	0,147	0,149	0,137	2,014	0,975	0,908	0,002	0,002	0,002
Motorcycles	4-stroke <250 cm³	Euro II	3,843	5,976	9,469	1,933	1,095	1,033	0,005	0,005	0,005	0,141	0,095	0,095	1,792	1,000	0,938	0,002	0,002	0,002
Motorcycles	4-stroke <250 cm³	Euro III	2,135	3,318	5,278	1,319	0,676	0,562	0,005	0,005	0,005	0,085	0,033	0,029	1,234	0,643	0,533	0,002	0,002	0,002
Motorcycles	4-stroke 250 - 750 cm³	Conventional	21,209	20,198	23,830	1,554	0,761	0,412	0,021	0,021	0,021	0,207	0,207	0,207	1,346	0,554	0,205	0,002	0,002	0,002
Motorcycles	4-stroke 250 - 750 cm³	Euro I	10,986	9,332	10,843	3,351	1,804	1,152	0,021	0,021	0,021	0,153	0,180	0,162	3,198	1,624	0,990	0,002	0,002	0,002
Motorcycles	4-stroke 250 - 750 cm³	Euro II	2,312	2,525	6,315	2,228	1,180	0,890	0,005	0,005	0,005	0,162	0,124	0,126	2,066	1,056	0,764	0,002	0,002	0,002
Motorcycles	4-stroke 250 - 750 cm³	Euro III	1,273	1,394	3,479	1,466	0,737	0,670	0,005	0,005	0,005	0,097	0,044	0,037	1,369	0,693	0,633	0,002	0,002	0,002
Motorcycles	4-stroke >750 cm³	Conventional	21,209	20,198	23,830	1,395	0,605	0,614	0,021	0,021	0,021	0,207	0,207	0,207	1,188	0,398	0,407	0,002	0,002	0,002
Motorcycles	4-stroke >750 cm³	Euro I	10,986	9,332	10,843	3,460	1,929	1,644	0,021	0,021	0,021	0,095	0,095	0,160	3,365	1,834	1,485	0,002	0,002	0,002
Motorcycles	4-stroke >750 cm³	Euro II	2,312	2,525	6,315	1,981	0,919	0,712	0,005	0,005	0,005	0,087	0,064	0,106	1,894	0,855	0,607	0,002	0,002	0,002
Motorcycles	4-stroke >750 cm³	Euro III	1,273	1,394	3,479	1,245	0,539	0,464	0,005	0,005	0,005	0,052	0,023	0,031	1,193	0,517	0,433	0,002	0,002	0,002

Annex 2B-8: Fuel consumption (GJ) and emissions (tonnes) per vehicle category and as totals

Sector	Year	FC (PJ)	SO_2	NO_x	NMVOC	CH_4	CO	CO_2	N_2O	NH_3	TSP
Passenger Cars	1985	66	1714	57216	68940	1576	543043	4847	164	48	1689
Passenger Cars	1986	67	1152	58346	68917	1599	515315	4901	166	49	1719
Passenger Cars	1987	67	1149	59333	68717	1621	492705	4914	168	50	1690
Passenger Cars	1988	68	1169	61147	68768	1645	455882	4975	173	51	1641
Passenger Cars	1989	67	848	61153	67298	1631	423852	4932	172	51	1602
Passenger Cars	1990	72	908	65510	70690	1737	431213	5235	183	54	1667
Passenger Cars	1991	76	953	68046	73286	1823	450464	5567	197	146	1704
Passenger Cars	1992	80	672	67915	72817	1838	436547	5816	214	339	1614
Passenger Cars	1993	82	365	66179	70395	1824	423024	5966	225	529	1557
Passenger Cars	1994	85	385	63881	67374	1774	391546	6197	241	807	1498
Passenger Cars	1995	86	387	59513	62856	1679	371759	6256	250	1073	1396
Passenger Cars	1996	86	391	55400	58678	1590	360862	6320	259	1323	1312
Passenger Cars	1997	89	398	52173	53954	1513	324514	6479	270	1663	1183
Passenger Cars	1998	90	407	48139	48596	1435	301585	6608	271	2013	1070
Passenger Cars	1999	91	317	43763	42860	1332	265549	6645	270	2291	984
Passenger Cars	2000	90	207	40013	35467	1237	241097	6604	267	2473	902
Passenger Cars	2001	89	204	36874	32570	1144	230608	6509	258	2480	839
Passenger Cars	2002	90	207	34669	29216	1057	210481	6599	255	2495	788
Passenger Cars	2003	92	212	32640	26645	982	200698	6761	252	2473	798
Passenger Cars	2004	93	214	30300	22726	881	175449	6821	245	2445	766
Passenger Cars	2005	93	42	27204	20470	779	167420	6776	232	2313	755
Passenger Cars	2006	93	43	24652	17491	685	148317	6805	222	2213	723
Passenger Cars	2007	98	45	23590	15173	614	133796	7185	225	2133	737
Passenger Cars	2008	100	46	21994	13413	540	124053	7281	221	1997	745
Passenger Cars	2009	96	44	19929	11496	470	108939	7040	211	1832	684
Passenger Cars	2010	96	44	18722	10346	413	102541	6933	206	1667	683
Passenger Cars	2011	95	43	17874	8510	359	84125	6766	206	1542	628
Light Duty Vehicles	1985	12	2488	5442	1851	81	13182	918	4	4	1383
Light Duty Vehicles	1986	14	1741	6187	2034	92	14486	1059	4	5	1595
Light Duty Vehicles	1987	15	1828	6505	2146	96	15339	1112	5	5	1684
Light Duty Vehicles	1988	15	1883	6663	2158	99	15137	1144	5	6	1676
Light Duty Vehicles	1989	16	1316	6845	2158	102	15084	1189	5	6	1731
Light Duty Vehicles	1990	17	1414	7313	2282	108	15974	1275	5	6	1854
Light Duty Vehicles	1991	18	1462	7623	2425	112	17120	1322	5	6	1960
Light Duty Vehicles	1992	18	936	7672	2505	115	17473	1312	6	6	1903

Light Duty Vehicles	1993	18	372	7946	2636	118	18674	1350	6	7	1992
Light Duty Vehicles	1994	20	400	8446	2778	126	19447	1445	6	7	2110
Light Duty Vehicles	1995	20	402	8344	2693	122	18847	1448	8	11	2045
Light Duty Vehicles	1996	20	411	8293	2567	117	18071	1475	11	19	1957
Light Duty Vehicles	1997	20	417	8186	2373	113	16226	1494	15	28	1737
Light Duty Vehicles	1998	21	424	8193	2265	110	15566	1525	19	38	1591
Light Duty Vehicles	1999	21	240	8160	2126	103	14284	1553	24	48	1432
Light Duty Vehicles	2000	21	50	8180	1939	96	13510	1580	29	58	1286
Light Duty Vehicles	2001	22	51	8288	1987	91	14004	1616	35	72	1183
Light Duty Vehicles	2002	23	53	8347	1871	84	13098	1667	40	78	1061
Light Duty Vehicles	2003	24	57	8771	1847	77	12933	1807	45	79	1034
Light Duty Vehicles	2004	27	62	9231	1756	74	12306	1964	52	80	950
Light Duty Vehicles	2005	29	13	9579	1732	64	12059	2109	58	77	924
Light Duty Vehicles	2006	31	14	10000	1660	55	11423	2272	64	75	883
Light Duty Vehicles	2007	32	15	10263	1560	48	10531	2394	68	69	847
Light Duty Vehicles	2008	31	14	9438	1337	39	9131	2291	66	59	731
Light Duty Vehicles	2009	29	14	8606	1169	32	8151	2137	62	55	635
Light Duty Vehicles	2010	28	13	8187	1104	28	7799	2083	62	51	592
Light Duty Vehicles	2011	27	12	7751	941	25	6676	1952	61	46	513
Heavy Duty Vehicles	1985	25	5735	24022	1429	180	5850	1819	75	7	884
Heavy Duty Vehicles	1986	28	3881	27058	1579	203	6469	2050	83	8	994
Heavy Duty Vehicles	1987	27	3804	26499	1531	198	6300	2009	81	8	973
Heavy Duty Vehicles	1988	27	3734	25996	1473	195	6108	1972	79	8	953
Heavy Duty Vehicles	1989	28	2593	27058	1520	203	6297	2053	82	8	991
Heavy Duty Vehicles	1990	29	2664	27736	1506	208	6346	2110	83	8	1013
Heavy Duty Vehicles	1991	29	2706	28201	1540	211	6476	2143	85	8	1030
Heavy Duty Vehicles	1992	28	1727	27644	1481	208	6321	2103	82	8	1008
Heavy Duty Vehicles	1993	27	641	26586	1386	201	6027	2032	78	8	969
Heavy Duty Vehicles	1994	29	682	27825	1440	215	6254	2159	83	8	1017
Heavy Duty Vehicles	1995	29	685	27113	1432	220	6182	2169	86	9	999
Heavy Duty Vehicles	1996	30	702	26773	1384	227	6109	2220	88	9	987
Heavy Duty Vehicles	1997	30	713	26566	1316	229	5998	2254	90	9	940
Heavy Duty Vehicles	1998	31	725	26685	1237	231	5913	2292	93	9	877
Heavy Duty Vehicles	1999	32	416	27534	1189	238	5984	2390	98	10	841
Heavy Duty Vehicles	2000	31	73	26444	1064	225	5652	2316	95	10	759
Heavy Duty Vehicles	2001	32	76	26920	1031	230	5756	2402	99	10	726
Heavy Duty Vehicles	2002	32	76	25928	954	224	5699	2389	98	10	672

Continued											
Heavy Duty Vehicles	2003	34	79	26233	935	233	5942	2507	103	10	657
Heavy Duty Vehicles	2004	35	82	26198	916	238	6103	2586	106	11	631
Heavy Duty Vehicles	2005	35	16	25457	873	237	6098	2600	105	10	595
Heavy Duty Vehicles	2006	38	18	26353	886	248	6526	2794	112	11	597
Heavy Duty Vehicles	2007	39	18	25359	800	223	6440	2882	115	12	540
Heavy Duty Vehicles	2008	36	17	21177	596	163	5474	2659	107	11	403
Heavy Duty Vehicles	2009	31	15	16895	435	115	4552	2305	92	9	297
Heavy Duty Vehicles	2010	32	15	16248	391	101	4636	2387	96	10	256
Heavy Duty Vehicles	2011	33	15	15467	349	89	4804	2390	99	10	237
Buses	1985	7	1683	7284	744	77	3022	541	18	2	312
Buses	1986	8	1087	7830	793	83	3187	581	19	2	335
Buses	1987	8	1065	7674	778	81	3114	569	19	2	329
Buses	1988	8	1069	7710	780	82	3103	572	19	2	330
Buses	1989	8	730	7890	794	83	3132	585	19	2	338
Buses	1990	8	780	8414	845	89	3362	625	21	2	360
Buses	1991	8	781	8430	848	89	3389	626	21	2	361
Buses	1992	8	484	8049	816	85	3314	598	20	2	344
Buses	1993	8	189	8142	828	86	3401	605	20	2	348
Buses	1994	9	200	8526	865	93	3769	645	22	2	362
Buses	1995	9	206	8559	852	97	4034	667	23	2	359
Buses	1996	9	216	8733	843	103	4222	700	24	2	362
Buses	1997	9	215	8523	790	102	4070	695	24	2	343
Buses	1998	9	210	8231	725	97	3865	679	24	2	312
Buses	1999	9	113	7914	655	92	3601	662	24	2	282
Buses	2000	9	20	7564	594	86	3382	640	23	2	254
Buses	2001	9	20	7487	561	84	3241	639	23	2	229
Buses	2002	9	20	7286	523	80	3132	637	23	2	213
Buses	2003	9	21	7438	504	81	3068	671	25	3	199
Buses	2004	9	22	7394	482	80	2972	684	25	3	192
Buses	2005	9	4	7077	442	75	2753	669	25	3	172
Buses	2006	9	4	6757	406	71	2569	654	24	2	159
Buses	2007	9	4	6615	378	67	2421	662	25	2	149
Buses	2008	9	4	6082	328	57	2179	641	24	2	128
Buses	2009	8	4	5454	271	46	1887	610	23	2	106
Buses	2010	8	4	5236	238	40	1774	617	23	2	93
Buses	2011	8	4	4938	205	35	1677	591	23	2	83

Continued											
Mopeds	1985	0	1	4	3010	47	2951	17	0	0	40
Mopeds	1986	0	0	4	2703	42	2648	15	0	0	36
Mopeds	1987	0	0	4	2500	39	2451	14	0	0	33
Mopeds	1988	0	0	3	2355	37	2303	13	0	0	31
Mopeds	1989	0	0	3	2236	35	2183	13	0	0	30
Mopeds	1990	0	0	3	2273	35	2221	13	0	0	30
Mopeds	1991	0	0	3	2329	36	2280	13	0	0	31
Mopeds	1992	0	0	3	2341	36	2291	13	0	0	31
Mopeds	1993	0	0	3	2314	36	2270	13	0	0	31
Mopeds	1994	0	0	3	2283	35	2237	13	0	0	30
Mopeds	1995	0	0	4	2570	40	2519	15	0	0	34
Mopeds	1996	0	1	4	2964	46	2912	17	0	0	40
Mopeds	1997	0	1	5	3653	57	3588	21	0	0	49
Mopeds	1998	0	1	6	4374	68	4306	25	0	0	59
Mopeds	1999	0	1	6	4237	66	4163	24	0	0	57
Mopeds	2000	0	1	6	4086	64	4081	24	0	0	56
Mopeds	2001	0	1	5	3100	48	3157	19	0	0	43
Mopeds	2002	0	1	5	3053	48	3179	19	0	0	43
Mopeds	2003	0	1	5	2897	45	3060	19	0	0	42
Mopeds	2004	0	1	8	2683	42	2846	18	0	0	39
Mopeds	2005	0	0	12	2474	38	2607	17	0	0	36
Mopeds	2006	0	0	17	2315	36	2425	17	0	0	34
Mopeds	2007	0	0	22	2144	33	2233	16	0	0	32
Mopeds	2008	0	0	26	1997	31	2073	16	0	0	30
Mopeds	2009	0	0	28	1821	28	1879	15	0	0	27
Mopeds	2010	0	0	29	1626	25	1674	13	0	0	25
Mopeds	2011	0	0	30	1459	22	1490	12	0	0	22
Motorcycles	1985	0	1	57	507	53	5437	25	1	1	13
Motorcycles	1986	0	1	57	508	53	5439	25	1	1	13
Motorcycles	1987	0	1	55	494	52	5299	25	1	1	13
Motorcycles	1988	0	1	56	506	53	5365	25	1	1	13
Motorcycles	1989	0	1	55	501	52	5284	25	1	1	13
Motorcycles	1990	0	1	59	536	56	5670	27	1	1	14
Motorcycles	1991	0	1	61	549	57	5839	27	1	1	14
Motorcycles	1992	0	1	65	588	61	6234	29	1	1	15
Motorcycles	1993	0	1	69	614	65	6599	31	1	1	16

Continued											
Motorcycles	1994	0	1	74	662	69	7041	33	1	1	17
Motorcycles	1995	0	1	76	683	71	7275	34	1	1	17
Motorcycles	1996	0	1	78	692	73	7418	35	1	1	18
Motorcycles	1997	0	1	82	736	76	7784	36	1	1	19
Motorcycles	1998	1	1	85	757	79	8069	38	1	1	19
Motorcycles	1999	1	1	87	780	80	8222	38	1	1	20
Motorcycles	2000	1	1	87	751	79	8079	39	1	1	19
Motorcycles	2001	1	1	90	762	79	7929	39	1	1	19
Motorcycles	2002	1	1	94	788	80	7978	41	1	1	18
Motorcycles	2003	1	1	96	795	79	7882	41	1	1	18
Motorcycles	2004	1	1	97	784	78	7625	41	1	1	17
Motorcycles	2005	1	0	101	789	77	7387	42	1	1	16
Motorcycles	2006	1	0	109	817	79	7336	45	1	1	16
Motorcycles	2007	1	0	116	832	80	7291	48	1	1	15
Motorcycles	2008	1	0	118	819	79	7074	49	1	1	15
Motorcycles	2009	1	0	113	771	74	6588	48	1	1	13
Motorcycles	2010	1	0	115	751	74	6552	48	1	1	13
Motorcycles	2011	1	0	114	738	72	6400	46	1	1	12
Total	1985	111	11621	94025	76480	2015	573486	8167	261	63	4322
Total	1986	118	7862	99481	76534	2072	547545	8632	274	65	4692
Total	1987	118	7847	100070	76166	2088	525208	8644	274	66	4723
Total	1988	118	7857	101575	76040	2110	487897	8702	276	67	4645
Total	1989	120	5488	103005	74507	2105	455832	8797	279	68	4703
Total	1990	126	5767	109036	78131	2233	464786	9284	292	72	4938
Total	1991	132	5903	112365	80977	2329	485567	9699	308	163	5099
Total	1992	134	3820	111348	80548	2343	472180	9872	322	356	4915
Total	1993	136	1569	108926	78173	2330	459994	9997	330	546	4912
Total	1994	143	1669	108755	75402	2312	430293	10493	353	825	5035
Total	1995	144	1682	103610	71087	2230	410616	10589	368	1096	4852
Total	1996	147	1721	99281	67128	2155	399593	10766	383	1354	4674
Total	1997	149	1744	95535	62822	2090	362180	10979	401	1703	4271
Total	1998	152	1768	91339	57955	2020	339304	11167	409	2063	3928
Total	1999	154	1088	87464	51847	1912	301803	11313	417	2352	3615
Total	2000	153	352	82295	43901	1788	275801	11203	415	2544	3277
Total	2001	153	353	79663	40011	1676	264696	11223	416	2566	3038
Total	2002	155	357	76328	36405	1574	243567	11352	417	2587	2796

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Total	2003	161	371	75183	33624	1497	233584	11806	426	2566	2747
Total	2004	165	381	73227	29348	1392	207300	12115	429	2538	2596
Total	2005	166	77	69430	26780	1270	198324	12214	420	2404	2499
Total	2006	171	79	67888	23575	1174	178596	12587	423	2303	2412
Total	2007	179	83	65966	20888	1065	162712	13187	434	2218	2321
Total	2008	176	81	58834	18490	907	149983	12937	419	2070	2052
Total	2009	166	77	51027	15963	765	131996	12154	390	1900	1763
Total	2010	165	76	48538	14456	682	124975	12081	388	1731	1662
Total	2011	165	74	46175	12201	601	105172	11758	390	1601	1495

Annex 2B-9: COPERT IV:DEA statistics fuel use ratios and mileage adjustment factors

Sales			1985	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Fuel ratio	Gasoline	DEA:COPERT IV	1,06	1,01	1,05	1,10	1,13	1,16	1,14	1,12	1,13	1,14	1,12	1,13	1,12	1,13	1,13	1,11	1,10	1,10	1,11	1,11	1,12	1,11	1,10
	Diesel	DEA:COPERT IV	1,22	1,33	1,36	1,32	1,32	1,40	1,39	1,40	1,42	1,41	1,40	1,35	1,36	1,35	1,42	1,44	1,43	1,40	1,44	1,39	1,32	1,34	1,35
Consumption																									
Fuel ratio	Gasoline	DEA:COPERT IV	1,11	1,11	1,10	1,11	1,12	1,13	1,13	1,13	1,14	1,15	1,17	1,19	1,16	1,17	1,16	1,14	1,12	1,11	1,11	1,11	1,13	1,13	1,11
	Diesel	DEA:COPERT IV	1,13	1,22	1,30	1,27	1,26	1,30	1,27	1,28	1,29	1,28	1,28	1,26	1,27	1,25	1,27	1,29	1,29	1,27	1,29	1,25	1,20	1,22	1,23

Annex 2B-10

Correspondence table between actual aircraft type codes and representative aircraft types

ICAO code	Representative aircraft	Type	ICAO code	Representative aircraft	Type	ICAO code	Representative aircraft	Type
B73	B737 400	L2J	BN2T	Cessna 208 Caravan	L2T	H60	S61	H2T
739	B737 400	L2J	BSTP	S61	H2T	HA4T	RJ 100	L2J
7474	B737 400	L2J	C10T	Cessna 208 Caravan	L1T	HEL	Shorts 360 300	
757	B757	L2J	C130	Lockheed C-130H Hercules	L4T	HF20	RJ 100	L2J
A109	S61	H2T	C141	DC10-30	L4J	HR16	F50	L2T
A124	B747 400	L4J	C160	F50	L2T	HS25	RJ 100	L2J
A139	S61	H2T	C17	A340	L4J	HS74	F50	L2T
A300	A310	L2J	C17C	A340	L4J	HTA0	BAe Jetstream 31	L2T
A304	A310	L2J	C208	Cessna 208 Caravan	L1T	HU30	S61	H1P
A306	A310	L2J	C20A	Shorts 360 300	L2T	HU50	Shorts 360 300	L2T
A30B	A310	L2J	C212	Shorts 360 300	L2T	IL18	Lockheed P-3B Orion	L4T
A310	A310	L2J	C25A	RJ 100	L2J	IL62	B767 300 ER	L4J
A318	A320	L2J	C25B	RJ 100	L2J	IL76	B767 300 ER	L4J
A319	A320	L2J	C27J	Dash8 400	L2T	IL86	A340	L4J
A320	A320	L2J	C30J	Lockheed C-130H Hercules	L4T	IL96	A340	L4J
A321	A320	L2J	C406	Shorts 360 300	L2T	J32	BAe Jetstream 31	L2T
A322	A320	L2J	C425	Reims F406 Caravan II	L2T	J328	RJ 100	L2J
A330	A330	L2J	C441	Reims F406 Caravan II	L2T	JET	RJ 100	
A332	A330	L2J	C5	DC10-30	L4J	JS20	BAe Jetstream 31	L2T
A333	A330	L2J	C500	RJ 100	L2J	JS31	BAe Jetstream 31	L2T
A340	A340	L4J	C501	RJ 100	L2J	JS32	BAe Jetstream 31	L2T
A343	A340	L4J	C510	RJ 100	L2J	JS41	BAe Jetstream 41	L2T
A550	S61	H1P	C525	RJ 100	L2J	JSTA	Shorts 360 300	L2T
A748	Shorts 360 300	L2T	C550	RJ 100	L2J	JSTB	Shorts 360 300	L2T
AB30	A310	L2J	C551	RJ 100	L2J	KA27	S61	H2T
AC14	Shorts 360 300	L2T	C560	RJ 100	L2J	KODI	De Havilland DHC-3 Turbo-Otter	L1T
AC6T	Shorts 360 300	L2T	C56X	RJ 100	L2J	L101	DC10-30	L3J
AC90	Shorts 360 300	L2T	C650	RJ 100	L2J	L188	Dash8 400	L4T
AC95	Shorts 360 300	L2T	C680	RJ 100	L2J	L29A	BAe146	L4J
ALO3	S61	H1T	C750	RJ 100	L2J	L29B	BAe146	L4J
AN12	Dash8 400	L4T	CL3	RJ 100	L2J	L329	BAe146	L4J
AN22	Lockheed C-130H Hercules	L4T	CL30	RJ 100	L2J	L382	Shorts 360 300	L2T
AN24	F50	L2T	CL60	RJ 100	L2J	LJ24	RJ 100	L2J
AN26	Antonov 26	L2T	CL65	RJ 100	L2J	LJ25	RJ 100	L2J
AN28	Shorts 360 300	L2T	CN35	F50	L2T	LJ31	RJ 100	L2J
AN30	Antonov 26	L2T	CRJ	RJ 100	L2J	LJ35	RJ 100	L2J
AN32	Antonov 26	L2T	CRJ1	RJ 100	L2J	LJ36	RJ 100	L2J
AN7	BAC1-11	L2J	CRJ2	RJ 100	L2J	LJ40	RJ 100	L2J
AN72	BAC1-11	L2J	CRJ7	RJ 100	L2J	LJ45	RJ 100	L2J
AN74	BAC1-11	L2J	CRJ9	CRJ9	L2J	LJ55	RJ 100	L2J
ANF	Dash8 400	L4T	CV44	Dash8 400	L2T	LJ60	RJ 100	L2J
APF	ATR 42-320	L2T	CV58	Dash8 400	L2T	LR24	RJ 100	L2J
AS32	S61	H2T	CVLT	Dash8 400	L2T	LR25	RJ 100	L2J
AS35	S61	H1T	D228	Dornier 328-110	L2T	LR31	RJ 100	L2J
AS50	S61	H1T	D328	Shorts 360 300	L2T	LR35	RJ 100	L2J
AS55	S61	H2T	DA10	RJ 100	L2J	LR36	RJ 100	L2J
AS65	S61	H2T	DA20	RJ 100	L2J	LR55	RJ 100	L2J
ASJ	Shorts 360 300	L2T	DA30	RJ 100	L2J	LR60	RJ 100	L2J
ASTR	RJ 100	L2J	DA50	RJ 100	L3J	LYNX	S61	H2T

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AT42	ATR 42-320	L2T
AT43	ATR 42-320	L2T
AT44	ATR 42-320	L2T
AT45	ATR 42-320	L2T
AT5	ATR 42-320	L2T
AT72	ATR 72-200	L2T
ATP	S2000	L2T
ATR	ATR 42-320	L2T
ATR4	ATR 42-320	L2T
ATR7	ATR 72-200	L2T
AVRO	BAe146	L4J
AW13	S61	H2T
B06	S61	H1T
B105	S61	H2T
B12	S61	H2T
B190	Beech 1900C Airliner	L2T
B200	Shorts 360 300	L2T
B206	S61	H1T
B212	S61	H2T
B222	S61	H2T
B321	A320	L2J
B350	Beech Super King Air 350	L2T
B378	B737 400	L2J
B407	S61	H1T
B412	S61	H2T
B429	S61	H2T
B430	S61	H2T
B461	BAe146	L4J
B462	BAe146	L4J
B463	BAe146	L4J
B46C	BAe146	L4J
B703	B757	L4J
B707	B757	L2J
B712	B737 100	L2J
B717	DC9	L2J
B720	B757	L4J
B721	B727	L3J
B722	B727	L3J
B727	B727	L2J
B72S	B727	L3J
B732	B737 400	L2J
B733	B737 400	L2J
B734	B737 400	L2J
B735	B737 400	L2J
B736	B737 400	L2J
B737	B737 400	L2J
B738	B737 400	L2J
B739	B737 400	L2J
B73A	B737 100	L2J
B73B	B737 400	L2J
B73C	B737 400	L2J
B73E	B737 400	L2J
B73G	B737 400	L2J

DA90	RJ 100	L3J
DC10	DC10-30	L3J
DC8	B767 300 ER	L2J
DC85	B767 300 ER	L4J
DC86	B767 300 ER	L4J
DC87	B767 300 ER	L4J
DC8F	B767 300 ER	L2J
DC8S	B767 300 ER	L4J
DC9	DC9	L2J
DC93	RJ 100	L2J
DC94	DC9	L2J
DC95	DC9	L2J
DF2	RJ 100	L2J
DH 7	DHC7	L2T
DH2T	De Havilland DHC-3 Turbo-Otter	L1T
DH4	Dash8 400	L2T
DH6	Shorts 360 300	L2T
DH7	DHC7	L2T
DH8	Dash8 400	L2T
DH8A	Dash8 400	L2T
DH8C	Dash8 400	L2T
DH8D	Dash8 400	L2T
DHC6	Shorts 360 300	L2T
DHC8	Dash8 400	L2T
E110	Embraer 110P2A	L2T
E120	Shorts 360 300	L2T
E121	Embraer 110P2A	L2T
E135	RJ 100	L2J
E145	RJ 100	L2J
E170	CRJ9	L2J
E175	CRJ9	L2J
E19	B737 100	L2J
E190	B737 100	L2J
E195	B737 100	L2J
E70	CRJ9	L2J
E90	B737 100	L2J
EA19	A320	L2J
EA30	A310	L2J
EA31	A310	L2J
EA32	A320	L2J
EA33	A330	L2J
EA34	A340	L4J
EA50	RJ 100	L2J
EC12	S61	H1P
EC20	S61	H1T
EC25	S61	H2T
EC30	S61	H1T
EC35	S61	H2T
EC45	S61	H2T
EC55	S61	H2T
EH10	S61	H3T
EMB	Shorts 360 300	L2T
EN28	S61	H1P

M20K	Shorts 360 300	L2T
M7T	Cessna 208 Caravan	L1T
MD11	DC10-30	L3J
MD52	S61	H1T
MD80	MD 82	L2J
MD81	MD 82	L2J
MD82	MD 82	L2J
MD83	MD 82	L2J
MD87	MD 82	L2J
MD88	MD 82	L2J
MD90	B737 400	L2J
MI14	S61	H2T
MI2	S61	H2T
MI8	S61	H2T
MU2	Shorts 360 300	L2T
MU20	Shorts 360 300	L2T
MU30	RJ 100	L2J
N24A	Shorts 360 300	L2T
N262	Shorts 360 300	L2T
ND26	Shorts 360 300	L2T
NH90	S61	L1P
NO-MA	Shorts 360 300	L2T
OTH	F50	L2T
P180	Embraer 110P2A	L2T
P46T	Cessna 208 Caravan	L1T
P750	Cessna 208 Caravan	L1T
PA42	Reims F406 Caravan II	L2T
PA60	Cessna 208 Caravan	L2T
PAT4	Shorts 360 300	L2T
PAY1	Reims F406 Caravan II	L2T
PAY2	Reims F406 Caravan II	L2T
PAY3	Reims F406 Caravan II	L2T
PAY4	Shorts 360 300	L2T
PAZT	Shorts 360 300	L2T
PC12	Cessna 208 Caravan	L1T
PC7	Cessna 208 Caravan	L1T
PC9	Cessna 208 Caravan	L1T
PRM1	RJ 100	L2J
PUMA	S61	H2T
R22	S61	H1P
R44	S61	H1P
RH22	Shorts 360 300	L2T
RH44	S61	H1P
RJ1H	BAe146	L4J
RJ70	RJ 100	L4J
RJ85	RJ 100	L4J
S210	DC9	L2J
S269	S61	H1P
S330	S61	H1T
S350	F50	L2T
S355	S61	H1T
S365	S61	H1T
S601	RJ 100	L2J

Continued

B73S	B737 400	L2J	ER3	RJ 100	L2J	S61	S61	H2T
B741	B747 100-300	L4J	EXPL	S61	H2T	S65C	S61	H2T
B742	B747 100-300	L4J	F100	F100	L2J	S76	S61	H2T
B743	B747 100-300	L4J	F26T	Cessna 208 Caravan	L1T	S893	Shorts 360 300	L2T
B744	B747 400	L4J	F27	Fokker 27 Friendship	L2T	S92	S61	H2T
B747	B747 400	L4J	F28	F28	L2T	SA22	Shorts 360 300	L2T
B74A	B747 400	L4J	F2TH	RJ 100	L2J	SB05	RJ 100	L2J
B74B	B747 400	L4J	F406	Reims F406 Caravan II	L2T	SB20	S2000	L2T
B74D	B747 400	L4J	F50	F50	L2T	SBR1	RJ 100	L2J
B74F	B747 400	L4J	F70	F28	L2T	SC7	Shorts SC.7 Srs3M-200	L2T
B74S	B747 100-300	L4J	F71	F28	L2J	SF34	Saab 340B	L2T
B752	B757	L2J	F900	RJ 100	L3J	SH33	Shorts 330	L2T
B757	B757	L2J	FA10	RJ 100	L2J	SH36	Shorts 360 300	L2T
B762	B767 300 ER	L2J	FA20	RJ 100	L2J	SH60	S61	H2T
B763	B767 300 ER	L2J	FA50	RJ 100	L3J	SH7	Shorts 360 300	L2T
B764	B767 300 ER	L2J	FA7X	RJ 100	L3J	SK61	S61	H2T
B767	B767 300 ER	L2J	FK10	F100	L2J	SK76	S61	H2T
B772	B777	L2J	FK27	F50	L2T	STAR	Shorts 360 300	L2T
B773	B777	L2J	FK28	F28	L2J	SW2	Swearingen Metro III	L2T
B777	B777	L2J	FK50	F50	L2T	SW3	Swearingen Metro III	L2T
BA11	BAC1-11	L2J	FK70	F28	L2J	SW4	Swearingen Metro III	L2T
BA14	BAe146	L4J	FOUG	RJ 100	L2J	SW4A	S61	H1T
BA31	Shorts 360 300	L2T	G159	Shorts 360 300	L2T	SW4B	S61	H1T
BA32	Shorts 360 300	L2T	G2	Shorts 360 300	L2T	T134	F100	L2J
BA41	Shorts 360 300	L2T	G222	F28	L2T	T154	B727	L3J
BA46	BAe146	L4J	G3	F50	L2T	T204	B757	L2J
BAE1	BAe146	L4J	G4	CRJ9	L2J	TB21	Shorts 360 300	L2T
BATP	F50	L2T	GALX	RJ 100	L2J	TB9	Shorts 360 300	L2T
BE02	Shorts 360 300	L2T	GAZL	S61	H1T	TBM7	Cessna 208 Caravan	L1T
BE10	Beech Super King Air 200B	L2T	GIV	CRJ9	L2J	TBM8	Cessna 208 Caravan	L1T
BE20	Beech Super King Air 200B	L2T	GLEX	RJ 100	L2J	TEX2	Cessna 208 Caravan	L1T
BE30	Beech Super King Air 350	L2T	GLF2	RJ 100	L2J	TOR	RJ 100	L2J
BE40	RJ 100	L2J	GLF3	RJ 100	L2J	TU34	F100	L2J
BE90	Beech Super King Air 200B	L2T	GLF4	RJ 100	L2J	TU54	B757	L2J
BE99	Beech Super King Air 200B	L2T	GLF5	RJ 100	L2J	UH1	S61	H1T
BE9L	Reims F406 Caravan II	L2T	GULF	F50	L2T	VC10	B757	L4J
BE9T	Reims F406 Caravan II	L2T	H25A	RJ 100	L2J	VF14	RJ 100	L2J
BH06	S61	H1T	H25B	RJ 100	L2J	W3	S61	H2T
BH12	S61	H1T	H25C	RJ 100	L2J	WW24	RJ 100	L2J
BH21	S61	H1T	H269	S61	H1P	WW25	F50	L2T
BH41	S61	H1T	H36	S61	H1P	Y12	Shorts 360 300	L2T
BK17	S61	H2T	H46	S61	H2T	YK40	RJ 100	L3J
BN2	Shorts 360 300	L2T	H500	S61	H1T	YK42	DC9	L3J

LTO no. per representative aircraft type for domestic and int. flights (Copenhagen and other airports).

Flight	Airport name	Rep Aircraft	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Domestic	Copenhagen	A310	37	1	1	3	1	1		1	1		
Domestic	Copenhagen	A320	71	83	110	77	115	237	263	554	536	497	590
Domestic	Copenhagen	A330	4	28	213	228	228	228	232	211	225	223	237
Domestic	Copenhagen	A340	7	3	5	1				1			2
Domestic	Copenhagen	Antonov 26				91	284	246	253	253	249	63	
Domestic	Copenhagen	ATR 42-320	4494	5333	4951	2933	804	3320	3393	3820	2455	2925	2799
Domestic	Copenhagen	ATR 72-200	2358	2783	4495	5218	6664	5775	5449	7005	5697	6763	8108
Domestic	Copenhagen	B727		1									
Domestic	Copenhagen	B737 400	2264	1722	2212	959	514	549	1258	1376	2240	3521	3172
Domestic	Copenhagen	B747 400					1		1			1	
Domestic	Copenhagen	B757	227	264	152	146	100	101	141	154	112	85	4
Domestic	Copenhagen	B767 300 ER	206	182	24	1			1	24	15	1	4
Domestic	Copenhagen	BAe146	491	532	581	665	1034	1286	1078	1171	1032	934	607
Domestic	Copenhagen	Beech Super King Air 200B	3	12	5	9	8	7	2	5	7	10	7
Domestic	Copenhagen	Cessna 208 Caravan				1		2	1	1			
Domestic	Copenhagen	CRJ9	2	3	2	3	1	1		65	1890	2792	2596
Domestic	Copenhagen	Dash8 400	2016	3849	4188	8107	6686	4152	2462		1	1	
Domestic	Copenhagen	DC10-30				1		1					
Domestic	Copenhagen	DC9	113	5									
Domestic	Copenhagen	Dornier 328-110						1					
Domestic	Copenhagen	F100					1		39	10			
Domestic	Copenhagen	F28									2		
Domestic	Copenhagen	F50	292	167	20	3	7	1	54	74			
Domestic	Copenhagen	MD 82	4498	3131	1571	469	1345	1783	2686	2974	2130	1161	941
Domestic	Copenhagen	Reims F406 Caravan II	2	2	8	11	6	3	1	1	1		
Domestic	Copenhagen	RJ 100	2318	1048	325	327	560	882	1674	1802	1531	1472	1925
Domestic	Copenhagen	S2000	19	10									
Domestic	Copenhagen	S61		1	1	8	3	3	3		4	15	16
Domestic	Copenhagen	Shorts 330	7										
Domestic	Copenhagen	Shorts 360 300	948	525	471	378	431	453	19	8	13	7	15
Domestic	Copenhagen	Swearingen Metro III	29	27	29	14	13	19	31	10	6	15	29
Domestic	Copenhagen	Saab 340B		6	4		16		15	93	372	313	
Flight	Airport name	Rep Aircraft	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
International	Copenhagen	A310	2488	1900	1179	1081	1142	1318	1181	1164	747	614	711
International	Copenhagen	A320	3895	7851	11850	17052	16184	18835	21042	24157	22594	24778	27104
International	Copenhagen	A330	363	306	692	804	783	884	854	818	803	841	1043
International	Copenhagen	A340	456	1807	1845	2049	2028	1939	1752	1756	1488	1436	1696
International	Copenhagen	Antonov 26	702	516	517	521	552	549	592	542	416	269	254
International	Copenhagen	ATR 42-320	2817	1097	1226	666	312	196	1020	821	1160	802	390
International	Copenhagen	ATR 72-200	1311	1059	1235	791	571	461	434	651	291	273	712
International	Copenhagen	B727	2051	1143	109	2	1	1	1		4	1	
International	Copenhagen	B737 100						4	219	288	345	448	1557
International	Copenhagen	B737 400	29665	25656	27987	25883	24782	19369	20690	25053	22285	25416	24361
International	Copenhagen	B747 400	718	556	612	726	900	1084	1055	970	922	872	884
International	Copenhagen	B757	1701	2062	2285	2189	2011	2082	2625	2228	1867	1840	1644
International	Copenhagen	B767 300 ER	3026	1103	546	91	151	285	414	678	639	731	670
International	Copenhagen	B777	40	266	150	157	168	171	242	264	267	394	431
International	Copenhagen	BAC1-11	1	1	5		5	4	3	5	1	1	1
International	Copenhagen	BAe146	4510	5849	5131	3878	4540	4098	3723	7660	3202	2280	1077

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International	Copenhagen	Beech Super King Air 200B	13	12	16	16	48	37	60	37	37	30	54
International	Copenhagen	Cessna 208 Caravan	6	1		1	4	5	6	10	1	3	8
International	Copenhagen	CRJ9	56	48	43	70	443	1054	1398	1451	7235	12981	13811
International	Copenhagen	Dash8 400	8122	10809	13457	14213	13972	14831	11580	630	1620	2071	3157
International	Copenhagen	DC10-30	147	51	154	157	151	69	131	158	148	28	2
International	Copenhagen	DC9	5424	277	91	6	15	3	10	2	27	3	
International	Copenhagen	Dornier 328-110		3	6	9		1		1	2	1	1
International	Copenhagen	F100	625	464	6	307	666	664	750	1250	626	447	389
International	Copenhagen	F28	1433	832	716	727	554	648	390	539	430	128	43
International	Copenhagen	F50	6511	3335	6075	5107	4292	3268	2901	2634	794	679	767
International	Copenhagen	MD 82	32740	32219	23211	28009	28432	26979	24648	22120	15547	11841	13432
International	Copenhagen	Reims F406 Caravan II	6	19	16	12	23	17	24	19	8	8	2
International	Copenhagen	RJ 100	5925	6637	7266	8647	8941	9060	9934	13795	12301	9836	9446
International	Copenhagen	S2000	386	1029	346	496	1426	331	33	2	4	203	559
International	Copenhagen	S61	3541	3121	3	1	1	2	3	1	4		2
International	Copenhagen	Shorts 330	125			1							
International	Copenhagen	Shorts 360 300	545	89	154	137	280	63	73	224	201	157	25
International	Copenhagen	Swearingen Metro III	723	963	943	453	459	462	488	468	453	181	12
International	Copenhagen	Saab 340B	71	801	1145	1670	509	21	265	695	843	1303	738

Flight	Airport name	Rep Aircraft	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Domestic	Other airports	A310	31	3			6		1				
Domestic	Other airports	A320	115	126	98	38	156	357	342	573	552	541	635
Domestic	Other airports	A330	9	5	2	7	4		2	1	3	1	1
Domestic	Other airports	A340	6	2	1		1						
Domestic	Other airports	Antonov 26		1		83	274	249	254	252	252	63	
Domestic	Other airports	ATR 42-320	3182	4143	5143	3189	1773	3966	3714	3875	2579	3289	3588
Domestic	Other airports	ATR 72-200	2342	2751	4629	5446	7368	5649	5324	6082	5506	6103	7369
Domestic	Other airports	B727						1			1		
Domestic	Other airports	B737 400	2754	1755	2236	798	505	501	1295	1443	2246	3500	3075
Domestic	Other airports	B747 400		1									
Domestic	Other airports	B757	46	41	50	43	16	17	21	9	4	2	2
Domestic	Other airports	B767 300 ER	3	6	7		1		3	19	19	1	2
Domestic	Other airports	BAe Jetstream 31	249	328	349	331	626	699	582	331	147	89	33
Domestic	Other airports	BAe Jetstream 41	46	67	43	49	7		1				1
Domestic	Other airports	BAe146	46	60	62	100	231	261	259	281	173	94	110
Domestic	Other airports	Beech 1900C Airliner	135	370	668	928	651	35	5	3	1		
Domestic	Other airports	Beech Super King Air 200B	194	155	245	241	218	231	153	118	80	66	81
Domestic	Other airports	Beech Super King Air 350	18	2	6	7	3	1	86	46	11	9	11
Domestic	Other airports	Cessna 208 Caravan	11	24	58	86	98	155	101	129	104	75	106
Domestic	Other airports	CRJ9								49	1899	2792	2600
Domestic	Other airports	Dash8 400	2038	3828	4192	8105	6705	4157	2462				
Domestic	Other airports	DC10-30				3							
Domestic	Other airports	DC9	113	6									
Domestic	Other airports	De Havilland DHC-3 Turbo-Otter				1	2						
Domestic	Other airports	Dornier 328-110				2		1	1				
Domestic	Other airports	Embraer 110P2A	132	118	455	371	457	638	20	47	30	36	43
Domestic	Other airports	F100							37	1			
Domestic	Other airports	F50	140	183	9	2	2	1	53	69	4	1	
Domestic	Other airports	Fokker 27 Friendship	63	1			1	3		8			
Domestic	Other airports	Lockheed C-130H Hercules	17	12	13	46	54	27	46	38	44	69	49

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Domestic	Other airports	MD 82	4505	3140	1567	454	1358	1782	2692	3033	2155	1265	1148
Domestic	Other airports	Reims F406 Caravan II	264	298	262	159	134	68	109	71	53	21	12
Domestic	Other airports	RJ 100	3160	2387	1930	1618	1107	1639	2718	2754	2403	2235	2379
Domestic	Other airports	S2000	93	91	86	41	26	18	2	1			
Domestic	Other airports	S61	220	3018	4452	4432	4209	4760	5451	4744	4995	4562	4272
Domestic	Other airports	Shorts 330	7										
Domestic	Other airports	Shorts 360 300	389	207	144	63	145	131	317	465	530	266	39
Domestic	Other airports	Shorts SC.7 Srs3M-200	173			1		6	4				1
Domestic	Other airports	Swearingen Metro III	135	155	263	97	124	211	172	89	93	67	155
Domestic	Other airports	Saab 340B		510	389		401	892	925	1015	973	888	167

Flight	Airport name	Rep Aircraft	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
International	Other airports	A310	151	19	28	20	9	12	13	4	1	2	6
International	Other airports	A320	937	1004	834	849	924	1192	1090	1156	1038	1307	1413
International	Other airports	A330	60	11	3	13	3	7	10	5	2	13	17
International	Other airports	A340				2	3						
International	Other airports	Antonov 26	2	2		2	12	11	42	17	18	11	4
International	Other airports	ATR 42-320	161	242	403	527	1122	715	463	122	109	415	728
International	Other airports	ATR 72-200	15	45	82	46	140	264	363	458	431	451	356
International	Other airports	B727	82	90	77	26	26	46	1				
International	Other airports	B737 100	6					7	2		2	252	868
International	Other airports	B737 400	6906	6492	6680	6839	6734	4575	5592	6866	6179	7698	7544
International	Other airports	B747 100-300		1		2	10		1		2	5	3
International	Other airports	B747 400	2	7	10	16	10	5	15	8	8	6	7
International	Other airports	B757	107	137	188	150	79	114	88	64	70	266	316
International	Other airports	B767 300 ER	48	71	55	69	37	15	19	39	52	51	43
International	Other airports	BAC1-11		1	2	2	2	1					
International	Other airports	BAe Jetstream 31	1885	1802	2124	2718	2298	1811	1099	792	876	757	681
International	Other airports	BAe Jetstream 41	739	905	983	689	118	2		5	2	3	2
International	Other airports	BAe146	284	229	414	229	335	538	506	974	979	225	186
International	Other airports	Beech 1900C Airliner	92	1083	579	548	441	32	8	7	6	4	7
International	Other airports	Beech Super King Air 200B	89	123	281	288	339	404	349	361	231	203	177
International	Other airports	Beech Super King Air 350	162	28	26	22	34	22	30	38	36	52	33
International	Other airports	Cessna 208 Caravan	27	33	164	201	208	227	202	391	360	180	162
International	Other airports	CRJ9						443	874	261		1	8
International	Other airports	Dash8 400	19	147	498	68	97	62	38	31	43	78	174
International	Other airports	DC10-30		1	1	1	6	3		1		1	
International	Other airports	DC9		1	3	6			2		1		
International	Other airports	De Havilland DHC-3 Turbo-Otter			5	2	2		3				
International	Other airports	Dornier 328-110	1	3	7	6	7	9	12	8	26	10	6
International	Other airports	Embraer 110P2A	43	24	127	23	18	68	46	94	78	83	110
International	Other airports	F100	10		1	2	3	751	838	150	64	62	53
International	Other airports	F28						7	254	257	228	261	577
International	Other airports	F50	241	164	59	2	7	38	5	44	300	48	72
International	Other airports	Fokker 27 Friendship	551	359	4	1	10	150	5	3	1		1
International	Other airports	Lockheed C-130H Hercules	4	1	4	4	7	13	8	5	6	3	5
International	Other airports	MD 82	141	168	140	227	461	513	979	963	704	411	340
International	Other airports	Reims F406 Caravan II	195	410	394	267	268	197	254	131	94	45	34
International	Other airports	RJ 100	2740	3047	4544	5980	4083	4827	5706	6999	5866	7296	8466
International	Other airports	S2000	430	472	651	760	811	101	10	14	3	31	119
International	Other airports	S61	33	55	108	120	106	163	168	136	104	95	94

Continued													
International	Other airports	Shorts 330	12										
International	Other airports	Shorts 360 300	564	538	127	78	1680	2894	3074	2264	2044	1592	985
International	Other airports	Shorts SC.7 Srs3M-200			5	4	5	7	1	3			
International	Other airports	Swearingen Metro III	290	309	328	290	374	453	481	427	249	306	341
International	Other airports	Saab 340B	6	56	112	11	222	713	637	790	407	312	97

No. of flights between Danish airports and airports in Greenland and Faroe Islands

Area	Destination	Airport name	Distance NM	Rep Aircraft	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Greenland	Narsarsuaq	Billund	1694,92	RJ 100											1
Greenland	Narsarsuaq	Copenhagen	1796,98	B737 400	2	9	10	7	4	5		5	1		26
Greenland	Narsarsuaq	Copenhagen	1796,98	B757	68	73	65	63	61	66	77	72	50	39	
Greenland	Narsarsuaq	Copenhagen	1796,98	F50				1							
Greenland	Narsarsuaq	Copenhagen	1796,98	MD 82	4										
Greenland	Narsarsuaq	Copenhagen	1796,98	RJ 100					1	1	1			1	2
Greenland	Narsarsuaq	Roskilde	1783,48	Lockheed C-130H Hercules										1	
Greenland	Narsarsuaq	Roskilde	1783,48	RJ 100								1			
Greenland	Narsarsuaq	Sønderborg	1739,20	RJ 100										1	
Greenland	Narsarsuaq	Aalborg	1670,63	A320						1					
Greenland	Narsarsuaq	Aalborg	1670,63	B737 400						1	5	12	12	2	3
Greenland	Narsarsuaq	Aalborg	1670,63	B757				1	7	6	8	2			
Greenland	Narsarsuaq	Aalborg	1670,63	MD 82									2	11	14
Greenland	Narsarsuaq	Aalborg	1670,63	RJ 100					1						
Greenland	Narsarsuaq	Aarhus	1717,06	RJ 100	1										
Greenland	Søndre Strømfjord	Billund	1766,74	B737 400										1	
Greenland	Søndre Strømfjord	Billund	1766,74	MD 82										1	
Greenland	Søndre Strømfjord	Billund	1766,74	RJ 100	1	1				1					
Greenland	Søndre Strømfjord	Copenhagen	1852,59	A310									1		
Greenland	Søndre Strømfjord	Copenhagen	1852,59	A320							47	44			
Greenland	Søndre Strømfjord	Copenhagen	1852,59	A330		25	209	207	212	212	219	196	222	219	233
Greenland	Søndre Strømfjord	Copenhagen	1852,59	A340			1					1			2
Greenland	Søndre Strømfjord	Copenhagen	1852,59	B737 400	1	12		1		34	3	2	6	3	31
Greenland	Søndre Strømfjord	Copenhagen	1852,59	B757	112	136	22	30	30	26	51	77	57	45	4
Greenland	Søndre Strømfjord	Copenhagen	1852,59	B767 300 ER	191	167	8					8	1		4
Greenland	Søndre Strømfjord	Copenhagen	1852,59	DC10-30						1					
Greenland	Søndre Strømfjord	Copenhagen	1852,59	MD 82									1		
Greenland	Søndre Strømfjord	Copenhagen	1852,59	RJ 100		2	1	1	3	1	4	2	2		2
Greenland	Søndre Strømfjord	Copenhagen	1852,59	Shorts 360 300								1			
Greenland	Søndre Strømfjord	Roskilde	1842,33	F50								1			
Greenland	Søndre Strømfjord	Roskilde	1842,33	Lockheed C-130H Hercules							1		1		
Greenland	Søndre Strømfjord	Roskilde	1842,33	RJ 100				1					1		
Greenland	Søndre Strømfjord	Sønderborg	1815,87	RJ 100			13	6	6	4	1	13	11	13	19
Greenland	Søndre Strømfjord	Aalborg	1724,62	B737 400						1					
Greenland	Søndre Strømfjord	Aalborg	1724,62	RJ 100								4			

Continued

Greenland	Thule	Copenhagen	2084,23	A330				12	13	13	12	12			
Greenland	Thule	Copenhagen	2084,23	A340			4	1							
Greenland	Thule	Copenhagen	2084,23	B767 300 ER	12	13	11								
Greenland	Thule	Copenhagen	2084,23	MD 82	1										
Greenland	Thule	Copenhagen	2084,23	RJ 100					1						
Greenland	Thule	Roskilde	2078,83	RJ 100					1						
Greenland	Thule	Sønderborg	2081,53	RJ 100					1						
Faroe Islands	Vagar	Billund	632,83	ATR 42-320	2										
Faroe Islands	Vagar	Billund	632,83	ATR 72-200				1							
Faroe Islands	Vagar	Billund	632,83	B737 400	140	132	153	104		1					
Faroe Islands	Vagar	Billund	632,83	BAe146	34	46	56	97	208	214	215	162	119	57	79
Faroe Islands	Vagar	Billund	632,83	RJ 100					2	1	7	61	79	139	108
Faroe Islands	Vagar	Billund	632,83	S2000		1									
Faroe Islands	Vagar	Billund	632,83	Shorts 360 300						1					
Faroe Islands	Vagar	Copenhagen	725,70	ATR 72-200				4	3			1			
Faroe Islands	Vagar	Copenhagen	725,70	B737 400	364	362	357	307		1					
Faroe Islands	Vagar	Copenhagen	725,70	BAe146	488	529	579	664	1021	1270	1070	1088	1011	928	607
Faroe Islands	Vagar	Copenhagen	725,70	RJ 100		3			5	2	1	1	2	46	375
Faroe Islands	Vagar	Copenhagen	725,70	Shorts 360 300					1						2
Faroe Islands	Vagar	Karup	609,07	ATR 42-320										1	
Faroe Islands	Vagar	Karup	609,07	ATR 72-200					1						
Faroe Islands	Vagar	Roskilde	713,82	BAe146									1		
Faroe Islands	Vagar	Roskilde	713,82	RJ 100								2	1	2	
Faroe Islands	Vagar	Sønderborg	681,43	RJ 100			3		1		6	4	2	2	4
Faroe Islands	Vagar	Aalborg	597,73	ATR 72-200				1							
Faroe Islands	Vagar	Aalborg	597,73	B737 400	4			3	2	1	5	3			
Faroe Islands	Vagar	Aalborg	597,73	BAe146	1	2	2		10	27	34	36	33	26	26
Faroe Islands	Vagar	Aalborg	597,73	RJ 100		2						1	1	2	
Faroe Islands	Vagar	Aalborg	597,73	Swearingen Metro III						1					
Faroe Islands	Vagar	Aarhus	646,87	BAe146				1							
Faroe Islands	Vagar	Aarhus	646,87	Beech Super King Air 350											1
Faroe Islands	Vagar	Aarhus	646,87	RJ 100										1	

LTO fuel consumption and emission factors per representative aircraft type for Copenhagen Airport and other airports.

Origin	Representative aircraft	Fuel kg_LTO	Fuel GJ_LTO	SO_2 kg_LTO	NO_x kg_LTO	VOC kg_LTO	NMVOC kg_LTO	CH_4 kg_LTO	CO kg_LTO	CO_2 tons_LTO	N_2O kg_LTO	TSP kg_LTO
Copenhagen	A310	1200,971	52,242	1,201	21,747	2,417	2,185	0,242	11,518	3,761	0,100	0,070
Copenhagen	A320	609,300	26,505	0,609	9,940	1,595	1,442	0,160	11,029	1,908	0,100	0,070
Copenhagen	A330	1727,520	75,147	1,728	33,754	0,974	0,881	0,097	9,860	5,411	0,100	0,070
Copenhagen	A340	1573,488	68,447	1,573	33,462	8,487	7,672	0,849	22,757	4,928	0,100	0,070
Copenhagen	Antonov 26	143,310	6,234	0,143	0,202	7,559	6,833	0,756	10,907	0,449	0,100	0,070
Copenhagen	ATR 42-320	120,720	5,251	0,121	1,056	0,000	0,000	0,000	0,926	0,378	0,100	0,070
Copenhagen	ATR 72-200	144,130	6,270	0,144	1,514	0,000	0,000	0,000	0,775	0,451	0,100	0,070
Copenhagen	B727	1028,975	44,760	1,029	11,222	3,366	3,043	0,337	12,941	3,223	0,100	0,070
Copenhagen	B737 100	669,320	29,115	0,669	7,107	0,340	0,307	0,034	2,456	2,096	0,100	0,070
Copenhagen	B737 400	613,619	26,692	0,614	7,350	0,296	0,268	0,030	5,455	1,922	0,100	0,070
Copenhagen	B747 100-300	2603,373	113,247	2,603	53,265	16,181	14,627	1,618	34,464	8,154	0,100	0,070
Copenhagen	B747 400	2638,978	114,796	2,639	52,985	1,170	1,058	0,117	9,011	8,265	0,100	0,070
Copenhagen	B757	957,844	41,666	0,958	18,518	0,566	0,511	0,057	5,729	3,000	0,100	0,070
Copenhagen	B767 300 ER	1270,887	55,284	1,271	24,567	0,448	0,405	0,045	3,019	3,980	0,100	0,070
Copenhagen	B777	2022,840	87,994	2,023	50,760	10,356	9,362	1,036	27,738	6,336	0,100	0,070
Copenhagen	BAC1-11	474,566	20,644	0,475	4,466	9,648	8,722	0,965	17,460	1,486	0,100	0,070
Copenhagen	BAe Jetstream 31	47,110	2,049	0,047	0,381	0,048	0,044	0,005	0,551	0,148	0,100	0,070
Copenhagen	BAe Jetstream 41	64,920	2,824	0,065	0,483	0,096	0,087	0,010	0,884	0,203	0,100	0,070
Copenhagen	BAe146	422,117	18,362	0,422	3,590	0,528	0,477	0,053	4,714	1,322	0,100	0,070
Copenhagen	Beech 1900C Airliner	62,630	2,724	0,063	0,262	0,677	0,612	0,068	2,366	0,196	0,100	0,070
Copenhagen	Beech Super King Air 200B	54,170	2,356	0,054	0,251	0,140	0,127	0,014	0,814	0,170	0,100	0,070
Copenhagen	Beech Super King Air 350	60,770	2,643	0,061	0,252	0,251	0,227	0,025	2,001	0,190	0,100	0,070
Copenhagen	Cessna 208 Caravan	29,710	1,292	0,030	0,158	0,028	0,025	0,003	0,306	0,093	0,100	0,070
Copenhagen	CRJ9	365,221	15,887	0,365	3,877	0,020	0,018	0,002	2,028	1,144	0,100	0,070
Copenhagen	Dash8 400	124,022	5,395	0,124	0,884	0,605	0,547	0,061	1,432	0,388	0,100	0,070
Copenhagen	DC10-30	1836,099	79,870	1,836	39,603	10,300	9,311	1,030	27,670	5,751	0,100	0,070
Copenhagen	DC9	634,784	27,613	0,635	6,463	0,422	0,381	0,042	2,698	1,988	0,100	0,070
Copenhagen	De Havilland Dash 7	146,920	6,391	0,147	0,781	0,206	0,186	0,021	1,600	0,460	0,100	0,070
Copenhagen	De Havilland DHC-3 Turbo-Otter	32,400	1,409	0,032	0,177	0,018	0,016	0,002	0,284	0,101	0,100	0,070
Copenhagen	Dornier 328-110	130,990	5,698	0,131	1,246	0,000	0,000	0,000	0,757	0,410	0,100	0,070
Copenhagen	Embraer 110P2A	50,490	2,196	0,050	0,284	0,026	0,024	0,003	0,400	0,158	0,100	0,070
Copenhagen	F100	532,667	23,171	0,533	5,442	0,719	0,650	0,072	6,527	1,668	0,100	0,070
Copenhagen	F28	468,141	20,364	0,468	4,669	14,505	13,113	1,451	15,260	1,466	0,100	0,070
Copenhagen	F50	130,370	5,671	0,130	1,293	0,000	0,000	0,000	0,777	0,408	0,100	0,070
Copenhagen	Fokker 27 Friendship	169,480	7,372	0,169	0,346	1,862	1,684	0,186	8,035	0,531	0,100	0,070

Continued												
Copenhagen	Lockheed C-130H Hercules	287,800	12,519	0,288	1,975	0,945	0,855	0,095	2,021	0,901	0,100	0,070
Copenhagen	Lockheed P-3B Orion	265,340	11,542	0,265	1,792	0,907	0,820	0,091	1,926	0,831	0,100	0,070
Copenhagen	MD 82	758,573	32,998	0,759	11,365	1,065	0,963	0,106	3,433	2,376	0,100	0,070
Copenhagen	Reims F406 Caravan II	42,010	1,827	0,042	0,216	0,040	0,036	0,004	0,475	0,132	0,100	0,070
Copenhagen	RJ 100	161,020	7,004	0,161	1,122	0,236	0,214	0,024	2,542	0,504	0,100	0,070
Copenhagen	S2000	103,169	4,488	0,103	0,593	0,038	0,034	0,004	0,734	0,323	0,100	0,070
Copenhagen	S61	48,676	2,117	0,049	0,385	0,028	0,025	0,003	0,378	0,152	0,100	0,070
Copenhagen	Shorts 330	73,080	3,179	0,073	0,389	0,126	0,114	0,013	0,851	0,229	0,100	0,070
Copenhagen	Shorts 360 300	86,790	3,775	0,087	0,412	0,738	0,667	0,074	3,440	0,272	0,100	0,070
Copenhagen	Shorts SC.7 Srs3M-200	25,060	1,090	0,025	0,181	0,714	0,645	0,071	0,529	0,078	0,100	0,070
Copenhagen	Swearingen Metro III	47,650	2,073	0,048	0,390	0,047	0,043	0,005	0,544	0,149	0,100	0,070
Copenhagen	Saab 340B	78,190	3,401	0,078	0,510	0,238	0,215	0,024	0,456	0,245	0,100	0,070
Origin	Representative aircraft	Fuel kg_LTO	Fuel GJ_LTO	SO_2 kg_LTO	NO_x kg_LTO	VOC kg_LTO	NMVOC kg_LTO	CH_4 kg_LTO	CO kg_LTO	CO_2 tons_LTO	N_2O kg_LTO	TSP kg_LTO
Other airports	A310	1065,140	46,334	1,065	21,167	1,166	1,054	0,117	5,789	3,336	0,100	0,070
Other airports	A320	532,087	23,146	0,532	9,582	1,464	1,323	0,146	8,403	1,666	0,100	0,070
Other airports	A330	1525,920	66,378	1,526	32,805	0,519	0,469	0,052	5,204	4,779	0,100	0,070
Other airports	A340	1394,928	60,679	1,395	32,697	4,380	3,960	0,438	11,634	4,369	0,100	0,070
Other airports	Antonov 26	105,450	4,587	0,105	0,164	3,701	3,346	0,370	5,980	0,330	0,100	0,070
Other airports	ATR 42-320	89,400	3,889	0,089	0,849	0,000	0,000	0,000	0,557	0,280	0,100	0,070
Other airports	ATR 72-200	107,950	4,696	0,108	1,243	0,000	0,000	0,000	0,475	0,338	0,100	0,070
Other airports	B727	875,431	38,081	0,875	10,682	1,832	1,656	0,183	7,569	2,742	0,100	0,070
Other airports	B737 100	569,168	24,759	0,569	6,760	0,244	0,221	0,024	1,511	1,783	0,100	0,070
Other airports	B737 400	528,911	23,008	0,529	6,988	0,148	0,134	0,015	2,905	1,657	0,100	0,070
Other airports	B747 100-300	2279,174	99,144	2,279	52,194	7,752	7,007	0,775	16,956	7,138	0,100	0,070
Other airports	B747 400	2333,706	101,516	2,334	51,524	0,899	0,812	0,090	4,817	7,309	0,100	0,070
Other airports	B757	839,780	36,530	0,840	18,033	0,299	0,270	0,030	3,002	2,630	0,100	0,070
Other airports	B767 300 ER	1132,405	49,260	1,132	23,981	0,275	0,249	0,028	1,796	3,547	0,100	0,070
Other airports	B777	1806,840	78,598	1,807	49,609	5,389	4,871	0,539	14,282	5,659	0,100	0,070
Other airports	BAC1-11	391,766	17,042	0,392	4,280	4,950	4,475	0,495	9,347	1,227	0,100	0,070
Other airports	BAe Jetstream 31	36,250	1,577	0,036	0,330	0,027	0,024	0,003	0,317	0,114	0,100	0,070
Other airports	BAe Jetstream 41	48,600	2,114	0,049	0,401	0,049	0,044	0,005	0,484	0,152	0,100	0,070
Other airports	BAe146	363,161	15,798	0,363	3,348	0,334	0,302	0,033	2,723	1,137	0,100	0,070
Other airports	Beech 1900C Airliner	47,450	2,064	0,047	0,218	0,364	0,329	0,036	1,409	0,149	0,100	0,070
Other airports	Beech Super King Air 200B	42,350	1,842	0,042	0,212	0,066	0,060	0,007	0,472	0,133	0,100	0,070
Other airports	Beech Super King Air 350	47,150	2,051	0,047	0,210	0,125	0,113	0,012	1,214	0,148	0,100	0,070
Other airports	Cessna 208 Caravan	24,250	1,055	0,024	0,138	0,014	0,012	0,001	0,168	0,076	0,100	0,070

Continued												
Other airports	CRJ9	318,925	13,873	0,319	3,664	0,014	0,013	0,001	1,184	0,999	0,100	0,070
Other airports	Dash8 400	78,842	3,430	0,079	0,712	0,302	0,273	0,030	0,732	0,247	0,100	0,070
Other airports	DC10-30	1618,066	70,386	1,618	38,762	5,286	4,778	0,529	14,088	5,068	0,100	0,070
Other airports	DC9	538,259	23,414	0,538	6,142	0,281	0,254	0,028	1,636	1,686	0,100	0,070
Other airports	De Havilland Dash 7	115,600	5,029	0,116	0,668	0,097	0,087	0,010	0,909	0,362	0,100	0,070
Other airports	De Havilland DHC-3 Turbo-Otter	26,400	1,148	0,026	0,153	0,008	0,008	0,001	0,156	0,083	0,100	0,070
Other airports	Dornier 328-110	93,850	4,082	0,094	0,968	0,000	0,000	0,000	0,456	0,294	0,100	0,070
Other airports	Embraer 110P2A	40,350	1,755	0,040	0,239	0,014	0,013	0,001	0,227	0,126	0,100	0,070
Other airports	F100	447,982	19,487	0,448	5,301	0,440	0,398	0,044	3,666	1,403	0,100	0,070
Other airports	F28	388,971	16,920	0,389	4,460	7,163	6,475	0,716	8,274	1,218	0,100	0,070
Other airports	F50	95,750	4,165	0,096	1,043	0,000	0,000	0,000	0,466	0,300	0,100	0,070
Other airports	Fokker 27 Friendship	132,400	5,759	0,132	0,320	0,977	0,883	0,098	4,649	0,415	0,100	0,070
Other airports	Lockheed C-130H Hercules	214,000	9,309	0,214	1,555	0,501	0,452	0,050	1,170	0,670	0,100	0,070
Other airports	Lockheed P-3B Orion	194,300	8,452	0,194	1,389	0,479	0,433	0,048	1,107	0,609	0,100	0,070
Other airports	MD 82	660,780	28,744	0,661	10,974	0,725	0,655	0,072	2,198	2,070	0,100	0,070
Other airports	Reims F406 Caravan II	32,950	1,433	0,033	0,180	0,021	0,019	0,002	0,270	0,103	0,100	0,070
Other airports	RJ 100	130,900	5,694	0,131	1,007	0,117	0,106	0,012	1,257	0,410	0,100	0,070
Other airports	S2000	64,769	2,817	0,065	0,439	0,018	0,016	0,002	0,388	0,203	0,100	0,070
Other airports	S61	48,676	2,117	0,049	0,385	0,028	0,025	0,003	0,378	0,152	0,100	0,070
Other airports	Shorts 330	58,200	2,532	0,058	0,337	0,059	0,053	0,006	0,482	0,182	0,100	0,070
Other airports	Shorts 360 300	67,650	2,943	0,068	0,354	0,380	0,344	0,038	1,904	0,212	0,100	0,070
Other airports	Shorts SC.7 Srs3M-200	21,700	0,944	0,022	0,173	0,349	0,316	0,035	0,333	0,068	0,100	0,070
Other airports	Swearingen Metro III	37,150	1,616	0,037	0,341	0,027	0,024	0,003	0,319	0,116	0,100	0,070
Other airports	Saab 340B	58,450	2,543	0,058	0,448	0,151	0,137	0,015	0,278	0,183	0,100	0,070

Total distance flown (NM) and average cruise fuel consumption and emission factors per representative aircraft type for cruise flying.

Year	Airport name	Flight	Rep Aircraft	NM total	Fuel kg_NM	Fuel GJ_NM	SO_2 g_NM	NO_x g_NM	VOC g_NM	NMVOC g_NM	CH_4 g_NM	CO g_NM	CO_2 kg_NM	N_2O g_NM	TSP g_NM
2011	Copenhagen	Domestic	A320	70232	6,738	0,293	6,738	136,416	1,188	1,188	0	8,697	21,104	0,673	1,347
2011	Copenhagen	Domestic	A330	495	14,886	0,647	14,886	415,692	16,039	16,039	0	32,448	46,624	1,488	2,977
2011	Copenhagen	Domestic	ATR 42-320	295636	1,745	0,075	1,745	15,252	0	0	0	17,354	5,468	0,174	0,349
2011	Copenhagen	Domestic	ATR 72-200	866033	1,716	0,074	1,716	19,46	0	0	0	11,361	5,377	0,171	0,343
2011	Copenhagen	Domestic	B737 400	382615	6,205	0,269	6,205	75,167	1,197	1,197	0	19,246	19,434	0,62	1,241
2011	Copenhagen	Domestic	Beech Super King Air 200B	519	0,788	0,034	0,788	3,807	2,387	2,387	0	14,194	2,468	0,078	0,157
2011	Copenhagen	Domestic	CRJ9	284014	3,855	0,167	3,855	34,342	0,316	0,316	0	7,581	12,076	0,385	0,771
2011	Copenhagen	Domestic	MD 82	106978	8,784	0,382	8,784	149,614	4,801	4,801	0	14,437	27,511	0,878	1,756
2011	Copenhagen	Domestic	RJ 100	163698	2,955	0,128	2,955	29,195	2,365	2,365	0	22,429	9,256	0,295	0,591
2011	Copenhagen	Domestic	S61	893	3,505	0,152	3,505	27,695	1,998	1,998	0	27,239	10,979	0,35	0,701
2011	Copenhagen	Domestic	Shorts 360 300	1243	1,612	0,07	1,612	9,347	7,674	7,674	0	40,822	5,051	0,161	0,322
2011	Copenhagen	Domestic	Swearingen Metro III	3620	0,811	0,035	0,811	8,042	0,455	0,455	0	5,747	2,541	0,081	0,162
2011	Copenhagen	International	A310	289952	9,04	0,393	9,04	147,601	1,622	1,622	0	8,309	28,315	0,904	1,808
2011	Copenhagen	International	A320	16471839	5,508	0,239	5,508	81,863	0,961	0,961	0	5,393	17,253	0,55	1,101
2011	Copenhagen	International	A330	2915764	11,944	0,519	11,944	157,836	11,452	11,452	0	16,235	37,409	1,194	2,388
2011	Copenhagen	International	A340	6736150	12,777	0,555	12,777	209,108	10,149	10,149	0	13,655	40,018	1,277	2,555
2011	Copenhagen	International	Antonov 26	77829	2,709	0,117	2,709	3,563	78,629	78,629	0	174,031	8,487	0,27	0,541
2011	Copenhagen	International	ATR 42-320	118025	1,636	0,071	1,636	13,57	0	0	0	15,565	5,126	0,163	0,327
2011	Copenhagen	International	ATR 72-200	245445	1,716	0,074	1,716	17,316	0	0	0	9,917	5,376	0,171	0,343
2011	Copenhagen	International	B737 100	729663	5,66	0,246	5,66	53,508	4,712	4,712	0	11,678	17,728	0,566	1,132
2011	Copenhagen	International	B737 400	16088747	5,595	0,243	5,595	54,8	0,546	0,546	0	9,894	17,525	0,559	1,119
2011	Copenhagen	International	B747 400	3220267	19,577	0,851	19,577	277,564	4,998	4,998	0	19,295	61,317	1,957	3,915
2011	Copenhagen	International	B757	3062720	7,141	0,31	7,141	96,065	6,858	6,858	0	9,788	22,365	0,714	1,428
2011	Copenhagen	International	B767 300 ER	2224064	9,718	0,422	9,718	127,501	4,766	4,766	0	10,904	30,439	0,971	1,943
2011	Copenhagen	International	B777	1099827	14,371	0,625	14,371	232,878	14,476	14,476	0	18,82	45,013	1,437	2,874
2011	Copenhagen	International	BAC1-11	343	5,199	0,226	5,199	58,297	1,095	1,095	0	8,203	16,283	0,519	1,039
2011	Copenhagen	International	BAe146	517753	5,109	0,222	5,109	40,464	1,949	1,949	0	6,899	16,003	0,51	1,021
2011	Copenhagen	International	Beech Super King Air 200B	16765	0,748	0,032	0,748	3,055	3,431	3,431	0	19,284	2,342	0,074	0,149
2011	Copenhagen	International	Cessna 208 Caravan	4027	0,554	0,024	0,554	3,208	0,063	0,063	0	1,957	1,736	0,055	0,11
2011	Copenhagen	International	CRJ9	4892136	3,518	0,153	3,518	27,043	0,202	0,202	0	5,096	11,02	0,351	0,703
2011	Copenhagen	International	Dash8 400	1143635	3,121	0,135	3,121	41,283	5,778	5,778	0	16,636	9,777	0,312	0,624
2011	Copenhagen	International	DC10-30	1321	15,853	0,689	15,853	306,535	37,204	37,204	0	36,84	49,651	1,585	3,17
2011	Copenhagen	International	Dornier 328-110	295	1,414	0,061	1,414	12,37	0	0	0	11,288	4,428	0,141	0,282
2011	Copenhagen	International	F100	194231	4,929	0,214	4,929	43,794	1,992	1,992	0	7,437	15,44	0,492	0,985
2011	Copenhagen	International	F28	18886	4,672	0,203	4,672	49,612	8,748	8,748	0	8,229	14,633	0,467	0,934

Continued

2011	Copenhagen	International	F50	239963	2,184	0,095	2,184	26,709	0	0	0	11,333	6,84	0,218	0,436
2011	Copenhagen	International	MD 82	6030942	7,202	0,313	7,202	100,108	3,667	3,667	0	10,844	22,559	0,72	1,44
2011	Copenhagen	International	Reims F406 Caravan II	548	0,582	0,025	0,582	2,889	0,652	0,652	0	7,811	1,825	0,058	0,116
2011	Copenhagen	International	RJ 100	4081523	2,426	0,105	2,426	19,657	0,98	0,98	0	8,847	7,598	0,242	0,485
2011	Copenhagen	International	S2000	151841	2,667	0,116	2,667	26,769	0,166	0,166	0	10,198	8,355	0,266	0,533
2011	Copenhagen	International	S61	1118	3,832	0,166	3,832	30,275	2,184	2,184	0	29,777	12,003	0,383	0,766
2011	Copenhagen	International	Shorts 360 300	12220	1,483	0,064	1,483	7,465	5,329	5,329	0	35,528	4,647	0,148	0,296
2011	Copenhagen	International	Swearingen Metro III	4791	0,797	0,034	0,797	7,895	0,488	0,488	0	6,71	2,496	0,079	0,159
2011	Copenhagen	International	Saab 340B	144068	1,433	0,062	1,433	14,558	3,498	3,498	0	6,743	4,489	0,143	0,286
2011	Other airports	Domestic	A320	76103	6,738	0,293	6,738	136,448	1,188	1,188	0	8,699	21,103	0,673	1,347
2011	Other airports	Domestic	A330	119	14,897	0,648	14,897	416,925	16,044	16,044	0	32,433	46,657	1,489	2,979
2011	Other airports	Domestic	ATR 42-320	342438	1,745	0,075	1,745	15,246	0	0	0	17,348	5,466	0,174	0,349
2011	Other airports	Domestic	ATR 72-200	791544	1,716	0,074	1,716	19,461	0	0	0	11,362	5,377	0,171	0,343
2011	Other airports	Domestic	B737 400	380505	6,205	0,269	6,205	75,169	1,197	1,197	0	19,247	19,434	0,62	1,241
2011	Other airports	Domestic	B757	203	9,359	0,407	9,359	268,121	9,824	9,824	0	18,822	29,312	0,935	1,871
2011	Other airports	Domestic	B767 300 ER	183	11,305	0,491	11,305	207,98	1,942	1,942	0	29,063	35,409	1,13	2,261
2011	Other airports	Domestic	BAe Jetstream 31	1996	1,034	0,044	1,034	10,272	0,62	0,62	0	7,992	3,239	0,103	0,206
2011	Other airports	Domestic	BAe Jetstream 41	18	1,329	0,057	1,329	12,727	1,108	1,108	0	11,339	4,164	0,132	0,265
2011	Other airports	Domestic	BAe146	544	5,394	0,234	5,394	69,022	2,804	2,804	0	11,428	16,896	0,539	1,078
2011	Other airports	Domestic	Beech Super King Air 200B	7275	0,789	0,034	0,789	3,829	2,355	2,355	0	14,04	2,472	0,078	0,157
2011	Other airports	Domestic	Beech Super King Air 350	791	0,868	0,037	0,868	3,597	4,385	4,385	0	33,884	2,721	0,086	0,173
2011	Other airports	Domestic	Cessna 208 Caravan	7965	0,514	0,022	0,514	2,999	0,099	0,099	0	2,11	1,612	0,051	0,102
2011	Other airports	Domestic	CRJ9	284383	3,855	0,167	3,855	34,342	0,316	0,316	0	7,582	12,076	0,385	0,771
2011	Other airports	Domestic	Embraer 110P2A	2803	0,848	0,036	0,848	5,011	0,183	0,183	0	3,286	2,658	0,084	0,169
2011	Other airports	Domestic	Lockheed C-130H Hercules	5397	6,625	0,288	6,625	80,865	8,903	8,903	0	21,258	20,752	0,662	1,325
2011	Other airports	Domestic	MD 82	125673	8,786	0,382	8,786	149,746	4,802	4,802	0	14,439	27,518	0,878	1,757
2011	Other airports	Domestic	Reims F406 Caravan II	1116	0,584	0,025	0,584	3,147	0,427	0,427	0	5,542	1,831	0,058	0,116
2011	Other airports	Domestic	RJ 100	215568	2,955	0,128	2,955	29,187	2,363	2,363	0	22,417	9,255	0,295	0,591
2011	Other airports	Domestic	S61	458265	3,536	0,153	3,536	27,941	2,016	2,016	0	27,481	11,077	0,353	0,707
2011	Other airports	Domestic	Shorts 360 300	2425	1,614	0,07	1,614	9,37	7,702	7,702	0	40,883	5,056	0,161	0,322
2011	Other airports	Domestic	Shorts SC.7 Srs3M-200	154	1,324	0,057	1,324	13,035	0,791	0,791	0	6,577	4,146	0,132	0,264
2011	Other airports	Domestic	Swearingen Metro III	14986	0,811	0,035	0,811	8,046	0,454	0,454	0	5,718	2,542	0,081	0,162
2011	Other airports	Domestic	Saab 340B	4058	1,477	0,064	1,477	14,831	3,77	3,77	0	7,66	4,627	0,147	0,295
2011	Other Airports	International	A310	2471	9,024	0,392	9,024	149,335	1,585	1,585	0	7,994	28,265	0,902	1,804
2011	Other Airports	International	A320	1988099	5,09	0,221	5,09	67,524	0,884	0,884	0	4,189	15,944	0,509	1,018
2011	Other Airports	International	A330	40910	12,384	0,538	12,384	168,335	11,899	11,899	0	17,006	38,787	1,238	2,476

Continued															
2011	Other Airports	International	Antonov 26	1687	2,691	0,117	2,691	3,262	73,734	73,734	0	174,031	8,43	0,269	0,538
2011	Other Airports	International	ATR 42-320	152616	1,671	0,072	1,671	14,102	0	0	0	16,131	5,234	0,167	0,334
2011	Other Airports	International	ATR 72-200	91698	1,716	0,074	1,716	17,737	0	0	0	10,199	5,376	0,171	0,343
2011	Other Airports	International	B737 100	279483	5,994	0,26	5,994	59,872	5,553	5,553	0	14,362	18,775	0,599	1,198
2011	Other Airports	International	B737 400	6498025	5,596	0,243	5,596	53,787	0,477	0,477	0	8,954	17,528	0,559	1,119
2011	Other Airports	International	B747 100-300	3119	21,076	0,916	21,076	383,564	10,657	10,657	0	29,793	66,01	2,107	4,215
2011	Other Airports	International	B747 400	17988	19,333	0,841	19,333	274,659	5,803	5,803	0	21,421	60,553	1,933	3,866
2011	Other Airports	International	B757	195255	7,585	0,329	7,585	131,693	7,533	7,533	0	12,147	23,757	0,758	1,517
2011	Other Airports	International	B767 300 ER	78615	9,583	0,416	9,583	129,522	4,47	4,47	0	11,884	30,015	0,958	1,916
2011	Other Airports	International	BAe Jetstream 31	148403	0,983	0,042	0,983	10,129	0,501	0,501	0	6,866	3,079	0,098	0,196
2011	Other Airports	International	BAe Jetstream 41	2661	1,358	0,059	1,358	13,643	0,356	0,356	0	6,721	4,254	0,135	0,271
2011	Other Airports	International	BAe146	60026	5,144	0,223	5,144	46,009	2,157	2,157	0	8,181	16,112	0,514	1,028
2011	Other Airports	International	Beech 1900C Airliner	4235	0,909	0,039	0,909	3,633	8,825	8,825	0	40,829	2,849	0,09	0,181
2011	Other Airports	International	Beech Super King Air 200B	51375	0,75	0,032	0,75	3,109	3,355	3,355	0	18,913	2,351	0,075	0,15
2011	Other Airports	International	Beech Super King Air 350	17063	0,83	0,036	0,83	3,096	4,055	4,055	0	34,922	2,601	0,083	0,166
2011	Other Airports	International	Cessna 208 Caravan	68450	0,552	0,024	0,552	3,197	0,065	0,065	0	1,968	1,73	0,055	0,11
2011	Other Airports	International	CRJ9	4057	3,46	0,15	3,46	25,612	0,163	0,163	0	4,277	10,837	0,346	0,692
2011	Other Airports	International	Dash8 400	89250	3,081	0,134	3,081	39,33	5,728	5,728	0	16,777	9,65	0,308	0,616
2011	Other Airports	International	Dornier 328-110	4113	1,39	0,06	1,39	11,704	0	0	0	11,167	4,355	0,139	0,278
2011	Other Airports	International	Embraer 110P2A	29219	0,901	0,039	0,901	5,247	0,195	0,195	0	3,487	2,824	0,09	0,18
2011	Other Airports	International	F100	18594	5,103	0,222	5,103	49,463	2,255	2,255	0	8,929	15,985	0,51	1,02
2011	Other Airports	International	F28	190753	4,767	0,207	4,767	51,305	10,342	10,342	0	10,445	14,933	0,476	0,953
2011	Other Airports	International	F50	37306	2,124	0,092	2,124	25,163	0	0	0	10,473	6,653	0,212	0,424
2011	Other Airports	International	Fokker 27 Friendship	555	1,807	0,078	1,807	1,836	15,38	15,38	0	103,161	5,661	0,18	0,361
2011	Other Airports	International	Lockheed C-130H Hercules	4871	6,834	0,297	6,834	71,216	2,012	2,012	0	12,07	21,406	0,683	1,366
2011	Other Airports	International	MD 82	430430	6,402	0,278	6,402	75,8	2,926	2,926	0	8,481	20,054	0,64	1,28
2011	Other Airports	International	Reims F406 Caravan II	15806	0,582	0,025	0,582	2,8	0,729	0,729	0	8,582	1,823	0,058	0,116
2011	Other Airports	International	RJ 100	3632470	2,427	0,105	2,427	19,677	0,983	0,983	0	8,873	7,602	0,242	0,485
2011	Other Airports	International	S2000	27000	2,682	0,116	2,682	27,036	0,18	0,18	0	10,334	8,401	0,268	0,536
2011	Other Airports	International	S61	18637	3,695	0,16	3,695	29,193	2,106	2,106	0	28,713	11,574	0,369	0,739
2011	Other Airports	International	Shorts 360 300	341272	1,502	0,065	1,502	7,725	5,666	5,666	0	36,308	4,704	0,15	0,3
2011	Other Airports	International	Swearingen Metro III	92660	0,8	0,034	0,8	7,926	0,481	0,481	0	6,508	2,505	0,08	0,16
2011	Other Airports	International	Saab 340B	21949	1,422	0,061	1,422	14,492	3,431	3,431	0	6,518	4,455	0,142	0,284

Annex 2B-11: Basis fuel consumption and emission factors, deterioration factors, transient factors stock and activity data for non road working machinery and equipment, and recreational craft

Basis factors for diesel fuelled non road machinery.

Engine size [P=kW]	Emission Level	NO_x	VOC	CO	N_2O [g pr kWh]	NH_3	TSP	Fuel
P<19	<1981	12.0	5.0	7	0.035	0.002	2.8	300
P<19	1981-1990	11.5	3.8	6	0.035	0.002	2.3	285
P<19	1991-Stage I	11.2	2.5	5	0.035	0.002	1.6	270
P<19	Stage I	11.2	2.5	5	0.035	0.002	1.6	270
P<19	Stage II	11.2	2.5	5	0.035	0.002	1.6	270
P<19	Stage IIIA	11.2	2.5	5	0.035	0.002	1.6	270
P<19	Stage IIIB	11.2	2.5	5	0.035	0.002	1.6	270
P<19	Stage IV	11.2	2.5	5	0.035	0.002	1.6	270
19<=P<37	<1981	18.0	2.5	6.5	0.035	0.002	2	300
19<=P<37	1981-1990	18.0	2.2	5.5	0.035	0.002	1.4	281
19<=P<37	1991-Stage I	9.8	1.8	4.5	0.035	0.002	1.4	262
19<=P<37	Stage I	9.8	1.8	4.5	0.035	0.002	1.4	262
19<=P<37	Stage II	6.5	0.6	2.2	0.035	0.002	0.4	262
19<=P<37	Stage IIIA	6.2	0.6	2.2	0.035	0.002	0.4	262
19<=P<37	Stage IIIB	6.2	0.6	2.2	0.035	0.002	0.4	262
19<=P<37	Stage IV	6.2	0.6	2.2	0.035	0.002	0.4	262
37<=P<56	<1981	7.7	2.4	6	0.035	0.002	1.8	290
37<=P<56	1981-1990	8.6	2.0	5.3	0.035	0.002	1.2	275
37<=P<56	1991-Stage I	11.5	1.5	4.5	0.035	0.002	0.8	260
37<=P<56	Stage I	7.7	0.6	2.2	0.035	0.002	0.4	260
37<=P<56	Stage II	5.5	0.4	2.2	0.035	0.002	0.2	260
37<=P<56	Stage IIIA	3.9	0.4	2.2	0.035	0.002	0.2	260
37<=P<56	Stage IIIB	3.9	0.4	2.2	0.035	0.002	0.0225	260
37<=P<56	Stage IV	3.9	0.4	2.2	0.035	0.002	0.0225	260
56<=P<75	<1981	7.7	2.0	5	0.035	0.002	1.4	290
56<=P<75	1981-1990	8.6	1.6	4.3	0.035	0.002	1	275
56<=P<75	1991-Stage I	11.5	1.2	3.5	0.035	0.002	0.4	260
56<=P<75	Stage I	7.7	0.4	1.5	0.035	0.002	0.2	260
56<=P<75	Stage II	5.5	0.3	1.5	0.035	0.002	0.2	260
56<=P<75	Stage IIIA	4.0	0.3	1.5	0.035	0.002	0.2	260
56<=P<75	Stage IIIB	3.0	0.2	1.5	0.035	0.002	0.0225	260
56<=P<75	Stage IV	0.4	0.2	1.5	0.035	0.002	0.0225	260
75<=P<130	<1981	10.5	2.0	5	0.035	0.002	1.4	280
75<=P<130	1981-1990	11.8	1.6	4.3	0.035	0.002	1	268
75<=P<130	1991-Stage I	13.3	1.2	3.5	0.035	0.002	0.4	255
75<=P<130	Stage I	8.1	0.4	1.5	0.035	0.002	0.2	255
75<=P<130	Stage II	5.2	0.3	1.5	0.035	0.002	0.2	255
75<=P<130	Stage IIIA	3.4	0.3	1.5	0.035	0.002	0.2	255
75<=P<130	Stage IIIB	3.0	0.2	1.5	0.035	0.002	0.0225	255
75<=P<130	Stage IV	0.4	0.2	1.5	0.035	0.002	0.0225	255
130<=P<560	<1981	17.8	1.5	2.5	0.035	0.002	0.9	270
130<=P<560	1981-1990	12.4	1.0	2.5	0.035	0.002	0.8	260
130<=P<560	1991-Stage I	11.2	0.5	2.5	0.035	0.002	0.4	250
130<=P<560	Stage I	7.6	0.3	1.5	0.035	0.002	0.2	250
130<=P<560	Stage II	5.2	0.3	1.5	0.035	0.002	0.1	250
130<=P<560	Stage IIIA	3.4	0.3	1.5	0.035	0.002	0.1	250
130<=P<560	Stage IIIB	3.0	0.2	1.5	0.035	0.002	0.0225	250
130<=P<560	Stage IV	0.4	0.2	1.5	0.035	0.002	0.0225	250

Basis factors for 4-stroke gasoline non road machinery.

Engine	Size code	Size classe [S=ccm]	Emission Level	NO_x	VOC	CO	N_2O [g pr kWh]	NH_3	TSP	Fuel
4-stroke	SH2	20<=S<50	<1981	2.4	33	198	0.002	0.03	0.08	496
4-stroke	SH2	20<=S<50	1981-1990	3.5	27.5	165	0.002	0.03	0.08	474
4-stroke	SH2	20<=S<50	1991-Stage I	4.7	22	132	0.002	0.03	0.08	451
4-stroke	SH2	20<=S<50	Stage I	4.7	22	132	0.002	0.03	0.08	406
4-stroke	SH2	20<=S<50	Stage II	4.7	22	132	0.002	0.03	0.08	406
4-stroke	SH3	S>=50	<1981	2.4	33	198	0.002	0.03	0.08	496
4-stroke	SH3	S>=50	1981-1990	3.5	27.5	165	0.002	0.03	0.08	474
4-stroke	SH3	S>=50	1991-Stage I	4.7	22	132	0.002	0.03	0.08	451
4-stroke	SH3	S>=50	Stage I	4.7	22	132	0.002	0.03	0.08	406
4-stroke	SH3	S>=50	Stage II	4.7	22	132	0.002	0.03	0.08	406
4-stroke	SN1	S<66	<1981	1.2	26.9	822	0.002	0.03	0.08	603
4-stroke	SN1	S<66	1981-1990	1.8	22.5	685	0.002	0.03	0.08	603
4-stroke	SN1	S<66	1991-Stage I	2.4	18	548	0.002	0.03	0.08	603
4-stroke	SN1	S<66	Stage I	4.3	16.1	411	0.002	0.03	0.08	475
4-stroke	SN1	S<66	Stage II	4.3	16.1	411	0.002	0.03	0.08	475
4-stroke	SN2	66<=S<100	<1981	2.3	10.5	822	0.002	0.03	0.08	627
4-stroke	SN2	66<=S<100	1981-1990	3.5	8.7	685	0.002	0.03	0.08	599
4-stroke	SN2	66<=S<100	1991-Stage I	4.7	7	548	0.002	0.03	0.08	570
4-stroke	SN2	66<=S<100	Stage I	4.7	7	467	0.002	0.03	0.08	450
4-stroke	SN2	66<=S<100	Stage II	4.7	7	467	0.002	0.03	0.08	450
4-stroke	SN3	100<=S<225	<1981	2.6	19.1	525	0.002	0.03	0.08	601
4-stroke	SN3	100<=S<225	1981-1990	3.8	15.9	438	0.002	0.03	0.08	573
4-stroke	SN3	100<=S<225	1991-Stage I	5.1	12.7	350	0.002	0.03	0.08	546
4-stroke	SN3	100<=S<225	Stage I	5.1	11.6	350	0.002	0.03	0.08	546
4-stroke	SN3	100<=S<225	Stage II	5.1	9.4	350	0.002	0.03	0.08	546
4-stroke	SN4	S>=225	<1981	1.3	11.1	657	0.002	0.03	0.08	539
4-stroke	SN4	S>=225	1981-1990	2	9.3	548	0.002	0.03	0.08	514
4-stroke	SN4	S>=225	1991-Stage I	2.6	7.4	438	0.002	0.03	0.08	490
4-stroke	SN4	S>=225	Stage I	2.6	7.4	438	0.002	0.03	0.08	490
4-stroke	SN4	S>=225	Stage II	2.6	7.4	438	0.002	0.03	0.08	490

Basis factors for 2-stroke gasoline non road machinery.

Engine	Size code	Size classe [ccm]	Emission Level	NO_x	VOC	CO	N_2O [g pr kWh]	NH_3	TSP	Fuel
2-stroke	SH2	20<=S<50	<1981	1	305	695	0.002	0.01	7	882
2-stroke	SH2	20<=S<50	1981-1990	1	300	579	0.002	0.01	5.3	809
2-stroke	SH2	20<=S<50	1991-Stage I	1.1	203	463	0.002	0.01	3.5	735
2-stroke	SH2	20<=S<50	Stage I	1.5	188	379	0.002	0.01	3.5	720
2-stroke	SH2	20<=S<50	Stage II	1.5	44	379	0.002	0.01	3.5	500
2-stroke	SH3	S>=50	<1981	1.1	189	510	0.002	0.01	3.6	665
2-stroke	SH3	S>=50	1981-1990	1.1	158	425	0.002	0.01	2.7	609
2-stroke	SH3	S>=50	1991-Stage I	1.2	126	340	0.002	0.01	1.8	554
2-stroke	SH3	S>=50	Stage I	2	126	340	0.002	0.01	1.8	529
2-stroke	SH3	S>=50	Stage II	1.2	64	340	0.002	0.01	1.8	500
2-stroke	SN1	S<66	<1981	0.5	155	418	0.002	0.01	2.6	652
2-stroke	SN1	S<66	1981-1990	0.5	155	418	0.002	0.01	2.6	652
2-stroke	SN1	S<66	1991-Stage I	0.5	155	418	0.002	0.01	2.6	652
2-stroke	SN1	S<66	Stage I	0.5	155	418	0.002	0.01	2.6	652
2-stroke	SN1	S<66	Stage II	0.5	155	418	0.002	0.01	2.6	652
2-stroke	SN2	66<=S<100	<1981	0.5	155	418	0.002	0.01	2.6	652
2-stroke	SN2	66<=S<100	1981-1990	0.5	155	418	0.002	0.01	2.6	652
2-stroke	SN2	66<=S<100	1991-Stage I	0.5	155	418	0.002	0.01	2.6	652
2-stroke	SN2	66<=S<100	Stage I	0.5	155	418	0.002	0.01	2.6	652
2-stroke	SN2	66<=S<100	Stage II	0.5	155	418	0.002	0.01	2.6	652
2-stroke	SN3	100<=S<225	<1981	0.5	155	418	0.002	0.01	2.6	652
2-stroke	SN3	100<=S<225	1981-1990	0.5	155	418	0.002	0.01	2.6	652
2-stroke	SN3	100<=S<225	1991-Stage I	0.5	155	418	0.002	0.01	2.6	652
2-stroke	SN3	100<=S<225	Stage I	0.5	155	418	0.002	0.01	2.6	652
2-stroke	SN3	100<=S<225	Stage II	0.5	155	418	0.002	0.01	2.6	652
2-stroke	SN4	S>=225	<1981	0.5	155	418	0.002	0.01	2.6	652
2-stroke	SN4	S>=225	1981-1990	0.5	155	418	0.002	0.01	2.6	652
2-stroke	SN4	S>=225	1991-Stage I	0.5	155	418	0.002	0.01	2.6	652
2-stroke	SN4	S>=225	Stage I	0.5	155	418	0.002	0.01	2.6	652
2-stroke	SN4	S>=225	Stage II	0.5	155	418	0.002	0.01	2.6	652

Fuel consumption and emission factors for LPG fork lifts.

NO_x [g pr kWh]	VOC [g pr kWh]	CO [g pr kWh]	NH_3 [g pr kWh]	N_2O [g pr kWh]	TSP [g pr kWh]	FC [g pr kWh]
19	2.2	1.5	0.003	0.05	0.07	311

Fuel consumption and emission factors for All Terrain Vehicles (ATV's).

ATV type	NO_x [g pr GJ]	VOC [g pr GJ]	CO [g pr GJ]	NH_3 [g pr GJ]	N_2O [g pr GJ]	TSP [g pr GJ]	Fuel [kg pr hour]
Professional	108	1077	16306	2	2	32	1.125
Private	128	1527	22043	2	2	39	0.75

Fuel consumption and emission factors for recreational craft.

Fuel type	Vessel type	Engine	Engine type	Direktiv	Engine size	CO	VOC	N_2O	NH_3	NO_x	TSP	Fuel
					[kW]	[g pr kWh]						
Gasoline	Other boats (< 20 ft)	Out board	2-stroke	2003/44	8	202.5	45.9	0.01	0.002	2	10	791
Gasoline	Other boats (< 20 ft)	Out board	2-stroke	Konv.	8	427	257.0	0.01	0.002	2	10	791
Gasoline	Other boats (< 20 ft)	Out board	4-stroke	2003/44	8	202.5	24.0	0.03	0.002	7	0.08	426
Gasoline	Other boats (< 20 ft)	Out board	4-stroke	Konv.	8	520	24.0	0.03	0.002	7	0.08	426
Gasoline	Yawls and cabin boats	Out board	2-stroke	2003/44	20	162	36.5	0.01	0.002	3	10	791
Gasoline	Yawls and cabin boats	Out board	2-stroke	Konv.	20	374	172.0	0.01	0.002	3	10	791
Gasoline	Yawls and cabin boats	Out board	4-stroke	2003/44	20	162	14.0	0.03	0.002	10	0.08	426
Gasoline	Yawls and cabin boats	Out board	4-stroke	Konv.	20	390	14.0	0.03	0.002	10	0.08	426
Gasoline	Sailing boats (< 26 ft)	Out board	2-stroke	2003/44	10	189	43.0	0.01	0.002	2	10	791
Gasoline	Sailing boats (< 26 ft)	Out board	2-stroke	Konv.	10	427	257.0	0.01	0.002	2	10	791
Gasoline	Sailing boats (< 26 ft)	Out board	4-stroke	2003/44	10	189	24.0	0.03	0.002	7	0.08	426
Gasoline	Sailing boats (< 26 ft)	Out board	4-stroke	Konv.	10	520	24.0	0.03	0.002	7	0.08	426
Gasoline	Speed boats	In board	4-stroke	2003/44	90	141	10.0	0.03	0.002	12	0.08	426
Gasoline	Speed boats	In board	4-stroke	Konv.	90	346	10.0	0.03	0.002	12	0.08	426
Gasoline	Speed boats	Out board	2-stroke	2003/44	50	145.8	31.8	0.01	0.002	3	10	791
Gasoline	Speed boats	Out board	2-stroke	Konv.	50	374	172.0	0.01	0.002	3	10	791
Gasoline	Speed boats	Out board	4-stroke	2003/44	50	145.8	14.0	0.03	0.002	10	0.08	426
Gasoline	Speed boats	Out board	4-stroke	Konv.	50	390	14.0	0.03	0.002	10	0.08	426
Gasoline	Water scooters	Built in	2-stroke	2003/44	45	147	32.2	0.01	0.002	3	10	791
Gasoline	Water scooters	Built in	2-stroke	Konv.	45	374	172.0	0.01	0.002	3	10	791
Gasoline	Water scooters	Built in	4-stroke	2003/44	45	147	14.0	0.03	0.002	10	0.08	426
Gasoline	Water scooters	Built in	4-stroke	Konv.	45	390	14.0	0.03	0.002	10	0.08	426
Diesel	Motor boats (27-34 ft)	In board		2003/44	150	5	1.7	0.035	0.002	8.6	1	275
Diesel	Motor boats (27-34 ft)	In board		Konv.	150	5.3	2.0	0.035	0.002	8.6	1.2	275
Diesel	Motor boats (> 34 ft)	In board		2003/44	250	5	1.6	0.035	0.002	8.6	1	275
Diesel	Motor boats (> 34 ft)	In board		Konv.	250	5.3	2.0	0.035	0.002	8.6	1.2	275
Diesel	Motor boats (< 27 ft)	In board		2003/44	40	5	1.8	0.035	0.002	9.8	1	281
Diesel	Motor boats (< 27 ft)	In board		Konv.	40	5.5	2.2	0.035	0.002	18	1.4	281
Diesel	Motor sailors	In board		2003/44	30	5	1.9	0.035	0.002	9.8	1	281
Diesel	Motor sailors	In board		Konv.	30	5.5	2.2	0.035	0.002	18	1.4	281
Diesel	Sailing boats (> 26 ft)	In board		2003/44	30	5	1.9	0.035	0.002	9.8	1	281
Diesel	Sailing boats (> 26 ft)	In board		Konv.	30	5.5	2.2	0.035	0.002	18	1.4	281

CH_4 shares of VOC for diesel, gasoline and LPG.

Fuel type	CH_4 share of VOC
Diesel	0.016
Gasoline 4-stroke	0.1
Gasoline 2-stroke	0.009
LPG	0.05

Deterioration factors for diesel machinery.

Emission Level	NO_x	VOC	CO	TSP
<1981	0.024	0.047	0.185	0.473
1981-1990	0.024	0.047	0.185	0.473
1991-Stage I	0.024	0.047	0.185	0.473
Stage I	0.024	0.036	0.101	0.473
Stage II	0.009	0.034	0.101	0.473
Stage IIIA	0.008	0.027	0.151	0.473
Stage IIIB	0.008	0.027	0.151	0.473
Stage IV	0.008	0.027	0.151	0.473

Deterioration factors for gasoline 2-stroke machinery.

Engine	Size code	Size classe	Emission Level	NO_x	VOC	CO	TSP
2-stroke	SH2	20<=S<50	<1981	0	0.2	0.2	0
2-stroke	SH2	20<=S<50	1981-1990	0	0.2	0.2	0
2-stroke	SH2	20<=S<50	1991-Stage I	0	0.2	0.2	0
2-stroke	SH2	20<=S<50	Stage I	0	0.29	0.24	0
2-stroke	SH2	20<=S<50	Stage II	0	0.29	0.24	0
2-stroke	SH3	S>=50	<1981	-0.031	0.2	0.2	0
2-stroke	SH3	S>=50	1981-1990	-0.031	0.2	0.2	0
2-stroke	SH3	S>=50	1991-Stage I	-0.031	0.2	0.2	0
2-stroke	SH3	S>=50	Stage I	0	0.266	0.231	0
2-stroke	SH3	S>=50	Stage II	0	0.266	0.231	0
2-stroke	SN1	S<66	<1981	-0.6	0.201	0.9	1.1
2-stroke	SN1	S<66	1981-1990	-0.6	0.201	0.9	1.1
2-stroke	SN1	S<66	1991-Stage I	-0.6	0.201	0.9	1.1
2-stroke	SN1	S<66	Stage I	-0.33	0.266	1.109	5.103
2-stroke	SN1	S<66	Stage II	-0.33	0	1.109	5.103
2-stroke	SN2	66<=S<100	<1981	-0.6	0.201	0.9	1.1
2-stroke	SN2	66<=S<100	1981-1990	-0.6	0.201	0.9	1.1
2-stroke	SN2	66<=S<100	1991-Stage I	-0.6	0.201	0.9	1.1
2-stroke	SN2	66<=S<100	Stage I	-0.33	0.266	1.109	5.103
2-stroke	SN2	66<=S<100	Stage II	-0.33	0	1.109	5.103
2-stroke	SN3	100<=S<225	<1981	-0.6	0.201	0.9	1.1
2-stroke	SN3	100<=S<225	1981-1990	-0.6	0.201	0.9	1.1
2-stroke	SN3	100<=S<225	1991-Stage I	-0.6	0.201	0.9	1.1
2-stroke	SN3	100<=S<225	Stage I	-0.33	0.266	1.109	5.103
2-stroke	SN3	100<=S<225	Stage II	-0.33	0	1.109	5.103
2-stroke	SN4	S>=225	<1981	-0.6	0.201	0.9	1.1
2-stroke	SN4	S>=225	1981-1990	-0.6	0.201	0.9	1.1
2-stroke	SN4	S>=225	1991-Stage I	-0.6	0.201	0.9	1.1
2-stroke	SN4	S>=225	Stage I	-0.274	0	0.887	1.935
2-stroke	SN4	S>=225	Stage II	-0.274	0	0.887	1.935

Deterioration factors for gasoline 4-stroke machinery.

Engine	Size code	Size classe	Emission Level	NO_x	VOC	CO	TSP
4-stroke	SN1	S<66	<1981	-0.6	1.1	0.9	1.1
4-stroke	SN1	S<66	1981-1990	-0.6	1.1	0.9	1.1
4-stroke	SN1	S<66	1991-Stage I	-0.6	1.1	0.9	1.1
4-stroke	SN1	S<66	Stage I	-0.3	1.753	1.051	1.753
4-stroke	SN1	S<66	Stage II	-0.3	1.753	1.051	1.753
4-stroke	SN2	66<=S<100	<1981	-0.6	1.1	0.9	1.1
4-stroke	SN2	66<=S<100	1981-1990	-0.6	1.1	0.9	1.1
4-stroke	SN2	66<=S<100	1991-Stage I	-0.6	1.1	0.9	1.1
4-stroke	SN2	66<=S<100	Stage I	-0.3	1.753	1.051	1.753
4-stroke	SN2	66<=S<100	Stage II	-0.3	1.753	1.051	1.753
4-stroke	SN3	100<=S<225	<1981	-0.6	1.1	0.9	1.1
4-stroke	SN3	100<=S<225	1981-1990	-0.6	1.1	0.9	1.1
4-stroke	SN3	100<=S<225	1991-Stage I	-0.6	1.1	0.9	1.1
4-stroke	SN3	100<=S<225	Stage I	-0.3	1.753	1.051	1.753
4-stroke	SN3	100<=S<225	Stage II	-0.3	1.753	1.051	1.753
4-stroke	SN4	S>=225	<1981	-0.6	1.1	0.9	1.1
4-stroke	SN4	S>=225	1981-1990	-0.6	1.1	0.9	1.1
4-stroke	SN4	S>=225	1991-Stage I	-0.6	1.1	0.9	1.1
4-stroke	SN4	S>=225	Stage I	-0.599	1.095	1.307	1.095
4-stroke	SN4	S>=225	Stage II	-0.599	1.095	1.307	1.095
4-stroke	SH2	20<=S<50	<1981	0	0	0	0
4-stroke	SH2	20<=S<50	1981-1990	0	0	0	0
4-stroke	SH2	20<=S<50	1991-Stage I	0	0	0	0
4-stroke	SH2	20<=S<50	Stage I	0	0	0	0
4-stroke	SH2	20<=S<50	Stage II	0	0	0	0
4-stroke	SH3	S>=50	<1981	0	0	0	0
4-stroke	SH3	S>=50	1981-1990	0	0	0	0
4-stroke	SH3	S>=50	1991-Stage I	0	0	0	0
4-stroke	SH3	S>=50	Stage I	0	0	0	0
4-stroke	SH3	S>=50	Stage II	0	0	0	0

Transient factors for diesel machinery.

Emission Level	Load	NO_x	VOC	CO	TSP	Fuel
<1981	High	0.95	1.05	1.53	1.23	1.01
1981-1990	High	0.95	1.05	1.53	1.23	1.01
1991-Stage I	High	0.95	1.05	1.53	1.23	1.01
Stage I	High	0.95	1.05	1.53	1.23	1.01
Stage II	High	0.95	1.05	1.53	1.23	1.01
Stage IIIA	High	0.95	1.05	1.53	1.23	1.01
Stage IIIB	High	1	1	1	1	1
Stage IV	High	1	1	1	1	1
<1981	Low	1.1	2.29	2.57	1.97	1.18
1981-1990	Low	1.1	2.29	2.57	1.97	1.18
1991-Stage I	Low	1.1	2.29	2.57	1.97	1.18
Stage I	Low	1.1	2.29	2.57	1.97	1.18
Stage II	Low	1.1	2.29	2.57	1.97	1.18
Stage IIIA	Low	1.1	2.29	2.57	1.97	1.18
Stage IIIB	Low	1	1	1	1	1
Stage IV	Low	1	1	1	1	1

Annual working hours, load factors and lifetimes for agricultural tractors.

Tractor type	Annual working hours	Load factor	Lifetime (yrs)
Diesel	500 (0-7 years) 500-100 (7-16 years) 100 (>16 years)	0.5	30
Gasoline (certified)	100	0.4	37
Gasoline (non certified)	50	0.4	37

Annual working hours, load factors and lifetimes for harvesters.

Annual working hours	Load factor	Lifetime (yrs)
250-100 (linear decrease 0-24 years)	0.8	25

Annual working hours, load factors and lifetime for machine pool machinery.

Tractor type	Hours pr yr	Load factor	Lifetime (yrs)
Tractors	750	0.5	7
Harvesters	100	0.8	11
Self-propelled vehicles	500	0.75	6

Operational data for other machinery types in agriculture.

Machinery type	Fuel type	Load factor	Lifetime (yrs)	Hours	Size (kW)
ATV private	Gasoline	-	6	250	-
ATV professional	Gasoline	-	8	400	-
Bedding machines	Gasoline	0.3	10	50	3
Fodder trucks	Gasoline	0.4	10	200	8
Other (gasoline)	Gasoline	0.4	10	50	5
Scrapers	Gasoline	0.3	10	50	3
Self-propelled vehicles	Diesel	0.75	15	150	60
Sweepers	Gasoline	0.3	10	50	3

Annual working hours, load factors and lifetimes for forestry machinery.

Machinery type	Hours	Load factors	Lifetime
Chippers	1200	0.5	6
Tractors (other)	100 (1990) 400 (2004)	0.5	15
Tractors (silvicultural)	800	0.5	6
Harvesters	1200	0.5	8
Forwarders	1200	0.5	8
Chain saws (forestry)	800	0.4	3

Annual working hours, load factors and lifetime for fork lifts.

Hours pr yr	Load factor	Lifetime (yrs)
1200 (>=50 kW and <=10 years old) 650 (>=50 kW and >10 years old) 650 (<50 kW)	0.27	20

Operational data for construction machinery.

Machinery type	Load factor	Lifetime	Hours	Size
Track type dozers	0.5	10	1100	140
Track type loaders	0.5	10	1100	100 (1990) 150 (2004)
Wheel loaders (0-5 tonnes)	0.5	10	1200	20
Wheel loaders (> 5,1 tonnes)	0.5	10	1200	120
Wheel type excavators	0.6	10	1200	100
Track type excavators (0-5 tonnes)	0.6	10	1100	20
Track type excavators (>5,1 tonnes)	0.6	10	1100	120
Excavators/Loaders	0.45	10	700	50
Dump trucks	0.4	10	900 (1990) 1200 (2004)	60 (1990) 180 (2004)
Mini loaders	0.5	14	700	30
Telescopic loaders	0.5	14	1000	35

Stock and operational data for other machinery types in industry.

Sector	Fuel type	Machinery type	Size (kW)	No	Load Factor	Hours
Construction machinery	Diesel	Tampers/Land rollers	30	2800	0.45	600
Construction machinery	Diesel	Generators (diesel)	45	5000	0.5	200
Construction machinery	Diesel	Kompressors (diesel)	45	5000	0.5	500
Construction machinery	Diesel	Pumps (diesel)	75	1000	0.5	5
Construction machinery	Diesel	Asphalt pavers	80	300	0.35	700
Construction machinery	Diesel	Motor graders	100	100	0.4	700
Construction machinery	Diesel	Refuse compressors	160	100	0.25	1300
Construction machinery	Gasoline	Generators (gasoline)	2.5	11000	0.4	80
Construction machinery	Gasoline	Pumps (gasoline)	4	10000	0.4	300
Construction machinery	Gasoline	Kompressors (gasoline)	4	500	0.35	15
Industry	Diesel	Refrigerating units (distribution)	8	3000	0.5	1250
Industry	Diesel	Refrigerating units (long distance)	15	3500	0.5	200
Industry	Diesel	Tractors (transport, industry)	50	3000	0.4	500
Airport GSE and other	Diesel	Airport GSE and other (light duty)	100	500	0.5	400
Airport GSE and other	Diesel	Airport GSE and other (medium duty)	125	350	0.5	300
Airport GSE and other	Diesel	Airport GSE and other (Heavy duty)	175	650	0.5	200
Building and construction	Diesel	Vibratory plates	6	3500	0.6	300
Building and construction	Diesel	Aereal lifts (diesel)	30	150	0.4	400
Building and construction	Diesel	Sweepers (diesel)	30	200	0.4	300
Building and construction	Diesel	High pressure cleaners (diesel)	30	50	0.8	500
Building and construction	Gasoline	Rammers	2.5	3000	0.4	80
Building and construction	Gasoline	Drills	3	100	0.4	10
Building and construction	Gasoline	Vibratory plates (gasoline)	4	2500	0.5	200
Building and construction	Gasoline	Cutters	4	800	0.5	50
Building and construction	Gasoline	Other (gasoline)	5	1000	0.5	40
Building and construction	Gasoline	High pressure cleaners (gasoline)	5	500	0.6	200
Building and construction	Gasoline	Sweepers (gasoline)	10	500	0.4	150
Building and construction	Gasoline	Slicers	10	100	0.7	150
Building and construction	Gasoline	Aereal lifts (gasoline)	20	50	0.4	400

Operational data for the most important types of household and gardening machinery.

Machinery type	Engine	Size (kW)	Hours	Load factor	Lifetime (yrs)
Chain saws (private)	2-stroke	2	5	0.3	10
Chain saws (professional)	2-stroke	3	270	0.4	3
Cultivators (private-large)	4-stroke	3.7	5	0.6	5
Cultivators (private-small)	4-stroke	1	5	0.6	15
Cultivators (professional)	4-stroke	7	360	0.6	8
Hedge cutters (private)	2-stroke	0.9	10	0.5	10
Hedge cutters (professional)	2-stroke	2	300	0.5	4
Lawn movers (private)	4-stroke	2.5 (2000) 3.5 (2004)	25	0.4	8
Lawn movers (professional)	4-stroke	2.5 (2000) 3.5 (2004)	250	0.4	4
Riders (private)	4-stroke	11	50	0.5	12
Riders (professional)	4-stroke	13	330	0.5	5
Shrub clearers (private)	2-stroke	1	15	0.6	10
Shrub clearers (professional)	2-stroke	2	300	0.6	4
Trimmers (private)	2-stroke	0.9	20	0.5	10
Trimmers (professional)	2-stroke	0.9	200	0.5	4

Stock and operational data for other machines in household and gardening.

Machinery type	Engine	No.	Size (kW)	Hours	Load factor	Lifetime (yrs)
Chippers	2-stroke	200	10	100	0.7	10
Garden shredders	2-stroke	500	3	20	0.7	10
Other (gasoline)	2-stroke	200	2	20	0.5	10
Suction machines	2-stroke	300	4	80	0.5	10
Wood cutters	4-stroke	100	4	15	0.5	10

Operational data for recreational craft.

Fuel type	Vessel type	Engine type	Stroke	Hours	Lifetime	Load factor
Gasoline	Other boats (<20 ft)	Out board engine	2-stroke	30	10	0.5
Gasoline	Other boats (<20 ft)	Out board engine	4-stroke	30	10	0.5
Gasoline	Yawls and cabin boats	Out board engine	2-stroke	50	10	0.5
Gasoline	Yawls and cabin boats	Out board engine	4-stroke	50	10	0.5
Gasoline	Sailing boats (<26ft)	Out board engine	2-stroke	5	10	0.5
Gasoline	Sailing boats (<26ft)	Out board engine	4-stroke	5	10	0.5
Gasoline	Speed boats	In board engine	4-stroke	75	10	0.5
Gasoline	Speed boats	Out board engine	2-stroke	50	10	0.5
Gasoline	Speed boats	Out board engine	4-stroke	50	10	0.5
Gasoline	Water scooters	Built in	2-stroke	10	10	0.5
Gasoline	Water scooters	Built in	4-stroke	10	10	0.5
Diesel	Motor boats (27-34 ft)	In board engine		150	15	0.5
Diesel	Motor boats (>34 ft)	In board engine		100	15	0.5
Diesel	Motor boats (<27 ft)	In board engine		75	15	0.5
Diesel	Motor sailors	In board engine		75	15	0.5
Diesel	Sailing boats (<26ft)	In board engine		25	15	0.5

Stock data for diesel tractors 1985-2011.

Size (kW)	Emission Level	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
37	<1981	3882	3792	3542	3543	3403	3234	3106	2922	2861	2610	2605	2273	2193	1918	1796
37	1981-1990	635	731	760	835	855	879	889	883	915	887	945	883	918	869	888
37	1991-Stage I							25	107	153	201	278	354	445	496	554
37	Stage I															
37	Stage II															
37	Stage IIIA															
45	<1981	25988	25387	23709	23718	22781	21650	20796	19563	19154	17475	17441	15219	14684	12840	12025
45	1981-1990	5740	6808	7263	8075	8476	8770	8867	8805	9128	8848	9419	8807	9151	8668	8856
45	1991-Stage I							203	202	209	203	216	202	210	199	203
49	1991-Stage I								154	281	485	602	618	702	749	765
52	1991-Stage I															247
52	Stage I															
52	Stage II															
52	Stage IIIA															
56	1991-Stage I								201	338	428	747	943	1181	1280	1307
60	<1981	54651	53387	49857	49877	47907	45529	43732	41140	40278	36747	36676	32004	30879	27001	25287
60	1981-1990	11751	14613	15795	17797	19395	20542	20770	20624	21380	20725	22063	20628	21434	20304	20744
60	1991-Stage I							863	857	888	861	917	857	891	844	862
63	1991-Stage I								468	855	1325	2014	2384	2837	3011	3076
67	1991-Stage I															671
67	Stage I															
67	Stage II															
67	Stage IIIA															
71	1991-Stage I								411	715	1179	1949	2507	3344	3594	3672
78	<1981	14558	14221	13281	13286	12761	12128	11649	10959	10729	9789	9770	8525	8226	7192	6736
78	1981-1990	4592	6152	7196	8559	10026	11323	11448	11368	11785	11424	12162	11371	11815	11192	11434
78	1991-Stage I							1233	1503	1713	1945	2429	2561	2946	2994	3287
78	Stage I															
78	Stage II															
78	Stage IIIA															
86	1991-Stage I								108	193	333	589	880	1364	1532	1718
86	Stage I															
86	Stage II															
86	Stage IIIA															
93	1991-Stage I															149

Continued

93	Stage I															
93	Stage II															
93	Stage IIIA															
97	1991-Stage I								71	175	443	962	1556	2327	2638	2695
101	<1981	4659	4551	4250	4252	4084	3881	3728	3507	3433	3132	3126	2728	2632	2302	2156
101	1981-1990	1158	1434	1618	1921	2156	2377	2403	2387	2474	2398	2553	2387	2480	2350	2400
101	1991-Stage I							266	264	274	266	283	264	275	260	696
101	Stage I															
101	Stage II															
101	Stage IIIA															
112	1991-Stage I								63	114	166	252	422	690	790	978
112	Stage I															
112	Stage II															
112	Stage IIIA															
127	1991-Stage I								12	36	81	193	279	408	457	590
127	Stage I															
127	Stage II															
127	Stage IIIA															
131	<1981	798	780	728	728	700	665	639	601	588	537	536	467	451	394	369
131	1981-1990	288	421	500	651	753	887	897	890	923	895	952	890	925	876	895
131	1991-Stage I							97	97	100	97	103	97	100	95	97
157	1981-1990		2	3	6	11	15	15	15	16	15	16	15	16	15	15
157	1991-Stage I							9	23	39	102	232	357	545	648	784
157	Stage I															
157	Stage II															
157	Stage IIIA															
157	Stage IIIB															
186	1991-Stage I															23
186	Stage I															
186	Stage II															
186	Stage IIIA															
186	Stage IIIB															

Continued

Size (kW)	Emission Level	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
37	<1981	1601	1449	1298	1148	993	833	664	504	342	176		
37	1981-1990	871	876	882	892	900	906	903	914	930	959	991	834

Continued													
37	1991-Stage I	568	572	576	582	587	592	590	597	607	626	647	667
37	Stage I		33	56	83	84	84	84	85	86	89	92	95
37	Stage II					23	53	162	324	330	340	351	362
37	Stage IIIA									109	205	333	491
45	<1981	10715	9700	8690	7685	6646	5577	4447	3376	2290	1180		
45	1981-1990	8681	8731	8800	8894	8974	9037	9006	9116	9274	9563	9883	8931
45	1991-Stage I	199	200	202	204	206	207	207	209	213	219	227	234
49	1991-Stage I	750	754	760	768	775	780	778	787	801	826	853	880
52	1991-Stage I	358	360	363	367	370	373	372	376	383	395	408	421
52	Stage I		132	242	377	381	383	382	387	393	406	419	432
52	Stage II					68	147	241	347	353	364	377	388
52	Stage IIIA									86	133	202	290
56	1991-Stage I	1281	1289	1299	1313	1325	1334	1329	1346	1369	1412	1459	1504
60	<1981	22533	20397	18273	16162	13976	11729	9351	7099	4815	2482		
60	1981-1990	20333	20451	20612	20834	21019	21167	21096	21353	21723	22401	23150	21220
60	1991-Stage I	845	850	856	866	873	879	876	887	903	931	962	991
63	1991-Stage I	3015	3033	3057	3090	3117	3139	3128	3167	3221	3322	3433	3539
67	1991-Stage I	1343	1351	1361	1376	1388	1398	1393	1410	1435	1479	1529	1576
67	Stage I		533	835	1113	1123	1131	1127	1141	1161	1197	1237	1275
67	Stage II					375	729	1144	1524	1550	1599	1652	1703
67	Stage IIIA									303	472	658	890
71	1991-Stage I	3600	3620	3649	3688	3721	3747	3735	3780	3846	3966	4098	4225
78	<1981	6002	5433	4868	4305	3723	3124	2491	1891	1283	661		
78	1981-1990	11208	11273	11361	11484	11586	11668	11628	11770	11974	12348	12761	12450
78	1991-Stage I	3436	3727	3756	3797	3830	3857	3844	3891	3959	4082	4219	4349
78	Stage I			325	329	332	334	333	337	343	354	365	377
78	Stage II				227	310	400	463	469	477	492	508	524
78	Stage IIIA								63	121	147	183	226
86	1991-Stage I	1876	2023	2039	2061	2079	2094	2087	2112	2149	2216	2290	2361
86	Stage I			134	136	137	138	137	139	142	146	151	156
86	Stage II				91	343	530	760	769	783	807	834	860
86	Stage IIIA								226	434	529	657	811
93	1991-Stage I	245	325	327	331	334	336	335	339	345	356	368	379
93	Stage I			114	115	116	117	116	118	120	123	128	132
93	Stage II				107	186	313	512	518	527	544	562	579
93	Stage IIIA								264	470	574	682	836

Continued													
97	1991-Stage I	2642	2657	2678	2707	2731	2750	2741	2774	2822	2911	3008	3101
101	<1981	1921	1739	1558	1378	1191	1000	797	605	410	212		
101	1981-1990	2353	2367	2385	2411	2432	2449	2441	2471	2514	2592	2679	2536
101	1991-Stage I	1116	1567	1579	1596	1611	1622	1616	1636	1664	1716	1774	1828
101	Stage I			232	234	236	238	237	240	244	252	260	268
101	Stage II				136	357	635	776	785	799	824	851	878
101	Stage IIIA								188	336	410	487	597
112	1991-Stage I	1265	1626	1639	1656	1671	1683	1677	1698	1727	1781	1841	1897
112	Stage I			465	470	474	478	476	482	490	505	522	539
112	Stage II				337	732	1170	1763	1785	1815	1872	1935	1994
112	Stage IIIA								378	663	823	971	1264
127	1991-Stage I	707	847	854	863	871	877	874	884	900	928	959	988
127	Stage I			152	154	155	156	156	158	161	166	171	176
127	Stage II				78	268	453	591	599	609	628	649	669
127	Stage IIIA								292	675	880	1048	1254
131	<1981	329	298	267	236	204	171	137	104	70	36		
131	1981-1990	878	883	890	899	907	914	911	922	938	967	999	991
131	1991-Stage I	95	96	96	97	98	99	99	100	102	105	108	112
157	1981-1990	15	15	15	15	16	16	16	16	16	17	17	18
157	1991-Stage I	900	905	912	922	930	937	934	945	961	991	1025	1056
157	Stage I		89	89	90	91	92	91	92	94	97	100	103
157	Stage II			149	415	695	1089	1085	1098	1117	1152	1191	1227
157	Stage IIIA							623	1453	2140	2586	3047	3141
157	Stage IIIB												388
186	1991-Stage I	53	54	54	55	55	56	55	56	57	59	61	63
186	Stage I		47	48	48	49	49	49	49	50	52	54	55
186	Stage II			68	207	320	481	480	486	494	509	526	543
186	Stage IIIA							272	685	1103	1427	1665	1717
186	Stage IIIB												228

Stock data for gasoline tractors 1985-2005.

Size (kW)	Emission Level	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Certified	<1981	13176	12541	11906	11270	10635	10000	9053	8148	7285	6465	5687	4951	4258	3607	2998
Non certified	<1981	26352	25082	23811	22541	21270	20000	19042	18041	16998	15913	14785	13616	12403	11149	9852

Continued		2000	2001	2002	2003	2004	2005
Certified	<1981	2432	1908	1427	987	591	236
Non certified	<1981	8512	7131	5707	4240	2732	1180

Stock data for harvesters 1985-2011.

FSize	Size Group	Emission Level	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
0	0<S<=50	<1981	26601	24394	22599	22144	19842	18915	17241	15607	14575	12673	10700	9491	6966	5446	3589
0	0<S<=50	1981-1990	519	534	550	582	566	591	594	601	635	636	633	683	641	686	672
50	50<S<=60	<1981	2703	2648	2634	2785	2711	2828	2847	2876	3040	3044	3029	3271	3068	2930	2235
50	50<S<=60	1981-1990	853	1102	1164	1275	1258	1333	1341	1355	1432	1434	1427	1541	1446	1548	1516
50	50<S<=60	1991-Stage I							8	8	8	8	8	9	9	9	9
60	60<S<=70	<1981	1786	1750	1741	1841	1792	1869	1881	1901	2009	2012	2002	2162	2028	2171	2127
60	60<S<=70	1981-1990	1138	1679	1943	2237	2213	2348	2363	2388	2524	2527	2515	2716	2547	2727	2671
60	60<S<=70	1991-Stage I							8	16	18	21	22	24	23	24	24
70	70<S<=80	<1981	929	910	905	958	932	972	979	989	1045	1046	1041	1125	1055	1129	1106
70	70<S<=80	1981-1990	383	699	1026	1165	1318	1493	1502	1518	1604	1606	1598	1726	1619	1733	1698
70	70<S<=80	1991-Stage I							72	77	83	86	87	96	91	98	96
70	70<S<=80	Stage I															1
80	80<S<=90	<1981	323	317	315	333	324	338	340	344	363	364	362	391	367	393	385
80	80<S<=90	1981-1990	383	562	645	967	1107	1466	1475	1491	1575	1577	1570	1695	1590	1702	1667
80	80<S<=90	1991-Stage I							61	158	181	200	200	217	207	222	217
80	80<S<=90	Stage I															1
90	90<S<=100	1981-1990	89	175	235	387	515	670	674	681	720	721	717	775	726	778	762
90	90<S<=100	1991-Stage I							180	257	320	329	351	382	367	393	385
90	90<S<=100	Stage I															1
100	100<S<=120	1981-1990		54	106	219	334	589	592	599	633	634	630	681	639	684	670
100	100<S<=120	1991-Stage I							129	253	316	375	440	567	586	673	660
100	100<S<=120	Stage I															2
120	120<S<=140	1981-1990				4	69	183	184	186	197	197	196	212	199	213	208
120	120<S<=140	1991-Stage I							70	148	189	215	319	484	626	804	860
120	120<S<=140	Stage I															21
120	120<S<=140	Stage II															
120	120<S<=140	Stage IIIA															

Continued			1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
120	120<S<=140	Stage IIIB															
140	140<S<=160	1991-Stage I								8	36	69	112	271	354	554	632
140	140<S<=160	Stage II															
140	140<S<=160	Stage IIIA															
140	140<S<=160	Stage IIIB															
160	160<S<=180	1991-Stage I											26	69	200	374	440
160	160<S<=180	Stage II															
160	160<S<=180	Stage IIIA															
160	160<S<=180	Stage IIIB															
180	180<S<=200	1991-Stage I												20	67	117	193
180	180<S<=200	Stage II															
180	180<S<=200	Stage IIIA															
180	180<S<=200	Stage IIIB															
200	200<S<=220	1991-Stage I														45	92
200	200<S<=220	Stage II															
200	200<S<=220	Stage IIIA															
200	200<S<=220	Stage IIIB															
220	220<S<=240	1991-Stage I															3
220	220<S<=240	Stage II															
220	220<S<=240	Stage IIIA															
220	220<S<=240	Stage IIIB															
240	240<S<=260	1991-Stage I															3
240	240<S<=260	Stage II															
240	240<S<=260	Stage IIIA															
240	240<S<=260	Stage IIIB															
260	260<S<=280	1991-Stage I															14
260	260<S<=280	Stage II															
260	260<S<=280	Stage IIIA															
260	260<S<=280	Stage IIIB															
280	280<S<=300	1991-Stage I															
280	280<S<=300	Stage II															
280	280<S<=300	Stage IIIA															
280	280<S<=300	Stage IIIB															
300	300<S<=320	Stage II															
300	300<S<=320	Stage IIIA															
300	300<S<=320	Stage IIIB															

Continued														
FSize	Size Group	Emission Level	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
0	0<S<=50	<1981	2873	1854	1275	754	269							
0	0<S<=50	1981-1990	715	758	778	816	882	913	779	628	448	268	78	38
50	50<S<=60	<1981	1999	1570	1260	897	391							
50	50<S<=60	1981-1990	1612	1711	1755	1841	1990	2060	1856	1645	1335	1034	730	296
50	50<S<=60	1991-Stage I	10	10	10	11	12	12	12	12	12	12	13	15
60	60<S<=70	<1981	2073	1648	1340	981	482							
60	60<S<=70	1981-1990	2841	3014	3093	3243	3506	3630	3344	3062	2659	2284	1922	1053
60	60<S<=70	1991-Stage I	25	27	27	29	31	32	32	32	32	33	35	39
70	70<S<=80	<1981	1176	1248	1105	735	216							
70	70<S<=80	1981-1990	1806	1916	1966	2061	2229	2307	2164	2043	1939	1862	1813	1415
70	70<S<=80	1991-Stage I	102	109	112	117	126	131	130	129	131	134	141	161
70	70<S<=80	Stage I	1	1	1	1	1	1	1	1	1	1	2	2
80	80<S<=90	<1981	409	434	445	467	216							
80	80<S<=90	1981-1990	1773	1881	1931	2024	2189	2266	2123	2002	1897	1819	1768	1642
80	80<S<=90	1991-Stage I	231	245	252	264	285	295	294	292	295	303	317	363
80	80<S<=90	Stage I	1	1	1	1	1	1	1	1	1	1	2	2
90	90<S<=100	1981-1990	810	860	882	925	1000	1035	1031	1023	986	964	957	915
90	90<S<=100	1991-Stage I	410	435	446	468	506	524	521	518	523	538	563	643
90	90<S<=100	Stage I	1	1	1	1	1	1	1	1	1	1	2	2
100	100<S<=120	1981-1990	712	756	775	813	879	910	906	900	909	934	978	1008
100	100<S<=120	1991-Stage I	702	744	764	801	866	896	892	886	896	920	963	1100
100	100<S<=120	Stage I	2	2	2	3	3	3	3	3	3	3	3	4
120	120<S<=140	1981-1990	222	235	241	253	274	283	282	280	283	291	304	348
120	120<S<=140	1991-Stage I	918	977	1003	1051	1137	1177	1172	1163	1176	1208	1264	1444
120	120<S<=140	Stage I	26	31	32	33	36	37	37	37	37	38	40	46
120	120<S<=140	Stage II					3	4	4	4	4	4	4	4
120	120<S<=140	Stage IIIA							1	1	1	4	5	5
120	120<S<=140	Stage IIIB												3
140	140<S<=160	1991-Stage I	715	795	816	855	925	957	953	946	957	983	1028	1175
140	140<S<=160	Stage II			20	35	48	56	56	56	56	58	60	69
140	140<S<=160	Stage IIIA							5	8	12	16	18	21
140	140<S<=160	Stage IIIB												5
160	160<S<=180	1991-Stage I	533	602	618	648	700	725	722	716	724	744	779	890
160	160<S<=180	Stage II			40	70	91	105	105	104	105	108	113	129
160	160<S<=180	Stage IIIA							9	14	20	24	27	31

160	160<S<=180	Stage IIIB												4
180	180<S<=200	1991-Stage I	249	300	308	323	349	362	360	357	361	371	389	444
180	180<S<=200	Stage II			61	91	114	129	128	127	129	132	138	158
180	180<S<=200	Stage IIIA							9	14	20	24	27	31
180	180<S<=200	Stage IIIB												4
200	200<S<=220	1991-Stage I	142	187	192	201	218	225	224	223	225	231	242	277
200	200<S<=220	Stage II			40	70	91	105	105	104	105	108	113	129
200	200<S<=220	Stage IIIA							9	14	20	24	27	31
200	200<S<=220	Stage IIIB												4
220	220<S<=240	1991-Stage I	48	151	155	162	175	181	181	179	181	186	195	223
220	220<S<=240	Stage II			72	114	164	221	220	219	221	227	238	271
220	220<S<=240	Stage IIIA							61	123	196	237	276	315
220	220<S<=240	Stage IIIB												45
240	240<S<=260	1991-Stage I	71	142	145	152	165	170	170	169	170	175	183	209
240	240<S<=260	Stage II			72	125	201	301	299	297	301	309	323	369
240	240<S<=260	Stage IIIA							113	232	371	450	525	599
240	240<S<=260	Stage IIIB												85
260	260<S<=280	1991-Stage I	61	131	134	140	152	157	157	155	157	161	169	193
260	260<S<=280	Stage II			72	125	201	301	299	297	301	309	323	369
260	260<S<=280	Stage IIIA							113	232	371	450	525	599
260	260<S<=280	Stage IIIB												85
280	280<S<=300	1991-Stage I		33	34	36	39	40	40	40	40	41	43	49
280	280<S<=300	Stage II			72	125	201	301	299	297	301	309	323	369
280	280<S<=300	Stage IIIA							113	232	371	450	525	599
280	280<S<=300	Stage IIIB												85
300	300<S<=320	Stage II				25	60	108	108	107	108	111	116	133
300	300<S<=320	Stage IIIA							57	116	185	225	262	300
300	300<S<=320	Stage IIIB												43

Stock data for fork lifts 1985-2010.

FuelCode	Size (kW)	Emission Level	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
205B	35	<1981	387	361	336	311	285	260	234	209	183	158	133	107	84	58	30
205B	35	1981-1990	120	162	202	239	270	297	297	297	297	297	297	297	297	297	297
205B	35	1991-Stage I							26	49	65	93	131	168	218	247	275
205B	35	Stage II															
205B	35	Stage IIIA															
205B	45	<1981	1612	1506	1400	1294	1188	1082	976	870	764	658	552	446	349	243	126
205B	45	1981-1990	499	674	839	994	1122	1233	1233	1233	1233	1233	1233	1233	1233	1233	1233
205B	45	1991-Stage I							108	203	270	386	544	699	905	1063	1063
205B	45	Stage I															151
205B	45	Stage II															
205B	45	Stage IIIA															
205B	50	<1981	2173	2031	1888	1745	1602	1459	1316	1174	1031	888	745	602	471	328	170
205B	50	1981-1990	673	909	1131	1340	1512	1662	1662	1662	1662	1662	1662	1662	1662	1662	1662
205B	50	1991-Stage I							145	273	363	519	732	940	1217	1469	1469
205B	50	Stage I															240
205B	50	Stage II															
205B	50	Stage IIIA															
205B	75	<1981	497	465	432	399	367	334	301	269	236	203	170	138	108	75	39
205B	75	1981-1990	154	208	259	307	347	382	382	382	382	382	382	382	382	382	382
205B	75	1991-Stage I							33	63	84	120	169	217	281	354	354
205B	75	Stage I															70
205B	75	Stage II															
205B	75	Stage IIIA															
205B	120	<1981	111	103	96	89	81	74	67	60	52	45	38	31	24	17	9
205B	120	1981-1990	34	46	57	68	77	85	85	85	85	85	85	85	85	85	85
205B	120	1991-Stage I							7	14	19	27	38	49	63	97	97
205B	120	Stage I															32
205B	120	Stage II															
205B	120	Stage IIIA															
3030	33		5420	5427	5390	5323	5265	5215	5156	5068	4947	4863	4835	4792	4732	4765	4712
3030	40		4917	4923	4889	4828	4775	4730	4676	4596	4486	4410	4384	4344	4289	4295	4223
3030	50		2149	2151	2137	2110	2087	2067	2044	2008	1960	1926	1915	1897	1874	1926	1941
3030	78		97	97	96	95	94	93	92	91	89	88	88	87	86	90	92
3030	120															1	2

Continued

FuelCode	Size (kW)	Emission Level	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
205B	35	<1981												
205B	35	1981-1990	297	277	249	232	198	177	135	95	58	27		
205B	35	1991-Stage I	304	304	304	304	304	304	304	304	304	304	304	278
205B	35	Stage II		23	53	75	89	117	152	152	152	152	152	152
205B	35	Stage IIIA								41	76	92	99	126
205B	45	<1981												
205B	45	1981-1990	1233	1151	1036	964	820	734	559	394	239	111		
205B	45	1991-Stage I	1063	1063	1063	1063	1063	1063	1063	1063	1063	1063	1063	955
205B	45	Stage I	303	422	524	664	664	664	664	664	664	664	664	664
205B	45	Stage II					104	232	452	612	612	612	612	612
205B	45	Stage IIIA									126	181	225	346
205B	50	<1981												
205B	50	1981-1990	1662	1551	1396	1299	1105	989	753	531	322	150		
205B	50	1991-Stage I	1469	1469	1469	1469	1469	1469	1469	1469	1469	1469	1469	1324
205B	50	Stage I	461	682	897	1135	1135	1135	1135	1135	1135	1135	1135	1135
205B	50	Stage II					187	447	818	1134	1134	1134	1134	1134
205B	50	Stage IIIA									181	275	354	562
205B	75	<1981												
205B	75	1981-1990	382	357	321	299	255	228	174	123	75	35		
205B	75	1991-Stage I	354	354	354	354	354	354	354	354	354	354	354	321
205B	75	Stage I	162	234	311	311	311	311	311	311	311	311	311	311
205B	75	Stage II				58	129	208	326	326	326	326	326	326
205B	75	Stage IIIA								142	213	252	294	376
205B	120	<1981												
205B	120	1981-1990	85	80	72	67	57	51	39	28	17	8		
205B	120	1991-Stage I	97	97	97	97	97	97	97	97	97	97	97	90
205B	120	Stage I	71	89	118	118	118	118	118	118	118	118	118	118
205B	120	Stage II				16	38	58	112	112	112	112	112	112
205B	120	Stage IIIA								58	70	76	140	179
3030	33		4718	4677	4655	4595	4494	4345	4220	4154	4043	3941	3746	3644
3030	40		4218	4214	4244	4224	4166	4116	4048	4005	3951	3878	3723	3660
3030	50		1897	1938	2003	2020	2018	2029	2061	2136	2198	2192	2142	2172
3030	78		88	95	98	99	104	104	114	123	147	149	151	161
3030	120		2	2	3	3	3	3	3	3	3	3	7	8

Stock data for construction machinery 1985-2011.

EquipmentName (Eng)	Emission Level	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Track type dozers	<1981	125	100	75	50	25										
Track type dozers	1981-1990	125	150	175	200	225	250	221	193	166	139	114	89	66	43	21
Track type dozers	1991-Stage I							25	48	71	93	114	134	153	172	189
Track type dozers	Stage II															
Track type dozers	Stage IIIA															
Track type dozers	Stage IIIB															
Track type loaders	<1981	50	40	30	20	10										
Track type loaders	1981-1990	50	60	70	80	90	100	89	79	68	58	48	38	28	19	9
Track type loaders	1991-Stage I							10	20	29	39	48	57	66	75	83
Track type loaders	Stage II															
Track type loaders	Stage IIIA															
Track type loaders	Stage IIIB															
Wheel loaders (0-5 tonnes)	1981-1990							186	331	434	496	517	496	434	331	186
Wheel loaders (0-5 tonnes)	1991-Stage I							21	83	186	331	517	744	1013	1323	1674
Wheel loaders (0-5 tonnes)	Stage II															
Wheel loaders (0-5 tonnes)	Stage IIIA															
Wheel loaders (> 5,1 tonnes)	<1981	1250	1000	750	500	250										
Wheel loaders (> 5,1 tonnes)	1981-1990	1250	1500	1750	2000	2250	2500	2228	1960	1698	1441	1188	941	698	460	228
Wheel loaders (> 5,1 tonnes)	1991-Stage I							248	490	728	960	1188	1411	1629	1841	1822
Wheel loaders (> 5,1 tonnes)	Stage I															228
Wheel loaders (> 5,1 tonnes)	Stage II															
Wheel loaders (> 5,1 tonnes)	Stage IIIA															
Wheel type excavators	<1981	500	400	300	200	100										
Wheel type excavators	1981-1990	500	600	700	800	900	1000	862	732	611	498	394	298	211	132	62
Wheel type excavators	1991-Stage I							96	183	262	332	394	447	491	528	493
Wheel type excavators	Stage I															62
Wheel type excavators	Stage II															
Wheel type excavators	Stage IIIA															
Track type excavators (0-5 tonnes)	1981-1990							459	816	1071	1224	1275	1224	1071	816	459
Track type excavators (0-5 tonnes)	1991-Stage I							51	204	459	816	1275	1837	2500	3265	4132
Track type excavators (0-5 tonnes)	Stage II															
Track type excavators (0-5 tonnes)	Stage IIIA															
Track type excavators (>5,1 tonnes)	<1981	1000	800	600	400	200										
Track type excavators (>5,1 tonnes)	1981-1990	1000	1200	1400	1600	1800	2000	1798	1596	1394	1194	993	794	594	396	198
Track type excavators (>5,1 tonnes)	1991-Stage I							200	399	598	796	993	1190	1387	1583	1581

Continued																
Track type excavators (>5,1 tonnes)	Stage I															198
Track type excavators (>5,1 tonnes)	Stage II															
Track type excavators (>5,1 tonnes)	Stage IIIA															
Excavators/Loaders	<1981	2100	1680	1260	840	420										
Excavators/Loaders	1981-1990	2100	2520	2940	3360	3780	4200	3807	3408	3003	2592	2175	1752	1323	888	447
Excavators/Loaders	1991-Stage I							423	852	1287	1728	2175	2628	3087	3552	3575
Excavators/Loaders	Stage I															447
Excavators/Loaders	Stage II															
Excavators/Loaders	Stage IIIA															
Dump trucks	<1981	250	200	150	100	50										
Dump trucks	1981-1990	250	300	350	400	450	500	489	469	441	404	358	304	241	169	89
Dump trucks	1991-Stage I							54	117	189	269	358	455	561	676	711
Dump trucks	Stage I															89
Dump trucks	Stage II															
Dump trucks	Stage IIIA															
Mini loaders	<1981	1800	1600	1400	1200	1000	800	635	447	235						
Mini loaders	1981-1990	1000	1200	1400	1600	1800	2000	2118	2237	2355	2473	2332	2168	1980	1768	1532
Mini loaders	1991-Stage I							212	447	706	989	1296	1626	1980	2357	2758
Mini loaders	Stage II															
Mini loaders	Stage IIIA															
Telescopic loaders	1981-1990											149	265	348	398	414
Telescopic loaders	1991-Stage I											83	199	348	530	746
Telescopic loaders	Stage II															
Telescopic loaders	Stage IIIA															

Continued

EquipmentName (Eng)	Emission Level	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Track type dozers	<1981												
Track type dozers	1981-1990												
Track type dozers	1991-Stage I	206	201	177	154	132	128	125	116	95	59	27	
Track type dozers	Stage II			20	38	56	86	100	116	126	119	109	105
Track type dozers	Stage IIIA							25	58	95	119	137	132
Track type dozers	Stage IIIB												26
Track type loaders	<1981												
Track type loaders	1981-1990												
Track type loaders	1991-Stage I	91	91	81	71	62	61	71	68	55	38	19	
Track type loaders	Stage II			9	18	26	40	56	68	73	76	75	72

Continued

Track type loaders	Stage IIIA							14	34	55	76	94	90
Track type loaders	Stage IIIB												18
Wheel loaders (0-5 tonnes)	1981-1990												
Wheel loaders (0-5 tonnes)	1991-Stage I	2067	2046	1984	1881	1736	1444	1269	1045	726	353		
Wheel loaders (0-5 tonnes)	Stage II		227	496	806	1158	1444	1903	2090	2177	2117	2024	1644
Wheel loaders (0-5 tonnes)	Stage IIIA								348	726	1058	1349	1644
Wheel loaders (> 5,1 tonnes)	<1981												
Wheel loaders (> 5,1 tonnes)	1981-1990												
Wheel loaders (> 5,1 tonnes)	1991-Stage I	1802	1559	1322	1089	861	677	485	273				
Wheel loaders (> 5,1 tonnes)	Stage I	450	668	881	871	861	902	969	1092	1174	854	547	266
Wheel loaders (> 5,1 tonnes)	Stage II				218	431	677	969	1092	1174	1138	1094	1062
Wheel loaders (> 5,1 tonnes)	Stage IIIA								273	587	854	1094	1328
Wheel type excavators	<1981												
Wheel type excavators	1981-1990												
Wheel type excavators	1991-Stage I	459	372	293	223	162	118	74	38				
Wheel type excavators	Stage I	115	160	196	179	162	157	148	152	146	103	62	31
Wheel type excavators	Stage II				45	81	118	148	152	146	138	124	122
Wheel type excavators	Stage IIIA								38	73	103	124	153
Track type excavators (0-5 tonnes)	1981-1990												
Track type excavators (0-5 tonnes)	1991-Stage I	5101	5050	4897	4642	4285	3889	3599	3027	2073	995		
Track type excavators (0-5 tonnes)	Stage II		561	1224	1990	2857	3889	5399	6054	6220	5968	5554	4398
Track type excavators (0-5 tonnes)	Stage IIIA								1009	2073	2984	3702	4398
Track type excavators (>5,1 tonnes)	<1981												
Track type excavators (>5,1 tonnes)	1981-1990												
Track type excavators (>5,1 tonnes)	1991-Stage I	1579	1380	1181	983	785	683	536	313				
Track type excavators (>5,1 tonnes)	Stage I	395	591	787	786	785	910	1073	1251	1338	980	623	303
Track type excavators (>5,1 tonnes)	Stage II				197	393	683	1073	1251	1338	1307	1245	1213
Track type excavators (>5,1 tonnes)	Stage IIIA								313	669	980	1245	1516
Excavators/Loaders	<1981												
Excavators/Loaders	1981-1990												
Excavators/Loaders	1991-Stage I	3599	3170	2735	2295	1848	1370	938	481				
Excavators/Loaders	Stage I	900	1359	1824	2295	2310	2283	2344	2403	2314	1688	1137	691
Excavators/Loaders	Stage II					462	913	1406	1922	1851	1688	1516	1382
Excavators/Loaders	Stage IIIA									463	844	1137	1382
Dump trucks	<1981												
Dump trucks	1981-1990												

Continued													
Dump trucks	1991-Stage I	745	682	611	530	442	385	301	176				
Dump trucks	Stage I	186	292	407	530	552	642	752	880	943	739	514	319
Dump trucks	Stage II					110	257	451	704	754	739	685	637
Dump trucks	Stage IIIA									189	369	514	637
Mini loaders	<1981												
Mini loaders	1981-1990	1273	990	684	354								
Mini loaders	1991-Stage I	3183	3301	3419	3537	3656	2756	2294	1077	715	498	329	207
Mini loaders	Stage II		330	684	1061	1462	1531	1720	923	715	597	494	414
Mini loaders	Stage IIIA								154	238	299	329	345
Telescopic loaders	1981-1990	398	348	265	149								
Telescopic loaders	1991-Stage I	994	1160	1326	1491	1657	1740	1837	1846	1687	1343	1009	732
Telescopic loaders	Stage II		116	265	447	663	966	1378	1582	1687	1612	1514	1464
Telescopic loaders	Stage IIIA								264	562	806	1009	1220

Stock data for machine pools 1985-2011

EquipmentName (Eng)	Emission Level	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Tractors (machine pools)	<1981	1236	627													
Tractors (machine pools)	1981-1990	3091	3763	4575	4515	4370	4100	3643	2808	2368	1786	1214	604			
Tractors (machine pools)	1991-Stage I							607	1123	1776	2382	3035	3624	4324	4210	4336
Tractors (machine pools)	Stage I															
Tractors (machine pools)	Stage II															
Tractors (machine pools)	Stage IIIA															
Harvesters (machine pools)	<1981	969	776	661	472	287	139									
Harvesters (machine pools)	1981-1990	807	932	1157	1257	1294	1385	1385	1197	927	794	712	512	421	282	162
Harvesters (machine pools)	1991-Stage I							139	266	348	454	593	615	737	751	729
Harvesters (machine pools)	Stage II															
Harvesters (machine pools)	Stage IIIA															
Harvesters (machine pools)	Stage IIIB															
Self-propelled vehicles (machine pools)	1981-1990									72	61	38				
Self-propelled vehicles (machine pools)	1991-Stage I									72	122	190	263	278	277	295
Self-propelled vehicles (machine pools)	Stage II															
Self-propelled vehicles (machine pools)	Stage IIIA															
Self-propelled vehicles (machine pools)	Stage IIIB															

Continued	Emission Level	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Tractors (machine pools)	<1981												
Tractors (machine pools)	1981-1990												
Tractors (machine pools)	1991-Stage I	3956	4069	3323	2566	2066	1421	927	487				
Tractors (machine pools)	Stage I			554	513	517	474	464	487	512			
Tractors (machine pools)	Stage II				513	1033	1421	1855	1946	2046	1985	1571	1047
Tractors (machine pools)	Stage IIIA								487	1023	1488	2094	2618
Harvesters (machine pools)	<1981												
Harvesters (machine pools)	1981-1990	78											
Harvesters (machine pools)	1991-Stage I	778	779	651	531	472	300	257	211	169	127	85	42
Harvesters (machine pools)	Stage II			65	118	177	171	172	169	169	169	169	169
Harvesters (machine pools)	Stage IIIA							43	85	127	169	211	211
Harvesters (machine pools)	Stage IIIB												42
Self-propelled vehicles (machine pools)	1981-1990												
Self-propelled vehicles (machine pools)	1991-Stage I	289	314	237	203	153	99	49					
Self-propelled vehicles (machine pools)	Stage II			47	102	153	199	194	189	142	94	47	
Self-propelled vehicles (machine pools)	Stage IIIA							49	94	142	189	236	236
Self-propelled vehicles (machine pools)	Stage IIIB												47

Stock data for household and gardening 1985-2011.

SNAP	EquipmentName (Eng)	Emission Level	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
0809	Lawn movers (private)	<1981	253125	168750	84375												
0809	Lawn movers (private)	1981-1990	421875	506250	590625	675000	675000	675000	590625	506250	421875	337500	253125	168750	84375		
0809	Lawn movers (private)	1991-Stage I							84375	168750	253125	337500	421875	506250	590625	675000	675000
0809	Lawn movers (private)	Stage I															
0809	Lawn movers (private)	Stage II															
0809	Cultivators (private-large)	<1981	73333	66000	58667	51333	44000	36667	29333	22000	14667	7333					
0809	Cultivators (private-large)	1981-1990	36667	44000	51333	58667	66000	73333	73333	73333	73333	73333	73333	66000	58667	51333	44000
0809	Cultivators (private-large)	1991-Stage I							7333	14667	22000	29333	36667	44000	51333	58667	66000
0809	Cultivators (private-large)	Stage II															
0809	Cultivators (private-small)	1981-1990	10000	10000	10000	10000	10000	10000	8000	6000	4000	2000					
0809	Cultivators (private-small)	1991-Stage I							2000	4000	6000	8000	10000	10000	10000	10000	10000
0809	Cultivators (private-small)	Stage II															
0809	Chain saws (private)	<1981	125000	100000	75000	50000	25000										
0809	Chain saws (private)	1981-1990	125000	150000	175000	200000	225000	250000	227250	204000	180250	156000	131250	106000	80250	54000	27250
0809	Chain saws (private)	1991-Stage I							25250	51000	77250	104000	131250	159000	187250	216000	245250
0809	Chain saws (private)	Stage I															
0809	Chain saws (private)	Stage II															
0809	Riders (private)	<1981	40950	35100	29250	23400	17550	11700	5880								
0809	Riders (private)	1981-1990	29250	35100	40950	46800	52650	58500	58796	59388	54248	49167	44056	38828	33392	27660	21544
0809	Riders (private)	1991-Stage I							5880	11878	18083	24583	31469	38828	46748	55320	64631
0809	Riders (private)	Stage I															
0809	Riders (private)	Stage II															
0809	Shrub clearers (private)	<1981	24000	19200	14400	9600	4800										
0809	Shrub clearers (private)	1981-1990	24000	28800	33600	38400	43200	48000	47520	46080	43680	40320	36000	30720	24480	17280	9120
0809	Shrub clearers (private)	1991-Stage I							5280	11520	18720	26880	36000	46080	57120	69120	82080
0809	Shrub clearers (private)	Stage I															
0809	Shrub clearers (private)	Stage II															
0809	Hedge cutters (private)	<1981	6850	5480	4110	2740	1370										
0809	Hedge cutters (private)	1981-1990	6850	8220	9590	10960	12330	13700	15237	16128	16373	15972	14925	13232	10893	7908	4277
0809	Hedge cutters (private)	1991-Stage I							1693	4032	7017	10648	14925	19848	25417	31632	38493
0809	Hedge cutters (private)	Stage I															
0809	Hedge cutters (private)	Stage II															
0809	Trimmers (private)	<1981	25500	20400	15300	10200	5100										
0809	Trimmers (private)	1981-1990	25500	30600	35700	40800	45900	51000	48086	44686	40800	36429	31571	26229	20400	14086	7286
0809	Trimmers (private)	1991-Stage I							5343	11171	17486	24286	31571	39343	47600	56343	65571

Continued

0809	Trimmers (private)	Stage I															
0809	Trimmers (private)	Stage II															
0811	Lawn movers (professional)	1981-1990	25000	25000	25000	25000	25000	25000	18750	12500	6250						
0811	Lawn movers (professional)	1991-Stage I							6250	12500	18750	25000	25000	25000	25000	25000	25000
0811	Lawn movers (professional)	Stage I															
0811	Lawn movers (professional)	Stage II															
0811	Cultivators (professional)	<1981	3750	2500	1250												
0811	Cultivators (professional)	1981-1990	6250	7500	8750	10000	10000	10000	8750	7500	6250	5000	3750	2500	1250		
0811	Cultivators (professional)	1991-Stage I							1250	2500	3750	5000	6250	7500	8750	10000	10000
0811	Cultivators (professional)	Stage I															
0811	Cultivators (professional)	Stage II															
0811	Chain saws (professional)	1981-1990	10000	10000	10000	10000	10000	10000	7333	4000							
0811	Chain saws (professional)	1991-Stage I							3667	8000	13000	14000	15000	16000	17000	18000	19000
0811	Chain saws (professional)	Stage I															
0811	Chain saws (professional)	Stage II															
0811	Riders (professional)	1981-1990	4800	4800	4800	4800	4800	4800	3878	2966	2035	1056					
0811	Riders (professional)	1991-Stage I							970	1978	3053	4224	5520	5760	6000	6240	6480
0811	Riders (professional)	Stage I															
0811	Riders (professional)	Stage II															
0811	Shrub clearers (professional)	1981-1990	2000	2000	2000	2000	2000	2000	1650	1200	650						
0811	Shrub clearers (professional)	1991-Stage I							550	1200	1950	2800	3000	3200	3400	3600	3800
0811	Shrub clearers (professional)	Stage I															
0811	Shrub clearers (professional)	Stage II															
0811	Hedge cutters (professional)	1981-1990	1300	1300	1300	1300	1300	1300	1178	920	528						
0811	Hedge cutters (professional)	1991-Stage I							393	920	1583	2380	2650	2920	3190	3460	3730
0811	Hedge cutters (professional)	Stage I															
0811	Hedge cutters (professional)	Stage II															
0811	Trimmers (professional)	1981-1990	9000	9000	9000	9000	9000	9000	7071	4929	2571						
0811	Trimmers (professional)	1991-Stage I							2357	4929	7714	10714	11143	11571	12000	12429	12857
0811	Trimmers (professional)	Stage I															
0811	Trimmers (professional)	Stage II															

Continued

SNAP	EquipmentName (Eng)	Emission Level	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
0809	Lawn movers (private)	<1981												
0809	Lawn movers (private)	1981-1990												
0809	Lawn movers (private)	1991-Stage I	675000	675000	675000	675000	675000	595000	513750	428125	342500	256875	171250	85625

Continued			2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
0809	Lawn movers (private)	Stage I						85000	171250	256875	256875	256875	256875	256875
0809	Lawn movers (private)	Stage II									85625	171250	256875	342500
0809	Cultivators (private-large)	<1981												
0809	Cultivators (private-large)	1981-1990	36667	29333	22000	14667	7333							
0809	Cultivators (private-large)	1991-Stage I	73333	80667	88000	95333	102667	102667	95333	88000	80667	73333	66000	58667
0809	Cultivators (private-large)	Stage II						7333	14667	22000	29333	36667	44000	51333
0809	Cultivators (private-small)	1981-1990												
0809	Cultivators (private-small)	1991-Stage I	10000	10000	10000	10000	10000	8000	6000	4000	2000			
0809	Cultivators (private-small)	Stage II						2000	4000	6000	8000	10000	10000	10000
0809	Chain saws (private)	<1981												
0809	Chain saws (private)	1981-1990												
0809	Chain saws (private)	1991-Stage I	275000	280750	286500	292250	298000	268200	238400	208600	178800	149000	119200	89400
0809	Chain saws (private)	Stage I						29800	59600	89400	89400	89400	89400	89400
0809	Chain saws (private)	Stage II									29800	59600	89400	119200
0809	Riders (private)	<1981												
0809	Riders (private)	1981-1990	14954	7910										
0809	Riders (private)	1991-Stage I	74771	87015	101775	109920	119360	117741	114313	107663	99047	86666	74285	61904
0809	Riders (private)	Stage I						10704	22863	23925	24762	24762	24762	24762
0809	Riders (private)	Stage II								11963	24762	37143	49523	61904
0809	Shrub clearers (private)	<1981												
0809	Shrub clearers (private)	1981-1990												
0809	Shrub clearers (private)	1991-Stage I	96000	107000	118000	129000	140000	126000	112000	98000	84000	70000	56000	42000
0809	Shrub clearers (private)	Stage I						14000	28000	42000	42000	42000	42000	42000
0809	Shrub clearers (private)	Stage II									14000	28000	42000	56000
0809	Hedge cutters (private)	<1981												
0809	Hedge cutters (private)	1981-1990												
0809	Hedge cutters (private)	1991-Stage I	46000	52900	59800	66700	73600	66240	58880	51520	44160	36800	29440	22080
0809	Hedge cutters (private)	Stage I						7360	14720	22080	22080	22080	22080	22080
0809	Hedge cutters (private)	Stage II									7360	14720	22080	29440
0809	Trimmers (private)	<1981												
0809	Trimmers (private)	1981-1990												
0809	Trimmers (private)	1991-Stage I	75286	77714	80143	82571	85000	76500	68000	59500	51000	42500	34000	25500
0809	Trimmers (private)	Stage I						8500	17000	25500	25500	25500	25500	25500
0809	Trimmers (private)	Stage II									8500	17000	25500	34000
0811	Lawn movers (professional)	1981-1990												
0811	Lawn movers (professional)	1991-Stage I	25000	25000	25000	25000	25000	18750	12500	6250				

Continued			2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
0811	Lawn movers (professional)	Stage I						6250	12500	18750	18750	12500	6250	
0811	Lawn movers (professional)	Stage II									6250	12500	18750	25000
0811	Cultivators (professional)	<1981												
0811	Cultivators (professional)	1981-1990												
0811	Cultivators (professional)	1991-Stage I	10000	10000	10000	10000	10000	8750	7500	6250	5000	3750	2500	1250
0811	Cultivators (professional)	Stage I						1250	2500	3750	3750	3750	3750	3750
0811	Cultivators (professional)	Stage II									1250	2500	3750	5000
0811	Chain saws (professional)	1981-1990												
0811	Chain saws (professional)	1991-Stage I	20000	27500	35000	42500	50000	33333	16667					
0811	Chain saws (professional)	Stage I						16667	33333	50000	50000	33333	16667	
0811	Chain saws (professional)	Stage II										16667	33333	50000
0811	Riders (professional)	1981-1990												
0811	Riders (professional)	1991-Stage I	6720	7802	9726	12492	16100	15728	13398	9444	4800			
0811	Riders (professional)	Stage I						3932	8932	9444	9600	9600	4800	
0811	Riders (professional)	Stage II								4722	9600	14400	19200	24000
0811	Shrub clearers (professional)	1981-1990												
0811	Shrub clearers (professional)	1991-Stage I	4000	5500	7000	8500	10000	7500	5000	2500				
0811	Shrub clearers (professional)	Stage I						2500	5000	7500	7500	5000	2500	
0811	Shrub clearers (professional)	Stage II									2500	5000	7500	10000
0811	Hedge cutters (professional)	1981-1990												
0811	Hedge cutters (professional)	1991-Stage I	4000	4600	5200	5800	6400	4800	3200	1600				
0811	Hedge cutters (professional)	Stage I						1600	3200	4800	4800	3200	1600	
0811	Hedge cutters (professional)	Stage II									1600	3200	4800	6400
0811	Trimmers (professional)	1981-1990												
0811	Trimmers (professional)	1991-Stage I	13286	13714	14143	14571	15000	11250	7500	3750				
0811	Trimmers (professional)	Stage I						3750	7500	11250	11250	7500	3750	
0811	Trimmers (professional)	Stage II									3750	7500	11250	15000

Stock data for small boats and pleasure crafts 1985-2011.

Brændstof	Motortakt	Boat type	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Diesel		Motor boats (27-34 ft)	1550	1550	1719	1889	2058	2228	2397	2567	2736	2906	3075	3244	3414	3583	3753
Diesel		Motor boats (> 34 ft)	450	450	503	556	608	661	714	767	819	872	925	978	1031	1083	1136
Diesel		Motor boats <(27 ft)	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000
Diesel		Motor sailors	3500	3500	3583	3667	3750	3833	3917	4000	4083	4167	4250	4333	4417	4500	4583
Diesel		Sailing boats (> 26 ft)	7500	7500	7917	8333	8750	9167	9583	10000	10417	10833	11250	11667	12083	12500	12917
Benzin	2-takt	Other boats (< 20 ft)	4000	4000	4056	4111	4167	4222	4278	4333	4389	4444	4500	4556	4565	4527	4439
Benzin	2-takt	Yawls and cabin boats	4000	4000	4056	4111	4167	4222	4278	4333	4389	4444	4500	4556	4565	4527	4439
Benzin	2-takt	Sailing boats (< 26 ft)	19000	19000	18778	18556	18333	18111	17889	17667	17444	17222	17000	16778	16390	15843	15144
Benzin	2-takt	Speed boats	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	2970	2910	2820
Benzin	2-takt	Water scooters	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	990	970	940
Benzin	4-takt	Other boats (< 20 ft)													46	140	283
Benzin	4-takt	Yawls and cabin boats													46	140	283
Benzin	4-takt	Sailing boats (< 26 ft)													166	490	967
Benzin	4-takt	Speed boats	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000
Benzin	4-takt	Speed boats													30	90	180
Benzin	4-takt	Water scooters													10	30	60

Continued

Brændstof	Motortakt	Boat type	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Diesel		Motor boats (27-34 ft)	3922	4092	4261	4431	4600	4600	4600	4600	4600	4600	4600	4600
Diesel		Motor boats (> 34 ft)	1189	1242	1294	1347	1400	1400	1400	1400	1400	1400	1400	1400
Diesel		Motor boats <(27 ft)	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000
Diesel		Motor sailors	4667	4750	4833	4917	5000	5000	5000	5000	5000	5000	5000	5000
Diesel		Sailing boats (> 26 ft)	13333	13750	14167	14583	15000	15000	15000	15000	15000	15000	15000	15000
Benzin	2-takt	Other boats (< 20 ft)	4300	4108	3862	3560	3200	2750	2250	1800	1400	1050	750	500
Benzin	2-takt	Yawls and cabin boats	4300	4108	3862	3560	3200	2750	2250	1800	1400	1050	750	500
Benzin	2-takt	Sailing boats (< 26 ft)	14300	13317	12201	10960	9600	8250	6750	5400	4200	3150	2250	1500
Benzin	2-takt	Speed boats	2700	2550	2370	2160	1920	1650	1350	1080	840	630	450	300
Benzin	2-takt	Water scooters	900	850	790	720	640	550	450	360	280	210	150	100
Benzin	4-takt	Other boats (< 20 ft)	478	725	1027	1384	1800	2250	2750	3200	3600	3950	4250	4500
Benzin	4-takt	Yawls and cabin boats	478	725	1027	1384	1800	2250	2750	3200	3600	3950	4250	4500
Benzin	4-takt	Sailing boats (< 26 ft)	1589	2350	3243	4262	5400	6750	8250	9600	10800	11850	12750	13500
Benzin	4-takt	Speed boats	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000
Benzin	4-takt	Speed boats	300	450	630	840	1080	1350	1650	1920	2160	2370	2550	2700
Benzin	4-takt	Water scooters	100	150	210	280	360	450	550	640	720	790	850	900

Engine sizes (kW) for recreational craft 1985-2011.

Motor type	Boat type	1985	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004-2011
2-takt	Other boats (< 20 ft)	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
2-takt	Yawls and cabin boats	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
2-takt	Sailing boats (< 26 ft)	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
2-takt	Speed boats	25	31	32	33	35	36	38	39	40	42	43	44	46	47	49	50
2-takt	Water scooters	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45
4-takt	Other boats (< 20 ft)									8	8	8	8	8	8	8	8
4-takt	Yawls and cabin boats									20	20	20	20	20	20	20	20
4-takt	Sailing boats (< 26 ft)									10	10	10	10	10	10	10	10
4-takt	Speed boats (in board eng.)	45	55	58	60	63	65	68	70	73	75	78	80	83	85	88	90
4-takt	Speed boats (out board eng.)									40	42	43	44	46	47	49	50
4-takt	Water scooters									45	45	45	45	45	45	45	45
Diesel	Motor boats (27-34 ft)	70	88	92	97	101	106	110	114	119	123	128	132	137	141	146	150
Diesel	Motor boats (> 34 ft)	120	149	156	163	171	178	185	192	199	207	214	221	228	236	243	250
Diesel	Motor boats <(27 ft)	20	24	26	27	28	29	30	31	32	33	34	36	37	38	39	40
Diesel	Motor sailors	20	22	23	23	24	24	25	26	26	27	27	28	28	29	29	30
Diesel	Sailing boats (> 26 ft)	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30

Annex 3B-12: Traffic data and different technical and operational data for Danish domestic ferries

Annual traffic data for ferries (no. of round trips) for Danish domestic ferries.

Domestic ferry lines	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Korsør-Nyborg, DSB	9305	9167	9237	8959	8813	8789	8746	3258	0	0
Korsør-Nyborg, Vognmandsruten	7512	7363	7468	7496	7502	7828	7917	8302	3576	0
Halsskov-Knudshoved	10601	10582	11701	11767	12420	12970	13539	13612	5732	0
Kalundborg-Juelsminde	0	1326	1733	1542	1541	1508	856	0	0	0
Kalundborg-Århus	1907	2400	3162	2921	2913	3540	4962	4888	4483	1454
Sjællands Odde-Ebeltoft	3908	3978	4008	3988	4325	4569	5712	8153	7851	7720
Sjællands Odde-Århus	0	0	0	0	0	0	0	0	0	2339
Hundested-Grenaa	1026	1025	1032	1030	718	602	67	0	0	0
København-Rønne	558	545	484	412	427	426	437	465	458	506
Køge-Rønne	0	0	0	0	0	0	0	0	0	0
Kalundborg-Samsø	873	873	860	881	826	811	813	823	824	850
Tårs-Spodsbjerg	7656	8835	9488	9535	9402	9562	9000	9129	7052	6442
Hirtshals-Torshavn	0	0	0	0	0	0	0	0	0	0
Hanstholm-Torshavn	0	14	15	0	0	0	0	0	0	48
Esbjerg-Torshavn	9	9	9	15	14	13	0	0	0	0
Local ferries	176891	179850	181834	178419	202445	209129	182750	197489	200027	202054

Stéphane Rolland	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Korsør-Nyborg, DSB	0	0	0	0	0	0	0	0	0	0	0	0
Korsør-Nyborg, Vognmandsruten	0	0	0	0	0	0	0	0	0	0	0	0
Halsskov-Knudshoved	0	0	0	0	0	0	0	0	0	0	0	0
Kalundborg-Juelsminde	0	0	0	0	0	0	0	0	0	0	0	0
Kalundborg-Århus	1870	1804	2037	1800	1750	1725	1724	1695	1694	1668	1552	1158
Sjællands Odde-Ebeltoft	4775	4226	3597	3191	2906	2889	2690	2670	2577	2454	2409	1960
Sjællands Odde-Århus	1799	1817	1825	2359	2863	2795	2853	2810	2814	2810	2735	2796
Hundested-Grenaa	0	0	0	0	0	0	0	0	0	0	0	0
København-Rønne	491	430	413	397	293	0	0	0	0	0	0	0
Køge-Rønne	0	0	0	0	154	488	436	399	428	407	459	365
Kalundborg-Samsø	828	817	833	831	841	867	862	887	921	969	937	919
Tårs-Spodsbjerg	6477	6498	6468	6516	6497	6494	6460	6493	6504	6474	6529	6185
Hirtshals-Torshavn	0	0	0	0	0	0	0	0	0	0	13	63
Hanstholm-Torshavn	67	94	85	50	59	51	51	48	52	27	20	0
Esbjerg-Torshavn	0	0	0	0	0	0	0	0	0	35	30	0
Local ferries	201833	200130	208396	208501	206297	205564	203413	205260	210089	209082	205461	202510

Ferry data: Service, name, engine year, main engine MCR (kW), engine type, specific fuel consumption (sfc), aux. engine (kW).

Ferry service	Ferry name	Engine year	Main engine MCR (kW)	Engine type	Sfc (g/kWh)	Fuel type	Aux engine (kW)
Esbjerg-Torshavn	Gamle Norrøna	1973	11768	Medium speed (4-stroke)	239	Diesel	2354
Esbjerg-Torshavn	Nye Norrøna	2003	21600	Medium speed (4-stroke)	190	Fuel	4320
Halsskov-Knudshoved	ARVEPRINS KNUD	1963	8238	Slow speed (2-stroke)	220	Fuel	1666
Halsskov-Knudshoved	DRONNING MARGRETHE II	1973	8826	Medium speed (4-stroke)	230	Diesel	1692
Halsskov-Knudshoved	HEIMDAL	1983	8309	Medium speed (4-stroke)	220	Diesel	740
Halsskov-Knudshoved	KNUDSHOVED	1961	6400	Slow speed (2-stroke)	220	Fuel	1840
Halsskov-Knudshoved	KONG FREDERIK IX	1954	6767	Slow speed (2-stroke)	225	Fuel	1426
Halsskov-Knudshoved	KRAKA	1982	8309	Medium speed (4-stroke)	220	Diesel	740
Halsskov-Knudshoved	LODBROG	1982	8309	Medium speed (4-stroke)	220	Diesel	740
Halsskov-Knudshoved	PRINSESSE ANNE-MARIE	1960	8238	Slow speed (2-stroke)	220	Fuel	1360
Halsskov-Knudshoved	PRINSESSE ELISABETH	1964	8238	Slow speed (2-stroke)	220	Fuel	1360
Halsskov-Knudshoved	ROMSØ	1973	8826	Medium speed (4-stroke)	230	Diesel	1728
Halsskov-Knudshoved	SPROGØ	1962	6400	Slow speed (2-stroke)	220	Fuel	1840
Hanstholm-Torshavn	Gamle Norrøna	1973	11768	Medium speed (4-stroke)	239	Diesel	2354
Hanstholm-Torshavn	Nye Norrøna	2003	21600	Medium speed (4-stroke)	190	Fuel	4320
Hirtshals-Torshavn	Nye Norrøna	2003	21600	Medium speed (4-stroke)	190	Fuel	4320
Hundested-Grenaa	DJURSLAND	1974	9856	Medium speed (4-stroke)	230	Diesel	900
Hundested-Grenaa	KATTEGAT	1995	23200	High speed (4-stroke)	205	Diesel	1223
Hundested-Grenaa	KONG FREDERIK IX	1954	6767	Slow speed (2-stroke)	235	Fuel	1375
Hundested-Grenaa	PRINSESSE ANNE-MARIE	1960	8238	Slow speed (2-stroke)	220	Fuel	1360
Kalundborg-Juelsminde	Mercandia I	1989	2950	High speed (4-stroke)	220	Diesel	0
Kalundborg-Juelsminde	Mercandia II	1989	2950	High speed (4-stroke)	220	Diesel	0
Kalundborg-Juelsminde	Mercandia III	1989	2950	High speed (4-stroke)	220	Diesel	0
Kalundborg-Juelsminde	Mercandia IV	1989	2950	High speed (4-stroke)	220	Diesel	0
Kalundborg-Samsø	HOLGER DANSKE	1976	2354	High speed (4-stroke)	225	Diesel	600
Kalundborg-Samsø	KALUNDBORG	1952	3825	Slow speed (2-stroke)	235	Fuel	570
Kalundborg-Samsø	KYHOLM	1998	2940	High speed (4-stroke)	195	Diesel	864
Kalundborg-Samsø	VESBORG	1995	1770	High speed (4-stroke)	200	Diesel	494
Kalundborg-Århus	ASK	1984	8826	Medium speed (4-stroke)	215	Diesel	2220
Kalundborg-Århus	ASK	1984	8826	Medium speed (4-stroke)	215	Diesel	3000
Kalundborg-Århus	ASK	1984	9840	Medium speed (4-stroke)	215	Diesel	3000
Kalundborg-Århus	CAT-LINK I	1995	17280	High speed (4-stroke)	205	Diesel	1160
Kalundborg-Århus	CAT-LINK II	1995	17280	High speed (4-stroke)	205	Diesel	1160
Kalundborg-Århus	CAT-LINK III	1995	22000	High speed (4-stroke)	205	Diesel	800
Kalundborg-Århus	CAT-LINK IV	1998	28320	High speed (4-stroke)	205	Diesel	920

Continued							
Kalundborg-Århus	CAT-LINK V	1998	28320	High speed (4-stroke)	205	Diesel	920
Kalundborg-Århus	KATTEGAT SYD	1979	7650	Medium speed (4-stroke)	225	Diesel	1366
Kalundborg-Århus	KNUDSHOVED	1961	6400	Slow speed (2-stroke)	220	Fuel	1840
Kalundborg-Århus	KONG FREDERIK IX	1954	6767	Slow speed (2-stroke)	225	Fuel	1426
Kalundborg-Århus	KRAKA	1982	8309	Medium speed (4-stroke)	220	Diesel	740
Kalundborg-Århus	MAREN MOLS	1996	11700	Slow speed (2-stroke)	180	Diesel	2530
Kalundborg-Århus	METTE MOLS	1996	11700	Slow speed (2-stroke)	180	Diesel	2530
Kalundborg-Århus	NIELS KLIM	1986	12474	Slow speed (2-stroke)	215	Fuel	4440
Kalundborg-Århus	PEDER PAARS	1985	12474	Slow speed (2-stroke)	215	Fuel	4440
Kalundborg-Århus	PRINSESSE ELISABETH	1964	8238	Slow speed (2-stroke)	220	Fuel	1360
Kalundborg-Århus	ROSTOCK LINK	1975	8385	Medium speed (4-stroke)	230	Diesel	2500
Kalundborg-Århus	SØLØVEN/SØBJØRNEN	1992	4000	High speed (4-stroke)	210	Diesel	272
Kalundborg-Århus	URD	1981	8826	Medium speed (4-stroke)	215	Diesel	2220
Kalundborg-Århus	URD	1981	8826	Medium speed (4-stroke)	215	Diesel	3000
Kalundborg-Århus	URD	1981	9840	Medium speed (4-stroke)	215	Diesel	3000
Korsør-Nyborg, DSB	ASA-THOR	1965	6472	Slow speed (2-stroke)	220	Fuel	1305
Korsør-Nyborg, DSB	DRONNING INGRID	1980	18720	Medium speed (4-stroke)	220	Diesel	2932
Korsør-Nyborg, DSB	DRONNING MARGRETHE II	1973	8826	Medium speed (4-stroke)	230	Diesel	1692
Korsør-Nyborg, DSB	KONG FREDERIK IX	1954	6767	Slow speed (2-stroke)	225	Fuel	1426
Korsør-Nyborg, DSB	KRONPRINS FREDERIK	1981	18720	Medium speed (4-stroke)	220	Diesel	2932
Korsør-Nyborg, DSB	PRINS JOACHIM	1980	18720	Medium speed (4-stroke)	220	Diesel	2932
Korsør-Nyborg, DSB	SPROGØ/KNUDSHOVED	1962	6400	Slow speed (2-stroke)	220	Fuel	1840
Korsør-Nyborg, Vognmandsruten	Superflex Alfa	1989	2950	High speed (4-stroke)	220	Diesel	0
Korsør-Nyborg, Vognmandsruten	Superflex Bravo	1989	2950	High speed (4-stroke)	220	Diesel	0
Korsør-Nyborg, Vognmandsruten	Superflex Charlie	1988	2950	High speed (4-stroke)	220	Diesel	0
København-Rønne	JENS KOFOED	1979	12950	Medium speed (4-stroke)	233	Fuel	2889
København-Rønne	JENS KOFOED	2009	12950	Medium speed (4-stroke)	190	Fuel	2889
København-Rønne	POVL ANKER	1979	12950	Medium speed (4-stroke)	233	Fuel	2889
København-Rønne	POVL ANKER	2009	12950	Medium speed (4-stroke)	190	Fuel	2889
Køge-Rønne	DUEODDE	2005	8640	Medium speed (4-stroke)	190	Fuel	1545
Køge-Rønne	HAMMERODDE	2005	8640	Medium speed (4-stroke)	190	Fuel	1545
Køge-Rønne	JENS KOFOED	1979	12950	Medium speed (4-stroke)	233	Fuel	2889
Køge-Rønne	POVL ANKER	1979	12950	Medium speed (4-stroke)	233	Fuel	2889
Køge-Rønne	POVL ANKER	2009	12950	Medium speed (4-stroke)	190	Fuel	2889
Sjællands Odde-Ebeltoft	MAI MOLS	1996	24800	Gas turbine	240	Diesel	752
Sjællands Odde-Ebeltoft	MAREN MOLS	1975	12062	Medium speed (4-stroke)	230	Fuel	1986

Continued							
Sjællands Odde-Ebeltoft	MAREN MOLS 2	1996	11700	Slow speed (2-stroke)	180	Diesel	2530
Sjællands Odde-Ebeltoft	METTE MOLS	1975	12062	Medium speed (4-stroke)	230	Fuel	1986
Sjællands Odde-Ebeltoft	METTE MOLS 2	1996	11700	Slow speed (2-stroke)	180	Diesel	2530
Sjællands Odde-Ebeltoft	MIE MOLS	1971	5884	Medium speed (4-stroke)	230	Diesel	
Sjællands Odde-Ebeltoft	MIE MOLS 2	1996	24800	Gas turbine	240	Diesel	752
Sjællands Odde-Århus	MADS MOLS	1998	28320	High speed (4-stroke)	205	Diesel	920
Sjællands Odde-Århus	MAI MOLS	1996	24800	Gas turbine	240	Diesel	752
Sjællands Odde-Århus	MAX MOLS	1998	28320	High speed (4-stroke)	205	Diesel	920
Sjællands Odde-Århus	MIE MOLS	1996	24800	Gas turbine	240	Diesel	752
Tårs-Spodsbjerg	FRIGG SYDFYEN	1984	1300	Medium speed (4-stroke)	220	Diesel	780
Tårs-Spodsbjerg	ODIN SYDFYEN	1982	1180	Medium speed (4-stroke)	220	Diesel	780
Tårs-Spodsbjerg	SPODSBJERG	1972	1530	Medium speed (4-stroke)	225	Diesel	300
Tårs-Spodsbjerg	SPODSBJERG	2006	1545	Medium speed (4-stroke)	190	Diesel	300
Tårs-Spodsbjerg	THOR SYDFYEN	1978	1176	Medium speed (4-stroke)	225	Diesel	300
Tårs-Spodsbjerg	THOR SYDFYEN	2008	1176	Medium speed (4-stroke)	190	Diesel	300
Sjællands Odde-Århus	MIE MOLS	1996	24800	Gas turbine	240	Diesel	752
Tårs-Spodsbjerg	FRIGG SYDFYEN	1984	1300	Medium speed (4-stroke)	220	Diesel	780
Tårs-Spodsbjerg	ODIN SYDFYEN	1982	1180	Medium speed (4-stroke)	220	Diesel	780
Tårs-Spodsbjerg	SPODSBJERG	1972	1530	Medium speed (4-stroke)	225	Diesel	300
Tårs-Spodsbjerg	SPODSBJERG	2006	1545	Medium speed (4-stroke)	190	Diesel	300
Tårs-Spodsbjerg	THOR SYDFYEN	1978	1176	Medium speed (4-stroke)	225	Diesel	300
Tårs-Spodsbjerg	THOR SYDFYEN	2008	1176	Medium speed (4-stroke)	190	Diesel	300

Ferry data: Sailing time (single trip).

Ferry service	Ferry name	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006-2009	2010-2011
Esbjerg-Torshavn	Gamle Norrøna	1860	1860	1860	1860	1860	1860	1860	1860	1860	1860	1860	1860	1860					
Esbjerg-Torshavn	Nye Norrøna														1860	1860	1860	1860	1860
Halsskov-Knudshoved	ARVEPRINS KNUD	60	60	60	60	60	60	60	60	60									
Halsskov-Knudshoved	DRONNING MARGRETHE II	60	60	60	60	60	60	60	60	60									
Halsskov-Knudshoved	HEIMDAL	60	60	60	60	60	60	60	60	60									
Halsskov-Knudshoved	KNUDSHOVED	60	60	60	60	60	60	60	60	60									
Halsskov-Knudshoved	KONG FREDERIK IX	60	60	60	60	60	60	60	60	60									
Halsskov-Knudshoved	KRAKA	60	60	60	60	60	60	60	60	60									
Halsskov-Knudshoved	LODBROG	60	60	60	60	60	60	60	60	60									
Halsskov-Knudshoved	PRINSESSE ANNE-MARIE	60	60	60	60	60	60	60	60	60									
Halsskov-Knudshoved	PRINSESSE ELISABETH	60	60	60	60	60	60	60	60	60									

Continued

Halsskov-Knudshoved	ROMSØ	60	60	60	60	60	60	60	60	60									
Halsskov-Knudshoved	SPROGØ	60	60	60	60	60	60	60	60	60									
Hanstholm-Torshavn	Gamle Norrøna	1740	1740	1740	1740	1740	1740	1740	1740	1740	1740	1740	1740	1740					
Hanstholm-Torshavn	Nye Norrøna														1740	1740	1740	1740	1740
Hirtshals-Torshavn	Nye Norrøna																		1740
Hundested-Grenaa	DJURSLAND	160	160	160	160	160													
Hundested-Grenaa	KATTEGAT						90	90											
Hundested-Grenaa	KONG FREDERIK IX					170													
Hundested-Grenaa	PRINSESSE ANNE-MARIE					165													
Kalundborg-Juelsminde	Mercandia I	160	160	160	160	160	160	160											
Kalundborg-Juelsminde	Mercandia II	160	160	160	160	160	160	160											
Kalundborg-Juelsminde	Mercandia III	160	160	160	160	160	160	160											
Kalundborg-Juelsminde	Mercandia IV	160	160	160	160	160	160	160											
Kalundborg-Samsø	HOLGER DANSKE			120	120	120	120	120	120	120									
Kalundborg-Samsø	KALUNDBORG	120	120	120															
Kalundborg-Samsø	KYHOLM									110	110	110	110	110	110	110	110	110	110
Kalundborg-Samsø	VESBORG									120									
Kalundborg-Århus	ASK		195	195	195	195	195	195	195	195	195								
Kalundborg-Århus	CAT-LINK I						80	85	90	95									
Kalundborg-Århus	CAT-LINK II						80	85	90	95									
Kalundborg-Århus	CAT-LINK III							85	90	95									
Kalundborg-Århus	CAT-LINK IV									80	80								
Kalundborg-Århus	CAT-LINK V									80	80								
Kalundborg-Århus	KATTEGAT SYD										195								
Kalundborg-Århus	KNUDSHOVED		190																
Kalundborg-Århus	KONG FREDERIK IX		190	190	190	190	190	190											
Kalundborg-Århus	KRAKA									195									
Kalundborg-Århus	MAREN MOLS											160	160	155	155	155	155	165	165
Kalundborg-Århus	METTE MOLS											160	160	155	155	155	155	165	165
Kalundborg-Århus	NIELS KLIM	185	185																
Kalundborg-Århus	PEDER PAARS	185	185																
Kalundborg-Århus	PRINSESSE ELISABETH		185																
Kalundborg-Århus	ROSTOCK LINK										195								
Kalundborg-Århus	SØLØVEN/SØBJØRNEN		90	90	90	90	90	90											
Kalundborg-Århus	URD		195	195	195	195	195	195	195	195	195								
Korsør-Nyborg, DSB	ASA-THOR	65	65	65	65	65	65	65	65										
Korsør-Nyborg, DSB	DRONNING INGRID	65	65	65	65	65	65	65	65										

Continued

Korsør-Nyborg, DSB	DRONNING MARGRETHE II	65	65	65	65	65	65	65	65										
Korsør-Nyborg, DSB	KONG FREDERIK IX	75	75	75	75	75	75	75	75										
Korsør-Nyborg, DSB	KRONPRINS FREDERIK	65	65	65	65	65	65	65	65										
Korsør-Nyborg, DSB	PRINS JOACHIM	65	65	65	65	65	65	65	65										
Korsør-Nyborg, DSB	SPROGØ/KNUDSHOVED	75	75	75	75	75	75	75	75										
Korsør-Nyborg, Vognmandsruten	Superflex Alfa	70	70	70	70	70	70	70	70	70									
Korsør-Nyborg, Vognmandsruten	Superflex Bravo	70	70	70	70	70	70	70	70	70									
Korsør-Nyborg, Vognmandsruten	Superflex Charlie	70	70	70	70	70	70	70	70	70									
København-Rønne	JENS KOFOED	420	420	420	420	420	420	420	420	420	420	420	420	420	420	420	420	420	420
København-Rønne	POVL ANKER	420	420	420	420	420	420	420	420	420	420	420	420	420	420	420	420	420	420
Køge-Rønne	DUEODDE																375	375	375
Køge-Rønne	HAMMERODDE																375	375	375
Køge-Rønne	JENS KOFOED															375	375		
Køge-Rønne	POVL ANKER															375	375	375	375
Sjællands Odde-Ebeltoft	MAI MOLS							45	45	45	45	45	45	45	45	45	45	50	50
Sjællands Odde-Ebeltoft	MAREN MOLS	100	100	100	100	100	100	100											
Sjællands Odde-Ebeltoft	MAREN MOLS 2							100	100	100	95								
Sjællands Odde-Ebeltoft	METTE MOLS	100	100	100	100	100	100	100											
Sjællands Odde-Ebeltoft	METTE MOLS 2							100	100	100	95								
Sjællands Odde-Ebeltoft	MIE MOLS	105	105	105	105	105	105	105											
Sjællands Odde-Ebeltoft	MIE MOLS 2							45	45	45	45	45	45	45	45	45	45	50	50
Sjællands Odde-Århus	MADS MOLS										60	65	65	65	65	65	65	70	70
Sjællands Odde-Århus	MAI MOLS													65	65	65	65	68	68
Sjællands Odde-Århus	MAX MOLS										60	65	65	65	65	65	65	70	70
Sjællands Odde-Århus	MIE MOLS													65	65	65	65	68	68
Tårs-Spodsbjerg	FRIGG SYDFYEN	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45
Tårs-Spodsbjerg	ODIN SYDFYEN	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45
Tårs-Spodsbjerg	SPODSBJERG	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45
Tårs-Spodsbjerg	THOR SYDFYEN	45	45	45	45	45	17	45	45	45	45	45	45	45	45	45	45	45	45

Ferry data: Load factor (% MCR).

Ferry service	Ferry name	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007-2009	2010-2011
Esbjerg-Torshavn	Gamle Norrøna	90	90	90	90	90	90	90	90	90	90	90	90	90						
Esbjerg-Torshavn	Nye Norrøna														90	90	90	90	90	90
Halsskov-Knudshoved	ARVEPRINS KNUD	85	85	85	85	85	85	85	85	85										
Halsskov-Knudshoved	DRONNING MARGRETHE II	85	85	85	85	85	85	85	85	85										
Halsskov-Knudshoved	HEIMDAL	85	85	85	85	85	85	85	85	85										
Halsskov-Knudshoved	KNUDSHOVED	85	85	85	85	85	85	85	85	85										
Halsskov-Knudshoved	KONG FREDERIK IX	85	85	85	85	85	85	85	85	85										
Halsskov-Knudshoved	KRAKA	85	85	85	85	85	85	85	85	85										
Halsskov-Knudshoved	LODBROG	85	85	85	85	85	85	85	85	85										
Halsskov-Knudshoved	PRINSESSE ANNE-MARIE	85	85	85	85	85	85	85	85	85										
Halsskov-Knudshoved	PRINSESSE ELISABETH	85	85	85	85	85	85	85	85	85										
Halsskov-Knudshoved	ROMSØ	85	85	85	85	85	85	85	85	85										
Halsskov-Knudshoved	SPROGØ	85	85	85	85	85	85	85	85	85										
Hanstholm-Torshavn	Gamle Norrøna	90	90	90	90	90	90	90	90	90	90	90	90	90						
Hanstholm-Torshavn	Nye Norrøna														90	90	90	90	90	90
Hirtshals-Torshavn	Nye Norrøna																			90
Hundested-Grenaa	DJURSLAND	80	80	80	80	80														
Hundested-Grenaa	KATTEGAT						85	85												
Hundested-Grenaa	KONG FREDERIK IX					65														
Hundested-Grenaa	PRINSESSE ANNE-MARIE					85														
Kalundborg-Juelsminde	Mercandia I	75	75	75	75	75	75	75												
Kalundborg-Juelsminde	Mercandia II	70	70	70	70	70	70	70												
Kalundborg-Juelsminde	Mercandia III	70	70	70	70	70	70	70												
Kalundborg-Juelsminde	Mercandia IV	70	70	70	70	70	70	70												
Kalundborg-Samsø	HOLGER DANSKE			85	85	85	85	85	85	85										
Kalundborg-Samsø	KALUNDBORG	80	80	80																
Kalundborg-Samsø	KYHOLM									85	85	85	85	85	85	85	85	85	85	85
Kalundborg-Samsø	VESBORG									95										
Kalundborg-Århus	ASK		85	85	85	80	80	80	80	80	80									
Kalundborg-Århus	CAT-LINK I						95	90	90	85										
Kalundborg-Århus	CAT-LINK II						95	90	90	85										
Kalundborg-Århus	CAT-LINK III							95	95	90										
Kalundborg-Århus	CAT-LINK IV									95	95									

Continued

Kalundborg-Århus	CAT-LINK V									95	95									
Kalundborg-Århus	KATTEGAT SYD										85									
Kalundborg-Århus	KNUDSHOVED		85																	
Kalundborg-Århus	KONG FREDERIK IX		85	85	85	85	85	85												
Kalundborg-Århus	KRAKA									85										
Kalundborg-Århus	MAREN MOLS											85	85	85	85	85	85	82	80	80
Kalundborg-Århus	METTE MOLS											85	85	85	85	85	85	82	80	80
Kalundborg-Århus	NIELS KLIM	85	85																	
Kalundborg-Århus	PEDER PAARS	85	85																	
Kalundborg-Århus	PRINSESSE ELISABETH		80																	
Kalundborg-Århus	ROSTOCK LINK										80									
Kalundborg-Århus	SØLØVEN/SØBJØRNEN		90	90	90	90	90	90												
Kalundborg-Århus	URD		85	85	85	85	85	85	85	80	80									
Korsør-Nyborg, DSB	ASA-THOR	85	85	85	85	85	85	85	85											
Korsør-Nyborg, DSB	DRONNING INGRID	60	60	60	60	60	60	60	60											
Korsør-Nyborg, DSB	DRONNING MARGRETHE II	85	85	85	85	85	85	85	85											
Korsør-Nyborg, DSB	KONG FREDERIK IX	70	70	70	70	70	70	70	70											
Korsør-Nyborg, DSB	KRONPRINS FREDERIK	60	60	60	60	60	60	60	60											
Korsør-Nyborg, DSB	PRINS JOACHIM	60	60	60	60	60	60	60	60											
Korsør-Nyborg, DSB	SPROGØ/KNUDSHOVED	70	70	70	70	70	70	70	70											
Korsør-Nyborg, Vognmandsruten	Superflex Alfa	70	70	70	70	70	70	70	70	70										
Korsør-Nyborg, Vognmandsruten	Superflex Bravo	70	70	70	70	70	70	70	70	70										
Korsør-Nyborg, Vognmandsruten	Superflex Charlie	70	70	70	70	70	70	70	70	70										
København-Rønne	JENS KOFOED	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31
København-Rønne	POVL ANKER	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31
Køge-Rønne	DUEODDE																69	65	65	65
Køge-Rønne	HAMMERODDE																69	65	66	66
Køge-Rønne	JENS KOFOED															31	31			
Køge-Rønne	POVL ANKER															31	31	45	49	49
Sjællands Odde-Ebeltoft	MAI MOLS							80	80	80	80	80	80	80	80	80	80	79	78	78
Sjællands Odde-Ebeltoft	MAREN MOLS	75	75	75	75	75	75	75												
Sjællands Odde-Ebeltoft	MAREN MOLS 2							80	80	80	85									
Sjællands Odde-Ebeltoft	METTE MOLS	75	75	75	75	75	75	75												
Sjællands Odde-Ebeltoft	METTE MOLS 2							80	80	80	85									

Continued

Sjællands Odde-Ebeltoft	MIE MOLS	85	85	85	85	85	85	85												
Sjællands Odde-Ebeltoft	MIE MOLS 2							80	80	80	80	80	80	80	80	80	80	79	78	78
Sjællands Odde-Århus	MADS MOLS										90	85	85	85	85	85	85	67	67	67
Sjællands Odde-Århus	MAI MOLS													75	75	75	75	69	69	69
Sjællands Odde-Århus	MAX MOLS										90	85	85	85	85	85	85	67	67	67
Sjællands Odde-Århus	MIE MOLS													75	75	75	75	69	69	69
Tårs-Spodsbjerg	FRIGG SYDFYEN	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80
Tårs-Spodsbjerg	ODIN SYDFYEN	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80
Tårs-Spodsbjerg	SPODSBJERG	75	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80
Tårs-Spodsbjerg	THOR SYDFYEN	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80

Ferry data: Round trip shares (%).

Ferry service	Ferry name	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2008	2009	2010	2011
Esbjerg-Torshavn	Gamle Norrøna	100	100	100	100	100	100	100	100	100	100	100	100	100								
Esbjerg-Torshavn	Nye Norrøna														100	100	100	100	100	100	100	100
Halsskov-Knudshoved	ARVEPRINS KNUD	21	20	20	20	21	19	19	18	20												
Halsskov-Knudshoved	DRONNING MARGRETHE II	2	0	0	0	0	0	0	0	0												
Halsskov-Knudshoved	HEIMDAL	23	24	22	24	23	21	21	19	22												
Halsskov-Knudshoved	KNUDSHOVED	0	0	0	0	0	0	2	5	0												
Halsskov-Knudshoved	KONG FREDERIK IX	0	0	0	0	0	0	0	0	0												
Halsskov-Knudshoved	KRAKA	24	25	23	23	21	20	20	20	21												
Halsskov-Knudshoved	LODBROG	0	0	0	0	0	0	0	7	14												
Halsskov-Knudshoved	PRINSESSE ANNE-MARIE	0	0	0	0	0	6	2	0	0												
Halsskov-Knudshoved	PRINSESSE ELISABETH	0	0	0	3	0	0	0	0	0												
Halsskov-Knudshoved	ROMSØ	21	22	21	16	20	19	21	21	23												
Halsskov-Knudshoved	SPROGØ	9	9	15	14	15	15	14	11	1												
Hanstholm-Torshavn	Gamle Norrøna	100	100	100	100	100	100	100	100	100	100	100	100	100								
Hanstholm-Torshavn	Nye Norrøna														100	100	100	100	100	100	100	100
Hirtshals-Torshavn	Nye Norrøna																				100	100
Hundested-Grenaa	DJURSLAND	100	100	100	100	50																
Hundested-Grenaa	KATTEGAT						100	100														
Hundested-Grenaa	KONG FREDERIK IX					5																
Hundested-Grenaa	PRINSESSE ANNE-MARIE					45																
Kalundborg-Juelsminde	Mercandia I	25	25	25	25	25	25	25														
Kalundborg-Juelsminde	Mercandia II	25	25	25	25	25	25	25														
Kalundborg-Juelsminde	Mercandia III	25	25	25	25	25	25	25														
Kalundborg-Juelsminde	Mercandia IV	25	25	25	25	25	25	25														

Continued

Kalundborg-Samsø	HOLGER DANSKE			95	100	100	100	100	100	92												
Kalundborg-Samsø	KALUNDBORG	100	100	5																		
Kalundborg-Samsø	KYHOLM									6	100	100	100	100	100	100	100	100	100	100	100	100
Kalundborg-Samsø	VESBORG									2												
Kalundborg-Århus	ASK		16	32	26	33	27	18	11	12	2											
Kalundborg-Århus	CAT-LINK I						17	25	28	11												
Kalundborg-Århus	CAT-LINK II						1	23	28	8												
Kalundborg-Århus	CAT-LINK III							8	24	19												
Kalundborg-Århus	CAT-LINK IV									23	26											
Kalundborg-Århus	CAT-LINK V									15	26											
Kalundborg-Århus	KATTEGAT SYD										2											
Kalundborg-Århus	KNUDSHOVED		4																			
Kalundborg-Århus	KONG FREDERIK IX		4	0	7	0	0	2														
Kalundborg-Århus	KRAKA									2												
Kalundborg-Århus	MAREN MOLS											50	50	50	50	50	50	50	50	50	50	50
Kalundborg-Århus	METTE MOLS											50	50	50	50	50	50	50	50	50	50	50
Kalundborg-Århus	NIELS KLIM	50	20																			
Kalundborg-Århus	PEDER PAARS	50	16																			
Kalundborg-Århus	PRINSESSE ELISABETH		4																			
Kalundborg-Århus	ROSTOCK LINK										22											
Kalundborg-Århus	SØLØVEN/SØBJØRNEN		21	36	34	34	28	5														
Kalundborg-Århus	URD		16	32	33	33	27	18	11	9	22											
Korsør-Nyborg, DSB	ASA-THOR	13	13	13	11	9	9	9	6													
Korsør-Nyborg, DSB	DRONNING INGRID	26	28	26	28	28	29	28	31													
Korsør-Nyborg, DSB	DRONNING MARGRETHE II	3	0	3	1	3	1	2	0													
Korsør-Nyborg, DSB	KONG FREDERIK IX	0	0	0	0	3	4	1	0													
Korsør-Nyborg, DSB	KRONPRINS FREDERIK	27	28	27	29	28	29	29	32													
Korsør-Nyborg, DSB	PRINS JOACHIM	25	27	25	27	27	27	27	28													
Korsør-Nyborg, DSB	SPROGØ/KNUDSHOVED	6	4	5	4	1	1	4	3													
Korsør-Nyborg, Vognmandsruten	Superflex Alfa	33	33	33	33	33	33	33	33	33												
Korsør-Nyborg, Vognmandsruten	Superflex Bravo	33	33	33	33	33	33	33	33	33												
Korsør-Nyborg, Vognmandsruten	Superflex Charlie	34	34	34	34	34	34	34	34	34												
København-Rønne	JENS KOFOED	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
København-Rønne	POVL ANKER	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
Køge-Rønne	DUEODDE																25	49	46	51	46	0
Køge-Rønne	HAMMERODDE																35	49	47	49	54	100
Køge-Rønne	JENS KOFOED															50	20					

Continued																						
Køge-Rønne	POVL ANKER															50	20	3	7	0	0	0
Sjællands Odde-Ebeltoft	MAI MOLS							21	35	35	35	50	50	50	50	50	50	50	50	50	50	50
Sjællands Odde-Ebeltoft	MAREN MOLS	40	40	40	40	40	40	15														
Sjællands Odde-Ebeltoft	MAREN MOLS 2							18	15	15	15											
Sjællands Odde-Ebeltoft	METTE MOLS	40	40	40	40	40	40	17														
Sjællands Odde-Ebeltoft	METTE MOLS 2							15	15	15	15											
Sjællands Odde-Ebeltoft	MIE MOLS	20	20	20	20	20	20	5														
Sjællands Odde-Ebeltoft	MIE MOLS 2							9	35	35	35	50	50	50	50	50	50	50	50	50	50	50
Sjællands Odde-Århus	MADS MOLS										50	95	90	95	60	60	35	30	0	0	0	0
Sjællands Odde-Århus	MAI MOLS													1	10	15	15	20	19	20	18	20
Sjællands Odde-Århus	MAX MOLS										50	5	10	3	20	10	35	30	62	60	64	60
Sjællands Odde-Århus	MIE MOLS													1	10	15	15	20	19	20	18	20
Tårs-Spodsbjerg	FRIGG SYDFYEN	41	40	39	38	36	36	36	32	33	45	45	45	45	45	45	45	45	45	45	45	45
Tårs-Spodsbjerg	ODIN SYDFYEN	41	40	39	38	36	36	36	32	33	45	45	45	45	45	45	45	45	45	45	45	45
Tårs-Spodsbjerg	SPODSBJERG	4	2	8	8	9	8	8	19	20	10	10	10	10	10	10	10	10	10	10	10	10
Tårs-Spodsbjerg	THOR SYDFYEN	14	18	14	16	19	20	20	17	14	0	0	0	0	0	0	0	0	0	0	0	0

Annex 2B-13 Fuel consumption and emission factors, engine specific (NO_x, CO, VOC (NMVOC and CH_4)), and fuel type specific (S-%, SO_2, PM) for ship engines

Specific fuel consumption and NO_x emission factors (g pr kWh) per engine year for diesel ship engines.

Year	High speed 4-stroke sfc (g pr kWh)	Medium speed 4-stroke sfc (g pr kWh)	Slow speed 2-stroke sfc (g pr kWh)	High speed 4-stroke NO_X (g pr kWh)	Medium speed 4-stroke NO_X (g pr kWh)	Slow speed 2-stroke NO_X (g pr kWh)
1949	265.5	255.5	235.5	7.3	8.0	14.5
1950	265.0	255.0	235.0	7.3	8.0	14.5
1951	264.5	254.5	234.5	7.3	8.0	14.5
1952	264.0	254.0	234.0	7.3	8.0	14.5
1953	263.5	253.5	233.5	7.3	8.0	14.5
1954	263.0	253.0	233.0	7.3	8.0	14.5
1955	262.4	252.4	232.4	7.3	8.0	14.5
1956	261.9	251.9	231.9	7.4	8.1	14.6
1957	261.3	251.3	231.3	7.5	8.2	14.7
1958	260.7	250.7	230.7	7.6	8.3	14.8
1959	260.1	250.1	230.1	7.7	8.4	14.9
1960	259.5	249.5	229.5	7.8	8.5	15.0
1961	258.9	248.9	228.9	7.9	8.6	15.1
1962	258.2	248.2	228.2	8.0	8.7	15.1
1963	257.6	247.6	227.6	8.1	8.8	15.2
1964	256.9	246.9	226.9	8.2	8.9	15.3
1965	256.1	246.1	226.1	8.3	9.0	15.4
1966	255.4	245.4	225.4	8.3	9.1	15.5
1967	254.6	244.6	224.6	8.4	9.2	15.6
1968	253.8	243.8	223.8	8.5	9.3	15.7
1969	253.0	243.0	223.0	8.6	9.4	15.8
1970	252.1	242.1	222.1	8.7	9.5	15.9
1971	251.2	241.2	221.2	8.8	9.6	16.0
1972	250.3	240.3	220.3	8.9	9.7	16.1
1973	249.3	239.3	219.3	9.0	9.8	16.2
1974	248.3	238.3	218.3	9.1	9.9	16.3
1975	247.3	237.3	217.3	9.2	10.0	16.4
1976	246.2	236.2	216.2	9.3	10.1	16.4
1977	245.0	235.0	215.0	9.3	10.2	16.5
1978	243.8	233.8	213.8	9.4	10.3	16.6
1979	242.6	232.6	212.6	9.5	10.4	16.7
1980	241.3	231.3	211.3	9.6	10.5	16.8
1981	239.9	229.9	209.9	9.7	10.6	16.9
1982	238.5	228.5	208.5	9.8	10.7	17.0
1983	237.0	227.0	207.0	9.9	10.8	17.4
1984	235.5	225.5	205.5	10.0	10.9	17.8
1985	233.9	223.9	203.9	10.1	11.0	18.2
1986	232.2	222.2	202.2	10.2	11.1	18.6
1987	230.5	220.5	200.5	10.3	11.3	19.0
1988	228.6	218.6	198.6	10.5	11.4	19.3
1989	226.7	216.7	196.7	10.6	11.6	19.5
1990	224.8	214.8	194.8	10.7	11.7	19.8
1991	222.7	212.7	192.7	10.9	11.9	20.0
1992	220.5	210.5	190.5	11.0	12.0	19.8
1993	218.3	208.3	188.3	11.1	12.1	19.6
1994	216.0	206.0	186.0	11.3	12.3	19.4
1995	213.6	203.6	183.6	11.4	12.4	19.3
1996	211.0	201.0	181.0	11.5	12.6	19.1
1997	208.4	198.4	178.4	11.7	12.7	18.9

Continued						
1998	205.7	195.7	175.7	11.8	12.9	18.7
1999	202.9	192.9	172.9	11.9	13.0	18.5
2000	199.9	189.9	169.9	11.0	12.0	16.0
2011	199.9	189.9	169.9	8.69	9.72	13.6

CO and VOC emission factors (g/kg fuel) for ship engines.

	High speed 4-stroke CO	Medium speed 4-stroke CO	Slow speed 2-stroke CO	High speed 4-stroke VOC	Medium speed 4-stroke VOC	Slow speed 2-stroke VOC
1949	6.03	6.26	6.79	1.88	1.96	2.12
1950	6.04	6.27	6.81	1.89	1.96	2.13
1951	6.05	6.29	6.82	1.89	1.96	2.13
1952	6.06	6.30	6.84	1.89	1.97	2.14
1953	6.07	6.31	6.85	1.90	1.97	2.14
1954	6.08	6.33	6.87	1.90	1.98	2.15
1955	6.10	6.34	6.88	1.91	1.98	2.15
1956	6.11	6.35	6.90	1.91	1.99	2.16
1957	6.12	6.37	6.92	1.91	1.99	2.16
1958	6.14	6.38	6.93	1.92	1.99	2.17
1959	6.15	6.40	6.95	1.92	2.00	2.17
1960	6.17	6.41	6.97	1.93	2.00	2.18
1961	6.18	6.43	6.99	1.93	2.01	2.18
1962	6.20	6.45	7.01	1.94	2.01	2.19
1963	6.21	6.46	7.03	1.94	2.02	2.20
1964	6.23	6.48	7.05	1.95	2.03	2.20
1965	6.25	6.50	7.08	1.95	2.03	2.21
1966	6.26	6.52	7.10	1.96	2.04	2.22
1967	6.28	6.54	7.12	1.96	2.04	2.23
1968	6.30	6.56	7.15	1.97	2.05	2.23
1969	6.32	6.58	7.17	1.98	2.06	2.24
1970	6.35	6.61	7.20	1.98	2.06	2.25
1971	6.37	6.63	7.23	1.99	2.07	2.26
1972	6.39	6.66	7.26	2.00	2.08	2.27
1973	6.42	6.69	7.29	2.01	2.09	2.28
1974	6.44	6.71	7.33	2.01	2.10	2.29
1975	6.47	6.74	7.36	2.02	2.11	2.30
1976	6.50	6.77	7.40	2.03	2.12	2.31
1977	6.53	6.81	7.44	2.04	2.13	2.33
1978	6.56	6.84	7.48	2.05	2.14	2.34
1979	6.60	6.88	7.53	2.06	2.15	2.35
1980	6.63	6.92	7.57	2.07	2.16	2.37
1981	6.67	6.96	7.62	2.08	2.17	2.38
1982	6.71	7.00	7.67	2.10	2.19	2.40
1983	6.75	7.05	7.73	2.11	2.20	2.42
1984	6.79	7.10	7.79	2.12	2.22	2.43
1985	6.84	7.15	7.85	2.14	2.23	2.45
1986	6.89	7.20	7.91	2.15	2.25	2.47
1987	6.94	7.26	7.98	2.17	2.27	2.49
1988	7.00	7.32	8.05	2.19	2.29	2.52
1989	7.06	7.38	8.13	2.21	2.31	2.54
1990	7.12	7.45	8.22	2.22	2.33	2.57
1991	7.18	7.52	8.30	2.25	2.35	2.59
1992	7.25	7.60	8.40	2.27	2.37	2.62
1993	7.33	7.68	8.50	2.29	2.40	2.66
1994	7.41	7.77	8.60	2.31	2.43	2.69
1995	7.49	7.86	8.72	2.34	2.46	2.72

Continued						
1996	7.58	7.96	8.84	2.37	2.49	2.76
1997	7.68	8.06	8.97	2.40	2.52	2.80
1998	7.78	8.18	9.11	2.43	2.56	2.85
1999	7.89	8.30	9.26	2.46	2.59	2.89
2000	8.00	8.43	9.42	2.50	2.63	2.94

NMVOC and CH_4 emission factors (g/kg fuel) for ship engines.

	High speed 4-stroke NMVOC	Medium speed 4-stroke NMVOC	Slow speed 2-stroke NMVOC	High speed 4-stroke CH_4	Medium speed 4-stroke CH_4	Slow speed 2-stroke CH_4
1949	1.83	1.90	2.06	0.06	0.06	0.06
1950	1.83	1.90	2.06	0.06	0.06	0.06
1951	1.83	1.91	2.07	0.06	0.06	0.06
1952	1.84	1.91	2.07	0.06	0.06	0.06
1953	1.84	1.91	2.08	0.06	0.06	0.06
1954	1.84	1.92	2.08	0.06	0.06	0.06
1955	1.85	1.92	2.09	0.06	0.06	0.06
1956	1.85	1.93	2.09	0.06	0.06	0.06
1957	1.86	1.93	2.10	0.06	0.06	0.06
1958	1.86	1.93	2.10	0.06	0.06	0.07
1959	1.86	1.94	2.11	0.06	0.06	0.07
1960	1.87	1.94	2.11	0.06	0.06	0.07
1961	1.87	1.95	2.12	0.06	0.06	0.07
1962	1.88	1.95	2.13	0.06	0.06	0.07
1963	1.88	1.96	2.13	0.06	0.06	0.07
1964	1.89	1.96	2.14	0.06	0.06	0.07
1965	1.89	1.97	2.14	0.06	0.06	0.07
1966	1.90	1.98	2.15	0.06	0.06	0.07
1967	1.90	1.98	2.16	0.06	0.06	0.07
1968	1.91	1.99	2.17	0.06	0.06	0.07
1969	1.92	2.00	2.17	0.06	0.06	0.07
1970	1.92	2.00	2.18	0.06	0.06	0.07
1971	1.93	2.01	2.19	0.06	0.06	0.07
1972	1.94	2.02	2.20	0.06	0.06	0.07
1973	1.95	2.03	2.21	0.06	0.06	0.07
1974	1.95	2.04	2.22	0.06	0.06	0.07
1975	1.96	2.04	2.23	0.06	0.06	0.07
1976	1.97	2.05	2.24	0.06	0.06	0.07
1977	1.98	2.06	2.26	0.06	0.06	0.07
1978	1.99	2.07	2.27	0.06	0.06	0.07
1979	2.00	2.09	2.28	0.06	0.06	0.07
1980	2.01	2.10	2.30	0.06	0.06	0.07
1981	2.02	2.11	2.31	0.06	0.07	0.07
1982	2.03	2.12	2.33	0.06	0.07	0.07
1983	2.05	2.14	2.34	0.06	0.07	0.07
1984	2.06	2.15	2.36	0.06	0.07	0.07
1985	2.07	2.17	2.38	0.06	0.07	0.07
1986	2.09	2.18	2.40	0.06	0.07	0.07
1987	2.10	2.20	2.42	0.07	0.07	0.07
1988	2.12	2.22	2.44	0.07	0.07	0.08
1989	2.14	2.24	2.47	0.07	0.07	0.08
1990	2.16	2.26	2.49	0.07	0.07	0.08
1991	2.18	2.28	2.52	0.07	0.07	0.08
1992	2.20	2.30	2.55	0.07	0.07	0.08
1993	2.22	2.33	2.58	0.07	0.07	0.08
1994	2.25	2.35	2.61	0.07	0.07	0.08

Continued						
1995	2.27	2.38	2.64	0.07	0.07	0.08
1996	2.30	2.41	2.68	0.07	0.07	0.08
1997	2.33	2.44	2.72	0.07	0.08	0.08
1998	2.36	2.48	2.76	0.07	0.08	0.09
1999	2.39	2.51	2.81	0.07	0.08	0.09
2000	2.43	2.55	2.85	0.08	0.08	0.09

S-%, SO_2 and PM emission factors (g/kg fuel and g/GJ) per fuel type for diesel ship engines.

Fuel type	SNAPCode	Year	S %	SO_2 (g/kg)	TSP (g/kg)	PM_{10} (g/kg)	$PM_{2.5}$ (g/kg)	SO_2 (g/GJ)	TSP (g/GJ)	PM_{10} (g/GJ)	$PM_{2.5}$ (g/GJ)
Fuel	National sea	1990	2,6	52,8	6,1	6,0	6,0	1291,0	149,2	147,8	147,0
Fuel	National sea	1991	2,4	47,0	4,9	4,9	4,8	1149,1	120,2	119,0	118,4
Fuel	National sea	1992	1,8	36,0	3,3	3,2	3,2	880,2	79,8	79,0	78,6
Fuel	National sea	1993	2,4	47,8	5,1	5,0	5,0	1168,7	123,9	122,6	122,0
Fuel	National sea	1994	2,6	52,4	6,0	6,0	5,9	1281,2	147,0	145,6	144,8
Fuel	National sea	1995	3,0	59,0	7,7	7,6	7,6	1442,5	188,0	186,1	185,2
Fuel	National sea	1996	2,6	51,4	5,8	5,7	5,7	1256,7	141,7	140,2	139,5
Fuel	National sea	1997	2,7	54,8	6,6	6,5	6,5	1339,9	160,8	159,2	158,4
Fuel	National sea	1998	2,0	39,4	3,7	3,7	3,6	963,3	90,6	89,7	89,2
Fuel	National sea	1999	2,0	39,4	3,7	3,7	3,6	963,3	90,6	89,7	89,2
Fuel	National sea	2000	1,8	36,2	3,3	3,3	3,2	885,1	80,4	79,6	79,2
Fuel	National sea	2001	1,7	34,0	3,0	3,0	3,0	831,3	74,1	73,4	73,0
Fuel	National sea	2002	1,5	30,2	2,6	2,6	2,6	738,4	64,3	63,7	63,3
Fuel	National sea	2003	1,6	32,4	2,9	2,8	2,8	792,2	69,8	69,1	68,8
Fuel	National sea	2004	2,0	39,6	3,7	3,7	3,7	968,2	91,3	90,4	89,9
Fuel	National sea	2005	2,0	40,0	3,8	3,8	3,7	978,0	92,6	91,7	91,3
Fuel	National sea	2006	1,9	38,8	3,6	3,6	3,6	948,7	88,6	87,7	87,3
Fuel	National sea	2007	1,2	24,0	2,1	2,1	2,1	586,8	51,0	50,5	50,3
Fuel	National sea	2008	1,2	24,0	2,1	2,1	2,1	586,8	51,0	50,5	50,3
Fuel	National sea	2009	1,2	24,0	2,1	2,1	2,1	586,8	51,0	50,5	50,3
Fuel	National sea	2010	1,0	20,0	1,8	1,8	1,8	489,0	44,0	43,5	43,3
Fuel	National sea	2011	1,0	20,0	1,8	1,8	1,8	489,0	44,0	43,5	43,3
Fuel	International sea	1990	3,0	59,2	7,7	7,7	7,6	1447,4	189,4	187,5	186,6
Fuel	International sea	1991	2,9	57,8	7,4	7,3	7,2	1413,2	179,8	178,0	177,1
Fuel	International sea	1992	2,9	57,6	7,3	7,2	7,2	1408,3	178,5	176,7	175,8
Fuel	International sea	1993	3,2	64,0	9,3	9,2	9,1	1564,8	226,5	224,2	223,1
Fuel	International sea	1994	3,0	60,6	8,2	8,1	8,0	1481,7	199,6	197,6	196,6
Fuel	International sea	1995	3,3	66,0	10,0	9,9	9,8	1613,7	244,0	241,6	240,4
Fuel	International sea	1996	3,4	68,4	10,9	10,8	10,8	1672,4	266,9	264,2	262,9
Fuel	International sea	1997	3,5	69,0	11,2	11,0	11,0	1687,0	272,9	270,2	268,8
Fuel	International sea	1998	3,4	68,4	10,9	10,8	10,8	1672,4	266,9	264,2	262,9
Fuel	International sea	1999	3,5	69,0	11,2	11,0	11,0	1687,0	272,9	270,2	268,8
Fuel	International sea	2000	3,4	67,2	10,4	10,3	10,3	1643,0	255,2	252,6	251,4
Fuel	International sea	2001	3,4	68,4	10,9	10,8	10,8	1672,4	266,9	264,2	262,9
Fuel	International sea	2002	3,4	68,8	11,1	11,0	10,9	1682,2	270,9	268,2	266,8
Fuel	International sea	2003	3,1	62,2	8,7	8,6	8,5	1520,8	211,8	209,7	208,6

Continued												
Fuel	International sea	2004	3,2	64,0	9,3	9,2	9,1	1564,8	226,5	224,2	223,1
Fuel	International sea	2005	3,5	70,0	11,6	11,5	11,4	1711,5	283,2	280,4	279,0
Fuel	International sea	2006	3,4	67,0	10,4	10,3	10,2	1638,1	253,3	250,8	249,5
Fuel	International sea	2007	1,5	30,0	2,6	2,6	2,6	733,5	63,8	63,2	62,9
Fuel	International sea	2008	1,5	30,0	2,6	2,6	2,6	733,5	63,8	63,2	62,9
Fuel	International sea	2009	1,5	30,0	2,6	2,6	2,6	733,5	63,8	63,2	62,9
Fuel	International sea	2010	1,0	20,0	1,8	1,8	1,8	489,0	44,0	43,5	43,3
Fuel	International sea	2011	1,0	20,0	1,8	1,8	1,8	489,0	44,0	43,5	43,3
Diesel		1990	0,2	4,0	1,0	1,0	1,0	93,7	23,2	23,0	22,9
Diesel		1991	0,2	4,0	1,0	1,0	1,0	93,7	23,2	23,0	22,9
Diesel		1992	0,2	4,0	1,0	1,0	1,0	93,7	23,2	23,0	22,9
Diesel		1993	0,2	4,0	1,0	1,0	1,0	93,7	23,2	23,0	22,9
Diesel		1994	0,2	4,0	1,0	1,0	1,0	93,7	23,2	23,0	22,9
Diesel		1995	0,2	4,0	1,0	1,0	1,0	93,7	23,2	23,0	22,9
Diesel		1996	0,2	4,0	1,0	1,0	1,0	93,7	23,2	23,0	22,9
Diesel		1997	0,2	4,0	1,0	1,0	1,0	93,7	23,2	23,0	22,9
Diesel		1998	0,2	4,0	1,0	1,0	1,0	93,7	23,2	23,0	22,9
Diesel		1999	0,2	4,0	1,0	1,0	1,0	93,7	23,2	23,0	22,9
Diesel		2000	0,2	4,0	1,0	1,0	1,0	93,7	23,2	23,0	22,9
Diesel		2001	0,2	4,0	1,0	1,0	1,0	93,7	23,2	23,0	22,9
Diesel		2002	0,2	4,0	1,0	1,0	1,0	93,7	23,2	23,0	22,9
Diesel		2003	0,2	4,0	1,0	1,0	1,0	93,7	23,2	23,0	22,9
Diesel		2004	0,2	4,0	1,0	1,0	1,0	93,7	23,2	23,0	22,9
Diesel		2005	0,2	4,0	1,0	1,0	1,0	93,7	23,2	23,0	22,9
Diesel		2006	0,2	4,0	1,0	1,0	1,0	93,7	23,2	23,0	22,9
Diesel		2007	0,2	4,0	1,0	1,0	1,0	93,7	23,2	23,0	22,9
Diesel		2008	0,1	2,0	0,9	0,9	0,9	46,8	21,5	21,3	21,2
Diesel		2009	0,1	2,0	0,9	0,9	0,9	46,8	21,5	21,3	21,2
Diesel		2010	0,1	2,0	0,9	0,9	0,9	46,8	21,5	21,3	21,2
Diesel		2011	0,1	2,0	0,9	0,9	0,9	46,8	21,5	21,3	21,2

Annex 2B-14: Fuel sales figures from DEA, and further processed fuel consumption data suited for the Danish inventory

Enhed: TJ	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Landbrug og skovbrug															
- LPG	88	84	354	311	457	438	412	359	234	205	204	212	184	219	162
- motorbenzin	425	184	315	317	304	274	251	240	208	166	161	191	70	61	56
- gas/dieselolie	9199	9634	9498	9520	10605	10528	10700	11028	11423	11494	11585	13088	13875	13310	13909
Gartneri															
- LPG	8	5	47	47	53	50	47	39	26	23	23	22	20	24	17
- motorbenzin	10	3	6	6	11	10	10	12	23	18	18	19	7	6	6
- gas/dieselolie	1705	1270	1405	1383	1231	1409	1687	1887	1205	963	1138	487	356	341	347
Fiskeri															
- LPG	0	0	34	29	50	42	34	30	12	18	16	36	5	1	16
- motorbenzin	0	1	2	2	9	9	10	8	7	7	8	7	6	6	60
- petroleum	7	2	9	5	12	26	9	5	4	3	4	3	3	2	0
- gas/dieselolie	9152	10248	8390	9499	10038	10422	10809	10868	8843	8796	8277	8750	8748	9186	9282
- fuelolie	27	5	82	68	251	285	113	231	146	8	19	219	260	27	0
Fremstillingsvirksomhed															
- LPG	2860	2839	2688	2553	2080	2032	2076	1827	1858	2029	2234	2404	2106	2017	1917
- motorbenzin	262	273	453	326	136	177	161	158	145	138	110	86	82	137	80
- gas/dieselolie	15576	15441	14743	13346	12670	12259	12934	11901	11323	10154	10401	10184	8921	8720	8852
- fuelolie	29465	29451	21518	19056	16741	15989	17133	16694	14600	15438	14000	12632	11009	10943	8704
Bygge- og anlægsvirksomhed															
- LPG	305	343	500	451	575	500	573	708	579	522	501	509	471	575	422
- motorbenzin	19	85	52	48	36	34	26	24	20	23	25	34	27	23	27
- gas/dieselolie	5313	4962	4378	4220	3945	3548	3797	3839	3871	4145	5317	5572	6079	5947	6556
Eenfamiliehuse															
- motorbenzin	1006	1046	1073	1114	1128	1131	1146	1158	1168	1194	1233	1258	1299	1317	1357
- gas/dieselolie	74257	69392	68349	59832	46935	41152	45219	38406	45029	39770	40004	41836	36491	34902	32936
Etageboliger															
- gas/dieselolie	10584	9968	10112	7266	7350	5311	5420	4507	4938	3909	3284	3460	3105	2948	2739
Road transport, DEA statistics															
- gasoline	66 037	68 670	70 502	73 151	74 152	74 326	75 290	76 084	76 697	78 425	80 998	82 656	85 341	86 520	89 129
- gas/diesel oil	45 609	49 738	49 626	49 686	51 854	54 746	58 427	57 511	56 796	58 755	58 561	59 851	60 528	61 072	63 619
- bioethanol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
- biodiesel	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Continued

Non-road, DEA statistics															
- LPG	2 955	2 929	3 089	2 911	2 590	2 520	2 535	2 224	2 118	2 257	2 461	2 638	2 310	2 260	2 097
- gasoline	1 722	1 590	1 898	1 810	1 616	1 626	1 595	1 592	1 563	1 540	1 547	1 589	1 485	1 545	1 526
- gas/diesel oil	31 793	31 307	30 025	28 469	28 451	27 744	29 118	28 655	27 822	26 755	28 441	29 331	29 231	28 319	29 665
Non-road, NERI model															
- LPG	1232	1233	1225	1209	1196	1185	1172	1151	1124	1105	1099	1088	1075	1086	1077
- gasoline	2998	2950	2903	2856	2813	2770	2702	2641	2587	2550	2521	2499	2479	2463	2456
- gas/diesel oil	26357	26895	26577	27075	26940	26800	26734	26046	26073	25235	25798	25139	25536	24844	24885
Recreational craft, NERI model															
- gasoline	270	270	279	289	299	309	319	329	339	348	358	368	377	385	391
- gas/diesel oil	219	219	247	277	309	343	378	415	454	495	537	581	628	676	726
Non-road, added 0202															
- gas/diesel oil	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Non-road, added 0203 and 0301															
- gas/diesel oil	5436	4412	3448	1395	1510	944	2384	2609	1748	1521	2642	4192	3695	3475	4780
- LPG	1724	1696	1864	1701	1393	1335	1363	1073	994	1152	1362	1549	1235	1175	1020
Non-road, added 0203															
- gas/diesel oil	1864	1537	1252	534	628	406	1014	1176	794	708	1182	1940	1799	1675	2297
- LPG	56	52	242	209	274	259	247	192	122	116	125	137	109	126	87
Non-road, added 0301															
- gas/diesel oil	3572	2875	2196	860	882	538	1370	1433	955	813	1460	2252	1896	1800	2483
- LPG	1668	1644	1622	1492	1119	1076	1116	881	872	1036	1237	1412	1126	1048	933
Non-road, added road transport															
- gasoline	-1276	-1360	-1005	-1046	-1197	-1145	-1107	-1049	-1023	-1010	-975	-909	-994	-918	-931
Fisheries, added national sea transport															
- fuel oil	27	5	82	68	251	285	113	231	146	8	19	219	260	27	0
Fisheries, consumed by recreational craft															
- gasoline	0	1	2	2	9	9	10	8	7	7	8	7	6	6	60
National sea transport, input NERI model															
- LPG	3	1	3	-	2	2	2	3	16	1	2	1	2	3	1
- kerosene	5	-	5	3	1	0	2	1	1	1	1	1	0	1	0
- gas/diesel oil	3 074	3 045	3 032	3 230	2 669	2 782	3 313	3 501	4 971	5 035	6 049	6 764	5 899	4 113	3 409
- fuel oil	2 541	3 424	3 922	2 795	4 228	3 845	4 429	3 646	2 797	2 160	1 592	1 379	1 210	1 367	1 435

Continued

Fisheries, input NERI model															
- LPG	-	-	34	29	50	42	34	30	12	18	16	36	5	1	16
- gasoline	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
- kerosene	7	2	9	5	12	26	9	5	4	3	4	3	3	2	0
- gas/diesel oil	8 932	10 029	8 143	9 222	9 729	10 080	10 431	10 453	8 389	8 301	7 740	8 169	8 120	8 510	8 556
International sea transport, input NERI model															
- gas/diesel oil	7 171	7 867	8 547	9 743	10 514	11 633	12 590	16 881	19 114	24 123	26 743	27 231	25 325	31 243	26 085
- fuel oil	10 123	12 236	20 883	27 532	27 667	28 543	23 470	20 998	36 988	39 024	39 509	35 739	32 427	26 952	28 526
National sea transport, output NERI model															
- gas/diesel oil	5285	5285	5285	5285	5285	5285	6015	6920	6673	6618	7028	8465	8967	7333	6201
- fuel oil	4571	4571	4571	4571	4571	4571	3926	3202	3201	3362	3382	2826	2052	1590	1455
- kerosene	5	0	5	3	1	0	2	1	1	1	1	1	0	1	0
- LPG	3	1	3	0	2	2	2	3	16	1	2	1	2	3	1
Fisheries, output NERI model															
- gas/diesel oil	7064	8131	6233	7509	7455	7920	8170	7482	7075	7097	7134	6744	5328	5566	6375
- kerosene	7	2	9	5	12	26	9	5	4	3	4	3	3	2	0
- LPG	0	0	34	29	50	42	34	30	12	18	16	36	5	1	16
International sea transport, out-put NERI model															
- gas/diesel oil	6828	7524	8204	9400	10171	11289	12149	16433	18726	23742	26370	26955	25049	30967	25474
- fuel oil	9394	11507	20155	26804	26938	27815	22742	20269	36259	38296	38780	35010	31698	26223	27797
National sea transport, added 0301															
- fuel oil	-2 030	-1 147	- 649	-1 776	- 343	- 726	504	445	- 404	-1 201	-1 789	-1 447	- 842	- 223	- 20
Road transport, NERI excl. traded fuels															
- gasoline	64 492	67 041	69 220	71 819	72 664	72 882	73 874	74 714	75 342	77 074	79 674	81 385	83 976	85 223	87 867
- gas/diesel oil	45 609	49 738	49 626	49 686	51 854	54 746	58 427	57 511	56 796	58 755	58 561	59 851	60 528	61 072	63 619
- bioethanol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
- biodiesel	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Continued

Enhed: TJ	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Landbrug og skovbrug												
- LPG	179	190	159	153	138	121	116	110	103	114	126	129
- motorbenzin	38	39	28	42	51	52	20	21	20	31	31	25
- gas/dieselolie	13689	13437	13706	13463	12934	12464	13047	12481	13658	14346	14471	14226

Continued												
Gartneri												
- LPG	19	20	17	16	14	12	12	11	10	11	13	13
- motorbenzin	4	4	3	5	6	6	2	2	2	3	3	2
- gas/dieselolie	698	581	529	556	488	407	391	418	483	508	513	383
Fiskeri												
- LPG	13	19	21	20	18	20	20	18	12	12	12	11
- motorbenzin	67	3	3	0	0	0	1	1	1	1	1	1
- petroleum	25	1	1	1	1	1	0	0	0	0	0	0
- gas/dieselolie	9347	8908	8888	8428	7337	7340	7362	6854	6258	6075	6037	5739
- fuelolie	0	0	4	84	35	126	86	13	14	17	0	0
Fremstillingsvirksomhed												
- LPG	1819	1526	1405	1472	1488	1478	1482	1216	1178	1029	1093	986
- motorbenzin	97	69	42	26	30	21	32	16	15	97	84	118
- gas/dieselolie	8635	10099	9155	9964	10515	10022	9132	8170	7449	6141	6244	4904
- fuelolie	8221	7395	7818	6916	6940	6055	8527	6422	5319	4015	5032	3844
Bygge- og anlægsvirksomhed												
- LPG	165	179	236	226	228	224	248	222	172	103	94	98
- motorbenzin	33	24	26	27	27	27	27	28	26	20	22	21
- gas/dieselolie	5950	6356	6226	6226	6227	6338	6187	6410	6339	5429	5341	5370
Eenfamiliehuse												
- motorbenzin	1355	1317	1313	1303	1288	1250	1216	1193	1135	1092	1016	944
- gas/dieselolie	27929	28996	26967	24932	22863	21712	19572	18012	16585	15625	16536	13698
Etageboliger												
- gas/dieselolie	2346	2511	2031	2095	2427	2151	1625	1411	1610	1658	1630	1305
Road transport, DEA statistics												
- gasoline	88 975	86 474	86 247	85 611	84 629	82 118	79 822	78 325	74 545	71 689	66 750	62 004
- gas/diesel oil	64 282	66 254	66 814	70 875	75 422	79 476	86 223	93 111	93 437	88 454	92 359	92 691
- bioethanol	-	-	-	-	-	-	151	252	210	204	1 118	2 062
- biodiesel	-	-	-	-	-	-	-	-	10	139	16	3 492
Non-road, DEA statistics												
- LPG	2 018	1 736	1 581	1 641	1 640	1 612	1 610	1 337	1 292	1 155	1 232	1 128
- gasoline	1 525	1 453	1 412	1 404	1 402	1 356	1 296	1 259	1 199	1 242	1 155	1 111
- gas/diesel oil	28 972	30 473	29 616	30 209	30 164	29 232	28 757	27 479	27 929	26 425	26 569	24 883
Non-road, NERI model												
- LPG	1071	1073	1084	1079	1065	1049	1038	1040	986	817	985	976
- gasoline	2458	2622	2833	3090	3391	3604	3807	3923	3975	3942	3957	3933

Continued												
- gas/diesel oil	24630	24923	25100	25301	25670	26361	27733	29495	30568	27052	29997	30108
Recreational craft, NERI model												
- gasoline	396	400	403	404	404	393	382	371	361	353	346	340
- gas/diesel oil	777	831	886	944	1002	1002	1002	1002	1002	1002	1002	1002
Non-road, added 0202												
- gas/diesel oil	0	0	0	0	0	0	0	-2016	-2638	-627	-3428	-5225
Non-road, added 0203 and 0301												
- gas/diesel oil	4342	5550	4516	4908	4494	2871	1025	0	0	0	0	0
- LPG	947	662	497	563	575	562	572	298	306	338	247	152
Non-road, added 0203												
- gas/diesel oil	2156	2553	2171	2278	2000	1264	479	0	0	0	0	0
- LPG	93	80	55	58	53	46	46	27	27	37	28	19
Non-road, added 0301												
- gas/diesel oil	2186	2997	2346	2630	2494	1607	546	0	0	0	0	0
- LPG	854	582	442	505	522	516	526	271	279	301	219	133
Non-road, added road transport												
- gasoline	-932	-1169	-1421	-1686	-1990	-2248	-2511	-2663	-2776	-2700	-2802	-2822
Fisheries, added national sea transport												
- fuel oil	0	0	4	84	35	126	86	13	14	17	0	0
Fisheries, consumed by recreational craft												
- gasoline	67	3	3	0	0	0	1	1	1	1	1	1
National sea transport, input NERI model												
- LPG	0	-	-	0	0	0	0	0	-	-	-	-
- kerosene	1	1	1	1	1	1	0	-	-	-	-	-
- gas/diesel oil	5 348	5 608	5 855	6 009	5 259	6 646	5 986	5 233	6 954	6 489	5 665	5 654
- fuel oil	1 509	1 513	2 068	1 907	1 704	1 506	1 367	1 110	1 174	1 062	868	732
Fisheries, input NERI model												
- LPG	13	19	21	20	18	20	20	18	12	12	12	11
- gasoline	-	-	-	-	-	-	-	-	-	-	-	1
- kerosene	25	1	1	1	1	1	0	0	0	-	-	-
- gas/diesel oil	8 570	8 077	8 001	7 484	6 335	6 338	6 360	5 852	5 256	5 073	5 035	4 737
International sea transport, input NERI model												
- gas/diesel oil	20 892	19 022	19 505	18 549	14 357	11 630	10 829	9 124	11 218	10 433	11 493	10 432
- fuel oil	33 165	25 924	17 547	20 462	17 298	20 591	31 565	35 243	27 164	11 091	17 493	18 909

Continued												
National sea transport, output NERI model												
- gas/diesel oil	5258	5233	5061	4475	4591	4559	4427	4435	4393	4317	4069	3755
- fuel oil	1444	1400	1387	1862	1853	1859	2026	2004	2148	2287	2456	2375
- kerosene	1	1	1	1	1	1	0	0	0	0	0	0
- LPG	0	0	0	0	0	0	0	0	0	0	12	0
Fisheries, output NERI model												
- gas/diesel oil	7422	9384	9664	9294	7286	8725	8166	6966	8106	7514	7770	7788
- kerosene	25	1	1	1	1	1	0	0	0	0	0	0
- LPG	13	19	21	20	18	20	20	18	12	12	0	11
International sea transport, output NERI model												
- gas/diesel oil	22129	18090	18636	18273	14074	11330	10583	8809	10928	10164	11356	10282
- fuel oil	32437	25195	16818	19247	16118	19411	30172	33848	25650	9416	15682	17120
National sea transport, added 0301												
- fuel oil	65	113	681	45	- 148	- 353	- 659	- 893	- 974	-1 225	-1 588	-1 644
Road transport, NERI excl. traded fuels												
- gasoline	87 713	84 907	84 426	83 521	82 235	79 477	76 930	75 292	71 409	68 637	63 603	58 844
- gas/diesel oil	64 282	66 254	66 814	70 875	75 422	79 476	86 223	93 111	93 437	88 454	92 359	92 691
- bioethanol	-	-	-	-	-	-	151	252	210	204	1 118	2 062
- biodiesel	-	-	-	-	-	-	-	-	10	139	16	3 492

Annex 2B-15: Emission factors and total emissions in CollectER format

1990 emission factors for SO_2, NO_x; NMVOC, CH_4, CO, CO_2, N_2O, NH_3; TSP; PM_{10} and $PM_{2.5}$.

Year		SNAP ID	Category		Fuel type	SO_2	NO_x	NMVOC	CH_4	CO	CO_2	N_2O	NH_3	TSP	PM_{10}	$PM_{2.5}$
						g pr GJ	g pr GJ	g pr GJ	g pr GJ	g pr GJ	g pr GJ	g pr GJ	g pr GJ	g pr GJ	g pr GJ	g pr GJ
1990	A	070101	Passenger cars	Highway	Diesel	93,68	279,53	25,07	3,74	179,70	74,00	0,00	0,47	79,48	79,48	79,48
1990	A	070101	Passenger cars	Highway	Gasoline	2,28	1315,35	381,72	10,89	3817,22	73,00	2,72	0,84	12,84	12,84	12,84
1990	A	070101	Passenger cars	Highway	LPG	0,00	1151,70	187,09	10,06	3914,25	63,10	0,00	0,00	10,06	10,06	10,06
1990	A	070102	Passenger cars	Rural	Diesel	93,68	280,57	42,09	6,82	268,08	74,00	0,00	0,57	75,13	75,13	75,13
1990	A	070102	Passenger cars	Rural	Gasoline	2,28	1148,38	500,38	13,79	4273,20	73,00	3,08	0,95	14,97	14,97	14,97
1990	A	070102	Passenger cars	Rural	LPG	0,00	1248,46	305,18	16,91	1146,38	63,10	0,00	0,00	14,49	14,49	14,49
1990	A	070103	Passenger cars	Urban	Diesel	93,68	220,85	103,04	6,82	344,97	74,00	0,00	0,32	144,24	144,24	144,24
1990	A	070103	Passenger cars	Urban	Gasoline	2,28	558,41	1095,32	56,50	12514,04	73,00	2,71	0,54	12,37	12,37	12,37
1990	A	070103	Passenger cars	Urban	LPG	0,00	528,01	473,05	20,80	1587,66	63,10	0,00	0,00	10,40	10,40	10,40
1990	A	070201	Light duty vehicles	Highway	Diesel	93,68	270,67	30,19	2,60	344,14	74,00	0,00	0,32	104,48	104,48	104,48
1990	A	070201	Light duty vehicles	Highway	Gasoline	2,28	1369,26	170,29	10,11	2987,40	73,00	2,63	0,81	16,17	16,17	16,17
1990	A	070201	Light duty vehicles	Highway	LPG	0,00	1151,70	187,09	10,06	3914,25	63,10	0,00	0,00	10,06	10,06	10,06
1990	A	070202	Light duty vehicles	Rural	Diesel	93,68	299,25	33,22	4,26	358,42	74,00	0,00	0,36	107,73	107,73	107,73
1990	A	070202	Light duty vehicles	Rural	Gasoline	2,28	1188,86	262,59	15,25	2316,18	73,00	2,48	0,76	15,25	15,25	15,25
1990	A	070202	Light duty vehicles	Rural	LPG	0,00	1248,46	305,18	16,91	1146,38	63,10	0,00	0,00	14,49	14,49	14,49
1990	A	070203	Light duty vehicles	Urban	Diesel	93,68	469,24	74,81	4,58	463,37	74,00	0,00	0,23	165,76	165,76	165,76
1990	A	070203	Light duty vehicles	Urban	Gasoline	2,28	547,55	874,08	39,84	9527,46	73,00	1,84	0,37	7,37	7,37	7,37
1990	A	070203	Light duty vehicles	Urban	LPG	0,00	487,91	487,73	19,58	1705,63	63,10	0,00	0,00	9,79	9,79	9,79
1990	A	070301	Heavy duty vehicles	Highway	Diesel	93,68	978,47	41,71	6,44	200,02	74,00	3,08	0,31	35,10	35,10	35,10
1990	A	070301	Heavy duty vehicles	Highway	Gasoline	2,28	1037,78	474,61	9,69	7610,35	73,00	0,83	0,28	55,35	55,35	55,35
1990	A	070302	Heavy duty vehicles	Rural	Diesel	93,68	984,85	57,74	6,78	211,25	74,00	2,92	0,29	35,73	35,73	35,73
1990	A	070302	Heavy duty vehicles	Rural	Gasoline	2,28	1141,55	820,40	16,74	8371,39	73,00	0,91	0,30	60,88	60,88	60,88
1990	A	070303	Heavy duty vehicles	Urban	Diesel	93,68	966,99	86,86	12,42	269,91	74,00	2,30	0,23	42,21	42,21	42,21
1990	A	070303	Heavy duty vehicles	Urban	Gasoline	2,28	456,62	696,09	14,21	7102,99	73,00	0,61	0,20	40,59	40,59	40,59
1990	A	070400	Mopeds	Urban	Gasoline	2,28	18,26	12503,20	200,00	12602,74	73,00	0,91	0,91	171,69	171,69	171,69
1990	A	070501	Motorcycles	Highway	Gasoline	2,28	264,11	1072,19	129,96	16302,60	73,00	1,35	1,35	31,73	31,73	31,73
1990	A	070502	Motorcycles	Rural	Gasoline	2,28	185,41	981,69	159,32	15782,07	73,00	1,66	1,66	38,90	38,90	38,90
1990	A	070503	Motorcycles	Urban	Gasoline	2,28	112,92	1149,21	155,11	15187,59	73,00	1,61	1,61	37,87	37,87	37,87
1990	A	080100	Military		AvGas	22,83	859,00	1242,60	21,90	6972,00	73,00	2,00	1,60	10,00	10,00	10,00
1990	A	080100	Military		Diesel	93,68	719,72	55,39	6,74	268,73	74,00	1,73	0,32	66,49	66,49	66,49
1990	A	080100	Military		Gasoline	2,28	991,97	1128,00	27,57	6765,35	73,00	2,85	0,79	14,34	14,34	14,34

Continued														
1990	A	080100	Military	Jet fuel	22,99	250,57	24,94	2,65	229,89	72,00	2,30	0,00	1,16	1,16	1,16
1990	A	080200	Railways	Diesel	93,68	1225,13	79,94	3,07	223,21	74,00	2,04	0,20	50,26	50,26	50,26
1990	A	080200	Railways	Kerosene	5,00	50,00	3,00	7,00	20,00	72,00	2,00	0,00	121,95	115,85	110,06
1990	A	080300	Inland waterways	Diesel	93,68	983,64	171,79	2,79	453,65	74,00	2,96	0,17	106,93	106,93	106,93
1990	A	080300	Inland waterways	Gasoline	2,28	291,33	3606,55	50,38	13853,27	73,00	0,78	0,08	182,44	182,44	182,44
1990	A	080402	National sea traffic	Diesel	93,68	1104,18	50,57	1,56	166,83	74,00	4,68	0,00	23,21	22,98	22,87
1990	A	080402	National sea traffic	Kerosene	2,30	50,00	3,00	7,00	20,00	72,00	0,00	0,00	5,00	5,00	5,00
1990	A	080402	National sea traffic	LPG	0,00	1249,00	384,94	20,26	443,00	63,10	0,00	0,00	0,20	0,20	0,20
1990	A	080402	National sea traffic	Residual oil	1290,95	1615,26	53,44	1,65	176,29	78,00	4,89	0,00	149,25	147,75	147,01
1990	A	080403	Fishing	Diesel	93,68	1052,12	49,13	1,52	162,08	74,00	4,68	0,00	23,21	22,98	22,87
1990	A	080403	Fishing	Kerosene	2,30	50,00	3,00	7,00	20,00	72,00	0,00	0,00	5,00	5,00	5,00
1990	A	080403	Fishing	LPG	0,00	1249,00	384,94	20,26	443,00	63,10	0,00	0,00	0,20	0,20	0,20
1990	A	080404	International sea traffic	Diesel	93,68	1208,60	49,46	1,53	163,17	74,00	4,68	0,00	23,21	22,98	22,87
1990	A	080404	International sea traffic	Residual oil	1447,43	1689,57	53,98	1,67	178,09	78,00	4,89	0,00	189,43	187,53	186,59
1990	A	080501	Air traffic, Dom. < 3000 ft.	AvGas	22,83	859,00	1242,60	21,90	6972,00	73,00	2,00	1,60	10,00	10,00	10,00
1990	A	080501	Air traffic, Dom. < 3000 ft.	Jet fuel	22,99	314,51	14,93	1,59	90,41	72,00	5,70	0,00	1,16	1,16	1,16
1990	A	080502	Air traffic, Int. < 3000 ft.	AvGas	22,83	859,00	1242,60	21,90	6972,00	73,00	2,00	1,60	10,00	10,00	10,00
1990	A	080502	Air traffic, Int. < 3000 ft.	Jet fuel	22,99	309,25	16,47	1,75	168,98	72,00	7,10	0,00	1,16	1,16	1,16
1990	A	080503	Air traffic, Dom. > 3000 ft.	Jet fuel	22,99	330,11	12,36	1,31	90,75	72,00	2,30	0,00	1,16	1,16	1,16
1990	A	080504	Air traffic, Int. > 3000 ft.	Jet fuel	22,99	244,20	6,48	0,69	54,10	72,00	2,30	0,00	1,16	1,16	1,16
1990	A	080600	Agriculture	Diesel	93,68	758,87	156,85	2,55	635,53	74,00	2,93	0,17	144,45	144,45	144,45
1990	A	080600	Agriculture	Gasoline	2,28	31,60	949,55	88,42	47524,17	73,00	1,28	0,09	6,56	6,56	6,56
1990	A	080700	Forestry	Diesel	93,68	857,48	156,47	2,54	645,65	74,00	2,97	0,17	149,05	149,05	149,05
1990	A	080700	Forestry	Gasoline	2,28	40,39	7206,91	60,42	18057,40	73,00	0,37	0,07	101,22	101,22	101,22
1990	A	080800	Industry	Diesel	93,68	933,58	178,23	2,90	655,80	74,00	2,94	0,17	154,50	154,50	154,50
1990	A	080800	Industry	Gasoline	2,28	136,27	1610,77	120,61	14797,46	73,00	1,33	0,09	12,40	12,40	12,40
1990	A	080800	Industry	LPG	0,00	1328,11	146,09	7,69	104,85	63,10	3,50	0,21	4,89	4,89	4,89
1990	A	080900	Household and gardening	Gasoline	2,28	63,98	3366,01	95,22	32901,19	73,00	1,15	0,08	20,75	20,75	20,75
1990	A	081100	Commercial and institutional	Gasoline	2,28	68,83	2280,66	97,87	29887,31	73,00	1,09	0,08	24,00	24,00	24,00
1990	P	080501	Air traffic, Dom. < 3000 ft.	AvGas	22,83	859,00	1242,60	21,90	6972,00	73,00	2,00	1,60	10,00	10,00	10,00
1990	P	080501	Air traffic, Dom. < 3000 ft.	Jet fuel	22,99	283,87	20,73	2,20	129,70	72,00	4,58	0,00	1,16	1,16	1,16
1990	P	080502	Air traffic, Int. < 3000 ft.	AvGas	22,83	859,00	1242,60	21,90	6972,00	73,00	2,00	1,60	10,00	10,00	10,00
1990	P	080502	Air traffic, Int. < 3000 ft.	Jet fuel	22,99	324,87	34,25	3,64	157,15	72,00	3,79	0,00	1,16	1,16	1,16
1990	P	080503	Air traffic, Dom. > 3000 ft.	Jet fuel	22,99	314,86	11,78	1,25	84,05	72,00	2,30	0,00	1,16	1,16	1,16
1990	P	080504	Air traffic, Int. > 3000 ft.	Jet fuel	22,99	290,20	10,08	1,07	37,65	72,00	2,30	0,00	1,16	1,16	1,16

1990 emission factors for Arsenic, Cadmium, Chromium, Copper, Mercury, Nickel, Lead, Selenium and Zinc.

Year		SNAP ID	Category		Fuel type	Arsenic mg pr GJ	Cadmium mg pr GJ	Chromium mg pr GJ	Copper mg pr GJ	Mercury mg pr GJ	Nickel mg pr GJ	Lead mg pr GJ	Selenium mg pr GJ	Zinc mg pr GJ
1990	A	070101	Passenger cars	Highway	Diesel	0,002	0,292	0,926	0,657	0,124	0,296	1,757	0,002	58,606
1990	A	070101	Passenger cars	Highway	Gasoline	0,007	0,273	0,386	1,043	0,199	0,321	1472,004	0,005	54,458
1990	A	070101	Passenger cars	Highway	LPG	0,000	0,300	0,270	1,052	0,000	0,300	0,901	0,000	60,097
1990	A	070102	Passenger cars	Rural	Diesel	0,002	0,355	1,083	0,770	0,124	0,358	2,133	0,002	71,144
1990	A	070102	Passenger cars	Rural	Gasoline	0,007	0,308	0,417	1,165	0,199	0,356	1472,109	0,005	61,472
1990	A	070102	Passenger cars	Rural	LPG	0,000	0,361	0,325	1,262	0,000	0,361	1,082	0,000	72,116
1990	A	070103	Passenger cars	Urban	Diesel	0,002	0,198	0,691	0,488	0,124	0,201	1,192	0,002	39,770
1990	A	070103	Passenger cars	Urban	Gasoline	0,007	0,178	0,300	0,711	0,199	0,226	1471,720	0,005	35,492
1990	A	070103	Passenger cars	Urban	LPG	0,000	0,194	0,175	0,679	0,000	0,194	0,582	0,000	38,818
1990	A	070201	Light duty vehicles	Highway	Diesel	0,002	0,193	0,678	0,478	0,124	0,196	1,161	0,002	38,731
1990	A	070201	Light duty vehicles	Highway	Gasoline	0,007	0,253	0,367	0,972	0,199	0,301	1471,943	0,005	50,405
1990	A	070201	Light duty vehicles	Highway	LPG	0,000	0,198	0,178	0,693	0,000	0,198	0,594	0,000	39,594
1990	A	070202	Light duty vehicles	Rural	Diesel	0,002	0,211	0,723	0,511	0,124	0,214	1,269	0,002	42,337
1990	A	070202	Light duty vehicles	Rural	Gasoline	0,007	0,239	0,355	0,922	0,199	0,287	1471,901	0,005	47,576
1990	A	070202	Light duty vehicles	Rural	LPG	0,000	0,238	0,214	0,831	0,000	0,238	0,713	0,000	47,513
1990	A	070203	Light duty vehicles	Urban	Diesel	0,002	0,135	0,533	0,374	0,124	0,138	0,813	0,002	27,133
1990	A	070203	Light duty vehicles	Urban	Gasoline	0,007	0,118	0,246	0,499	0,199	0,166	1471,538	0,005	23,388
1990	A	070203	Light duty vehicles	Urban	LPG	0,000	0,120	0,108	0,421	0,000	0,120	0,361	0,000	24,068
1990	A	070301	Heavy duty vehicles	Highway	Diesel	0,002	0,150	0,570	0,401	0,124	0,153	0,903	0,002	30,130
1990	A	070301	Heavy duty vehicles	Highway	Gasoline	0,007	0,207	0,326	0,813	0,199	0,255	1471,807	0,005	41,332
1990	A	070302	Heavy duty vehicles	Rural	Diesel	0,002	0,143	0,555	0,390	0,124	0,147	0,866	0,002	28,884
1990	A	070302	Heavy duty vehicles	Rural	Gasoline	0,007	0,220	0,338	0,857	0,199	0,268	1471,845	0,005	43,830
1990	A	070303	Heavy duty vehicles	Urban	Diesel	0,002	0,115	0,483	0,338	0,124	0,118	0,693	0,002	23,142
1990	A	070303	Heavy duty vehicles	Urban	Gasoline	0,007	0,143	0,268	0,586	0,199	0,190	1471,613	0,005	28,351
1990	A	070400	Mopeds	Urban	Gasoline	0,007	0,005	0,144	0,103	0,199	0,053	1471,199	0,005	0,753
1990	A	070501	Motorcycles	Highway	Gasoline	0,007	0,134	0,260	0,556	0,199	0,182	1471,587	0,005	26,666
1990	A	070502	Motorcycles	Rural	Gasoline	0,007	0,163	0,287	0,659	0,199	0,211	1471,675	0,005	32,520
1990	A	070503	Motorcycles	Urban	Gasoline	0,007	0,159	0,283	0,644	0,199	0,207	1471,663	0,005	31,681
1990	A	080100	Military		AvGas	0,007	0,253	0,367	0,972	0,198	0,301	12785,388	0,005	50,452
1990	A	080100	Military		Diesel	0,002	0,172	0,625	0,440	0,124	0,175	1,035	0,002	34,517
1990	A	080100	Military		Gasoline	0,007	0,256	0,371	0,984	0,199	0,304	1471,954	0,005	51,135
1990	A	080100	Military		Jet fuel	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
1990	A	080200	Railways		Diesel	0,002	0,186	0,660	0,465	0,124	0,189	1,118	0,002	37,295
1990	A	080200	Railways		Kerosene	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000

Continued													
1990	A	080300	Inland waterways	Diesel	0,002	0,186	0,660	0,465	0,124	0,189	1,118	0,002	37,295
1990	A	080300	Inland waterways	Gasoline	0,007	0,253	0,367	0,972	0,198	0,301	0,773	0,005	50,452
1990	A	080402	National sea traffic	Diesel	1,171	0,234	0,937	1,171	1,170	1,639	2,340	4,684	11,710
1990	A	080402	National sea traffic	Kerosene	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
1990	A	080402	National sea traffic	LPG	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
1990	A	080402	National sea traffic	Residual oil	12,225	0,733	4,890	12,225	0,490	733,496	4,890	9,780	22,005
1990	A	080403	Fishing	Diesel	1,171	0,234	0,937	1,171	1,170	1,639	2,340	4,684	11,710
1990	A	080403	Fishing	Kerosene	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
1990	A	080403	Fishing	LPG	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
1990	A	080404	International sea traffic	Diesel	1,171	0,234	0,937	1,171	1,170	1,639	2,340	4,684	11,710
1990	A	080404	International sea traffic	Residual oil	12,225	0,733	4,890	12,225	0,490	733,496	4,890	9,780	22,005
1990	A	080501	Air traffic, Dom. < 3000 ft.	AvGas	0,007	0,253	0,367	0,972	0,198	0,301	13505,692	0,005	50,452
1990	A	080501	Air traffic, Dom. < 3000 ft.	Jet fuel	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
1990	A	080502	Air traffic, Int. < 3000 ft.	AvGas	0,007	0,253	0,367	0,972	0,198	0,301	13505,692	0,005	50,452
1990	A	080502	Air traffic, Int. < 3000 ft.	Jet fuel	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
1990	A	080503	Air traffic, Dom. > 3000 ft.	Jet fuel	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
1990	A	080504	Air traffic, Int. > 3000 ft.	Jet fuel	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
1990	A	080600	Agriculture	Diesel	0,002	0,186	0,660	0,465	0,124	0,189	1,118	0,002	37,295
1990	A	080600	Agriculture	Gasoline	0,007	0,253	0,367	0,972	0,198	0,301	0,773	0,005	50,452
1990	A	080700	Forestry	Diesel	0,002	0,186	0,660	0,465	0,124	0,189	1,118	0,002	37,295
1990	A	080700	Forestry	Gasoline	0,007	0,253	0,367	0,972	0,198	0,301	0,773	0,005	50,452
1990	A	080800	Industry	Diesel	0,002	0,186	0,660	0,465	0,124	0,189	1,118	0,002	37,295
1990	A	080800	Industry	Gasoline	0,007	0,253	0,367	0,972	0,198	0,301	0,773	0,005	50,452
1990	A	080800	Industry	LPG	0,000	0,131	0,118	0,457	0,000	0,131	0,392	0,000	26,126
1990	A	080900	Household and gardening	Gasoline	0,007	0,253	0,367	0,972	0,198	0,301	0,773	0,005	50,452
1990	A	081100	Commercial and institutional	Gasoline	0,007	0,253	0,367	0,972	0,198	0,301	0,773	0,005	50,452
1990	P	080501	Air traffic, Dom. < 3000 ft.	AvGas	0,007	0,253	0,367	0,972	0,198	0,301	13505,692	0,005	50,452
1990	P	080501	Air traffic, Dom. < 3000 ft.	Jet fuel	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
1990	P	080502	Air traffic, Int. < 3000 ft.	AvGas	0,007	0,253	0,367	0,972	0,198	0,301	13505,692	0,005	50,452
1990	P	080502	Air traffic, Int. < 3000 ft.	Jet fuel	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
1990	P	080503	Air traffic, Dom. > 3000 ft.	Jet fuel	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
1990	P	080504	Air traffic, Int. > 3000 ft.	Jet fuel	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000

1990 emission factors for Dioxins/, Flouranthene, Benzo(b), Benzo(k), Benzo(a), Benzo(g,h,i) and indeno(1,2,3-c,d).

Year		SNAP ID	Category		Fuel type	Dioxins/ microg pr GJ	Flouranthene mg pr GJ	Benzo(b) mg pr GJ	Benzo(k) mg pr GJ	Benzo(a) mg pr GJ	Benzo(g,h,i) mg pr GJ	indeno(1,2,3-c,d) mg pr GJ
1990	A	070101	Passenger cars	Highway	Diesel	0,001	12,250	0,748	0,678	0,818	1,589	0,771
1990	A	070101	Passenger cars	Highway	Gasoline	0,013	8,507	0,553	0,425	0,468	1,106	0,425
1990	A	070101	Passenger cars	Highway	LPG	0,000	0,000	0,000	0,000	0,000	0,000	0,000
1990	A	070102	Passenger cars	Rural	Diesel	0,001	14,889	0,909	0,824	0,994	1,932	0,937
1990	A	070102	Passenger cars	Rural	Gasoline	0,015	9,540	0,620	0,477	0,525	1,240	0,477
1990	A	070102	Passenger cars	Rural	LPG	0,000	0,000	0,000	0,000	0,000	0,000	0,000
1990	A	070103	Passenger cars	Urban	Diesel	0,001	9,303	0,568	0,515	0,621	1,207	0,586
1990	A	070103	Passenger cars	Urban	Gasoline	0,010	6,427	0,418	0,321	0,354	0,835	0,321
1990	A	070103	Passenger cars	Urban	LPG	0,000	0,000	0,000	0,000	0,000	0,000	0,000
1990	A	070201	Light duty vehicles	Highway	Diesel	0,000	8,505	0,519	0,470	0,568	1,104	0,536
1990	A	070201	Light duty vehicles	Highway	Gasoline	0,013	8,086	0,526	0,404	0,445	1,051	0,404
1990	A	070201	Light duty vehicles	Highway	LPG	0,000	0,000	0,000	0,000	0,000	0,000	0,000
1990	A	070202	Light duty vehicles	Rural	Diesel	0,001	9,306	0,568	0,515	0,622	1,207	0,586
1990	A	070202	Light duty vehicles	Rural	Gasoline	0,012	7,625	0,495	0,381	0,419	0,991	0,381
1990	A	070202	Light duty vehicles	Rural	LPG	0,000	0,000	0,000	0,000	0,000	0,000	0,000
1990	A	070203	Light duty vehicles	Urban	Diesel	0,000	6,954	0,425	0,385	0,464	0,902	0,438
1990	A	070203	Light duty vehicles	Urban	Gasoline	0,007	4,558	0,296	0,228	0,251	0,592	0,228
1990	A	070203	Light duty vehicles	Urban	LPG	0,000	0,000	0,000	0,000	0,000	0,000	0,000
1990	A	070301	Heavy duty vehicles	Highway	Diesel	0,001	2,086	0,526	0,780	0,097	0,078	0,136
1990	A	070301	Heavy duty vehicles	Highway	Gasoline	0,000	0,000	0,000	0,000	0,000	0,000	0,000
1990	A	070302	Heavy duty vehicles	Rural	Diesel	0,001	2,208	0,557	0,825	0,103	0,082	0,144
1990	A	070302	Heavy duty vehicles	Rural	Gasoline	0,000	0,000	0,000	0,000	0,000	0,000	0,000
1990	A	070303	Heavy duty vehicles	Urban	Diesel	0,001	1,788	0,451	0,668	0,083	0,067	0,117
1990	A	070303	Heavy duty vehicles	Urban	Gasoline	0,000	0,000	0,000	0,000	0,000	0,000	0,000
1990	A	070400	Mopeds	Urban	Gasoline	0,000	0,000	0,000	0,000	0,000	0,000	0,000
1990	A	070501	Motorcycles	Highway	Gasoline	0,020	12,673	0,824	0,634	0,697	1,647	0,634
1990	A	070502	Motorcycles	Rural	Gasoline	0,024	15,176	0,986	0,759	0,834	1,973	0,759
1990	A	070503	Motorcycles	Urban	Gasoline	0,024	15,300	0,994	0,765	0,841	1,989	0,765
1990	A	080100	Military		AvGas	0,005	4,329	0,209	0,071	0,114	0,689	0,245
1990	A	080100	Military		Diesel	0,001	4,391	0,571	0,568	0,290	0,550	0,290
1990	A	080100	Military		Gasoline	0,006	5,257	0,277	0,116	0,142	0,825	0,300
1990	A	080100	Military		Jet fuel	0,000	0,000	0,000	0,000	0,000	0,000	0,000
1990	A	080200	Railways		Diesel	0,001	1,366	0,348	0,389	0,057	0,049	0,089
1990	A	080200	Railways		Kerosene	0,000	0,000	0,000	0,000	0,000	0,000	0,000

Continued											
1990	A	080300	Inland waterways	Diesel	0,001	4,391	0,571	0,568	0,290	0,550	0,290
1990	A	080300	Inland waterways	Gasoline	0,005	4,329	0,209	0,071	0,114	0,689	0,245
1990	A	080402	National sea traffic	Diesel	0,012	7,420	0,640	0,300	0,150	1,430	1,180
1990	A	080402	National sea traffic	Kerosene	0,000	0,000	0,000	0,000	0,000	0,000	0,000
1990	A	080402	National sea traffic	LPG	0,000	0,000	0,000	0,000	0,000	0,000	0,000
1990	A	080402	National sea traffic	Residual oil	0,013	5,190	0,270	0,050	0,020	0,070	0,030
1990	A	080403	Fishing	Diesel	0,012	7,420	0,640	0,300	0,150	1,430	1,180
1990	A	080403	Fishing	Kerosene	0,000	0,000	0,000	0,000	0,000	0,000	0,000
1990	A	080403	Fishing	LPG	0,000	0,000	0,000	0,000	0,000	0,000	0,000
1990	A	080404	International sea traffic	Diesel	0,012	7,420	0,640	0,300	0,150	1,430	1,180
1990	A	080404	International sea traffic	Residual oil	0,013	4,120	0,200	0,090	0,070	0,260	0,200
1990	A	080501	Air traffic, Dom. < 3000 ft.	AvGas	0,005	4,329	0,209	0,071	0,114	0,689	0,245
1990	A	080501	Air traffic, Dom. < 3000 ft.	Jet fuel	0,000	0,000	0,000	0,000	0,000	0,000	0,000
1990	A	080502	Air traffic, Int. < 3000 ft.	AvGas	0,005	4,329	0,209	0,071	0,114	0,689	0,245
1990	A	080502	Air traffic, Int. < 3000 ft.	Jet fuel	0,000	0,000	0,000	0,000	0,000	0,000	0,000
1990	A	080503	Air traffic, Dom. > 3000 ft.	Jet fuel	0,000	0,000	0,000	0,000	0,000	0,000	0,000
1990	A	080504	Air traffic, Int. > 3000 ft.	Jet fuel	0,000	0,000	0,000	0,000	0,000	0,000	0,000
1990	A	080600	Agriculture	Diesel	0,001	4,391	0,571	0,568	0,290	0,550	0,290
1990	A	080600	Agriculture	Gasoline	0,005	4,329	0,209	0,071	0,114	0,689	0,245
1990	A	080700	Forestry	Diesel	0,001	4,391	0,571	0,568	0,290	0,550	0,290
1990	A	080700	Forestry	Gasoline	0,005	4,329	0,209	0,071	0,114	0,689	0,245
1990	A	080800	Industry	Diesel	0,001	4,391	0,571	0,568	0,290	0,550	0,290
1990	A	080800	Industry	Gasoline	0,005	4,329	0,209	0,071	0,114	0,689	0,245
1990	A	080800	Industry	LPG	0,000	0,000	0,000	0,000	0,000	0,000	0,000
1990	A	080900	Household and gardening	Gasoline	0,005	4,329	0,209	0,071	0,114	0,689	0,245
1990	A	081100	Commercial and institutional	Gasoline	0,005	4,329	0,209	0,071	0,114	0,689	0,245
1990	P	080501	Air traffic, Dom. < 3000 ft.	AvGas	0,005	4,329	0,209	0,071	0,114	0,689	0,245
1990	P	080501	Air traffic, Dom. < 3000 ft.	Jet fuel	0,000	0,000	0,000	0,000	0,000	0,000	0,000
1990	P	080502	Air traffic, Int. < 3000 ft.	AvGas	0,005	4,329	0,209	0,071	0,114	0,689	0,245
1990	P	080502	Air traffic, Int. < 3000 ft.	Jet fuel	0,000	0,000	0,000	0,000	0,000	0,000	0,000
1990	P	080503	Air traffic, Dom. > 3000 ft.	Jet fuel	0,000	0,000	0,000	0,000	0,000	0,000	0,000
1990	P	080504	Air traffic, Int. > 3000 ft.	Jet fuel	0,000	0,000	0,000	0,000	0,000	0,000	0,000

2011 emission factors for SO_2, NO_x; NMVOC, CH_4, CO, CO_2, N_2O, NH_3; TSP; PM_{10} and $PM_{2.5}$.

Year		SNAP ID	Category		Fuel type	SO_2	NO_x	NMVOC	CH_4	CO	CO_2	N_2O	NH_3	TSP	PM_{10}	$PM_{2.5}$
						g pr GJ	g pr GJ	g pr GJ	g pr GJ	g pr GJ	g pr GJ	g pr GJ	g pr GJ	g pr GJ	g pr GJ	g pr GJ
2011	A	070101	Passenger cars	Highway	Bio ethanol	0,00	155,25	36,83	3,07	749,17	0,00	0,84	32,19	1,07	1,07	1,07
2011	A	070101	Passenger cars	Highway	Biodiesel	0,00	288,01	4,33	0,14	14,28	0,00	2,08	0,51	14,02	14,02	14,02
2011	A	070101	Passenger cars	Highway	Diesel	0,47	288,01	4,33	0,14	14,28	74,00	2,08	0,51	14,02	14,02	14,02
2011	A	070101	Passenger cars	Highway	Gasoline	0,46	155,25	36,83	3,07	749,17	73,00	0,84	32,19	1,07	1,07	1,07
2011	A	070101	Passenger cars	Highway	LPG	0,00	264,87	42,11	4,10	1449,08	63,10	0,71	0,00	10,05	10,05	10,05
2011	A	070102	Passenger cars	Rural	Bio ethanol	0,00	126,17	42,11	3,73	607,75	0,00	1,58	35,85	1,04	1,04	1,04
2011	A	070102	Passenger cars	Rural	Biodiesel	0,00	244,82	5,69	0,28	26,79	0,00	2,22	0,54	11,50	11,50	11,50
2011	A	070102	Passenger cars	Rural	Diesel	0,47	244,82	5,69	0,28	26,79	74,00	2,22	0,54	11,50	11,50	11,50
2011	A	070102	Passenger cars	Rural	Gasoline	0,46	126,17	42,11	3,73	607,75	73,00	1,58	35,85	1,04	1,04	1,04
2011	A	070102	Passenger cars	Rural	LPG	0,00	288,65	64,66	6,88	551,80	63,10	1,45	0,00	14,45	14,45	14,45
2011	A	070103	Passenger cars	Urban	Bio ethanol	0,00	152,97	310,96	12,23	3322,87	0,00	2,26	8,67	0,96	0,96	0,96
2011	A	070103	Passenger cars	Urban	Biodiesel	0,00	235,59	16,64	0,64	73,99	0,00	5,27	0,36	21,08	21,08	21,08
2011	A	070103	Passenger cars	Urban	Diesel	0,47	235,59	16,64	0,64	73,99	74,00	5,27	0,36	21,08	21,08	21,08
2011	A	070103	Passenger cars	Urban	Gasoline	0,46	152,97	310,96	12,23	3322,87	73,00	2,26	8,67	0,96	0,96	0,96
2011	A	070103	Passenger cars	Urban	LPG	0,00	144,09	142,60	9,57	927,28	63,10	3,51	0,00	11,72	11,72	11,72
2011	A	070201	Light duty vehicles	Highway	Bio ethanol	0,00	170,40	20,27	2,84	570,88	0,00	1,88	22,88	1,44	1,44	1,44
2011	A	070201	Light duty vehicles	Highway	Biodiesel	0,00	292,25	19,69	0,21	126,18	0,00	1,51	0,37	20,11	20,11	20,11
2011	A	070201	Light duty vehicles	Highway	Diesel	0,47	292,25	19,69	0,21	126,18	74,00	1,51	0,37	20,11	20,11	20,11
2011	A	070201	Light duty vehicles	Highway	Gasoline	0,46	170,40	20,27	2,84	570,88	73,00	1,88	22,88	1,44	1,44	1,44
2011	A	070201	Light duty vehicles	Highway	LPG	0,00	127,95	19,27	2,13	1005,60	63,10	0,41	0,00	10,04	10,04	10,04
2011	A	070202	Light duty vehicles	Rural	Bio ethanol	0,00	149,05	29,88	3,09	432,24	0,00	2,99	22,86	1,29	1,29	1,29
2011	A	070202	Light duty vehicles	Rural	Biodiesel	0,00	305,37	22,27	0,48	108,34	0,00	1,66	0,40	16,49	16,49	16,49
2011	A	070202	Light duty vehicles	Rural	Diesel	0,47	305,37	22,27	0,48	108,34	74,00	1,66	0,40	16,49	16,49	16,49
2011	A	070202	Light duty vehicles	Rural	Gasoline	0,46	149,05	29,88	3,09	432,24	73,00	2,99	22,86	1,29	1,29	1,29
2011	A	070202	Light duty vehicles	Rural	LPG	0,00	139,87	29,19	3,57	420,56	63,10	0,93	0,00	14,45	14,45	14,45
2011	A	070203	Light duty vehicles	Urban	Bio ethanol	0,00	132,56	192,71	8,20	3607,15	0,00	4,62	4,85	0,79	0,79	0,79
2011	A	070203	Light duty vehicles	Urban	Biodiesel	0,00	284,90	43,76	0,95	142,66	0,00	3,38	0,26	26,39	26,39	26,39
2011	A	070203	Light duty vehicles	Urban	Diesel	0,47	284,90	43,76	0,95	142,66	74,00	3,38	0,26	26,39	26,39	26,39
2011	A	070203	Light duty vehicles	Urban	Gasoline	0,46	132,56	192,71	8,20	3607,15	73,00	4,62	4,85	0,79	0,79	0,79
2011	A	070203	Light duty vehicles	Urban	LPG	0,00	76,20	66,46	5,20	527,77	63,10	1,99	0,00	12,29	12,29	12,29
2011	A	070301	Heavy duty vehicles	Highway	Bio ethanol	0,00	1037,78	474,61	9,69	7610,35	0,00	0,83	0,28	55,35	55,35	55,35
2011	A	070301	Heavy duty vehicles	Highway	Biodiesel	0,00	441,06	8,82	2,49	135,76	0,00	3,13	0,31	7,01	7,01	7,01
2011	A	070301	Heavy duty vehicles	Highway	Diesel	0,47	441,06	8,82	2,49	135,76	74,00	3,13	0,31	7,01	7,01	7,01
2011	A	070301	Heavy duty vehicles	Highway	Gasoline	0,46	1037,78	474,61	9,69	7610,35	73,00	0,83	0,28	55,35	55,35	55,35

Continued

2011	A	070302	Heavy duty vehicles	Rural	Bio ethanol	0,00	1141,55	820,40	16,74	8371,39	0,00	0,91	0,30	60,88	60,88	60,88
2011	A	070302	Heavy duty vehicles	Rural	Biodiesel	0,00	493,50	11,78	2,79	132,39	0,00	2,95	0,30	7,46	7,46	7,46
2011	A	070302	Heavy duty vehicles	Rural	Diesel	0,47	493,50	11,78	2,79	132,39	74,00	2,95	0,30	7,46	7,46	7,46
2011	A	070302	Heavy duty vehicles	Rural	Gasoline	0,46	1141,55	820,40	16,74	8371,39	73,00	0,91	0,30	60,88	60,88	60,88
2011	A	070303	Heavy duty vehicles	Urban	Bio ethanol	0,00	456,62	696,09	14,21	7102,99	0,00	0,61	0,20	40,59	40,59	40,59
2011	A	070303	Heavy duty vehicles	Urban	Biodiesel	0,00	589,92	17,24	4,40	146,84	0,00	2,49	0,25	9,06	9,06	9,06
2011	A	070303	Heavy duty vehicles	Urban	Diesel	0,47	589,92	17,24	4,40	146,84	74,00	2,49	0,25	9,06	9,06	9,06
2011	A	070303	Heavy duty vehicles	Urban	Gasoline	0,46	456,62	696,09	14,21	7102,99	73,00	0,61	0,20	40,59	40,59	40,59
2011	A	070400	Mopeds	Urban	Bio ethanol	0,00	175,67	7973,23	127,45	8602,84	0,00	1,33	1,33	129,35	129,35	129,35
2011	A	070400	Mopeds	Urban	Gasoline	0,46	175,67	7973,23	127,45	8602,84	73,00	1,33	1,33	129,35	129,35	129,35
2011	A	070501	Motorcycles	Highway	Bio ethanol	0,00	269,76	675,80	91,40	10509,20	0,00	1,27	1,27	16,22	16,22	16,22
2011	A	070501	Motorcycles	Highway	Gasoline	0,46	269,76	675,80	91,40	10509,20	73,00	1,27	1,27	16,22	16,22	16,22
2011	A	070502	Motorcycles	Rural	Bio ethanol	0,00	192,42	672,51	110,48	9734,47	0,00	1,55	1,55	19,76	19,76	19,76
2011	A	070502	Motorcycles	Rural	Gasoline	0,46	192,42	672,51	110,48	9734,47	73,00	1,55	1,55	19,76	19,76	19,76
2011	A	070503	Motorcycles	Urban	Bio ethanol	0,00	118,94	828,11	116,17	9372,12	0,00	1,51	1,51	19,27	19,27	19,27
2011	A	070503	Motorcycles	Urban	Gasoline	0,46	118,94	828,11	116,17	9372,12	73,00	1,51	1,51	19,27	19,27	19,27
2011	A	080100	Military		AvGas	22,99	859,00	1242,60	21,90	6972,00	73,00	2,00	1,60	10,00	10,00	10,00
2011	A	080100	Military		Diesel	0,45	356,88	14,23	1,41	96,32	74,00	2,77	0,38	13,26	13,26	13,26
2011	A	080100	Military		Gasoline											
2011	A	080100	Military		Jet fuel	22,99	250,57	24,94	2,65	229,89	72,00	2,30	0,00	1,16	1,16	1,16
2011	A	080200	Railways		Diesel	0,47	742,00	52,00	2,00	118,00	74,00	2,04	0,20	23,00	23,00	23,00
2011	A	080200	Railways		Gasoline											
2011	A	080200	Railways		Kerosene											
2011	A	080300	Inland waterways		Diesel	46,84	825,62	158,45	2,58	441,24	74,00	2,97	0,17	96,88	96,88	96,88
2011	A	080300	Inland waterways		Gasoline	0,46	553,37	1012,43	63,61	12234,24	73,00	1,51	0,10	25,88	25,88	25,88
2011	A	080402	National sea traffic		Diesel	46,84	937,63	50,45	1,51	87,65	74,00	4,68	0,00	21,55	21,33	21,22
2011	A	080402	National sea traffic		Kerosene											
2011	A	080402	National sea traffic		LPG											
2011	A	080402	National sea traffic		Residual oil	489,00	1915,27	62,82	1,94	207,25	78,00	4,89	0,00	43,98	43,54	43,32
2011	A	080403	Fishing		Diesel	46,84	1357,45	57,57	1,78	189,92	74,00	4,68	0,00	21,55	21,33	21,22
2011	A	080403	Fishing		Gasoline											
2011	A	080403	Fishing		Kerosene											
2011	A	080403	Fishing		LPG	0,00	1249,00	384,94	20,26	443,00	63,10	0,00	0,00	0,20	0,20	0,20
2011	A	080404	International sea traffic		Diesel	46,84	1581,64	57,33	1,77	189,13	74,00	4,68	0,00	21,55	21,33	21,22
2011	A	080404	International sea traffic		Residual oil	489,00	2117,61	63,03	1,95	207,93	78,00	4,89	0,00	43,98	43,54	43,32
2011	A	080501	Air traffic, Dom. < 3000 ft.		AvGas	22,83	859,00	1242,60	21,90	6972,00	73,00	2,00	1,60	10,00	10,00	10,00

Continued

2011	A	080501	Air traffic, Dom. < 3000 ft.	Jet fuel	22,99	284,89	11,54	1,28	136,44	72,00	10,91	0,00	1,16	1,16	1,16
2011	A	080502	Air traffic, Int. < 3000 ft.	AvGas	22,83	859,00	1242,60	21,90	6972,00	73,00	2,00	1,60	10,00	10,00	10,00
2011	A	080502	Air traffic, Int. < 3000 ft.	Jet fuel	22,99	298,32	26,20	2,90	172,60	72,00	7,34	0,00	1,16	1,16	1,16
2011	A	080503	Air traffic, Dom. > 3000 ft.	Jet fuel	22,99	260,08	6,28	0,00	104,78	72,00	2,30	0,00	1,16	1,16	1,16
2011	A	080504	Air traffic, Int. > 3000 ft.	Jet fuel	22,99	237,65	5,96	0,00	47,45	72,00	2,30	0,00	1,16	1,16	1,16
2011	A	080600	Agriculture	Diesel	0,47	562,43	52,92	0,86	324,09	74,00	3,18	0,18	42,64	42,64	42,64
2011	A	080600	Agriculture	Gasoline	0,46	111,27	1198,19	160,47	21945,38	73,00	1,72	1,52	31,17	31,17	31,17
2011	A	080700	Forestry	Diesel	0,47	374,90	28,01	0,46	238,70	74,00	3,21	0,18	26,08	26,08	26,08
2011	A	080700	Forestry	Gasoline	0,46	54,79	3964,24	30,97	17915,98	73,00	0,46	0,09	82,19	82,19	82,19
2011	A	080800	Industry	Diesel	0,47	522,00	57,77	0,94	315,59	74,00	3,09	0,18	50,33	50,33	50,33
2011	A	080800	Industry	Gasoline	0,46	210,48	1532,21	108,78	13987,88	73,00	1,48	0,10	18,98	18,98	18,98
2011	A	080800	Industry	LPG	0,00	1328,11	146,09	7,69	104,85	63,10	3,50	0,21	4,89	4,89	4,89
2011	A	080900	Household and gardening	Gasoline	0,46	104,08	2323,91	75,64	30217,30	73,00	1,26	0,09	16,95	16,95	16,95
2011	A	081100	Commercial and institutional	Gasoline	0,46	91,70	1548,53	64,42	30858,88	73,00	1,13	0,09	28,48	28,48	28,48
2011	P	080501	Air traffic, Dom. < 3000 ft.	AvGas	22,83	859,00	1242,60	21,90	6972,00	73,00	2,00	1,60	10,00	10,00	10,00
2011	P	080501	Air traffic, Dom. < 3000 ft.	Jet fuel	22,99	276,53	12,78	1,41	182,87	72,00	7,48	0,00	1,16	1,16	1,16
2011	P	080502	Air traffic, Int. < 3000 ft.	AvGas	22,83	859,00	1242,60	21,90	6972,00	73,00	2,00	1,60	10,00	10,00	10,00
2011	P	080502	Air traffic, Int. < 3000 ft.	Jet fuel	22,99	339,69	32,74	3,62	238,55	72,00	3,91	0,00	1,16	1,16	1,16
2011	P	080503	Air traffic, Dom. > 3000 ft.	Jet fuel	22,99	268,00	9,89	0,00	61,85	72,00	2,30	0,00	1,16	1,16	1,16
2011	P	080504	Air traffic, Int. > 3000 ft.	Jet fuel	22,99	307,14	9,61	0,00	31,96	72,00	2,30	0,00	1,16	1,16	1,16

2011 emission factors for Arsenic, Cadmium, Chromium, Copper, Mercury, Nickel, Lead, Selenium and Zinc.

Year		SNAP ID	Category		Fuel type	Arsenic mg pr GJ	Cadmium mg pr GJ	Chromium mg pr GJ	Copper mg pr GJ	Mercury mg pr GJ	Nickel mg pr GJ	Lead mg pr GJ	Selenium mg pr GJ	Zinc mg pr GJ
2011	A	070101	Passenger cars	Highway	Bio ethanol	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
2011	A	070101	Passenger cars	Highway	Biodiesel	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
2011	A	070101	Passenger cars	Highway	Diesel	0,002	0,303	0,953	0,676	0,124	0,306	1,821	0,002	60,728
2011	A	070101	Passenger cars	Highway	Gasoline	0,007	0,327	0,434	1,233	0,199	0,375	0,996	0,005	65,321
2011	A	070101	Passenger cars	Highway	LPG	0,000	0,289	0,260	1,013	0,000	0,289	0,868	0,000	57,864
2011	A	070102	Passenger cars	Rural	Bio ethanol	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
2011	A	070102	Passenger cars	Rural	Biodiesel	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
2011	A	070102	Passenger cars	Rural	Diesel	0,002	0,323	1,004	0,713	0,124	0,326	1,942	0,002	64,780
2011	A	070102	Passenger cars	Rural	Gasoline	0,007	0,346	0,451	1,298	0,199	0,394	1,052	0,005	69,054
2011	A	070102	Passenger cars	Rural	LPG	0,000	0,347	0,312	1,214	0,000	0,347	1,041	0,000	69,374
2011	A	070103	Passenger cars	Urban	Bio ethanol	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
2011	A	070103	Passenger cars	Urban	Biodiesel	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000

Continued														
2011	A	070103	Passenger cars	Urban	Diesel	0,002	0,215	0,734	0,519	0,124	0,219	1,297	0,002	43,252
2011	A	070103	Passenger cars	Urban	Gasoline	0,007	0,204	0,324	0,802	0,199	0,252	0,627	0,005	40,699
2011	A	070103	Passenger cars	Urban	LPG	0,000	0,211	0,190	0,738	0,000	0,211	0,633	0,000	42,200
2011	A	070201	Light duty vehicles	Highway	Bio ethanol	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
2011	A	070201	Light duty vehicles	Highway	Biodiesel	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
2011	A	070201	Light duty vehicles	Highway	Diesel	0,002	0,230	0,771	0,545	0,124	0,233	1,383	0,002	46,140
2011	A	070201	Light duty vehicles	Highway	Gasoline	0,007	0,247	0,362	0,951	0,199	0,295	0,755	0,005	49,237
2011	A	070201	Light duty vehicles	Highway	LPG	0,000	0,165	0,149	0,578	0,000	0,165	0,495	0,000	33,023
2011	A	070202	Light duty vehicles	Rural	Bio ethanol	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
2011	A	070202	Light duty vehicles	Rural	Biodiesel	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
2011	A	070202	Light duty vehicles	Rural	Diesel	0,002	0,251	0,824	0,584	0,124	0,255	1,512	0,002	50,443
2011	A	070202	Light duty vehicles	Rural	Gasoline	0,007	0,233	0,350	0,904	0,199	0,281	0,714	0,005	46,522
2011	A	070202	Light duty vehicles	Rural	LPG	0,000	0,198	0,178	0,693	0,000	0,198	0,594	0,000	39,587
2011	A	070203	Light duty vehicles	Urban	Bio ethanol	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
2011	A	070203	Light duty vehicles	Urban	Biodiesel	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
2011	A	070203	Light duty vehicles	Urban	Diesel	0,002	0,165	0,610	0,429	0,124	0,169	0,997	0,002	33,278
2011	A	070203	Light duty vehicles	Urban	Gasoline	0,007	0,123	0,250	0,516	0,199	0,171	0,382	0,005	24,364
2011	A	070203	Light duty vehicles	Urban	LPG	0,000	0,126	0,114	0,442	0,000	0,126	0,379	0,000	25,249
2011	A	070301	Heavy duty vehicles	Highway	Bio ethanol	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
2011	A	070301	Heavy duty vehicles	Highway	Biodiesel	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
2011	A	070301	Heavy duty vehicles	Highway	Diesel	0,002	0,153	0,580	0,408	0,124	0,157	0,925	0,002	30,881
2011	A	070301	Heavy duty vehicles	Highway	Gasoline	0,007	0,254	0,369	0,977	0,199	0,302	0,777	0,005	50,708
2011	A	070302	Heavy duty vehicles	Rural	Bio ethanol	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
2011	A	070302	Heavy duty vehicles	Rural	Biodiesel	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
2011	A	070302	Heavy duty vehicles	Rural	Diesel	0,002	0,148	0,565	0,397	0,124	0,151	0,890	0,002	29,692
2011	A	070302	Heavy duty vehicles	Rural	Gasoline	0,007	0,288	0,399	1,096	0,199	0,336	0,879	0,005	57,530
2011	A	070303	Heavy duty vehicles	Urban	Bio ethanol	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
2011	A	070303	Heavy duty vehicles	Urban	Biodiesel	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
2011	A	070303	Heavy duty vehicles	Urban	Diesel	0,002	0,127	0,514	0,360	0,124	0,131	0,768	0,002	25,624
2011	A	070303	Heavy duty vehicles	Urban	Gasoline	0,007	0,203	0,322	0,796	0,199	0,251	0,622	0,005	40,380
2011	A	070400	Mopeds	Urban	Bio ethanol	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
2011	A	070400	Mopeds	Urban	Gasoline	0,007	0,005	0,144	0,103	0,199	0,053	0,027	0,005	0,753
2011	A	070501	Motorcycles	Highway	Bio ethanol	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
2011	A	070501	Motorcycles	Highway	Gasoline	0,007	0,132	0,258	0,548	0,199	0,180	0,409	0,005	26,185
2011	A	070502	Motorcycles	Rural	Bio ethanol	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
2011	A	070502	Motorcycles	Rural	Gasoline	0,007	0,160	0,283	0,645	0,199	0,207	0,492	0,005	31,743

Continued

2011	A	070503	Motorcycles	Urban	Bio ethanol	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
2011	A	070503	Motorcycles	Urban	Gasoline	0,007	0,156	0,280	0,631	0,199	0,204	0,481	0,005	30,966
2011	A	080100	Military		AvGas	0,007	0,253	0,367	0,972	0,198	0,301	12785,390	0,005	50,452
2011	A	080100	Military		Diesel	0,002	0,209	0,712	0,503	0,120	0,212	1,258	0,002	41,953
2011	A	080100	Military		Gasoline									
2011	A	080100	Military		Jet fuel	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
2011	A	080200	Railways		Diesel	0,002	0,186	0,660	0,465	0,124	0,189	1,118	0,002	37,295
2011	A	080200	Railways		Gasoline									
2011	A	080200	Railways		Kerosene									
2011	A	080300	Inland waterways		Diesel	0,002	0,186	0,660	0,465	0,124	0,189	1,118	0,002	37,295
2011	A	080300	Inland waterways		Gasoline	0,007	0,253	0,367	0,972	0,198	0,301	0,773	0,005	50,452
2011	A	080402	National sea traffic		Diesel	1,170	0,230	0,940	1,170	1,170	1,640	2,340	4,680	11,710
2011	A	080402	National sea traffic		Kerosene									
2011	A	080402	National sea traffic		LPG									
2011	A	080402	National sea traffic		Residual oil	12,220	0,730	4,890	12,220	0,490	733,500	4,890	9,780	22,000
2011	A	080403	Fishing		Diesel	1,170	0,230	0,940	1,170	1,170	1,640	2,340	4,680	11,710
2011	A	080403	Fishing		Gasoline									
2011	A	080403	Fishing		Kerosene									
2011	A	080403	Fishing		LPG	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
2011	A	080404	International sea traffic		Diesel	1,170	0,230	0,940	1,170	1,170	1,640	2,340	4,680	11,710
2011	A	080404	International sea traffic		Residual oil	12,220	0,730	4,890	12,220	0,490	733,500	4,890	9,780	22,000
2011	A	080501	Air traffic, Dom. < 3000 ft.		AvGas	0,007	0,253	0,367	0,972	0,198	0,301	13505,692	0,005	50,452
2011	A	080501	Air traffic, Dom. < 3000 ft.		Jet fuel	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
2011	A	080502	Air traffic, Int. < 3000 ft.		AvGas	0,007	0,253	0,367	0,972	0,198	0,301	13505,692	0,005	50,452
2011	A	080502	Air traffic, Int. < 3000 ft.		Jet fuel	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
2011	A	080503	Air traffic, Dom. > 3000 ft.		Jet fuel	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
2011	A	080504	Air traffic, Int. > 3000 ft.		Jet fuel	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
2011	A	080600	Agriculture		Diesel	0,002	0,186	0,660	0,465	0,124	0,189	1,118	0,002	37,295
2011	A	080600	Agriculture		Gasoline	0,007	0,253	0,367	0,972	0,198	0,301	0,773	0,005	50,452
2011	A	080700	Forestry		Diesel	0,002	0,186	0,660	0,465	0,124	0,189	1,118	0,002	37,295
2011	A	080700	Forestry		Gasoline	0,007	0,253	0,367	0,972	0,198	0,301	0,773	0,005	50,452
2011	A	080800	Industry		Diesel	0,002	0,186	0,660	0,465	0,124	0,189	1,118	0,002	37,295
2011	A	080800	Industry		Gasoline	0,007	0,253	0,367	0,972	0,198	0,301	0,773	0,005	50,452
2011	A	080800	Industry		LPG	0,000	0,131	0,118	0,457	0,000	0,131	0,392	0,000	26,126
2011	A	080900	Household and gardening		Gasoline	0,007	0,253	0,367	0,972	0,198	0,301	0,773	0,005	50,452
2011	A	081100	Commercial and institutional		Gasoline	0,007	0,253	0,367	0,972	0,198	0,301	0,773	0,005	50,452

Continued

2011	P	080501	Air traffic, Dom. < 3000 ft.	AvGas	0,007	0,253	0,367	0,972	0,198	0,301	13505,692	0,005	50,452
2011	P	080501	Air traffic, Dom. < 3000 ft.	Jet fuel	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
2011	P	080502	Air traffic, Int. < 3000 ft.	AvGas	0,007	0,253	0,367	0,972	0,198	0,301	13505,692	0,005	50,452
2011	P	080502	Air traffic, Int. < 3000 ft.	Jet fuel	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
2011	P	080503	Air traffic, Dom. > 3000 ft.	Jet fuel	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
2011	P	080504	Air traffic, Int. > 3000 ft.	Jet fuel	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000

2011 emission factors for Dioxins/, Flouranthene, Benzo(b), Benzo(k), Benzo(a), Benzo(g,h,i) and indeno(1,2,3-c,d).

Year		SNAP ID	Category		Fuel type	Dioxins/ microg pr GJ	Flouranthene mg pr GJ	Benzo(b) mg pr GJ	Benzo(k) mg pr GJ	Benzo(a) mg pr GJ	Benzo(g,h,i) mg pr GJ	indeno(1,2,3-c,d) mg pr GJ
2011	A	070101	Passenger cars	Highway	Bio ethanol	0,001	1,179	0,210	0,253	0,207	0,421	0,300
2011	A	070101	Passenger cars	Highway	Biodiesel	0,000	12,815	0,782	0,709	0,856	1,663	0,807
2011	A	070101	Passenger cars	Highway	Diesel	0,000	12,815	0,782	0,709	0,856	1,663	0,807
2011	A	070101	Passenger cars	Highway	Gasoline	0,001	1,179	0,210	0,253	0,207	0,421	0,300
2011	A	070101	Passenger cars	Highway	LPG	0,000	0,000	0,000	0,000	0,000	0,000	0,000
2011	A	070102	Passenger cars	Rural	Bio ethanol	0,001	1,296	0,234	0,282	0,230	0,468	0,334
2011	A	070102	Passenger cars	Rural	Biodiesel	0,001	14,593	0,891	0,807	0,975	1,894	0,919
2011	A	070102	Passenger cars	Rural	Diesel	0,001	14,593	0,891	0,807	0,975	1,894	0,919
2011	A	070102	Passenger cars	Rural	Gasoline	0,001	1,296	0,234	0,282	0,230	0,468	0,334
2011	A	070102	Passenger cars	Rural	LPG	0,000	0,000	0,000	0,000	0,000	0,000	0,000
2011	A	070103	Passenger cars	Urban	Bio ethanol	0,000	0,752	0,130	0,155	0,128	0,261	0,184
2011	A	070103	Passenger cars	Urban	Biodiesel	0,001	9,684	0,591	0,536	0,647	1,257	0,610
2011	A	070103	Passenger cars	Urban	Diesel	0,001	9,684	0,591	0,536	0,647	1,257	0,610
2011	A	070103	Passenger cars	Urban	Gasoline	0,000	0,752	0,130	0,155	0,128	0,261	0,184
2011	A	070103	Passenger cars	Urban	LPG	0,000	0,000	0,000	0,000	0,000	0,000	0,000
2011	A	070201	Light duty vehicles	Highway	Bio ethanol	0,001	1,062	0,160	0,185	0,155	0,321	0,218
2011	A	070201	Light duty vehicles	Highway	Biodiesel	0,001	9,234	0,564	0,511	0,617	1,198	0,581
2011	A	070201	Light duty vehicles	Highway	Diesel	0,001	9,234	0,564	0,511	0,617	1,198	0,581
2011	A	070201	Light duty vehicles	Highway	Gasoline	0,001	1,062	0,160	0,185	0,155	0,321	0,218
2011	A	070201	Light duty vehicles	Highway	LPG	0,000	0,000	0,000	0,000	0,000	0,000	0,000
2011	A	070202	Light duty vehicles	Rural	Bio ethanol	0,001	1,002	0,151	0,175	0,147	0,303	0,206
2011	A	070202	Light duty vehicles	Rural	Biodiesel	0,001	10,103	0,617	0,559	0,675	1,311	0,636
2011	A	070202	Light duty vehicles	Rural	Diesel	0,001	10,103	0,617	0,559	0,675	1,311	0,636
2011	A	070202	Light duty vehicles	Rural	Gasoline	0,001	1,002	0,151	0,175	0,147	0,303	0,206
2011	A	070202	Light duty vehicles	Rural	LPG	0,000	0,000	0,000	0,000	0,000	0,000	0,000
2011	A	070203	Light duty vehicles	Urban	Bio ethanol	0,000	0,579	0,087	0,101	0,085	0,175	0,119

Continued												
2011	A	070203	Light duty vehicles	Urban	Biodiesel	0,000	7,261	0,443	0,402	0,485	0,942	0,457
2011	A	070203	Light duty vehicles	Urban	Diesel	0,000	7,261	0,443	0,402	0,485	0,942	0,457
2011	A	070203	Light duty vehicles	Urban	Gasoline	0,000	0,579	0,087	0,101	0,085	0,175	0,119
2011	A	070203	Light duty vehicles	Urban	LPG	0,000	0,000	0,000	0,000	0,000	0,000	0,000
2011	A	070301	Heavy duty vehicles	Highway	Bio ethanol	0,000	0,000	0,000	0,000	0,000	0,000	0,000
2011	A	070301	Heavy duty vehicles	Highway	Biodiesel	0,001	2,030	0,512	0,759	0,095	0,076	0,133
2011	A	070301	Heavy duty vehicles	Highway	Diesel	0,001	2,030	0,512	0,759	0,095	0,076	0,133
2011	A	070301	Heavy duty vehicles	Highway	Gasoline	0,000	0,000	0,000	0,000	0,000	0,000	0,000
2011	A	070302	Heavy duty vehicles	Rural	Bio ethanol	0,000	0,000	0,000	0,000	0,000	0,000	0,000
2011	A	070302	Heavy duty vehicles	Rural	Biodiesel	0,001	2,066	0,521	0,772	0,096	0,077	0,135
2011	A	070302	Heavy duty vehicles	Rural	Diesel	0,001	2,066	0,521	0,772	0,096	0,077	0,135
2011	A	070302	Heavy duty vehicles	Rural	Gasoline	0,000	0,000	0,000	0,000	0,000	0,000	0,000
2011	A	070303	Heavy duty vehicles	Urban	Bio ethanol	0,000	0,000	0,000	0,000	0,000	0,000	0,000
2011	A	070303	Heavy duty vehicles	Urban	Biodiesel	0,001	1,676	0,423	0,626	0,078	0,063	0,110
2011	A	070303	Heavy duty vehicles	Urban	Diesel	0,001	1,676	0,423	0,626	0,078	0,063	0,110
2011	A	070303	Heavy duty vehicles	Urban	Gasoline	0,000	0,000	0,000	0,000	0,000	0,000	0,000
2011	A	070400	Mopeds	Urban	Bio ethanol	0,000	0,000	0,000	0,000	0,000	0,000	0,000
2011	A	070400	Mopeds	Urban	Gasoline	0,000	0,000	0,000	0,000	0,000	0,000	0,000
2011	A	070501	Motorcycles	Highway	Bio ethanol	0,020	12,799	0,832	0,640	0,704	1,664	0,640
2011	A	070501	Motorcycles	Highway	Gasoline	0,020	12,799	0,832	0,640	0,704	1,664	0,640
2011	A	070502	Motorcycles	Rural	Bio ethanol	0,024	15,331	0,996	0,766	0,843	1,993	0,766
2011	A	070502	Motorcycles	Rural	Gasoline	0,024	15,331	0,996	0,766	0,843	1,993	0,766
2011	A	070503	Motorcycles	Urban	Bio ethanol	0,024	15,500	1,007	0,775	0,852	2,015	0,775
2011	A	070503	Motorcycles	Urban	Gasoline	0,024	15,500	1,007	0,775	0,852	2,015	0,775
2011	A	080100	Military		AvGas	0,005	4,329	0,209	0,071	0,114	0,689	0,245
2011	A	080100	Military		Diesel	0,001	4,350	0,510	0,496	0,256	0,464	0,264
2011	A	080100	Military		Gasoline							
2011	A	080100	Military		Jet fuel	0,000	0,000	0,000	0,000	0,000	0,000	0,000
2011	A	080200	Railways		Diesel	0,001	1,411	0,360	0,402	0,059	0,051	0,092
2011	A	080200	Railways		Gasoline							
2011	A	080200	Railways		Kerosene							
2011	A	080300	Inland waterways		Diesel	0,001	4,350	0,510	0,496	0,256	0,464	0,264
2011	A	080300	Inland waterways		Gasoline	0,005	4,329	0,209	0,071	0,114	0,689	0,245
2011	A	080402	National sea traffic		Diesel	0,012	7,420	0,640	0,300	0,150	1,430	1,180
2011	A	080402	National sea traffic		Kerosene							
2011	A	080402	National sea traffic		LPG							

Continued											
2011	A	080402	National sea traffic	Residual oil	0,013	5,190	0,270	0,050	0,020	0,070	0,030
2011	A	080403	Fishing	Diesel	0,012	7,420	0,640	0,300	0,150	1,430	1,180
2011	A	080403	Fishing	Gasoline							
2011	A	080403	Fishing	Kerosene							
2011	A	080403	Fishing	LPG	0,000	0,000	0,000	0,000	0,000	0,000	0,000
2011	A	080404	International sea traffic	Diesel	0,012	7,420	0,640	0,300	0,150	1,430	1,180
2011	A	080404	International sea traffic	Residual oil	0,013	4,120	0,200	0,090	0,070	0,260	0,200
2011	A	080501	Air traffic, Dom. < 3000 ft.	AvGas	0,005	4,329	0,209	0,071	0,114	0,689	0,245
2011	A	080501	Air traffic, Dom. < 3000 ft.	Jet fuel	0,000	0,000	0,000	0,000	0,000	0,000	0,000
2011	A	080502	Air traffic, Int. < 3000 ft.	AvGas	0,005	4,329	0,209	0,071	0,114	0,689	0,245
2011	A	080502	Air traffic, Int. < 3000 ft.	Jet fuel	0,000	0,000	0,000	0,000	0,000	0,000	0,000
2011	A	080503	Air traffic, Dom. > 3000 ft.	Jet fuel	0,000	0,000	0,000	0,000	0,000	0,000	0,000
2011	A	080504	Air traffic, Int. > 3000 ft.	Jet fuel	0,000	0,000	0,000	0,000	0,000	0,000	0,000
2011	A	080600	Agriculture	Diesel	0,001	4,350	0,510	0,496	0,256	0,464	0,264
2011	A	080600	Agriculture	Gasoline	0,005	4,329	0,209	0,071	0,114	0,689	0,245
2011	A	080700	Forestry	Diesel	0,001	4,350	0,510	0,496	0,256	0,464	0,264
2011	A	080700	Forestry	Gasoline	0,005	4,329	0,209	0,071	0,114	0,689	0,245
2011	A	080800	Industry	Diesel	0,001	4,350	0,510	0,496	0,256	0,464	0,264
2011	A	080800	Industry	Gasoline	0,005	4,329	0,209	0,071	0,114	0,689	0,245
2011	A	080800	Industry	LPG	0,000	0,000	0,000	0,000	0,000	0,000	0,000
2011	A	080900	Household and gardening	Gasoline	0,005	4,329	0,209	0,071	0,114	0,689	0,245
2011	A	081100	Commercial and institutional	Gasoline	0,005	4,329	0,209	0,071	0,114	0,689	0,245
2011	P	080501	Air traffic, Dom. < 3000 ft.	AvGas	0,005	4,329	0,209	0,071	0,114	0,689	0,245
2011	P	080501	Air traffic, Dom. < 3000 ft.	Jet fuel	0,000	0,000	0,000	0,000	0,000	0,000	0,000
2011	P	080502	Air traffic, Int. < 3000 ft.	AvGas	0,005	4,329	0,209	0,071	0,114	0,689	0,245
2011	P	080502	Air traffic, Int. < 3000 ft.	Jet fuel	0,000	0,000	0,000	0,000	0,000	0,000	0,000
2011	P	080503	Air traffic, Dom. > 3000 ft.	Jet fuel	0,000	0,000	0,000	0,000	0,000	0,000	0,000
2011	P	080504	Air traffic, Int. > 3000 ft.	Jet fuel	0,000	0,000	0,000	0,000	0,000	0,000	0,000

1990 emissions for SO_2, NO_x; NMVOC, CH_4, CO, CO_2, N_2O, NH_3; TSP; PM_{10} and $PM_{2.5}$.

Year		SNAP ID	Category		Fuel type	Fuel	SO_2	NO_x	NMVOC	CH_4	CO	CO_2	N_2O	NH_3	TSP	PM_{10}	$PM_{2.5}$
						PJ	tonnes	tonnes	tonnes	tonnes	tonnes	ktonnes	tonnes	tonnes	tonnes	tonnes	tonnes
1990	A	070101	Passenger cars	Highway	Diesel	1,84	172,33	514,23	46,12	6,88	330,57	136,13	0,00	0,86	146,22	146,22	146,22
1990	A	070101	Passenger cars	Highway	Gasoline	13,64	31,14	17941,01	5206,57	148,53	52065,86	995,70	37,14	11,43	175,16	175,16	175,16
1990	A	070101	Passenger cars	Highway	LPG	0,017	0,00	20,08	3,26	0,18	68,23	1,10	0,00	0,00	0,18	0,18	0,18
1990	A	070102	Passenger cars	Rural	Diesel	3,739	350,29	1049,16	157,40	25,50	1002,43	276,71	0,00	2,13	280,94	280,94	280,94
1990	A	070102	Passenger cars	Rural	Gasoline	29,81	68,05	34230,22	14915,05	411,15	127372,72	2175,93	91,75	28,23	446,30	446,30	446,30
1990	A	070102	Passenger cars	Rural	LPG	0,036	0,00	44,81	10,95	0,61	41,15	2,26	0,00	0,00	0,52	0,52	0,52
1990	A	070103	Passenger cars	Urban	Diesel	2,571	240,85	567,80	264,93	17,55	886,92	190,26	0,00	0,81	370,85	370,85	370,85
1990	A	070103	Passenger cars	Urban	Gasoline	19,93	45,50	11129,18	21829,78	1126,14	249404,96	1454,89	54,00	10,80	246,59	246,59	246,59
1990	A	070103	Passenger cars	Urban	LPG	0,026	0,00	13,47	12,07	0,53	40,50	1,61	0,00	0,00	0,27	0,27	0,27
1990	A	070201	Light duty vehicles	Highway	Diesel	3,352	314,00	907,29	101,20	8,71	1153,53	248,05	0,00	1,09	350,21	350,21	350,21
1990	A	070201	Light duty vehicles	Highway	Gasoline	0,396	0,90	542,61	67,48	4,01	1183,85	28,93	1,04	0,32	6,41	6,41	6,41
1990	A	070201	Light duty vehicles	Highway	LPG	0,015	0,00	16,85	2,74	0,15	57,28	0,92	0,00	0,00	0,15	0,15	0,15
1990	A	070202	Light duty vehicles	Rural	Diesel	7,977	747,28	2387,17	265,03	34,00	2859,22	590,31	0,00	2,83	859,40	859,40	859,40
1990	A	070202	Light duty vehicles	Rural	Gasoline	1,094	2,50	1300,90	287,33	16,69	2534,47	79,88	2,71	0,83	16,69	16,69	16,69
1990	A	070202	Light duty vehicles	Rural	LPG	0,032	0,00	39,65	9,69	0,54	36,40	2,00	0,00	0,00	0,46	0,46	0,46
1990	A	070203	Light duty vehicles	Urban	Diesel	3,713	347,82	1742,28	277,76	16,99	1720,50	274,76	0,00	0,84	615,45	615,45	615,45
1990	A	070203	Light duty vehicles	Urban	Gasoline	0,671	1,53	367,62	586,86	26,75	6396,69	49,01	1,24	0,25	4,95	4,95	4,95
1990	A	070203	Light duty vehicles	Urban	LPG	0,019	0,00	9,07	9,07	0,36	31,71	1,17	0,00	0,00	0,18	0,18	0,18
1990	A	070301	Heavy duty vehicles	Highway	Diesel	10,37	971,35	10145,87	432,52	66,80	2074,02	767,32	31,95	3,20	363,93	363,93	363,93
1990	A	070301	Heavy duty vehicles	Highway	Gasoline	0,034	0,08	35,45	16,21	0,33	259,98	2,49	0,03	0,01	1,89	1,89	1,89
1990	A	070302	Heavy duty vehicles	Rural	Diesel	17,72	1659,89	17450,79	1023,06	120,07	3743,13	1311,23	51,77	5,18	633,09	633,09	633,09
1990	A	070302	Heavy duty vehicles	Rural	Gasoline	0,09	0,21	103,04	74,05	1,51	755,60	6,59	0,08	0,03	5,50	5,50	5,50
1990	A	070303	Heavy duty vehicles	Urban	Diesel	8,666	811,84	8380,30	752,74	107,60	2339,19	641,31	19,90	1,99	365,78	365,78	365,78
1990	A	070303	Heavy duty vehicles	Urban	Gasoline	0,075	0,17	34,44	52,51	1,07	535,81	5,51	0,05	0,02	3,06	3,06	3,06
1990	A	070400	Mopeds	Urban	Gasoline	0,176	0,40	3,22	2203,54	35,25	2221,08	12,87	0,16	0,16	30,26	30,26	30,26
1990	A	070501	Motorcycles	Highway	Gasoline	0,056	0,13	14,85	60,27	7,31	916,37	4,10	0,08	0,08	1,78	1,78	1,78
1990	A	070502	Motorcycles	Rural	Gasoline	0,135	0,31	24,98	132,28	21,47	2126,59	9,84	0,22	0,22	5,24	5,24	5,24
1990	A	070503	Motorcycles	Urban	Gasoline	0,173	0,39	19,53	198,77	26,83	2626,92	12,63	0,28	0,28	6,55	6,55	6,55
1990	A	080100	Military		AvGas	0,005	0,11	4,22	6,11	0,11	34,26	0,36	0,01	0,01	0,05	0,05	0,05
1990	A	080100	Military		Diesel	0,146	13,69	105,20	8,10	0,99	39,28	10,82	0,25	0,05	9,72	9,72	9,72
1990	A	080100	Military		Gasoline	1E-03	0,00	0,98	1,11	0,03	6,67	0,07	0,00	0,00	0,01	0,01	0,01
1990	A	080100	Military		Jet fuel	1,497	34,41	375,06	37,33	3,96	344,09	107,77	3,44		1,74	1,74	1,74
1990	A	080200	Railways		Diesel	4,01	375,64	4912,78	320,54	12,32	895,07	296,74	8,18	0,82	201,55	201,55	201,55
1990	A	080200	Railways		Gasoline	0	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00

Continued

1990	A	080300	Inland waterways	Diesel	0,343	32,10	337,02	58,86	0,96	155,43	25,35	1,01	0,06	36,64	36,64	36,64
1990	A	080300	Inland waterways	Gasoline	0,309	0,71	90,06	1114,91	15,58	4282,54	22,57	0,24	0,02	56,40	56,40	56,40
1990	A	080402	National sea traffic	Diesel	5,285	495,12	5836,01	267,28	8,27	881,74	391,12	24,76		122,69	121,47	120,85
1990	A	080402	National sea traffic	Residual oil	4,571	5901,32	7383,82	244,28	7,56	805,87	356,56	22,35		682,25	675,43	672,02
1990	A	080403	Fishing	Diesel	7,92	741,91	8332,71	389,10	12,03	1283,63	586,07	37,10		183,85	182,01	181,09
1990	A	080403	Fishing	Gasoline	0	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
1990	A	080403	Fishing	Residual oil	0	0,00	0,00	0,00	0,00	0,00	0,00	0,00		0,00	0,00	0,00
1990	A	080404	International sea traffic	Diesel	11,29	1057,56	13644,52	558,38	17,27	1842,07	835,42	52,88		262,07	259,45	258,14
1990	A	080404	International sea traffic	Residual oil	27,81	40259,78	46994,61	1501,54	46,44	4953,54	2169,54	136,01		5268,82	5216,14	5189,79
1990	A	080501	Air traffic, Dom. < 3000 ft.	AvGas	0,105	2,40	90,15	130,41	2,30	731,69	7,66	0,21	0,17	1,05	1,05	1,05
1990	A	080501	Air traffic, Dom. < 3000 ft.	Jet fuel	0,422	9,71	132,78	6,30	0,67	38,17	30,40	2,40		0,49	0,49	0,49
1990	A	080502	Air traffic, Int. < 3000 ft.	AvGas	0,031	0,70	26,34	38,10	0,67	213,76	2,24	0,06	0,05	0,31	0,31	0,31
1990	A	080502	Air traffic, Int. < 3000 ft.	Jet fuel	0,132	3,04	40,93	2,18	0,23	22,36	9,53	0,94		0,15	0,15	0,15
1990	A	080503	Air traffic, Dom. > 3000 ft.	Jet fuel	1,026	23,59	338,70	12,68	1,35	93,11	73,87	2,36		1,19	1,19	1,19
1990	A	080504	Air traffic, Int. > 3000 ft.	Jet fuel	1,612	37,06	393,62	10,45	1,11	87,20	116,06	3,71		1,87	1,87	1,87
1990	A	080600	Agriculture	Diesel	16,5	1545,32	12518,46	2587,36	42,07	10483,86	1220,72	48,34	2,76	2382,90	2382,90	2382,90
1990	A	080600	Agriculture	Gasoline	0,709	1,62	22,40	673,10	62,68	33688,19	51,75	0,91	0,06	4,65	4,65	4,65
1990	A	080700	Forestry	Diesel	0,145	13,62	124,63	22,74	0,37	93,84	10,76	0,43	0,02	21,66	21,66	21,66
1990	A	080700	Forestry	Gasoline	0,341	0,78	13,79	2460,65	20,63	6165,33	24,92	0,13	0,03	34,56	34,56	34,56
1990	A	080800	Industry	Diesel	10,16	951,61	9483,66	1810,53	29,44	6661,90	751,72	29,87	1,71	1569,49	1569,49	1569,49
1990	A	080800	Industry	Gasoline	0,175	0,40	23,88	282,25	21,13	2592,92	12,79	0,23	0,02	2,17	2,17	2,17
1990	A	080800	Industry	LPG	1,185	0,00	1573,62	173,10	9,11	124,23	74,76	4,14	0,25	5,80	5,80	5,80
1990	A	080900	Household and gardening	Gasoline	0,535	1,22	34,24	1801,26	50,96	17606,46	39,06	0,62	0,04	11,10	11,10	11,10
1990	A	081100	Commercial and institutional	Gasoline	1,01	2,31	69,51	2303,07	98,83	30181,04	73,72	1,10	0,08	24,24	24,24	24,24
1990	P	080501	Air traffic, Dom. < 3000 ft.	AvGas	0,009	0,20	7,42	10,74	0,19	60,25	0,63	0,02	0,01	0,09	0,09	0,09
1990	P	080501	Air traffic, Dom. < 3000 ft.	Jet fuel	0,502	11,54	142,54	10,41	1,11	65,13	36,16	2,30		0,58	0,58	0,58
1990	P	080502	Air traffic, Int. < 3000 ft.	AvGas	0,006	0,13	4,82	6,97	0,12	39,13	0,41	0,01	0,01	0,06	0,06	0,06
1990	P	080502	Air traffic, Int. < 3000 ft.	Jet fuel	2,001	46,00	650,12	68,54	7,28	314,49	144,09	7,58		2,32	2,32	2,32
1990	P	080503	Air traffic, Dom. > 3000 ft.	Jet fuel	1,305	30,00	410,96	15,38	1,63	109,71	93,97	3,00		1,51	1,51	1,51
1990	P	080504	Air traffic, Int. > 3000 ft.	Jet fuel	20,33	467,36	5899,81	204,92	21,76	765,45	1463,78	46,74		23,58	23,58	23,58

1990 emissions for Arsenic, Cadmium, Chromium, Copper, Mercury, Nickel, Lead, Selenium and Zinc.

Year		SNAP ID	Category		Fuel type	Fuel	Arsenic	Cadmium	Chromium	Copper	Mercury	Nickel	Lead	Selenium	Zinc
						PJ	kg	kg	kg	kg	kg	kg	kg	kg	kg
1990	A	070101	Passenger cars	Highway	Diesel	1,84	0,00	0,54	1,70	1,21	0,23	0,54	3,23	0,00	107,81
1990	A	070101	Passenger cars	Highway	Gasoline	13,64	0,09	3,72	5,26	14,22	2,71	4,38	20077,75	0,06	742,80

Continued															
1990	A	070101	Passenger cars	Highway	LPG	0,017	0,00	0,01	0,00	0,02	0,00	0,01	0,02	0,00	1,05
1990	A	070102	Passenger cars	Rural	Diesel	3,739	0,01	1,33	4,05	2,88	0,46	1,34	7,98	0,01	266,03
1990	A	070102	Passenger cars	Rural	Gasoline	29,81	0,20	9,19	12,43	34,73	5,92	10,61	43879,62	0,14	1832,30
1990	A	070102	Passenger cars	Rural	LPG	0,036	0,00	0,01	0,01	0,05	0,00	0,01	0,04	0,00	2,59
1990	A	070103	Passenger cars	Urban	Diesel	2,571	0,01	0,51	1,78	1,25	0,32	0,52	3,07	0,01	102,25
1990	A	070103	Passenger cars	Urban	Gasoline	19,93	0,14	3,55	5,98	14,16	3,96	4,51	29331,40	0,09	707,35
1990	A	070103	Passenger cars	Urban	LPG	0,026	0,00	0,00	0,00	0,02	0,00	0,00	0,01	0,00	0,99
1990	A	070201	Light duty vehicles	Highway	Diesel	3,352	0,01	0,65	2,27	1,60	0,42	0,66	3,89	0,01	129,82
1990	A	070201	Light duty vehicles	Highway	Gasoline	0,396	0,00	0,10	0,15	0,39	0,08	0,12	583,30	0,00	19,97
1990	A	070201	Light duty vehicles	Highway	LPG	0,015	0,00	0,00	0,00	0,01	0,00	0,00	0,01	0,00	0,58
1990	A	070202	Light duty vehicles	Rural	Diesel	7,977	0,02	1,68	5,77	4,07	0,99	1,71	10,12	0,02	337,73
1990	A	070202	Light duty vehicles	Rural	Gasoline	1,094	0,01	0,26	0,39	1,01	0,22	0,31	1610,62	0,00	52,06
1990	A	070202	Light duty vehicles	Rural	LPG	0,032	0,00	0,01	0,01	0,03	0,00	0,01	0,02	0,00	1,51
1990	A	070203	Light duty vehicles	Urban	Diesel	3,713	0,01	0,50	1,98	1,39	0,46	0,51	3,02	0,01	100,74
1990	A	070203	Light duty vehicles	Urban	Gasoline	0,671	0,00	0,08	0,16	0,33	0,13	0,11	987,98	0,00	15,70
1990	A	070203	Light duty vehicles	Urban	LPG	0,019	0,00	0,00	0,00	0,01	0,00	0,00	0,01	0,00	0,45
1990	A	070301	Heavy duty vehicles	Highway	Diesel	10,37	0,02	1,55	5,91	4,16	1,29	1,59	9,36	0,02	312,42
1990	A	070301	Heavy duty vehicles	Highway	Gasoline	0,034	0,00	0,01	0,01	0,03	0,01	0,01	50,28	0,00	1,41
1990	A	070302	Heavy duty vehicles	Rural	Diesel	17,72	0,04	2,54	9,83	6,90	2,20	2,60	15,34	0,04	511,81
1990	A	070302	Heavy duty vehicles	Rural	Gasoline	0,09	0,00	0,02	0,03	0,08	0,02	0,02	132,85	0,00	3,96
1990	A	070303	Heavy duty vehicles	Urban	Diesel	8,666	0,02	0,99	4,19	2,93	1,08	1,03	6,01	0,02	200,56
1990	A	070303	Heavy duty vehicles	Urban	Gasoline	0,075	0,00	0,01	0,02	0,04	0,01	0,01	111,01	0,00	2,14
1990	A	070400	Mopeds	Urban	Gasoline	0,176	0,00	0,00	0,03	0,02	0,04	0,01	259,28	0,00	0,13
1990	A	070501	Motorcycles	Highway	Gasoline	0,056	0,00	0,01	0,01	0,03	0,01	0,01	82,72	0,00	1,50
1990	A	070502	Motorcycles	Rural	Gasoline	0,135	0,00	0,02	0,04	0,09	0,03	0,03	198,30	0,00	4,38
1990	A	070503	Motorcycles	Urban	Gasoline	0,173	0,00	0,03	0,05	0,11	0,03	0,04	254,55	0,00	5,48
1990	A	080100	Military		AvGas	0,005	0,00	0,00	0,00	0,00	0,00	0,00	62,82	0,00	0,25
1990	A	080100	Military		Diesel	0,146	0,00	0,03	0,09	0,06	0,02	0,03	0,15	0,00	5,05
1990	A	080100	Military		Gasoline	1E-03	0,00	0,00	0,00	0,00	0,00	0,00	1,45	0,00	0,05
1990	A	080100	Military		Jet fuel	1,497		0,00	0,00	0,00		0,00		0,00	0,00
1990	A	080200	Railways		Diesel	4,01	0,01	0,74	2,65	1,87	0,50	0,76	4,48	0,01	149,55
1990	A	080200	Railways		Gasoline	0		0,00	0,00	0,00		0,00	0,00	0,00	0,00
1990	A	080300	Inland waterways		Diesel	0,343	0,00	0,06	0,23	0,16	0,04	0,06	0,38	0,00	12,78
1990	A	080300	Inland waterways		Gasoline	0,309	0,00	0,08	0,11	0,30	0,06	0,09	0,24	0,00	15,60
1990	A	080402	National sea traffic		Diesel	5,285	6,19	1,24	4,95	6,19	6,18	8,66	12,37	24,76	61,89
1990	A	080402	National sea traffic		Residual oil	4,571	55,88	3,35	22,35	55,88	2,24	3353,02	22,35	44,71	100,59

Continued

1990	A	080403	Fishing	Diesel	7,92	9,27	1,85	7,42	9,27	9,27	12,98	18,53	37,10	92,74
1990	A	080403	Fishing	Gasoline	0		0,00	0,00	0,00		0,00	0,00	0,00	0,00
1990	A	080403	Fishing	Residual oil	0	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
1990	A	080404	International sea traffic	Diesel	11,29	13,22	2,64	10,58	13,22	13,21	18,51	26,42	52,88	132,20
1990	A	080404	International sea traffic	Residual oil	27,81	340,03	20,40	136,01	340,03	13,63	20401,92	136,01	272,03	612,06
1990	A	080501	Air traffic, Dom. < 3000 ft.	AvGas	0,105	0,00	0,03	0,04	0,10	0,02	0,03	1417,38	0,00	5,29
1990	A	080501	Air traffic, Dom. < 3000 ft.	Jet fuel	0,422		0,00	0,00	0,00		0,00		0,00	0,00
1990	A	080502	Air traffic, Int. < 3000 ft.	AvGas	0,031	0,00	0,01	0,01	0,03	0,01	0,01	414,08	0,00	1,55
1990	A	080502	Air traffic, Int. < 3000 ft.	Jet fuel	0,132		0,00	0,00	0,00		0,00		0,00	0,00
1990	A	080503	Air traffic, Dom. > 3000 ft.	Jet fuel	1,026		0,00	0,00	0,00		0,00		0,00	0,00
1990	A	080504	Air traffic, Int. > 3000 ft.	Jet fuel	1,612		0,00	0,00	0,00		0,00		0,00	0,00
1990	A	080600	Agriculture	Diesel	16,5	0,04	3,06	10,88	7,67	2,04	3,12	18,44	0,04	615,23
1990	A	080600	Agriculture	Gasoline	0,709	0,00	0,18	0,26	0,69	0,14	0,21	0,55	0,00	35,76
1990	A	080700	Forestry	Diesel	0,145	0,00	0,03	0,10	0,07	0,02	0,03	0,16	0,00	5,42
1990	A	080700	Forestry	Gasoline	0,341	0,00	0,09	0,13	0,33	0,07	0,10	0,26	0,00	17,23
1990	A	080800	Industry	Diesel	10,16	0,02	1,88	6,70	4,73	1,26	1,92	11,36	0,02	378,86
1990	A	080800	Industry	Gasoline	0,175	0,00	0,04	0,06	0,17	0,03	0,05	0,14	0,00	8,84
1990	A	080800	Industry	LPG	1,185	0,00	0,15	0,14	0,54	0,00	0,15	0,46	0,00	30,96
1990	A	080900	Household and gardening	Gasoline	0,535	0,00	0,14	0,20	0,52	0,11	0,16	0,41	0,00	27,00
1990	A	081100	Commercial and institutional	Gasoline	1,01	0,01	0,26	0,37	0,98	0,20	0,30	0,78	0,00	50,95
1990	P	080501	Air traffic, Dom. < 3000 ft.	AvGas	0,009	0,00	0,00	0,00	0,01	0,00	0,00	116,72	0,00	0,44
1990	P	080501	Air traffic, Dom. < 3000 ft.	Jet fuel	0,502		0,00	0,00	0,00		0,00		0,00	0,00
1990	P	080502	Air traffic, Int. < 3000 ft.	AvGas	0,006	0,00	0,00	0,00	0,01	0,00	0,00	75,80	0,00	0,28
1990	P	080502	Air traffic, Int. < 3000 ft.	Jet fuel	2,001		0,00	0,00	0,00		0,00		0,00	0,00
1990	P	080503	Air traffic, Dom. > 3000 ft.	Jet fuel	1,305		0,00	0,00	0,00		0,00		0,00	0,00
1990	P	080504	Air traffic, Int. > 3000 ft.	Jet fuel	20,33		0,00	0,00	0,00		0,00		0,00	0,00

1990 emissions for Dioxins/, Flouranthene, Benzo(b), Benzo(k), Benzo(a), Benzo(g,h,i) and indeno(1,2,3-c,d).

Year		SNAP ID	Category		Fuel type	Fuel	Dioxins/	Flouranthene	Benzo(b)	Benzo(k)	Benzo(a)	Benzo(g,h,i)	indeno(1,2,3-c,d)
						PJ	g	kg	kg	kg	kg	kg	kg
1990	A	070101	Passenger cars	Highway	Diesel	1,84	0,00	22,53	1,38	1,25	1,50	2,92	1,42
1990	A	070101	Passenger cars	Highway	Gasoline	13,64	0,18	116,03	7,54	5,80	6,38	15,08	5,80
1990	A	070101	Passenger cars	Highway	LPG	0,017							
1990	A	070102	Passenger cars	Rural	Diesel	3,739	0,00	55,68	3,40	3,08	3,72	7,22	3,51
1990	A	070102	Passenger cars	Rural	Gasoline	29,81	0,45	284,37	18,48	14,21	15,64	36,97	14,21
1990	A	070102	Passenger cars	Rural	LPG	0,036							

Continued													
1990	A	070103	Passenger cars	Urban	Diesel	2,571	0,00	23,92	1,46	1,32	1,60	3,10	1,51
1990	A	070103	Passenger cars	Urban	Gasoline	19,93	0,20	128,10	8,33	6,40	7,05	16,65	6,40
1990	A	070103	Passenger cars	Urban	LPG	0,026							
1990	A	070201	Light duty vehicles	Highway	Diesel	3,352	0,00	28,51	1,74	1,58	1,90	3,70	1,80
1990	A	070201	Light duty vehicles	Highway	Gasoline	0,396	0,01	3,20	0,21	0,16	0,18	0,42	0,16
1990	A	070201	Light duty vehicles	Highway	LPG	0,015	0,00	0,00	0,00	0,00	0,00	0,00	0,00
1990	A	070202	Light duty vehicles	Rural	Diesel	7,977	0,00	74,23	4,53	4,11	4,96	9,63	4,67
1990	A	070202	Light duty vehicles	Rural	Gasoline	1,094	0,01	8,34	0,54	0,42	0,46	1,08	0,42
1990	A	070202	Light duty vehicles	Rural	LPG	0,032	0,00	0,00	0,00	0,00	0,00	0,00	0,00
1990	A	070203	Light duty vehicles	Urban	Diesel	3,713	0,00	25,82	1,58	1,43	1,72	3,35	1,63
1990	A	070203	Light duty vehicles	Urban	Gasoline	0,671	0,00	3,06	0,20	0,15	0,17	0,40	0,15
1990	A	070203	Light duty vehicles	Urban	LPG	0,019	0,00	0,00	0,00	0,00	0,00	0,00	0,00
1990	A	070301	Heavy duty vehicles	Highway	Diesel	10,37	0,01	21,63	5,46	8,08	1,01	0,81	1,41
1990	A	070301	Heavy duty vehicles	Highway	Gasoline	0,034							
1990	A	070302	Heavy duty vehicles	Rural	Diesel	17,72	0,02	39,12	9,87	14,62	1,83	1,46	2,56
1990	A	070302	Heavy duty vehicles	Rural	Gasoline	0,09							
1990	A	070303	Heavy duty vehicles	Urban	Diesel	8,666	0,01	15,49	3,91	5,79	0,72	0,58	1,01
1990	A	070303	Heavy duty vehicles	Urban	Gasoline	0,075							
1990	A	070400	Mopeds	Urban	Gasoline	0,176							
1990	A	070501	Motorcycles	Highway	Gasoline	0,056	0,00	0,71	0,05	0,04	0,04	0,09	0,04
1990	A	070502	Motorcycles	Rural	Gasoline	0,135	0,00	2,04	0,13	0,10	0,11	0,27	0,10
1990	A	070503	Motorcycles	Urban	Gasoline	0,173	0,00	2,65	0,17	0,13	0,15	0,34	0,13
1990	A	080100	Military		AvGas	0,005	0,00	0,02	0,00	0,00	0,00	0,00	0,00
1990	A	080100	Military		Diesel	0,146	0,00	0,64	0,08	0,08	0,04	0,08	0,04
1990	A	080100	Military		Gasoline	1E-03	0,00	0,01	0,00	0,00	0,00	0,00	0,00
1990	A	080100	Military		Jet fuel	1,497	0,00	0,00	0,00	0,00	0,00	0,00	0,00
1990	A	080200	Railways		Diesel	4,01	0,00	5,48	1,40	1,56	0,23	0,20	0,36
1990	A	080200	Railways		Gasoline	0	0,00	0,00	0,00	0,00	0,00	0,00	0,00
1990	A	080300	Inland waterways		Diesel	0,343	0,00	1,50	0,20	0,19	0,10	0,19	0,10
1990	A	080300	Inland waterways		Gasoline	0,309	0,00	1,34	0,06	0,02	0,04	0,21	0,08
1990	A	080402	National sea traffic		Diesel	5,285	0,06	39,22	3,38	1,59	0,79	7,56	6,24
1990	A	080402	National sea traffic		Residual oil	4,571	0,06	23,72	1,23	0,23	0,09	0,32	0,14
1990	A	080403	Fishing		Diesel	7,92	0,10	58,77	5,07	2,38	1,19	11,33	9,35
1990	A	080403	Fishing		Gasoline	0	0,00	0,00	0,00	0,00	0,00	0,00	0,00
1990	A	080403	Fishing		Residual oil	0	0,00	0,00	0,00	0,00	0,00	0,00	0,00
1990	A	080404	International sea traffic		Diesel	11,29	0,14	83,77	7,23	3,39	1,69	16,14	13,32

Continued

1990	A	080404	International sea traffic	Residual oil	27,81	0,37	114,60	5,56	2,50	1,95	7,23	5,56
1990	A	080501	Air traffic, Dom. < 3000 ft.	AvGas	0,105	0,00	0,45	0,02	0,01	0,01	0,07	0,03
1990	A	080501	Air traffic, Dom. < 3000 ft.	Jet fuel	0,422	0,00	0,00	0,00	0,00	0,00	0,00	0,00
1990	A	080502	Air traffic, Int. < 3000 ft.	AvGas	0,031	0,00	0,13	0,01	0,00	0,00	0,02	0,01
1990	A	080502	Air traffic, Int. < 3000 ft.	Jet fuel	0,132	0,00	0,00	0,00	0,00	0,00	0,00	0,00
1990	A	080503	Air traffic, Dom. > 3000 ft.	Jet fuel	1,026	0,00	0,00	0,00	0,00	0,00	0,00	0,00
1990	A	080504	Air traffic, Int. > 3000 ft.	Jet fuel	1,612	0,00	0,00	0,00	0,00	0,00	0,00	0,00
1990	A	080600	Agriculture	Diesel	16,5	0,01	72,44	9,41	9,37	4,78	9,07	4,79
1990	A	080600	Agriculture	Gasoline	0,709	0,00	3,07	0,15	0,05	0,08	0,49	0,17
1990	A	080700	Forestry	Diesel	0,145	0,00	0,64	0,08	0,08	0,04	0,08	0,04
1990	A	080700	Forestry	Gasoline	0,341	0,00	1,48	0,07	0,02	0,04	0,24	0,08
1990	A	080800	Industry	Diesel	10,16	0,01	44,61	5,80	5,77	2,94	5,59	2,95
1990	A	080800	Industry	Gasoline	0,175	0,00	0,76	0,04	0,01	0,02	0,12	0,04
1990	A	080800	Industry	LPG	1,185							
1990	A	080900	Household and gardening	Gasoline	0,535	0,00	2,32	0,11	0,04	0,06	0,37	0,13
1990	A	081100	Commercial and institutional	Gasoline	1,01	0,01	4,37	0,21	0,07	0,12	0,70	0,25
1990	P	080501	Air traffic, Dom. < 3000 ft.	AvGas	0,009	0,00	0,04	0,00	0,00	0,00	0,01	0,00
1990	P	080501	Air traffic, Dom. < 3000 ft.	Jet fuel	0,502	0,00	0,00	0,00	0,00	0,00	0,00	0,00
1990	P	080502	Air traffic, Int. < 3000 ft.	AvGas	0,006	0,00	0,02	0,00	0,00	0,00	0,00	0,00
1990	P	080502	Air traffic, Int. < 3000 ft.	Jet fuel	2,001	0,00	0,00	0,00	0,00	0,00	0,00	0,00
1990	P	080503	Air traffic, Dom. > 3000 ft.	Jet fuel	1,305	0,00	0,00	0,00	0,00	0,00	0,00	0,00
1990	P	080504	Air traffic, Int. > 3000 ft.	Jet fuel	20,33	0,00	0,00	0,00	0,00	0,00	0,00	0,00

2011 emissions for for SO_2, NO_x; NMVOC, CH_4, CO, CO_2, N_2O, NH_3; TSP; PM_{10} and $PM_{2.5}$.

Year		SNAP ID	Category		Fuel type	Fuel PJ	SO_2 tonnes	NO_x tonnes	NMVOC tonnes	CH_4 tonnes	CO tonnes	CO_2 ktonnes	N_2O tonnes	NH_3 tonnes	TSP tonnes	PM_{10} tonnes	PM2.5 tonnes
2011	A	070101	Passenger cars	Highway	Bio ethanol	0,523	0,00	81,27	19,28	1,61	392,17	0,00	0,44	16,85	0,56	0,56	0,56
2011	A	070101	Passenger cars	Highway	Biodiesel	0,358	0,00	103,09	1,55	0,05	5,11	0,00	0,75	0,18	5,02	5,02	5,02
2011	A	070101	Passenger cars	Highway	Diesel	10,42	4,88	3001,11	45,13	1,48	148,82	771,09	21,71	5,32	146,11	146,11	146,11
2011	A	070101	Passenger cars	Highway	Gasoline	14,73	6,73	2286,81	542,44	45,16	11035,25	1075,28	12,41	474,10	15,83	15,83	15,83
2011	A	070101	Passenger cars	Highway	LPG	3E-04	0,00	0,07	0,01	0,00	0,40	0,02	0,00	0,00	0,00	0,00	0,00
2011	A	070102	Passenger cars	Rural	Bio ethanol	0,848	0,00	106,98	35,70	3,16	515,32	0,00	1,34	30,40	0,88	0,88	0,88
2011	A	070102	Passenger cars	Rural	Biodiesel	0,575	0,00	140,69	3,27	0,16	15,40	0,00	1,28	0,31	6,61	6,61	6,61
2011	A	070102	Passenger cars	Rural	Diesel	16,73	7,84	4095,86	95,27	4,74	448,22	1238,02	37,19	9,11	192,35	192,35	192,35
2011	A	070102	Passenger cars	Rural	Gasoline	23,86	10,89	3010,35	1004,68	88,88	14500,35	1741,72	37,61	855,32	24,79	24,79	24,79
2011	A	070102	Passenger cars	Rural	LPG	4E-04	0,00	0,11	0,03	0,00	0,22	0,02	0,00	0,00	0,01	0,01	0,01

Continued

2011	A	070103	Passenger cars	Urban	Bio ethanol	0,581	0,00	88,93	180,79	7,11	1931,87	0,00	1,32	5,04	0,56	0,56	0,56
2011	A	070103	Passenger cars	Urban	Biodiesel	0,346	0,00	81,58	5,76	0,22	25,62	0,00	1,83	0,13	7,30	7,30	7,30
2011	A	070103	Passenger cars	Urban	Diesel	10,08	4,72	2375,05	167,76	6,42	745,88	746,01	53,13	3,65	212,48	212,48	212,48
2011	A	070103	Passenger cars	Urban	Gasoline	16,36	7,47	2502,44	5087,13	200,10	54360,23	1194,24	37,01	141,78	15,65	15,65	15,65
2011	A	070103	Passenger cars	Urban	LPG	3E-04	0,00	0,04	0,04	0,00	0,24	0,02	0,00	0,00	0,00	0,00	0,00
2011	A	070201	Light duty vehicles	Highway	Bio ethanol	0,017	0,00	2,89	0,34	0,05	9,69	0,00	0,03	0,39	0,02	0,02	0,02
2011	A	070201	Light duty vehicles	Highway	Biodiesel	0,222	0,00	64,92	4,37	0,05	28,03	0,00	0,34	0,08	4,47	4,47	4,47
2011	A	070201	Light duty vehicles	Highway	Diesel	6,467	3,03	1889,89	127,35	1,34	815,95	478,53	9,79	2,37	130,04	130,04	130,04
2011	A	070201	Light duty vehicles	Highway	Gasoline	0,478	0,22	81,43	9,69	1,36	272,80	34,88	0,90	10,93	0,69	0,69	0,69
2011	A	070201	Light duty vehicles	Highway	LPG	4E-04	0,00	0,05	0,01	0,00	0,38	0,02	0,00	0,00	0,00	0,00	0,00
2011	A	070202	Light duty vehicles	Rural	Bio ethanol	0,032	0,00	4,84	0,97	0,10	14,04	0,00	0,10	0,74	0,04	0,04	0,04
2011	A	070202	Light duty vehicles	Rural	Biodiesel	0,367	0,00	111,92	8,16	0,18	39,71	0,00	0,61	0,15	6,04	6,04	6,04
2011	A	070202	Light duty vehicles	Rural	Diesel	10,67	5,00	3258,31	237,63	5,11	1156,03	789,59	17,67	4,28	175,96	175,96	175,96
2011	A	070202	Light duty vehicles	Rural	Gasoline	0,914	0,42	136,21	27,31	2,82	395,01	66,71	2,73	20,89	1,18	1,18	1,18
2011	A	070202	Light duty vehicles	Rural	LPG	6E-04	0,00	0,08	0,02	0,00	0,24	0,04	0,00	0,00	0,01	0,01	0,01
2011	A	070203	Light duty vehicles	Urban	Bio ethanol	0,028	0,00	3,65	5,31	0,23	99,35	0,00	0,13	0,13	0,02	0,02	0,02
2011	A	070203	Light duty vehicles	Urban	Biodiesel	0,244	0,00	69,55	10,68	0,23	34,83	0,00	0,82	0,06	6,44	6,44	6,44
2011	A	070203	Light duty vehicles	Urban	Diesel	7,107	3,33	2024,73	311,03	6,74	1013,90	525,91	24,01	1,87	187,58	187,58	187,58
2011	A	070203	Light duty vehicles	Urban	Gasoline	0,775	0,35	102,73	149,35	6,35	2795,60	56,58	3,58	3,76	0,62	0,62	0,62
2011	A	070203	Light duty vehicles	Urban	LPG	4E-04	0,00	0,03	0,03	0,00	0,21	0,02	0,00	0,00	0,00	0,00	0,00
2011	A	070301	Heavy duty vehicles	Highway	Bio ethanol	8E-04	0,00	0,78	0,36	0,01	5,71	0,00	0,00	0,00	0,04	0,04	0,04
2011	A	070301	Heavy duty vehicles	Highway	Biodiesel	0,528	0,00	233,03	4,66	1,31	71,73	0,00	1,65	0,17	3,71	3,71	3,71
2011	A	070301	Heavy duty vehicles	Highway	Diesel	15,38	7,20	6783,75	135,63	38,23	2088,05	1138,16	48,14	4,81	107,86	107,86	107,86
2011	A	070301	Heavy duty vehicles	Highway	Gasoline	0,021	0,01	21,93	10,03	0,20	160,79	1,54	0,02	0,01	1,17	1,17	1,17
2011	A	070302	Heavy duty vehicles	Rural	Biodiesel	0,634	0,00	313,03	7,47	1,77	83,98	0,00	1,87	0,19	4,73	4,73	4,73
2011	A	070302	Heavy duty vehicles	Rural	Diesel	18,47	8,65	9112,75	217,50	51,60	2444,74	1366,46	54,51	5,45	137,84	137,84	137,84
2011	A	070302	Heavy duty vehicles	Rural	Gasoline	0,049	0,02	55,81	40,11	0,82	409,28	3,57	0,04	0,01	2,98	2,98	2,98
2011	A	070303	Heavy duty vehicles	Urban	Diesel	6,337	2,97	3738,10	109,23	27,89	930,48	468,91	15,75	1,58	57,44	57,44	57,44
2011	A	070303	Heavy duty vehicles	Urban	Gasoline	0,033	0,01	14,90	22,72	0,46	231,79	2,38	0,02	0,01	1,32	1,32	1,32
2011	A	070400	Mopeds	Urban	Bio ethanol	0,006	0,00	1,04	47,39	0,76	51,13	0,00	0,01	0,01	0,77	0,77	0,77
2011	A	070501	Motorcycles	Highway	Gasoline	0,11	0,05	29,71	74,42	10,07	1157,28	8,04	0,14	0,14	1,79	1,79	1,79
2011	A	070502	Motorcycles	Rural	Bio ethanol	0,009	0,00	1,64	5,73	0,94	83,00	0,00	0,01	0,01	0,17	0,17	0,17
2011	A	070502	Motorcycles	Rural	Gasoline	0,24	0,11	46,17	161,36	26,51	2335,64	17,52	0,37	0,37	4,74	4,74	4,74
2011	A	070503	Motorcycles	Urban	Bio ethanol	0,01	0,00	1,21	8,44	1,18	95,52	0,00	0,02	0,02	0,20	0,20	0,20
2011	A	070503	Motorcycles	Urban	Gasoline	0,287	0,13	34,11	237,49	33,32	2687,80	20,94	0,43	0,43	5,53	5,53	5,53
2011	A	080100	Military		AvGas	0,004	0,09	3,18	4,60	0,08	25,80	0,27	0,01	0,01	0,04	0,04	0,04

Continued

2011	A	080100	Military	Diesel	1,045	0,47	372,90	14,87	1,48	100,65	77,32	2,90	0,40	13,85	13,85	13,85
2011	A	080100	Military	Gasoline	0	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2011	A	080100	Military	Jet fuel	1,603	36,86	401,75	39,99	4,25	368,59	115,44	3,69	0,00	1,86	1,86	1,86
2011	A	080200	Railways	Diesel	3,37	1,58	2500,55	175,25	6,73	397,66	249,38	6,87	0,67	77,51	77,51	77,51
2011	A	080200	Railways	Gasoline	0	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2011	A	080200	Railways	Kerosene	0	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2011	A	080300	Inland waterways	Diesel	1,002	46,94	827,39	158,79	2,58	442,19	74,16	2,98	0,17	97,09	97,09	97,09
2011	A	080300	Inland waterways	Gasoline	0,34	0,16	188,06	344,06	21,62	4157,67	24,81	0,51	0,04	8,80	8,80	8,80
2011	A	080402	National sea traffic	Diesel	3,755	175,89	3520,95	189,44	5,66	329,15	277,88	17,59	0,00	80,91	80,10	79,70
2011	A	080402	National sea traffic	Kerosene	0											
2011	A	080402	National sea traffic	LPG	0											
2011	A	080402	National sea traffic	Residual oil	2,375	1161,61	4549,70	149,23	4,62	492,31	185,29	11,62		104,48	103,44	102,91
2011	A	080403	Fishing	Diesel	7,788	364,78	10571,80	448,35	13,87	1479,08	576,31	36,48	0,00	167,81	166,13	165,29
2011	A	080403	Fishing	Gasoline	0	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2011	A	080403	Fishing	Kerosene	0											
2011	A	080403	Fishing	LPG	0,011	0,00	13,90	4,29	0,23	4,93	0,70	0,00	0,00	0,00	0,00	0,00
2011	A	080404	International sea traffic	Diesel	10,28	481,59	16262,48	589,47	18,23	1944,63	760,87	48,16		221,55	219,33	218,22
2011	A	080404	International sea traffic	Residual oil	17,12	8371,55	36253,07	1079,02	33,37	3559,66	1335,35	83,72		752,98	745,45	741,68
2011	A	080501	Air traffic, Dom. < 3000 ft.	AvGas	0,057	1,30	48,95	70,81	1,25	397,28	4,16	0,11	0,09	0,57	0,57	0,57
2011	A	080501	Air traffic, Dom. < 3000 ft.	Jet fuel	0,248	5,70	70,69	2,86	0,32	33,86	17,87	2,71		0,29	0,29	0,29
2011	A	080502	Air traffic, Int. < 3000 ft.	AvGas	0,003	0,08	2,89	4,18	0,07	23,47	0,25	0,01	0,01	0,03	0,03	0,03
2011	A	080502	Air traffic, Int. < 3000 ft.	Jet fuel	0,332	7,63	98,99	8,69	0,96	57,27	23,89	2,43		0,38	0,38	0,38
2011	A	080503	Air traffic, Dom. > 3000 ft.	Jet fuel	0,555	12,76	144,36	3,49	0,00	58,16	39,97	1,28		0,64	0,64	0,64
2011	A	080504	Air traffic, Int. > 3000 ft.	Jet fuel	3,621	83,23	860,47	21,60	0,00	171,82	260,69	8,32		4,20	4,20	4,20
2011	A	080600	Agriculture	Diesel	17,27	8,09	9713,85	914,00	14,86	5597,45	1278,06	54,91	3,14	736,36	736,36	736,36
2011	A	080600	Agriculture	Gasoline	0,501	0,23	55,75	600,27	80,39	10994,21	36,57	0,86	0,76	15,62	15,62	15,62
2011	A	080700	Forestry	Diesel	0,159	0,07	59,60	4,45	0,07	37,95	11,76	0,51	0,03	4,15	4,15	4,15
2011	A	080700	Forestry	Gasoline	0,07	0,03	3,84	277,81	2,17	1255,55	5,12	0,03	0,01	5,76	5,76	5,76
2011	A	080800	Industry	Diesel	12,68	5,94	6618,08	732,38	11,91	4001,17	938,19	39,23	2,24	638,11	638,11	638,11
2011	A	080800	Industry	Gasoline	0,156	0,07	32,94	239,77	17,02	2188,93	11,42	0,23	0,02	2,97	2,97	2,97
2011	A	080800	Industry	LPG	0,976	0,00	1296,21	142,58	7,50	102,33	61,58	3,41	0,20	4,78	4,78	4,78
2011	A	080900	Household and gardening	Gasoline	0,858	0,39	89,26	1993,05	64,87	25915,11	62,61	1,08	0,08	14,54	14,54	14,54
2011	A	081100	Commercial and institutional	Gasoline	2,348	1,07	215,32	3636,02	151,25	72458,18	171,41	2,65	0,21	66,87	66,87	66,87
2011	P	080501	Air traffic, Dom. < 3000 ft.	AvGas	5E-04	0,01	0,39	0,57	0,01	3,18	0,03	0,00	0,00	0,00	0,00	0,00
2011	P	080501	Air traffic, Dom. < 3000 ft.	Jet fuel	0,281	6,47	77,78	3,59	0,40	51,43	20,25	2,11		0,33	0,33	0,33
2011	P	080502	Air traffic, Int. < 3000 ft.	AvGas	5E-04	0,01	0,42	0,61	0,01	3,42	0,04	0,00	0,00	0,00	0,00	0,00

Continued																
2011	P	080502	Air traffic, Int. < 3000 ft.	Jet fuel	2,684	61,70	911,71	87,87	9,72	640,25	193,24	10,50	0,00	3,11	3,11	3,11
2011	P	080503	Air traffic, Dom. > 3000 ft.	Jet fuel	0,881	20,26	236,14	8,72	0,00	54,49	63,44	2,03	0,00	1,02	1,02	1,02
2011	P	080504	Air traffic, Int. > 3000 ft.	Jet fuel	27,97	643,04	8591,33	268,71	0,00	894,10	2014,02	64,30	0,00	32,45	32,45	32,45

2011 emissions for for Arsenic, Cadmium, Chromium, Copper, Mercury, Nickel, Lead, Selenium and Zinc.

Year		SNAP ID	Category		Fuel type	Fuel	Arsenic	Cadmium	Chromium	Copper	Mercury	Nickel	Lead	Selenium	Zinc
						PJ	kg	kg	kg	kg	kg	kg	kg	kg	kg
2011	A	070101	Passenger cars	Highway	Bio ethanol	0,523	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2011	A	070101	Passenger cars	Highway	Biodiesel	0,358	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2011	A	070101	Passenger cars	Highway	Diesel	10,42	0,02	3,15	9,93	7,05	1,29	3,19	18,97	0,02	632,80
2011	A	070101	Passenger cars	Highway	Gasoline	14,73	0,10	4,82	6,40	18,16	2,93	5,53	14,67	0,07	962,18
2011	A	070101	Passenger cars	Highway	LPG	3E-04	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,02
2011	A	070102	Passenger cars	Rural	Bio ethanol	0,848	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2011	A	070102	Passenger cars	Rural	Biodiesel	0,575	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2011	A	070102	Passenger cars	Rural	Diesel	16,73	0,04	5,40	16,79	11,92	2,08	5,46	32,50	0,04	1083,78
2011	A	070102	Passenger cars	Rural	Gasoline	23,86	0,16	8,26	10,76	30,97	4,74	9,40	25,10	0,11	1647,57
2011	A	070102	Passenger cars	Rural	LPG	4E-04	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,03
2011	A	070103	Passenger cars	Urban	Bio ethanol	0,581	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2011	A	070103	Passenger cars	Urban	Biodiesel	0,346	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2011	A	070103	Passenger cars	Urban	Diesel	10,08	0,02	2,17	7,40	5,23	1,25	2,21	13,07	0,02	436,03
2011	A	070103	Passenger cars	Urban	Gasoline	16,36	0,11	3,34	5,29	13,12	3,25	4,13	10,25	0,07	665,82
2011	A	070103	Passenger cars	Urban	LPG	3E-04	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,01
2011	A	070201	Light duty vehicles	Highway	Bio ethanol	0,017	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2011	A	070201	Light duty vehicles	Highway	Biodiesel	0,222	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2011	A	070201	Light duty vehicles	Highway	Diesel	6,467	0,02	1,49	4,98	3,52	0,80	1,51	8,95	0,02	298,38
2011	A	070201	Light duty vehicles	Highway	Gasoline	0,478	0,00	0,12	0,17	0,45	0,09	0,14	0,36	0,00	23,53
2011	A	070201	Light duty vehicles	Highway	LPG	4E-04	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,01
2011	A	070202	Light duty vehicles	Rural	Bio ethanol	0,032	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2011	A	070202	Light duty vehicles	Rural	Biodiesel	0,367	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2011	A	070202	Light duty vehicles	Rural	Diesel	10,67	0,02	2,68	8,80	6,23	1,32	2,72	16,14	0,02	538,23
2011	A	070202	Light duty vehicles	Rural	Gasoline	0,914	0,01	0,21	0,32	0,83	0,18	0,26	0,65	0,00	42,51
2011	A	070202	Light duty vehicles	Rural	LPG	6E-04	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,02
2011	A	070203	Light duty vehicles	Urban	Bio ethanol	0,028	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2011	A	070203	Light duty vehicles	Urban	Biodiesel	0,244	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2011	A	070203	Light duty vehicles	Urban	Diesel	7,107	0,02	1,18	4,33	3,05	0,88	1,20	7,09	0,02	236,50
2011	A	070203	Light duty vehicles	Urban	Gasoline	0,775	0,01	0,10	0,19	0,40	0,15	0,13	0,30	0,00	18,88

Continued

2011	A	070203	Light duty vehicles	Urban	LPG	4E-04	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,01
2011	A	070301	Heavy duty vehicles	Highway	Bio ethanol	8E-04	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2011	A	070301	Heavy duty vehicles	Highway	Biodiesel	0,528	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2011	A	070301	Heavy duty vehicles	Highway	Diesel	15,38	0,04	2,36	8,92	6,27	1,91	2,41	14,23	0,04	474,96
2011	A	070301	Heavy duty vehicles	Highway	Gasoline	0,021	0,00	0,01	0,01	0,02	0,00	0,01	0,02	0,00	1,07
2011	A	070302	Heavy duty vehicles	Rural	Biodiesel	0,634	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2011	A	070302	Heavy duty vehicles	Rural	Diesel	18,47	0,04	2,72	10,43	7,33	2,29	2,79	16,43	0,04	548,28
2011	A	070302	Heavy duty vehicles	Rural	Gasoline	0,049	0,00	0,01	0,02	0,05	0,01	0,02	0,04	0,00	2,81
2011	A	070303	Heavy duty vehicles	Urban	Diesel	6,337	0,01	0,81	3,26	2,28	0,79	0,83	4,87	0,01	162,37
2011	A	070303	Heavy duty vehicles	Urban	Gasoline	0,033	0,00	0,01	0,01	0,03	0,01	0,01	0,02	0,00	1,32
2011	A	070400	Mopeds	Urban	Bio ethanol	0,006	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2011	A	070501	Motorcycles	Highway	Gasoline	0,11	0,00	0,01	0,03	0,06	0,02	0,02	0,05	0,00	2,88
2011	A	070502	Motorcycles	Rural	Bio ethanol	0,009	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2011	A	070502	Motorcycles	Rural	Gasoline	0,24	0,00	0,04	0,07	0,15	0,05	0,05	0,12	0,00	7,62
2011	A	070503	Motorcycles	Urban	Bio ethanol	0,01	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2011	A	070503	Motorcycles	Urban	Gasoline	0,287	0,00	0,04	0,08	0,18	0,06	0,06	0,14	0,00	8,88
2011	A	080100	Military		AvGas	0,004	0,00	0,00	0,00	0,00	0,00	0,00	47,31	0,00	0,19
2011	A	080100	Military		Diesel	1,045	0,00	0,22	0,74	0,53	0,13	0,22	1,31	0,00	43,84
2011	A	080100	Military		Gasoline	0	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2011	A	080100	Military		Jet fuel	1,603	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2011	A	080200	Railways		Diesel	3,37	0,01	0,63	2,22	1,57	0,42	0,64	3,77	0,01	125,69
2011	A	080200	Railways		Gasoline	0		0,00	0,00	0,00		0,00	0,00	0,00	0,00
2011	A	080200	Railways		Kerosene	0									
2011	A	080300	Inland waterways		Diesel	1,002	0,00	0,19	0,66	0,47	0,12	0,19	1,12	0,00	37,38
2011	A	080300	Inland waterways		Gasoline	0,34	0,00	0,09	0,12	0,33	0,07	0,10	0,26	0,00	17,15
2011	A	080402	National sea traffic		Diesel	3,755	4,39	0,86	3,53	4,39	4,39	6,16	8,79	17,57	43,97
2011	A	080402	National sea traffic		Kerosene	0									
2011	A	080402	National sea traffic		LPG	0									
2011	A	080402	National sea traffic		Residual oil	2,375	29,03	1,73	11,62	29,03	1,16	1742,42	11,62	23,23	52,26
2011	A	080403	Fishing		Diesel	7,788	9,11	1,79	7,32	9,11	9,11	12,77	18,22	36,45	91,20
2011	A	080403	Fishing		Gasoline	0		0,00	0,00	0,00		0,00	0,00	0,00	0,00
2011	A	080403	Fishing		Kerosene	0									
2011	A	080403	Fishing		LPG	0,011									
2011	A	080404	International sea traffic		Diesel	10,28	12,03	2,36	9,67	12,03	12,03	16,86	24,06	48,12	120,40
2011	A	080404	International sea traffic		Residual oil	17,12	209,20	12,50	83,72	209,20	8,39	12557,38	83,72	167,43	376,64
2011	A	080501	Air traffic, Dom. < 3000 ft.		AvGas	0,057	0,00	0,01	0,02	0,06	0,01	0,02	769,58	0,00	2,87

Continued

2011	A	080501	Air traffic, Dom. < 3000 ft.	Jet fuel	0,248		0,00	0,00	0,00		0,00	0,00	0,00	0,00
2011	A	080502	Air traffic, Int. < 3000 ft.	AvGas	0,003	0,00	0,00	0,00	0,00	0,00	0,00	45,46	0,00	0,17
2011	A	080502	Air traffic, Int. < 3000 ft.	Jet fuel	0,332		0,00	0,00	0,00		0,00	0,00	0,00	0,00
2011	A	080503	Air traffic, Dom. > 3000 ft.	Jet fuel	0,555		0,00	0,00	0,00		0,00	0,00	0,00	0,00
2011	A	080504	Air traffic, Int. > 3000 ft.	Jet fuel	3,621		0,00	0,00	0,00		0,00	0,00	0,00	0,00
2011	A	080600	Agriculture	Diesel	17,27	0,04	3,20	11,39	8,03	2,14	3,27	19,31	0,04	644,13
2011	A	080600	Agriculture	Gasoline	0,501	0,00	0,13	0,18	0,49	0,10	0,15	0,39	0,00	25,28
2011	A	080700	Forestry	Diesel	0,159	0,00	0,03	0,10	0,07	0,02	0,03	0,18	0,00	5,93
2011	A	080700	Forestry	Gasoline	0,07	0,00	0,02	0,03	0,07	0,01	0,02	0,05	0,00	3,54
2011	A	080800	Industry	Diesel	12,68	0,03	2,35	8,36	5,90	1,57	2,40	14,17	0,03	472,84
2011	A	080800	Industry	Gasoline	0,156	0,00	0,04	0,06	0,15	0,03	0,05	0,12	0,00	7,90
2011	A	080800	Industry	LPG	0,976	0,00	0,13	0,11	0,45	0,00	0,13	0,38	0,00	25,50
2011	A	080900	Household and gardening	Gasoline	0,858	0,01	0,22	0,31	0,83	0,17	0,26	0,66	0,00	43,27
2011	A	081100	Commercial and institutional	Gasoline	2,348	0,02	0,59	0,86	2,28	0,46	0,71	1,81	0,01	118,46
2011	P	080501	Air traffic, Dom. < 3000 ft.	AvGas	5E-04	0,00	0,00	0,00	0,00	0,00	0,00	6,16	0,00	0,02
2011	P	080501	Air traffic, Dom. < 3000 ft.	Jet fuel	0,281		0,00	0,00	0,00		0,00		0,00	0,00
2011	P	080502	Air traffic, Int. < 3000 ft.	AvGas	5E-04	0,00	0,00	0,00	0,00	0,00	0,00	6,62	0,00	0,02
2011	P	080502	Air traffic, Int. < 3000 ft.	Jet fuel	2,684	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2011	P	080503	Air traffic, Dom. > 3000 ft.	Jet fuel	0,881	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2011	P	080504	Air traffic, Int. > 3000 ft.	Jet fuel	27,97	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00

2011 emissions for for Dioxins/, Flouranthene, Benzo(b), Benzo(k), Benzo(a), Benzo(g,h,i) and indeno(1,2,3-c,d).

Year		SNAP ID	Category		Fuel type	Fuel	Dioxins/	Flouranthene	Benzo(b)	Benzo(k)	Benzo(a)	Benzo(g,h,i)	indeno(1,2,3-c,d)
						PJ	g	kg	kg	kg	kg	kg	kg
2011	A	070101	Passenger cars	Highway	Bio ethanol	0,523	0,00	0,62	0,11	0,13	0,11	0,22	0,16
2011	A	070101	Passenger cars	Highway	Biodiesel	0,358	0,00	4,59	0,28	0,25	0,31	0,60	0,29
2011	A	070101	Passenger cars	Highway	Diesel	10,42	0,00	133,53	8,15	7,39	8,92	17,33	8,41
2011	A	070101	Passenger cars	Highway	Gasoline	14,73	0,01	17,36	3,10	3,72	3,05	6,20	4,42
2011	A	070101	Passenger cars	Highway	LPG	3E-04							
2011	A	070102	Passenger cars	Rural	Bio ethanol	0,848	0,00	1,10	0,20	0,24	0,20	0,40	0,28
2011	A	070102	Passenger cars	Rural	Biodiesel	0,575	0,00	8,39	0,51	0,46	0,56	1,09	0,53
2011	A	070102	Passenger cars	Rural	Diesel	16,73	0,01	244,14	14,91	13,51	16,31	31,68	15,37
2011	A	070102	Passenger cars	Rural	Gasoline	23,86	0,01	30,92	5,58	6,72	5,50	11,16	7,98
2011	A	070102	Passenger cars	Rural	LPG	4E-04							
2011	A	070103	Passenger cars	Urban	Bio ethanol	0,581	0,00	0,44	0,08	0,09	0,07	0,15	0,11
2011	A	070103	Passenger cars	Urban	Biodiesel	0,346	0,00	3,35	0,20	0,19	0,22	0,44	0,21

Continued													
2011	A	070103	Passenger cars	Urban	Diesel	10,08	0,01	97,62	5,96	5,40	6,52	12,67	6,15
2011	A	070103	Passenger cars	Urban	Gasoline	16,36	0,01	12,30	2,13	2,54	2,09	4,26	3,02
2011	A	070103	Passenger cars	Urban	LPG	3E-04							
2011	A	070201	Light duty vehicles	Highway	Bio ethanol	0,017	0,00	0,02	0,00	0,00	0,00	0,01	0,00
2011	A	070201	Light duty vehicles	Highway	Biodiesel	0,222	0,00	2,05	0,13	0,11	0,14	0,27	0,13
2011	A	070201	Light duty vehicles	Highway	Diesel	6,467	0,00	59,71	3,65	3,30	3,99	7,75	3,76
2011	A	070201	Light duty vehicles	Highway	Gasoline	0,478	0,00	0,51	0,08	0,09	0,07	0,15	0,10
2011	A	070201	Light duty vehicles	Highway	LPG	4E-04	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2011	A	070202	Light duty vehicles	Rural	Bio ethanol	0,032	0,00	0,03	0,00	0,01	0,00	0,01	0,01
2011	A	070202	Light duty vehicles	Rural	Biodiesel	0,367	0,00	3,70	0,23	0,20	0,25	0,48	0,23
2011	A	070202	Light duty vehicles	Rural	Diesel	10,67	0,01	107,80	6,58	5,96	7,20	13,99	6,79
2011	A	070202	Light duty vehicles	Rural	Gasoline	0,914	0,00	0,92	0,14	0,16	0,13	0,28	0,19
2011	A	070202	Light duty vehicles	Rural	LPG	6E-04	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2011	A	070203	Light duty vehicles	Urban	Bio ethanol	0,028	0,00	0,02	0,00	0,00	0,00	0,00	0,00
2011	A	070203	Light duty vehicles	Urban	Biodiesel	0,244	0,00	1,77	0,11	0,10	0,12	0,23	0,11
2011	A	070203	Light duty vehicles	Urban	Diesel	7,107	0,00	51,60	3,15	2,85	3,45	6,70	3,25
2011	A	070203	Light duty vehicles	Urban	Gasoline	0,775	0,00	0,45	0,07	0,08	0,07	0,14	0,09
2011	A	070203	Light duty vehicles	Urban	LPG	4E-04	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2011	A	070301	Heavy duty vehicles	Highway	Bio ethanol	8E-04							
2011	A	070301	Heavy duty vehicles	Highway	Biodiesel	0,528	0,00	1,07	0,27	0,40	0,05	0,04	0,07
2011	A	070301	Heavy duty vehicles	Highway	Diesel	15,38	0,02	31,23	7,88	11,67	1,46	1,17	2,04
2011	A	070301	Heavy duty vehicles	Highway	Gasoline	0,021							
2011	A	070302	Heavy duty vehicles	Rural	Biodiesel	0,634	0,00	1,31	0,33	0,49	0,06	0,05	0,09
2011	A	070302	Heavy duty vehicles	Rural	Diesel	18,47	0,02	38,15	9,63	14,26	1,78	1,42	2,50
2011	A	070302	Heavy duty vehicles	Rural	Gasoline	0,049							
2011	A	070303	Heavy duty vehicles	Urban	Diesel	6,337	0,01	10,62	2,68	3,97	0,50	0,40	0,69
2011	A	070303	Heavy duty vehicles	Urban	Gasoline	0,033							
2011	A	070400	Mopeds	Urban	Bio ethanol	0,006							
2011	A	070501	Motorcycles	Highway	Gasoline	0,11	0,00	1,41	0,09	0,07	0,08	0,18	0,07
2011	A	070502	Motorcycles	Rural	Bio ethanol	0,009	0,00	0,13	0,01	0,01	0,01	0,02	0,01
2011	A	070502	Motorcycles	Rural	Gasoline	0,24	0,01	3,68	0,24	0,18	0,20	0,48	0,18
2011	A	070503	Motorcycles	Urban	Bio ethanol	0,01	0,00	0,16	0,01	0,01	0,01	0,02	0,01
2011	A	070503	Motorcycles	Urban	Gasoline	0,287	0,01	4,45	0,29	0,22	0,24	0,58	0,22
2011	A	080100	Military		AvGas	0,004	0,00	0,02	0,00	0,00	0,00	0,00	0,00
2011	A	080100	Military		Diesel	1,045	0,00	4,55	0,53	0,52	0,27	0,49	0,28
2011	A	080100	Military		Gasoline	0	0,00	0,00	0,00	0,00	0,00	0,00	0,00

Continued

2011	A	080100	Military	Jet fuel	1,603	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2011	A	080200	Railways	Diesel	3,37	0,00	4,76	1,21	1,35	0,20	0,17	0,31
2011	A	080200	Railways	Gasoline	0	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2011	A	080200	Railways	Kerosene	0							
2011	A	080300	Inland waterways	Diesel	1,002	0,00	4,36	0,51	0,50	0,26	0,47	0,26
2011	A	080300	Inland waterways	Gasoline	0,34	0,00	1,47	0,07	0,02	0,04	0,23	0,08
2011	A	080402	National sea traffic	Diesel	3,755	0,05	27,86	2,40	1,13	0,56	5,37	4,43
2011	A	080402	National sea traffic	Kerosene	0							
2011	A	080402	National sea traffic	LPG	0							
2011	A	080402	National sea traffic	Residual oil	2,375	0,03	12,33	0,64	0,12	0,05	0,17	0,07
2011	A	080403	Fishing	Diesel	7,788	0,09	57,79	4,98	2,34	1,17	11,14	9,19
2011	A	080403	Fishing	Gasoline	0	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2011	A	080403	Fishing	Kerosene	0							
2011	A	080403	Fishing	LPG	0,011							
2011	A	080404	International sea traffic	Diesel	10,28	0,12	76,29	6,58	3,08	1,54	14,70	12,13
2011	A	080404	International sea traffic	Residual oil	17,12	0,23	70,53	3,42	1,54	1,20	4,45	3,42
2011	A	080501	Air traffic, Dom. < 3000 ft.	AvGas	0,057	0,00	0,25	0,01	0,00	0,01	0,04	0,01
2011	A	080501	Air traffic, Dom. < 3000 ft.	Jet fuel	0,248	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2011	A	080502	Air traffic, Int. < 3000 ft.	AvGas	0,003	0,00	0,01	0,00	0,00	0,00	0,00	0,00
2011	A	080502	Air traffic, Int. < 3000 ft.	Jet fuel	0,332	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2011	A	080503	Air traffic, Dom. > 3000 ft.	Jet fuel	0,555	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2011	A	080504	Air traffic, Int. > 3000 ft.	Jet fuel	3,621	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2011	A	080600	Agriculture	Diesel	17,27	0,01	75,13	8,82	8,56	4,42	8,02	4,56
2011	A	080600	Agriculture	Gasoline	0,501	0,00	2,17	0,10	0,04	0,06	0,35	0,12
2011	A	080700	Forestry	Diesel	0,159	0,00	0,69	0,08	0,08	0,04	0,07	0,04
2011	A	080700	Forestry	Gasoline	0,07	0,00	0,30	0,01	0,00	0,01	0,05	0,02
2011	A	080800	Industry	Diesel	12,68	0,01	55,15	6,47	6,29	3,24	5,89	3,35
2011	A	080800	Industry	Gasoline	0,156	0,00	0,68	0,03	0,01	0,02	0,11	0,04
2011	A	080800	Industry	LPG	0,976							
2011	A	080900	Household and gardening	Gasoline	0,858	0,00	3,71	0,18	0,06	0,10	0,59	0,21
2011	A	081100	Commercial and institutional	Gasoline	2,348	0,01	10,16	0,49	0,17	0,27	1,62	0,57
2011	P	080501	Air traffic, Dom. < 3000 ft.	AvGas	5E-04	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2011	P	080501	Air traffic, Dom. < 3000 ft.	Jet fuel	0,281	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2011	P	080502	Air traffic, Int. < 3000 ft.	AvGas	5E-04	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2011	P	080502	Air traffic, Int. < 3000 ft.	Jet fuel	2,684	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2011	P	080503	Air traffic, Dom. > 3000 ft.	Jet fuel	0,881	0,00	0,00	0,00	0,00	0,00	0,00	0,00

Continued												
2011	P	080504	Air traffic, Int. > 3000 ft.	Jet fuel	27,97	0,00	0,00	0,00	0,00	0,00	0,00	0,00

Non-exhaust emission factors, activity data and total non-exhaust emissions of TSP, PM_{10} and $PM_{2.5}$ in 2010.

Year	Source	Category	Mileage kmkveh	TSP mg pr km	PM_{10} mg pr km	$PM_{2.5}$ mg pr km	As µg pr km	Cd µg pr km	Cr µg pr km	Cu µg pr km	Hg µg pr km	Ni µg pr km	Pb µg pr km	Se µg pr km	Zn µg pr km
2011	Brake wear	1	41665706	6,2	6,1	2,4	0,1	0,1	0,7	650,3	0,0	0,7	85,7	0,1	124,8
2011	Brake wear	2	9235669	12,1	11,8	4,7	0,1	0,1	1,3	1267,0	0,0	1,3	167,1	0,2	243,1
2011	Brake wear	3	3244541	29,8	29,2	11,6	0,3	0,1	4,9	224,7	0,0	3,4	12,1	0,6	224,0
2011	Brake wear	4	765114	47,5	46,6	18,5	0,5	0,1	3,0	650,8	0,0	7,6	34,7	1,0	443,7
2011	Brake wear	5	222820	6,2	6,1	2,4	0,1	0,1	0,7	649,2	0,0	0,7	85,6	0,1	124,6
2011	Brake wear	6	472210	4,2	4,1	1,6	0,0	0,0	0,4	439,8	0,0	0,4	58,0	0,1	84,4
2011	Road abrasion	1	41665706	15,0	7,5	4,1	0,0	0,0	0,3	0,1	0,0	0,2	0,7	0,0	1,1
2011	Road abrasion	2	9235669	15,0	7,5	4,1	0,0	0,0	0,3	0,1	0,0	0,2	0,7	0,0	1,1
2011	Road abrasion	3	3244541	76,0	38,0	20,5	0,0	0,0	1,5	0,8	0,0	1,2	3,6	0,0	5,7
2011	Road abrasion	4	765114	76,0	38,0	20,5	0,0	0,0	1,5	0,8	0,0	1,2	3,6	0,0	5,7
2011	Road abrasion	5	222820	6,0	3,0	1,6	0,0	0,0	0,1	0,1	0,0	0,1	0,3	0,0	0,5
2011	Road abrasion	6	472210	6,0	3,0	1,6	0,0	0,0	0,1	0,1	0,0	0,1	0,3	0,0	0,5
2011	Tyre wear	1	41665706	10,8	6,5	4,6	0,0	0,0	0,0	0,2	0,0	0,3	0,9	0,2	118,5
2011	Tyre wear	2	9235669	17,2	10,3	7,2	0,0	0,0	0,1	0,3	0,0	0,4	1,4	0,3	187,7
2011	Tyre wear	3	3244541	65,4	39,2	27,5	0,1	0,2	0,2	1,0	0,0	1,7	5,3	1,3	714,8
2011	Tyre wear	4	765114	61,3	36,8	25,7	0,0	0,2	0,2	1,0	0,0	1,6	4,9	1,2	670,1
2011	Tyre wear	5	222820	14,2	8,5	6,0	0,0	0,0	0,1	0,2	0,0	0,4	1,1	0,3	154,9
2011	Tyre wear	6	472210	17,8	10,7	7,5	0,0	0,0	0,1	0,3	0,0	0,5	1,4	0,4	194,1
2011	Total	1	41665706	32,0	20,1	11,0	0,1	0,1	1,0	650,6	0,0	1,2	87,3	0,3	244,4
2011	Total	2	9235669	44,2	29,6	16,0	0,1	0,2	1,6	1267,4	0,0	1,9	169,1	0,6	432,0
2011	Total	3	3244541	171,2	106,4	59,6	0,4	0,3	6,6	226,5	0,0	6,3	21,0	1,9	944,5
2011	Total	4	765114	184,8	121,3	64,8	0,5	0,3	4,8	652,5	0,0	10,3	43,2	2,2	1119,6
2011	Total	5	222820	26,3	17,6	10,0	0,1	0,1	0,8	649,5	0,0	1,1	87,0	0,4	280,0
2011	Total	6	472210	27,9	17,8	10,7	0,1	0,1	0,6	440,1	0,0	1,0	59,7	0,4	279,0

Year	Source	Category	TSP tonnes	PM_{10} tonnes	$PM_{2.5}$ tonnes	As kg	Cd kg	Cr kg	Cu kg	Hg kg	Ni kg	Pb kg	Se kg	Zn kg
2011	Brake wear	1	258	253	101	2,579	2,530	27,127	27093,176		27,153	3572,258	5,157	5199,480

Continued														
2011	Brake wear	2	111	109	43	1,114	1,093	11,716	11701,393		11,727	1542,838	2,227	2245,627
2011	Brake wear	3	97	95	38	0,967	0,297	15,863	729,172		11,027	39,368	1,935	726,759
2011	Brake wear	4	36	36	14	0,364	0,110	2,328	497,927		5,781	26,561	0,727	339,462
2011	Brake wear	5	1	1	1	0,014	0,014	0,145	144,660		0,145	19,074	0,028	27,762
2011	Brake wear	6	2	2	1	0,020	0,019	0,208	207,680		0,208	27,383	0,040	39,856
2011	Road abrasion	1	625	312	169	0,000	0,059	12,403	6,244	0,036	9,922	29,390	0,000	47,224
2011	Road abrasion	2	139	69	37	0,000	0,013	2,749	1,384	0,008	2,199	6,515	0,000	10,468
2011	Road abrasion	3	247	123	67	0,000	0,023	4,893	2,463	0,014	3,915	11,596	0,000	18,632
2011	Road abrasion	4	58	29	16	0,000	0,006	1,154	0,581	0,003	0,923	2,734	0,000	4,394
2011	Road abrasion	5	1	1	0	0,000	0,000	0,027	0,013	0,000	0,021	0,063	0,000	0,101
2011	Road abrasion	6	3	1	1	0,000	0,000	0,056	0,028	0,000	0,045	0,133	0,000	0,214
2011	Tyre wear	1	451	271	190	0,361	1,174	1,625	7,042		11,510	36,336	9,028	4936,275
2011	Tyre wear	2	159	95	67	0,127	0,412	0,571	2,473		4,043	12,763	3,171	1733,855
2011	Tyre wear	3	212	127	89	0,170	0,551	0,763	3,308		5,408	17,071	4,241	2319,083
2011	Tyre wear	4	47	28	20	0,038	0,122	0,169	0,731		1,196	3,774	0,938	512,734
2011	Tyre wear	5	3	2	1	0,003	0,008	0,011	0,049		0,080	0,254	0,063	34,521
2011	Tyre wear	6	8	5	4	0,007	0,022	0,030	0,131		0,214	0,675	0,168	91,663
2011	Total	1	1334	836	459	2,940	3,763	41,155	27106,461	0,036	48,584	3637,983	14,185	10182,979
2011	Total	2	408	274	147	1,241	1,518	15,036	11705,250	0,008	17,969	1562,116	5,398	3989,950
2011	Total	3	555	345	193	1,137	0,872	21,520	734,944	0,014	20,349	68,034	6,176	3064,474
2011	Total	4	141	93	50	0,401	0,237	3,651	499,239	0,003	7,900	33,070	1,665	856,590
2011	Total	5	6	4	2	0,016	0,022	0,183	144,723	0,000	0,247	19,391	0,091	62,384
2011	Total	6	13	8	5	0,026	0,041	0,294	207,840	0,000	0,467	28,191	0,207	131,733

Annex 2B-16: Fuel consumption and emissions in NFR format

Fuel 1999-2011.

NFR category	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Manufacturing industries/Construction (mobile)	11,7	11,7	11,6	11,6	11,6	11,5	11,5	11,5	11,5	11,5	11,6	11,7	11,7	11,9	11,9
Civil aviation (International, LTO)	1,7	1,8	1,8	1,9	2,1	2,2	2,1	2,3	2,3	2,4	2,5	2,8	3,0	3,0	3,2
Civil aviation (International, Cruise)	17,7	19,1	20,6	22,0	23,0	21,9	20,6	21,2	20,7	22,8	23,4	24,6	25,0	27,0	28,6
Civil aviation (Domestic, LTO)	1,1	1,0	1,1	1,1	1,1	1,0	0,9	0,9	0,9	0,9	0,9	0,9	1,0	0,9	0,8
Civil aviation (Domestic, Cruise)	2,5	2,3	2,7	2,7	2,6	2,3	1,9	1,8	1,8	1,8	1,8	1,9	1,9	1,8	1,7
Road transport: Passenger cars	66,3	67,0	67,2	68,1	67,5	71,6	76,2	79,6	81,6	84,8	85,6	86,4	88,6	90,4	90,9
Road transport:Light duty vehicles	12,4	14,3	15,1	15,5	16,1	17,3	17,9	17,8	18,3	19,6	19,6	20,0	20,2	20,7	21,0
Road transport:Heavy duty vehicles	31,9	35,6	34,9	34,4	35,7	37,0	37,4	36,5	35,6	37,9	38,3	39,5	39,9	40,2	41,2
Road transport: Mopeds & motorcycles	0,6	0,6	0,5	0,5	0,5	0,5	0,6	0,6	0,6	0,6	0,7	0,7	0,8	0,9	0,9
Railways	4,9	4,9	4,4	4,6	4,2	4,0	4,1	4,3	4,5	4,1	4,1	4,1	4,0	3,3	3,1
International navigation (Shipping)	16,2	19,0	28,4	36,2	37,1	39,1	34,9	36,7	55,0	62,0	65,1	62,0	56,7	57,2	53,3
National navigation (Shipping)	10,4	10,3	10,4	10,4	10,5	10,5	10,6	10,9	10,7	10,8	11,3	12,2	12,0	10,0	8,8
Commercial/Institutional: Mobile	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,1	1,1	1,1	1,1	1,2
Residential: Household and gardening (mobile)	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,6	0,6	0,6
Agriculture/Forestry/Fishing: Off-road agriculture/forestry	17,4	17,9	17,5	18,0	17,8	17,7	17,5	16,7	16,7	15,8	16,2	15,4	15,7	14,8	14,8
Agriculture/Forestry/Fishing: National fishing	7,1	8,1	6,3	7,5	7,5	8,0	8,2	7,5	7,1	7,1	7,2	6,8	5,3	5,6	6,4
Other, Mobile (military)	5,5	4,3	5,0	2,7	2,3	1,6	3,9	1,9	3,3	3,5	3,4	2,4	2,3	2,8	2,5

Continued

NFR category	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Manufacturing industries/Construction (mobile)	12,0	12,1	12,3	12,4	12,5	13,0	13,9	14,8	15,1	11,2	14,2	13,8
Civil aviation (International, LTO)	3,3	3,3	3,0	2,8	3,1	3,1	3,0	3,0	3,2	2,7	2,9	3,0
Civil aviation (International, Cruise)	29,3	29,8	25,6	26,9	30,9	32,7	32,9	33,7	33,6	29,4	30,8	31,6
Civil aviation (Domestic, LTO)	0,7	0,7	0,6	0,5	0,4	0,5	0,5	0,6	0,6	0,6	0,6	0,6
Civil aviation (Domestic, Cruise)	1,5	1,6	1,4	1,4	1,4	1,4	1,5	1,7	1,7	1,5	1,5	1,4
Road transport: Passenger cars	90,3	89,0	90,2	92,4	93,2	92,6	93,1	98,3	99,5	96,2	95,6	95,4
Road transport:Light duty vehicles	21,4	21,9	22,6	24,5	26,6	28,6	30,8	32,4	31,0	29,0	28,2	27,3
Road transport:Heavy duty vehicles	39,9	41,1	40,9	42,9	44,2	44,2	46,6	47,9	44,6	39,4	40,6	41,7
Road transport: Mopeds & motorcycles	0,9	0,8	0,8	0,8	0,8	0,8	0,8	0,9	0,9	0,9	0,9	0,8
Railways	3,1	2,9	2,8	3,0	2,9	3,1	3,1	3,1	3,2	3,1	3,3	3,4
International navigation (Shipping)	54,6	43,3	35,5	37,5	30,2	30,7	40,8	42,7	36,6	19,6	27,0	27,4
National navigation (Shipping)	7,9	7,9	7,7	7,7	7,9	7,8	7,8	7,8	7,9	8,0	7,9	7,5
Commercial/Institutional: Mobile	1,2	1,3	1,5	1,8	2,0	2,2	2,4	2,4	2,4	2,4	2,4	2,3

Continued

Residential: Household and gardening (mobile)	0,6	0,6	0,7	0,7	0,8	0,8	0,8	0,9	0,9	0,9	0,9	0,9
Agriculture/Forestry/Fishing: Off-road agriculture/forestry	14,4	14,5	14,6	14,6	14,9	15,0	15,5	16,4	17,1	17,3	17,6	18,0
Agriculture/Forestry/Fishing: National fishing	7,5	9,4	9,7	9,3	7,3	8,7	8,2	7,0	8,1	7,5	7,8	7,8
Other, Mobile (military)	1,5	1,3	1,2	1,3	3,3	3,7	1,7	2,4	1,5	2,2	1,5	2,7

Emissions 1985-1999.

pol_name	NFR category	Unit	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
SO_2	Manufacturing industries/Construction (mobile)	[tonnes]	2402	1441	1440	1438	956	952	955	957	957	959	968	244	246	249	251
SO_2	Civil aviation (International, LTO)	[tonnes]	38	41	42	44	49	50	48	52	53	55	59	63	68	69	73
SO_2	Civil aviation (International, Cruise)	[tonnes]	406	439	473	506	528	504	473	488	476	525	537	566	574	620	658
SO_2	Civil aviation (Domestic, LTO)	[tonnes]	25	23	24	24	25	24	20	20	20	20	21	22	23	20	18
SO_2	Civil aviation (Domestic, Cruise)	[tonnes]	57	54	61	62	59	54	44	42	41	42	42	44	45	42	38
SO_2	Road transport: Passenger cars	[tonnes]	1714	1152	1149	1169	848	908	953	672	365	385	387	391	398	407	317
SO_2	Road transport:Light duty vehicles	[tonnes]	2488	1741	1828	1883	1316	1414	1462	936	372	400	402	411	417	424	240
SO_2	Road transport:Heavy duty vehicles	[tonnes]	7418	4968	4868	4803	3323	3444	3487	2211	830	882	892	918	927	934	528
SO_2	Road transport: Mopeds & motorcycles	[tonnes]	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2
SO_2	Railways	[tonnes]	1152	695	618	641	393	376	382	263	105	95	96	95	93	78	40
SO_2	International navigation (Shipping)	[tonnes]	17037	20752	35647	46755	47058	41317	33277	30084	58492	58965	65049	61075	55822	46756	49282
SO_2	National navigation (Shipping)	[tonnes]	7480	7480	7484	7228	7231	6429	5111	3506	4410	4974	5588	4400	3650	2283	2051
SO_2	Commercial/Institutional: Mobile	[tonnes]	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3
SO_2	Residential: Household and gardening (mobile)	[tonnes]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
SO_2	Agriculture/Forestry/Fishing: Off-road agriculture/forestry	[tonnes]	3774	2341	2298	2369	1571	1561	1552	1485	1487	1407	1451	347	353	335	334
SO_2	Agriculture/Forestry/Fishing: National fishing	[tonnes]	993	1143	876	703	698	742	765	701	663	665	668	632	499	521	597
SO_2	Other, Mobile (military)	[tonnes]	408	260	193	72	70	48	206	82	76	80	80	56	54	65	47
NO_x	Manufacturing industries/Construction (mobile)	[tonnes]	10903	10964	11011	11044	11065	11081	11282	11440	11558	11677	11882	12080	12248	12425	12262
NO_x	Civil aviation (International, LTO)	[tonnes]	568	611	616	652	723	722	687	752	768	773	829	882	941	972	1030
NO_x	Civil aviation (International, Cruise)	[tonnes]	5096	5518	5952	6383	6591	6293	5899	6094	5935	6543	6688	7022	7117	7690	8174
NO_x	Civil aviation (Domestic, LTO)	[tonnes]	400	378	381	383	384	373	312	321	335	353	371	369	381	334	296
NO_x	Civil aviation (Domestic, Cruise)	[tonnes]	803	754	856	868	824	750	608	581	564	586	587	602	617	577	520
NO_x	Road transport: Passenger cars	[tonnes]	57216	58346	59333	61147	61153	65510	68046	67915	66179	63881	59513	55400	52173	48139	43763
NO_x	Road transport:Light duty vehicles	[tonnes]	5442	6187	6505	6663	6845	7313	7623	7672	7946	8446	8344	8293	8186	8193	8160
NO_x	Road transport:Heavy duty vehicles	[tonnes]	31306	34887	34173	33706	34948	36150	36631	35693	34728	36351	35672	35506	35089	34915	35448
NO_x	Road transport: Mopeds & motorcycles	[tonnes]	61	61	59	59	58	63	64	69	73	77	80	82	87	91	93
NO_x	Railways	[tonnes]	6025	6063	5391	5589	5145	4913	4995	5284	5485	4971	5015	4977	4846	4089	3730
NO_x	International navigation (Shipping)	[tonnes]	22455	26921	42068	54983	56940	60639	53939	55808	87852	99296	105113	100507	93239	92360	89143
NO_x	National navigation (Shipping)	[tonnes]	13299	13339	13414	13486	13568	13649	13180	12882	12753	12999	13679	14757	13544	11175	8720
NO_x	Commercial/Institutional: Mobile	[tonnes]	66	67	68	70	70	70	75	80	85	89	93	95	98	101	102
NO_x	Residential: Household and gardening (mobile)	[tonnes]	31	32	33	34	34	34	36	38	40	42	43	45	46	48	49
NO_x	Agriculture/Forestry/Fishing: Off-road agriculture/forestry	[tonnes]	11308	11907	11873	12471	12568	12679	12930	12627	12886	12461	13178	13139	13754	13273	13466
NO_x	Agriculture/Forestry/Fishing: National fishing	[tonnes]	6851	8008	6280	7673	7774	8387	8792	8198	7877	8063	8264	7999	6421	6846	8029
NO_x	Other, Mobile (military)	[tonnes]	2285	1951	1586	1003	874	485	1755	947	1234	1223	1637	910	1117	1300	1025
NMVOC	Manufacturing industries/Construction (mobile)	[tonnes]	2422	2395	2368	2339	2304	2266	2231	2191	2147	2107	2088	2095	2083	2074	1997

Continued

NMVOC	Civil aviation (International, LTO)	[tonnes]	85	97	107	121	136	116	107	108	106	84	115	121	124	125	116
NMVOC	Civil aviation (International, Cruise)	[tonnes]	176	191	206	221	225	215	202	209	203	223	228	239	242	261	278
NMVOC	Civil aviation (Domestic, LTO)	[tonnes]	186	185	158	165	162	158	146	143	140	169	184	171	164	147	142
NMVOC	Civil aviation (Domestic, Cruise)	[tonnes]	30	28	32	33	31	28	23	21	21	22	22	22	23	22	20
NMVOC	Road transport: Passenger cars	[tonnes]	44673	44130	43893	42358	40705	42446	44762	44188	43910	41686	39723	38622	35137	32615	28797
NMVOC	Road transport:Light duty vehicles	[tonnes]	1333	1468	1555	1524	1518	1607	1729	1753	1878	1948	1917	1905	1766	1743	1663
NMVOC	Road transport:Heavy duty vehicles	[tonnes]	2173	2372	2308	2253	2314	2351	2388	2297	2214	2305	2284	2227	2106	1962	1844
NMVOC	Road transport: Mopeds & motorcycles	[tonnes]	3304	3003	2797	2655	2531	2595	2665	2703	2707	2705	3001	3400	4097	4829	4697
NMVOC	Road transport: Gasoline evaporation	[tonnes]	24997	25561	25612	27250	27439	29132	29433	29607	27463	26759	24162	20974	19717	16806	14846
NMVOC	Railways	[tonnes]	393	396	352	365	336	321	326	345	358	324	327	325	316	267	276
NMVOC	International navigation (Shipping)	[tonnes]	825	974	1472	1892	1947	2060	1839	1928	2933	3318	3501	3343	3082	3102	2929
NMVOC	National navigation (Shipping)	[tonnes]	1560	1560	1592	1622	1654	1686	1719	1761	1786	1820	1879	1975	1969	1873	1776
NMVOC	Commercial/Institutional: Mobile	[tonnes]	2347	2333	2318	2303	2303	2303	2314	2302	2265	2285	2367	2458	2547	2636	2741
NMVOC	Residential: Household and gardening (mobile)	[tonnes]	1844	1833	1821	1809	1805	1801	1797	1792	1789	1785	1780	1774	1767	1759	1758
NMVOC	Agriculture/Forestry/Fishing: Off-road agricul-ture/forestry	[tonnes]	6020	6027	5902	5909	5824	5744	5360	4914	4584	4272	4146	3847	3687	3399	3219
NMVOC	Agriculture/Forestry/Fishing: National fishing	[tonnes]	337	390	314	375	383	405	417	384	360	366	370	361	279	292	344
NMVOC	Other, Mobile (military)	[tonnes]	570	444	169	472	302	53	158	84	120	117	143	88	99	110	104
CH_4	Manufacturing industries/Construction (mobile)	[tonnes]	63	63	62	61	61	60	58	57	56	54	53	53	53	53	51
CH_4	Civil aviation (International, LTO)	[tonnes]	6	7	8	9	9	8	8	8	8	8	11	12	12	12	11
CH_4	Civil aviation (International, Cruise)	[tonnes]	19	20	22	23	24	23	21	22	22	24	24	25	26	28	30
CH_4	Civil aviation (Domestic, LTO)	[tonnes]	5	5	4	5	4	4	4	4	4	5	5	5	5	4	4
CH_4	Civil aviation (Domestic, Cruise)	[tonnes]	3	3	3	3	3	3	2	2	2	2	2	2	2	2	2
CH_4	Road transport: Passenger cars	[tonnes]	1576	1599	1621	1645	1631	1737	1823	1838	1824	1774	1679	1590	1513	1435	1332
CH_4	Road transport:Light duty vehicles	[tonnes]	81	92	96	99	102	108	112	115	118	126	122	117	113	110	103
CH_4	Road transport:Heavy duty vehicles	[tonnes]	257	286	280	277	287	297	301	293	287	307	317	330	331	328	330
CH_4	Road transport: Mopeds & motorcycles	[tonnes]	100	95	91	89	86	91	93	97	101	104	111	119	133	147	147
CH_4	Railways	[tonnes]	15	15	14	14	13	12	13	13	14	12	13	12	12	10	11
CH_4	International navigation (Shipping)	[tonnes]	26	30	46	59	60	64	57	60	91	103	108	103	95	96	91
CH_4	National navigation (Shipping)	[tonnes]	30	30	31	31	32	32	33	34	34	35	36	38	38	35	34
CH_4	Commercial/Institutional: Mobile	[tonnes]	104	102	100	99	99	99	97	95	92	90	89	89	89	89	90
CH_4	Residential: Household and gardening (mobile)	[tonnes]	55	54	53	52	51	51	50	49	48	48	47	46	45	45	45
CH_4	Agriculture/Forestry/Fishing: Off-road agricul-ture/forestry	[tonnes]	145	142	137	134	130	126	118	111	105	98	95	89	85	80	77
CH_4	Agriculture/Forestry/Fishing: National fishing	[tonnes]	10	12	10	12	12	13	13	12	11	11	12	11	9	9	11
CH_4	Other, Mobile (military)	[tonnes]	28	23	16	17	13	5	17	9	12	12	17	10	12	13	11
CO	Manufacturing industries/Construction (mobile)	[tonnes]	9863	9784	9702	9611	9502	9379	9294	9188	9070	8956	8910	8963	8939	8907	8647
CO	Civil aviation (International, LTO)	[tonnes]	427	480	508	583	669	590	557	574	580	450	506	532	577	598	619

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CO	Civil aviation (International, Cruise)	[tonnes]	676	727	781	833	894	853	800	825	808	892	915	970	987	1065	1123
CO	Civil aviation (Domestic, LTO)	[tonnes]	1039	1037	885	931	916	895	826	801	780	941	1024	958	923	824	802
CO	Civil aviation (Domestic, Cruise)	[tonnes]	218	204	233	237	224	203	162	154	150	157	156	159	162	149	130
CO	Road transport: Passenger cars	[tonnes]	543043	515315	492705	455882	423852	431213	450464	436547	423024	391546	371759	360862	324514	301585	265549
CO	Road transport:Light duty vehicles	[tonnes]	13182	14486	15339	15137	15084	15974	17120	17473	18674	19447	18847	18071	16226	15566	14284
CO	Road transport:Heavy duty vehicles	[tonnes]	8872	9656	9414	9210	9429	9708	9864	9635	9428	10023	10216	10331	10068	9777	9585
CO	Road transport: Mopeds & motorcycles	[tonnes]	8389	8087	7749	7668	7467	7891	8118	8525	8869	9278	9794	10329	11372	12376	12385
CO	Railways	[tonnes]	1098	1105	982	1018	937	895	910	963	999	906	914	907	883	745	717
CO	International navigation (Shipping)	[tonnes]	2722	3214	4855	6243	6424	6796	6065	6361	9677	10946	11548	11030	10168	10233	9662
CO	National navigation (Shipping)	[tonnes]	5472	5473	5636	5797	5962	6126	6297	6491	6623	6805	7057	7246	7150	6983	6779
CO	Commercial/Institutional: Mobile	[tonnes]	31348	30972	30583	30181	30181	30181	29610	28987	28319	27809	27575	27800	28012	28211	28817
CO	Residential: Household and gardening (mobile)	[tonnes]	19086	18725	18352	17968	17789	17606	17238	16880	16708	16556	16422	16311	16217	16136	16286
CO	Agriculture/Forestry/Fishing: Off-road agricul-ture/forestry	[tonnes]	60053	58421	56249	54554	52494	50431	47422	44184	41431	38543	36465	33697	31539	28859	26698
CO	Agriculture/Forestry/Fishing: National fishing	[tonnes]	1112	1286	1007	1214	1223	1303	1348	1243	1177	1193	1208	1161	915	964	1121
CO	Other, Mobile (military)	[tonnes]	4228	3120	1313	3190	1971	424	1019	518	852	874	896	621	605	684	694
CO_2	Manufacturing industries/Construction (mobile)	[ktonnes]	850	849	848	846	843	839	841	841	839	839	846	851	858	865	871
CO_2	Civil aviation (International, LTO)	[ktonnes]	119	128	132	139	154	156	151	163	167	173	184	199	212	217	230
CO_2	Civil aviation (International, Cruise)	[ktonnes]	1272	1375	1481	1586	1655	1580	1481	1530	1492	1645	1683	1772	1798	1942	2060
CO_2	Civil aviation (Domestic, LTO)	[ktonnes]	77	72	77	77	78	75	62	62	62	64	66	69	72	63	55
CO_2	Civil aviation (Domestic, Cruise)	[ktonnes]	179	169	191	194	184	168	137	132	128	133	132	136	140	131	119
CO_2	Road transport: Passenger cars	[ktonnes]	4847	4901	4914	4975	4932	5235	5567	5816	5966	6197	6256	6320	6479	6608	6645
CO_2	Road transport:Light duty vehicles	[ktonnes]	918	1059	1112	1144	1189	1275	1322	1312	1350	1445	1448	1475	1494	1525	1553
CO_2	Road transport:Heavy duty vehicles	[ktonnes]	2360	2632	2579	2544	2638	2734	2769	2701	2637	2804	2836	2920	2949	2971	3052
CO_2	Road transport: Mopeds & motorcycles	[ktonnes]	43	41	39	38	37	39	41	42	44	46	49	52	57	63	63
CO_2	Railways	[ktonnes]	364	366	326	338	311	297	302	319	331	300	303	301	293	247	232
CO_2	International navigation (Shipping)	[ktonnes]	1238	1454	2179	2786	2854	3005	2673	2797	4214	4744	4976	4725	4326	4337	4053
CO_2	National navigation (Shipping)	[ktonnes]	784	784	787	790	793	796	803	817	803	814	850	917	898	745	655
CO_2	Commercial/Institutional: Mobile	[ktonnes]	74	74	74	74	74	74	74	75	75	77	78	80	81	83	85
CO_2	Residential: Household and gardening (mobile)	[ktonnes]	40	40	39	39	39	39	39	39	39	39	40	40	41	41	42
CO_2	Agriculture/Forestry/Fishing: Off-road agricul-ture/forestry	[ktonnes]	1283	1320	1294	1329	1318	1308	1295	1238	1235	1168	1199	1141	1159	1097	1091
CO_2	Agriculture/Forestry/Fishing: National fishing	[ktonnes]	523	602	464	558	556	591	607	556	525	527	529	502	395	412	473
CO_2	Other, Mobile (military)	[ktonnes]	402	316	361	196	165	119	287	141	237	252	252	176	171	204	182
N_2O	Manufacturing industries/Construction (mobile)	[tonnes]	34	34	34	34	34	34	34	35	35	35	35	36	36	36	37
N_2O	Civil aviation (International, LTO)	[tonnes]	6	6	7	7	8	9	8	9	10	10	11	12	13	13	14
N_2O	Civil aviation (International, Cruise)	[tonnes]	41	44	47	51	53	50	47	49	48	53	54	57	57	62	66
N_2O	Civil aviation (Domestic, LTO)	[tonnes]	4	4	5	5	5	5	5	5	5	5	5	6	6	5	5

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N_2O	Civil aviation (Domestic, Cruise)	[tonnes]	6	5	6	6	6	5	4	4	4	4	4	4	4	4	4
N_2O	Road transport: Passenger cars	[tonnes]	164	166	168	173	172	183	197	214	225	241	250	259	270	271	270
N_2O	Road transport:Light duty vehicles	[tonnes]	4	4	5	5	5	5	5	6	6	6	8	11	15	19	24
N_2O	Road transport:Heavy duty vehicles	[tonnes]	93	103	100	98	102	104	105	102	98	105	108	112	115	118	122
N_2O	Road transport: Mopeds & motorcycles	[tonnes]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
N_2O	Railways	[tonnes]	10	10	9	9	9	8	8	9	9	8	8	8	8	7	6
N_2O	International navigation (Shipping)	[tonnes]	78	92	137	175	179	189	168	176	265	298	313	297	272	273	255
N_2O	National navigation (Shipping)	[tonnes]	48	48	48	48	48	48	49	50	49	49	51	55	54	44	39
N_2O	Commercial/Institutional: Mobile	[tonnes]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
N_2O	Residential: Household and gardening (mobile)	[tonnes]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
N_2O	Agriculture/Forestry/Fishing: Off-road agriculture/forestry	[tonnes]	48	49	49	50	50	50	50	48	48	46	47	45	46	44	44
N_2O	Agriculture/Forestry/Fishing: National fishing	[tonnes]	33	38	29	35	35	37	38	35	33	33	33	32	25	26	30
N_2O	Other, Mobile (military)	[tonnes]	12	9	11	6	5	4	8	4	7	8	7	5	5	6	6
NH_3	Manufacturing industries/Construction (mobile)	[tonnes]	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
NH_3	Civil aviation (International, LTO)	[tonnes]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NH_3	Civil aviation (International, Cruise)	[tonnes]															0
NH_3	Civil aviation (Domestic, LTO)	[tonnes]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NH_3	Civil aviation (Domestic, Cruise)	[tonnes]															0
NH_3	Road transport: Passenger cars	[tonnes]	48	49	50	51	51	54	146	339	529	807	1073	1323	1663	2013	2291
NH_3	Road transport:Light duty vehicles	[tonnes]	4	5	5	6	6	6	6	6	7	7	11	19	28	38	48
NH_3	Road transport:Heavy duty vehicles	[tonnes]	9	10	10	10	10	10	11	10	10	11	11	11	12	12	12
NH_3	Road transport: Mopeds & motorcycles	[tonnes]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
NH_3	Railways	[tonnes]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
NH_3	International navigation (Shipping)	[tonnes]		0						0	0						
NH_3	National navigation (Shipping)	[tonnes]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NH_3	Commercial/Institutional: Mobile	[tonnes]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NH_3	Residential: Household and gardening (mobile)	[tonnes]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NH_3	Agriculture/Forestry/Fishing: Off-road agriculture/forestry	[tonnes]	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
NH_3	Agriculture/Forestry/Fishing: National fishing	[tonnes]		0	0	0	0	0	0	0	0	0	0		0	0	0
NH_3	Other, Mobile (military)	[tonnes]	1	1	0	0	0	0	1	0	0	0	1	0	0	1	1
TSP	Manufacturing industries/Construction (mobile)	[tonnes]	1823	1778	1733	1686	1634	1577	1533	1484	1433	1383	1349	1317	1284	1249	1193
TSP	Civil aviation (International, LTO)	[tonnes]	2	2	2	3	3	3	3	3	3	3	3	3	4	4	4
TSP	Civil aviation (International, Cruise)	[tonnes]	20	22	24	26	27	25	24	25	24	27	27	29	29	31	33
TSP	Civil aviation (Domestic, LTO)	[tonnes]	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
TSP	Civil aviation (Domestic, Cruise)	[tonnes]	3	3	3	3	3	3	2	2	2	2	2	2	2	2	2
TSP	Road transport: Passenger cars	[tonnes]	1689	1719	1690	1641	1602	1667	1704	1614	1557	1498	1396	1312	1183	1070	984

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TSP	Road transport:Light duty vehicles	[tonnes]	1383	1595	1684	1676	1731	1854	1960	1903	1992	2110	2045	1957	1737	1591	1432
TSP	Road transport:Heavy duty vehicles	[tonnes]	1197	1330	1302	1283	1329	1373	1391	1352	1317	1379	1358	1348	1283	1189	1123
TSP	Road transport: Mopeds & motorcycles	[tonnes]	53	49	46	44	42	44	45	46	47	47	52	57	67	78	76
TSP	Road transport: Automobile tyre and brake wear	[tonnes]	866	926	929	940	956	1009	1051	1069	1080	1142	1160	1184	1220	1250	1277
TSP	Road transport: Automobile road abrasion	[tonnes]	684	727	728	735	746	785	820	835	842	889	904	920	947	970	990
TSP	Railways	[tonnes]	247	249	222	229	211	202	205	217	225	204	206	204	199	168	146
TSP	International navigation (Shipping)	[tonnes]	2832	3448	5914	7810	7866	5531	4371	3999	8648	8194	10076	9968	9231	7717	8177
TSP	National navigation (Shipping)	[tonnes]	1099	1099	1103	1098	1103	898	710	519	660	762	919	723	670	451	417
TSP	Commercial/Institutional: Mobile	[tonnes]	24	24	24	24	24	24	24	23	22	23	24	25	27	28	29
TSP	Residential: Household and gardening (mobile)	[tonnes]	12	12	12	12	11	11	11	11	11	11	11	11	11	11	11
TSP	Agriculture/Forestry/Fishing: Off-road agricul-ture/forestry	[tonnes]	2606	2617	2517	2549	2492	2444	2344	2188	2136	1954	1922	1736	1659	1504	1428
TSP	Agriculture/Forestry/Fishing: National fishing	[tonnes]	177	203	156	174	173	184	190	174	164	165	166	157	124	129	148
TSP	Other, Mobile (military)	[tonnes]	101	101	50	18	26	12	114	67	64	55	117	46	73	77	47
PM_{10}	Manufacturing industries/Construction (mobile)	[tonnes]	1823	1778	1733	1686	1634	1577	1533	1484	1433	1383	1349	1317	1284	1249	1193
PM_{10}	Civil aviation (International, LTO)	[tonnes]	2	2	2	3	3	3	3	3	3	3	3	3	4	4	4
PM_{10}	Civil aviation (International, Cruise)	[tonnes]	20	22	24	26	27	25	24	25	24	27	27	29	29	31	33
PM_{10}	Civil aviation (Domestic, LTO)	[tonnes]	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
PM_{10}	Civil aviation (Domestic, Cruise)	[tonnes]	3	3	3	3	3	3	2	2	2	2	2	2	2	2	2
PM_{10}	Road transport: Passenger cars	[tonnes]	1689	1719	1690	1641	1602	1667	1704	1614	1557	1498	1396	1312	1183	1070	984
PM_{10}	Road transport:Light duty vehicles	[tonnes]	1383	1595	1684	1676	1731	1854	1960	1903	1992	2110	2045	1957	1737	1591	1432
PM_{10}	Road transport:Heavy duty vehicles	[tonnes]	1197	1330	1302	1283	1329	1373	1391	1352	1317	1379	1358	1348	1283	1189	1123
PM_{10}	Road transport: Mopeds & motorcycles	[tonnes]	53	49	46	44	42	44	45	46	47	47	52	57	67	78	76
PM_{10}	Road transport: Automobile tyre and brake wear	[tonnes]	646	690	693	701	713	752	783	796	803	849	863	880	906	928	948
PM_{10}	Road transport: Automobile road abrasion	[tonnes]	342	364	364	368	373	393	410	417	421	444	452	460	474	485	495
PM_{10}	Railways	[tonnes]	247	249	222	229	211	202	205	217	225	204	206	204	199	168	146
PM_{10}	International navigation (Shipping)	[tonnes]	2803	3413	5855	7732	7788	5476	4327	3959	8561	8112	9975	9869	9139	7639	8095
PM_{10}	National navigation (Shipping)	[tonnes]	1089	1089	1093	1088	1093	890	704	515	655	756	911	717	664	448	414
PM_{10}	Commercial/Institutional: Mobile	[tonnes]	24	24	24	24	24	24	24	23	22	23	24	25	27	28	29
PM_{10}	Residential: Household and gardening (mobile)	[tonnes]	12	12	12	12	11	11	11	11	11	11	11	11	11	11	11
PM_{10}	Agriculture/Forestry/Fishing: Off-road agricul-ture/forestry	[tonnes]	2606	2617	2517	2549	2492	2444	2344	2188	2136	1954	1922	1736	1659	1504	1428
PM_{10}	Agriculture/Forestry/Fishing: National fishing	[tonnes]	175	201	154	173	171	182	188	172	163	163	164	155	122	128	147
PM_{10}	Other, Mobile (military)	[tonnes]	101	101	50	18	26	12	114	67	64	55	117	46	73	77	47
$PM_{2.5}$	Manufacturing industries/Construction (mobile)	[tonnes]	1823	1778	1733	1686	1634	1577	1533	1484	1433	1383	1349	1317	1284	1249	1193
$PM_{2.5}$	Civil aviation (International, LTO)	[tonnes]	2	2	2	3	3	3	3	3	3	3	3	3	4	4	4
$PM_{2.5}$	Civil aviation (International, Cruise)	[tonnes]	20	22	24	26	27	25	24	25	24	27	27	29	29	31	33
$PM_{2.5}$	Civil aviation (Domestic, LTO)	[tonnes]	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2

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$PM_{2.5}$	Civil aviation (Domestic, Cruise)	[tonnes]	3	3	3	3	3	3	2	2	2	2	2	2	2	2	2
$PM_{2.5}$	Road transport: Passenger cars	[tonnes]	1689	1719	1690	1641	1602	1667	1704	1614	1557	1498	1396	1312	1183	1070	984
$PM_{2.5}$	Road transport:Light duty vehicles	[tonnes]	1383	1595	1684	1676	1731	1854	1960	1903	1992	2110	2045	1957	1737	1591	1432
$PM_{2.5}$	Road transport:Heavy duty vehicles	[tonnes]	1197	1330	1302	1283	1329	1373	1391	1352	1317	1379	1358	1348	1283	1189	1123
$PM_{2.5}$	Road transport: Mopeds & motorcycles	[tonnes]	53	49	46	44	42	44	45	46	47	47	52	57	67	78	76
$PM_{2.5}$	Road transport: Automobile tyre and brake wear	[tonnes]	354	378	379	384	391	412	429	437	441	467	474	484	499	511	522
$PM_{2.5}$	Road transport: Automobile road abrasion	[tonnes]	185	196	197	198	202	212	221	225	227	240	244	248	256	262	267
$PM_{2.5}$	Railways	[tonnes]	247	249	222	229	211	202	205	217	225	204	206	204	199	168	146
$PM_{2.5}$	International navigation (Shipping)	[tonnes]	2789	3396	5825	7693	7748	5448	4305	3939	8518	8071	9925	9819	9093	7601	8054
$PM_{2.5}$	National navigation (Shipping)	[tonnes]	1084	1084	1088	1083	1088	886	701	513	652	753	907	714	662	446	413
$PM_{2.5}$	Commercial/Institutional: Mobile	[tonnes]	24	24	24	24	24	24	24	23	22	23	24	25	27	28	29
$PM_{2.5}$	Residential: Household and gardening (mobile)	[tonnes]	12	12	12	12	11	11	11	11	11	11	11	11	11	11	11
$PM_{2.5}$	Agriculture/Forestry/Fishing: Off-road agricul-ture/forestry	[tonnes]	2606	2617	2517	2549	2492	2444	2344	2188	2136	1954	1922	1736	1659	1504	1428
$PM_{2.5}$	Agriculture/Forestry/Fishing: National fishing	[tonnes]	174	200	154	172	171	181	187	171	162	162	163	154	122	127	146
$PM_{2.5}$	Other, Mobile (military)	[tonnes]	101	101	50	18	26	12	114	67	64	55	117	46	73	77	47
Arsenic	Manufacturing industries/Construction (mobile)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Arsenic	Civil aviation (International, LTO)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Arsenic	Civil aviation (International, Cruise)	[kg]															0
Arsenic	Civil aviation (Domestic, LTO)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Arsenic	Civil aviation (Domestic, Cruise)	[kg]															0
Arsenic	Road transport: Passenger cars	[kg]	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
Arsenic	Road transport:Light duty vehicles	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Arsenic	Road transport:Heavy duty vehicles	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Arsenic	Road transport: Mopeds & motorcycles	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Arsenic	Road transport: Automobile tyre and brake wear	[kg]	4	4	4	4	4	4	5	5	5	5	5	5	5	5	5
Arsenic	Road transport: Automobile road abrasion	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Arsenic	Railways	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Arsenic	International navigation (Shipping)	[kg]	123	149	256	339	341	353	292	267	465	496	505	325	417	357	369
Arsenic	National navigation (Shipping)	[kg]	62	62	62	62	62	62	55	47	47	49	50	44	36	28	25
Arsenic	Commercial/Institutional: Mobile	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Arsenic	Residential: Household and gardening (mobile)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Arsenic	Agriculture/Forestry/Fishing: Off-road agricul-ture/forestry	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Arsenic	Agriculture/Forestry/Fishing: National fishing	[kg]	8	10	7	9	9	9	10	9	8	8	8	8	6	7	7
Arsenic	Other, Mobile (military)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cadmium	Manufacturing industries/Construction (mobile)	[kg]	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Cadmium	Civil aviation (International, LTO)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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Cadmium	Civil aviation (International, Cruise)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cadmium	Civil aviation (Domestic, LTO)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cadmium	Civil aviation (Domestic, Cruise)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cadmium	Road transport: Passenger cars	[kg]	17	17	17	18	18	19	20	21	22	23	23	23	23	24	24
Cadmium	Road transport:Light duty vehicles	[kg]	2	3	3	3	3	3	3	3	3	4	4	4	4	4	4
Cadmium	Road transport:Heavy duty vehicles	[kg]	5	5	5	5	5	5	5	5	5	5	5	6	6	6	6
Cadmium	Road transport: Mopeds & motorcycles	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cadmium	Road transport: Automobile tyre and brake wear	[kg]	4	4	4	4	4	5	5	5	5	5	5	5	6	6	6
Cadmium	Road transport: Automobile road abrasion	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cadmium	Railways	[kg]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Cadmium	International navigation (Shipping)	[kg]	8	10	17	22	22	23	20	19	31	34	35	20	29	26	26
Cadmium	National navigation (Shipping)	[kg]	5	5	5	5	5	5	4	4	4	4	4	4	4	3	3
Cadmium	Commercial/Institutional: Mobile	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cadmium	Residential: Household and gardening (mobile)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cadmium	Agriculture/Forestry/Fishing: Off-road agricul-ture/forestry	[kg]	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Cadmium	Agriculture/Forestry/Fishing: National fishing	[kg]	2	2	1	2	2	2	2	2	2	2	2	2	1	1	1
Cadmium	Other, Mobile (military)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chromium	Manufacturing industries/Construction (mobile)	[kg]	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
Chromium	Civil aviation (International, LTO)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chromium	Civil aviation (International, Cruise)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chromium	Civil aviation (Domestic, LTO)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chromium	Civil aviation (Domestic, Cruise)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chromium	Road transport: Passenger cars	[kg]	28	28	29	29	29	31	33	34	35	37	37	37	38	39	39
Chromium	Road transport:Light duty vehicles	[kg]	8	9	9	10	10	11	11	11	11	12	12	13	13	13	13
Chromium	Road transport:Heavy duty vehicles	[kg]	18	20	19	19	19	20	20	20	19	20	21	21	22	22	23
Chromium	Road transport: Mopeds & motorcycles	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chromium	Road transport: Automobile tyre and brake wear	[kg]	40	43	43	44	45	47	48	49	49	52	53	54	55	56	58
Chromium	Road transport: Automobile road abrasion	[kg]	14	14	14	15	15	16	16	17	17	18	18	18	19	19	20
Chromium	Railways	[kg]	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2
Chromium	International navigation (Shipping)	[kg]	52	63	106	140	141	147	123	115	195	210	214	131	178	157	160
Chromium	National navigation (Shipping)	[kg]	28	28	28	28	28	28	25	23	22	23	24	22	19	15	14
Chromium	Commercial/Institutional: Mobile	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chromium	Residential: Household and gardening (mobile)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chromium	Agriculture/Forestry/Fishing: Off-road agricul-ture/forestry	[kg]	11	11	11	12	11	11	11	11	11	10	10	10	10	10	10
Chromium	Agriculture/Forestry/Fishing: National fishing	[kg]	7	8	6	7	7	7	8	7	7	7	7	6	5	5	6
Chromium	Other, Mobile (military)	[kg]	1	1	0	0	0	0	1	1	1	0	1	0	1	1	1

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Copper	Manufacturing industries/Construction (mobile)	[kg]	6	6	5	5	5	5	5	5	5	5	5	6	6	6	6
Copper	Civil aviation (International, LTO)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Copper	Civil aviation (International, Cruise)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Copper	Civil aviation (Domestic, LTO)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Copper	Civil aviation (Domestic, Cruise)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Copper	Road transport: Passenger cars	[kg]	61	62	63	65	64	69	73	77	79	82	83	83	86	87	87
Copper	Road transport:Light duty vehicles	[kg]	6	7	8	8	8	9	9	9	9	10	10	10	11	11	11
Copper	Road transport:Heavy duty vehicles	[kg]	13	14	14	13	14	14	14	14	13	14	15	15	15	16	16
Copper	Road transport: Mopeds & motorcycles	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Copper	Road transport: Automobile tyre and brake wear	[kg]	24140	25381	25781	26436	26684	28446	29937	30964	31721	33385	33712	34115	35210	36060	36568
Copper	Road transport: Automobile road abrasion	[kg]	7	7	7	7	7	8	8	8	8	9	9	9	9	10	10
Copper	Railways	[kg]	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1
Copper	International navigation (Shipping)	[kg]	123	149	256	339	341	353	292	267	465	496	505	325	417	357	369
Copper	National navigation (Shipping)	[kg]	62	62	62	62	63	63	56	48	47	49	50	45	36	29	26
Copper	Commercial/Institutional: Mobile	[kg]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Copper	Residential: Household and gardening (mobile)	[kg]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Copper	Agriculture/Forestry/Fishing: Off-road agriculture/forestry	[kg]	9	9	9	9	9	9	9	8	8	8	8	8	8	7	7
Copper	Agriculture/Forestry/Fishing: National fishing	[kg]	8	10	7	9	9	9	10	9	8	8	8	9	6	7	7
Copper	Other, Mobile (military)	[kg]	1	1	0	0	0	0	1	0	0	0	1	0	1	1	0
Mercury	Manufacturing industries/Construction (mobile)	[kg]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Mercury	Civil aviation (International, LTO)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mercury	Civil aviation (International, Cruise)	[kg]															0
Mercury	Civil aviation (Domestic, LTO)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mercury	Civil aviation (Domestic, Cruise)	[kg]															0
Mercury	Road transport: Passenger cars	[kg]	13	13	13	13	13	14	14	15	16	16	16	16	17	17	17
Mercury	Road transport:Light duty vehicles	[kg]	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3
Mercury	Road transport:Heavy duty vehicles	[kg]	4	4	4	4	4	5	5	5	4	5	5	5	5	5	5
Mercury	Road transport: Mopeds & motorcycles	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mercury	Road transport: Automobile tyre and brake wear	[kg]															
Mercury	Road transport: Automobile road abrasion	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mercury	Railways	[kg]	1	1	1	1	1	0	1	1	1	1	1	1	0	0	0
Mercury	International navigation (Shipping)	[kg]	13	14	19	24	25	27	25	29	40	47	50	14	45	49	43
Mercury	National navigation (Shipping)	[kg]	9	9	9	9	9	9	9	10	9	10	10	11	12	10	8
Mercury	Commercial/Institutional: Mobile	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mercury	Residential: Household and gardening (mobile)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mercury	Agriculture/Forestry/Fishing: Off-road agriculture/forestry	[kg]	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2

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Mercury	Agriculture/Forestry/Fishing: National fishing	[kg]	8	10	7	9	9	9	10	9	8	8	8	8	6	7	7
Mercury	Other, Mobile (military)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nickel	Manufacturing industries/Construction (mobile)	[kg]	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Nickel	Civil aviation (International, LTO)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nickel	Civil aviation (International, Cruise)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nickel	Civil aviation (Domestic, LTO)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nickel	Civil aviation (Domestic, Cruise)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nickel	Road transport: Passenger cars	[kg]	20	20	20	21	21	22	23	25	25	26	26	27	27	28	28
Nickel	Road transport:Light duty vehicles	[kg]	2	3	3	3	3	3	4	4	4	4	4	4	4	4	4
Nickel	Road transport:Heavy duty vehicles	[kg]	5	5	5	5	5	5	5	5	5	5	6	6	6	6	6
Nickel	Road transport: Mopeds & motorcycles	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nickel	Road transport: Automobile tyre and brake wear	[kg]	51	54	55	55	56	59	61	62	63	66	67	69	71	72	74
Nickel	Road transport: Automobile road abrasion	[kg]	11	12	12	12	12	12	13	13	13	14	14	15	15	15	16
Nickel	Railways	[kg]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Nickel	International navigation (Shipping)	[kg]	6902	8453	14797	19676	19776	20420	16701	14894	26627	28129	28488	19451	23291	19285	20431
Nickel	National navigation (Shipping)	[kg]	3362	3362	3362	3362	3362	3362	2889	2360	2359	2477	2492	2087	1520	1179	1077
Nickel	Commercial/Institutional: Mobile	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nickel	Residential: Household and gardening (mobile)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nickel	Agriculture/Forestry/Fishing: Off-road agriculture/forestry	[kg]	3	4	3	4	3	3	3	3	3	3	3	3	3	3	3
Nickel	Agriculture/Forestry/Fishing: National fishing	[kg]	12	13	10	12	12	13	13	12	12	12	12	11	9	9	10
Nickel	Other, Mobile (military)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lead	Manufacturing industries/Construction (mobile)	[kg]	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Lead	Civil aviation (International, LTO)	[kg]	348	405	393	498	603	490	465	452	456	153	175	126	145	145	124
Lead	Civil aviation (International, Cruise)	[kg]															0
Lead	Civil aviation (Domestic, LTO)	[kg]	1815	1825	1506	1594	1563	1534	1423	1378	1328	1639	1788	1640	1559	1399	1387
Lead	Civil aviation (Domestic, Cruise)	[kg]															0
Lead	Road transport: Passenger cars	[kg]	203835	184449	143450	138437	119660	93303	72652	65867	28571	77	77	78	80	81	82
Lead	Road transport:Light duty vehicles	[kg]	6086	5953	4864	4732	4113	3199	2473	2264	1018	21	21	22	22	23	23
Lead	Road transport:Heavy duty vehicles	[kg]	769	703	530	482	416	325	252	225	113	31	32	33	34	34	35
Lead	Road transport: Mopeds & motorcycles	[kg]	1998	1726	1279	1203	1025	795	597	539	236	0	0	0	0	0	0
Lead	Road transport: Automobile tyre and brake wear	[kg]	3144	3303	3358	3446	3477	3709	3907	4047	4149	4366	4407	4457	4602	4714	4780
Lead	Road transport: Automobile road abrasion	[kg]	32	34	34	35	35	37	39	39	40	42	42	43	45	46	47
Lead	Railways	[kg]	5	6	5	5	5	4	5	5	5	5	5	5	4	4	4
Lead	International navigation (Shipping)	[kg]	62	74	118	153	156	162	140	138	221	243	251	132	214	201	196
Lead	National navigation (Shipping)	[kg]	35	35	35	35	35	35	34	33	32	33	34	35	32	26	23
Lead	Commercial/Institutional: Mobile	[kg]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

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Lead	Residential: Household and gardening (mobile)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lead	Agriculture/Forestry/Fishing: Off-road agriculture/forestry	[kg]	19	20	19	20	20	19	19	18	18	17	18	17	17	16	16
Lead	Agriculture/Forestry/Fishing: National fishing	[kg]	17	19	15	18	17	19	19	18	17	17	17	16	12	13	15
Lead	Other, Mobile (military)	[kg]	1206	855	168	879	478	64	82	63	121	86	104	99	125	118	79
Selenium	Manufacturing industries/Construction (mobile)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Selenium	Civil aviation (International, LTO)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Selenium	Civil aviation (International, Cruise)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Selenium	Civil aviation (Domestic, LTO)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Selenium	Civil aviation (Domestic, Cruise)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Selenium	Road transport: Passenger cars	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Selenium	Road transport:Light duty vehicles	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Selenium	Road transport:Heavy duty vehicles	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Selenium	Road transport: Mopeds & motorcycles	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Selenium	Road transport: Automobile tyre and brake wear	[kg]	17	19	19	19	19	20	21	21	22	23	23	24	24	25	26
Selenium	Road transport: Automobile road abrasion	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Selenium	Railways	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Selenium	International navigation (Shipping)	[kg]	124	148	236	306	311	325	279	275	442	486	503	264	427	402	391
Selenium	National navigation (Shipping)	[kg]	69	69	69	69	69	69	67	64	63	64	66	67	62	50	43
Selenium	Commercial/Institutional: Mobile	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Selenium	Residential: Household and gardening (mobile)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Selenium	Agriculture/Forestry/Fishing: Off-road agriculture/forestry	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Selenium	Agriculture/Forestry/Fishing: National fishing	[kg]	33	38	29	35	35	37	38	35	33	33	33	32	25	26	30
Selenium	Other, Mobile (military)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zinc	Manufacturing industries/Construction (mobile)	[kg]	424	423	423	422	421	419	420	420	419	419	422	425	428	432	435
Zinc	Civil aviation (International, LTO)	[kg]	1	2	1	2	2	2	2	2	2	1	1	0	1	1	0
Zinc	Civil aviation (International, Cruise)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zinc	Civil aviation (Domestic, LTO)	[kg]	7	7	6	6	6	6	5	5	5	6	7	6	6	5	5
Zinc	Civil aviation (Domestic, Cruise)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zinc	Road transport: Passenger cars	[kg]	3331	3405	3438	3529	3526	3763	4001	4211	4329	4501	4544	4563	4686	4756	4779
Zinc	Road transport:Light duty vehicles	[kg]	470	543	570	590	614	659	680	678	695	753	761	777	793	812	828
Zinc	Road transport:Heavy duty vehicles	[kg]	926	1027	1002	978	1012	1032	1048	1014	977	1047	1080	1108	1125	1146	1184
Zinc	Road transport: Mopeds & motorcycles	[kg]	11	11	11	11	11	11	12	13	13	14	15	15	16	16	16
Zinc	Road transport: Automobile tyre and brake wear	[kg]	11168	11887	11968	12160	12345	13068	13648	13950	14153	14952	15163	15444	15928	16316	16639
Zinc	Road transport: Automobile road abrasion	[kg]	52	55	55	56	56	59	62	63	64	67	68	69	72	73	75
Zinc	Railways	[kg]	183	185	164	170	157	150	152	161	167	151	153	152	148	124	117
Zinc	International navigation (Shipping)	[kg]	287	341	540	700	712	744	643	638	1017	1121	1162	595	991	940	910

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Zinc	National navigation (Shipping)	[kg]	184	184	186	187	189	191	187	184	183	188	195	202	193	165	151
Zinc	Commercial/Institutional: Mobile	[kg]	51	51	51	51	51	51	51	52	52	53	54	55	56	57	59
Zinc	Residential: Household and gardening (mobile)	[kg]	28	27	27	27	27	27	27	27	27	27	27	28	28	28	29
Zinc	Agriculture/Forestry/Fishing: Off-road agriculture/forestry	[kg]	664	682	668	685	679	674	666	636	634	600	614	584	593	561	558
Zinc	Agriculture/Forestry/Fishing: National fishing	[kg]	83	95	73	88	87	93	96	88	83	83	84	80	62	65	75
Zinc	Other, Mobile (military)	[kg]	63	61	24	23	22	5	57	35	31	28	63	26	46	54	37
Dioxins/furans	Manufacturing industries/Construction (mobile)	[g]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dioxins/furans	Civil aviation (International, LTO)	[g]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dioxins/furans	Civil aviation (International, Cruise)	[g]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dioxins/furans	Civil aviation (Domestic, LTO)	[g]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dioxins/furans	Civil aviation (Domestic, Cruise)	[g]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dioxins/furans	Road transport: Passenger cars	[g]	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0
Dioxins/furans	Road transport:Light duty vehicles	[g]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dioxins/furans	Road transport:Heavy duty vehicles	[g]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dioxins/furans	Road transport: Mopeds & motorcycles	[g]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dioxins/furans	Railways	[g]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dioxins/furans	International navigation (Shipping)	[g]	0	0	0	0	0	1	0	0	1	1	1	1	1	1	1
Dioxins/furans	National navigation (Shipping)	[g]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dioxins/furans	Commercial/Institutional: Mobile	[g]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dioxins/furans	Residential: Household and gardening (mobile)	[g]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dioxins/furans	Agriculture/Forestry/Fishing: Off-road agriculture/forestry	[g]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dioxins/furans	Agriculture/Forestry/Fishing: National fishing	[g]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dioxins/furans	Other, Mobile (military)	[g]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Flouranthene	Manufacturing industries/Construction (mobile)	[kg]	999	999	998	997	994	45	44	45	46	45	46	46	46	46	46
Flouranthene	Civil aviation (International, LTO)	[kg]	6	6	6	7	7	0	0	0	0	0	0	0	0	0	0
Flouranthene	Civil aviation (International, Cruise)	[kg]	60	65	70	75	79	0	0	0	0	0	0	0	0	0	0
Flouranthene	Civil aviation (Domestic, LTO)	[kg]	4	3	4	4	4	0	0	0	0	1	1	1	0	0	0
Flouranthene	Civil aviation (Domestic, Cruise)	[kg]	9	8	9	9	9	0	0	0	0	0	0	0	0	0	0
Flouranthene	Road transport: Passenger cars	[kg]	563	574	578	592	591	631	652	645	626	606	561	519	491	455	424
Flouranthene	Road transport:Light duty vehicles	[kg]	102	118	124	128	133	143	148	147	151	161	162	164	167	170	172
Flouranthene	Road transport:Heavy duty vehicles	[kg]	65	73	72	71	73	76	77	75	74	79	80	82	82	82	83
Flouranthene	Road transport: Mopeds & motorcycles	[kg]	5	5	5	5	5	5	6	6	6	7	7	7	7	8	8
Flouranthene	Railways	[kg]	479	482	428	444	409	5	5	6	6	6	6	6	6	5	4
Flouranthene	International navigation (Shipping)	[kg]	89	103	144	180	186	198	184	205	288	334	355	344	316	338	304
Flouranthene	National navigation (Shipping)	[kg]	85	85	88	91	94	66	68	71	70	70	74	82	82	67	58
Flouranthene	Commercial/Institutional: Mobile	[kg]	3	3	3	3	3	4	4	4	4	5	5	5	5	5	5

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Flouranthene	Residential: Household and gardening (mobile)	[kg]	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Flouranthene	Agriculture/Forestry/Fishing: Off-road agriculture/forestry	[kg]	1572	1625	1594	1644	1634	78	75	73	74	68	71	67	67	63	63
Flouranthene	Agriculture/Forestry/Fishing: National fishing	[kg]	52	60	46	56	55	59	61	56	52	53	53	50	40	41	47
Flouranthene	Other, Mobile (military)	[kg]	147	147	79	23	37	1	7	4	4	3	8	3	6	6	4
Benzo(b) flouranthene	Manufacturing industries/Construction (mobile)	[kg]	100	100	100	100	99	6	6	6	6	6	6	6	6	6	6
Benzo(b) flouranthene	Civil aviation (International, LTO)	[kg]	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0
Benzo(b) flouranthene	Civil aviation (International, Cruise)	[kg]	6	7	7	8	8	0	0	0	0	0	0	0	0	0	0
Benzo(b) flouranthene	Civil aviation (Domestic, LTO)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Benzo(b) flouranthene	Civil aviation (Domestic, Cruise)	[kg]	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0
Benzo(b) flouranthene	Road transport: Passenger cars	[kg]	36	37	37	38	38	41	42	42	42	41	39	37	36	35	34
Benzo(b) flouranthene	Road transport:Light duty vehicles	[kg]	6	7	8	8	8	9	9	9	9	10	10	10	10	11	11
Benzo(b) flouranthene	Road transport:Heavy duty vehicles	[kg]	16	18	18	18	18	19	19	19	19	20	20	21	21	21	21
Benzo(b) flouranthene	Road transport: Mopeds & motorcycles	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Benzo(b) flouranthene	Railways	[kg]	48	48	43	44	41	1	1	1	2	1	1	1	1	1	1
Benzo(b) flouranthene	International navigation (Shipping)	[kg]	6	7	9	11	12	13	12	15	19	23	25	24	22	25	22
Benzo(b) flouranthene	National navigation (Shipping)	[kg]	7	7	7	7	8	5	5	6	5	5	6	7	7	6	5
Benzo(b) flouranthene	Commercial/Institutional: Mobile	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Benzo(b) flouranthene	Residential: Household and gardening (mobile)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Benzo(b) flouranthene	Agriculture/Forestry/Fishing: Off-road agriculture/forestry	[kg]	157	162	159	164	163	10	9	9	9	9	9	8	8	8	8
Benzo(b) flouranthene	Agriculture/Forestry/Fishing: National fishing	[kg]	5	5	4	5	5	5	5	5	5	5	5	4	3	4	4
Benzo(b) flouranthene	Other, Mobile (military)	[kg]	15	15	8	2	4	0	1	1	1	0	1	0	1	1	1
Benzo(k) flouranthene	Manufacturing industries/Construction (mobile)	[kg]	43	43	43	43	43	6	6	6	6	6	6	6	6	6	6
Benzo(k) flouranthene	Civil aviation (International, LTO)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Benzo(k) flouranthene	Civil aviation (International, Cruise)	[kg]	3	3	3	3	3	0	0	0	0	0	0	0	0	0	0
Benzo(k) flouranthene	Civil aviation (Domestic, LTO)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Benzo(k) flouranthene	Civil aviation (Domestic, Cruise)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Benzo(k) flouranthene	Road transport: Passenger cars	[kg]	29	29	29	30	30	32	34	34	34	34	33	32	32	32	31
Benzo(k) flouranthene	Road transport:Light duty vehicles	[kg]	6	6	7	7	7	8	8	8	8	9	9	9	9	9	10
Benzo(k) flouranthene	Road transport:Heavy duty vehicles	[kg]	24	27	27	26	27	28	29	28	28	29	30	31	30	31	31
Benzo(k) flouranthene	Road transport: Mopeds & motorcycles	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Benzo(k) flouranthene	Railways	[kg]	21	21	18	19	18	2	2	2	2	2	2	2	2	1	1
Benzo(k) flouranthene	International navigation (Shipping)	[kg]	3	3	4	5	5	6	6	7	9	11	11	11	10	12	10
Benzo(k) flouranthene	National navigation (Shipping)	[kg]	3	3	3	3	3	2	2	2	2	2	3	3	3	3	2
Benzo(k) flouranthene	Commercial/Institutional: Mobile	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Benzo(k) flouranthene	Residential: Household and gardening (mobile)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Benzo(k) flouranthene	Agriculture/Forestry/Fishing: Off-road agricul/forestry	[kg]	67	70	68	70	70	10	9	9	9	9	9	8	8	8	7

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Benzo(k) flouranthene	Agriculture/Forestry/Fishing: National fishing	[kg]	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Benzo(k) flouranthene	Other, Mobile (military)	[kg]	6	6	3	1	2	0	1	1	1	0	1	0	1	1	1
Benzo(a) pyrene	Manufacturing industries/Construction (mobile)	[kg]	71	71	71	71	71	3	3	3	3	3	3	3	3	3	3
Benzo(a) pyrene	Civil aviation (International, LTO)	[kg]	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Benzo(a) pyrene	Civil aviation (International, Cruise)	[kg]	4	5	5	5	6	0	0	0	0	0	0	0	0	0	0
Benzo(a) pyrene	Civil aviation (Domestic, LTO)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Benzo(a) pyrene	Civil aviation (Domestic, Cruise)	[kg]	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0
Benzo(a) pyrene	Road transport: Passenger cars	[kg]	32	33	33	34	34	36	37	38	37	37	36	34	34	33	32
Benzo(a) pyrene	Road transport:Light duty vehicles	[kg]	7	8	8	8	9	9	10	10	10	11	11	11	11	11	12
Benzo(a) pyrene	Road transport:Heavy duty vehicles	[kg]	3	3	3	3	3	4	4	4	3	4	4	4	4	4	4
Benzo(a) pyrene	Road transport: Mopeds & motorcycles	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Benzo(a) pyrene	Railways	[kg]	34	34	31	32	29	0	0	0	0	0	0	0	0	0	0
Benzo(a) pyrene	International navigation (Shipping)	[kg]	2	2	3	3	3	4	3	4	5	6	7	6	6	6	6
Benzo(a) pyrene	National navigation (Shipping)	[kg]	2	2	3	3	3	1	1	1	1	1	1	2	2	1	1
Benzo(a) pyrene	Commercial/Institutional: Mobile	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Benzo(a) pyrene	Residential: Household and gardening (mobile)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Benzo(a) pyrene	Agriculture/Forestry/Fishing: Off-road agriculture/forestry	[kg]	112	116	114	117	117	5	5	5	5	4	4	4	4	4	4
Benzo(a) pyrene	Agriculture/Forestry/Fishing: National fishing	[kg]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Benzo(a) pyrene	Other, Mobile (military)	[kg]	10	11	6	2	3	0	0	0	0	0	1	0	0	0	0
Benzo(g,h,i) perylene	Manufacturing industries/Construction (mobile)	[kg]	143	143	143	142	142	6	6	6	6	5	6	5	5	5	5
Benzo(g,h,i) perylene	Civil aviation (International, LTO)	[kg]	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0
Benzo(g,h,i) perylene	Civil aviation (International, Cruise)	[kg]	9	9	10	11	11	0	0	0	0	0	0	0	0	0	0
Benzo(g,h,i) perylene	Civil aviation (Domestic, LTO)	[kg]	1	0	1	1	1	0	0	0	0	0	0	0	0	0	0
Benzo(g,h,i) perylene	Civil aviation (Domestic, Cruise)	[kg]	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0
Benzo(g,h,i) perylene	Road transport: Passenger cars	[kg]	73	75	75	77	77	82	85	86	84	83	79	76	74	71	68
Benzo(g,h,i) perylene	Road transport:Light duty vehicles	[kg]	13	15	16	17	17	19	19	19	20	21	21	21	22	22	23
Benzo(g,h,i) perylene	Road transport:Heavy duty vehicles	[kg]	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Benzo(g,h,i) perylene	Road transport: Mopeds & motorcycles	[kg]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Benzo(g,h,i) perylene	Railways	[kg]	68	69	61	63	58	0	0	0	0	0	0	0	0	0	0
Benzo(g,h,i) perylene	International navigation (Shipping)	[kg]	12	14	17	20	22	23	23	29	36	44	48	48	44	51	44
Benzo(g,h,i) perylene	National navigation (Shipping)	[kg]	11	11	11	12	12	8	9	11	10	10	11	13	14	11	10
Benzo(g,h,i) perylene	Commercial/Institutional: Mobile	[kg]	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1
Benzo(g,h,i) perylene	Residential: Household and gardening (mobile)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Benzo(g,h,i) perylene	Agriculture/Forestry/Fishing: Off-road agriculture/forestry	[kg]	225	232	228	235	233	10	9	9	9	8	9	8	8	7	7
Benzo(g,h,i) perylene	Agriculture/Forestry/Fishing: National fishing	[kg]	10	12	9	11	11	11	12	11	10	10	10	10	8	8	9
Benzo(g,h,i) perylene	Other, Mobile (military)	[kg]	21	21	11	3	5	0	1	1	1	0	1	0	1	1	0

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indeno(1,2,3-c,d) pyrene	Manufacturing industries/Construction (mobile)	[kg]	71	71	71	71	71	3	3	3	3	3	3	3	3	3	3
indeno(1,2,3-c,d) pyrene	Civil aviation (International, LTO)	[kg]	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
indeno(1,2,3-c,d) pyrene	Civil aviation (International, Cruise)	[kg]	4	5	5	5	6	0	0	0	0	0	0	0	0	0	0
indeno(1,2,3-c,d) pyrene	Civil aviation (Domestic, LTO)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
indeno(1,2,3-c,d) pyrene	Civil aviation (Domestic, Cruise)	[kg]	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0
indeno(1,2,3-c,d) pyrene	Road transport: Passenger cars	[kg]	29	30	30	31	31	33	34	35	35	36	35	35	35	35	35
indeno(1,2,3-c,d) pyrene	Road transport:Light duty vehicles	[kg]	6	7	8	8	8	9	9	9	9	10	10	10	10	11	11
indeno(1,2,3-c,d) pyrene	Road transport:Heavy duty vehicles	[kg]	4	5	5	5	5	5	5	5	5	5	5	5	5	5	5
indeno(1,2,3-c,d) pyrene	Road transport: Mopeds & motorcycles	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
indeno(1,2,3-c,d) pyrene	Railways	[kg]	34	34	31	32	29	0	0	0	0	0	0	0	0	0	0
indeno(1,2,3-c,d) pyrene	International navigation (Shipping)	[kg]	10	11	14	16	17	19	19	23	29	36	39	39	36	42	36
indeno(1,2,3-c,d) pyrene	National navigation (Shipping)	[kg]	8	8	8	8	9	7	7	8	8	8	9	10	11	9	8
indeno(1,2,3-c,d) pyrene	Commercial/Institutional: Mobile	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
indeno(1,2,3-c,d) pyrene	Residential: Household and gardening (mobile)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
indeno(1,2,3-c,d) pyrene	Agriculture/Forestry/Fishing: Off-road agricul-ture/forestry	[kg]	112	116	114	117	117	5	5	5	5	4	5	4	4	4	4
indeno(1,2,3-c,d) pyrene	Agriculture/Forestry/Fishing: National fishing	[kg]	8	10	7	9	9	9	10	9	8	8	8	8	6	7	8
indeno(1,2,3-c,d) pyrene	Other, Mobile (military)	[kg]	10	11	6	2	3	0	0	0	0	0	1	0	0	0	0

Emissions 2000-2011.

pol_name	NFR category	Unit	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
SO_2	Manufacturing industries/Construction (mobile)	[tonnes]	253	256	258	261	263	28	30	32	33	24	31	6
SO_2	Civil aviation (International, LTO)	[tonnes]	76	76	70	65	71	71	68	70	74	63	66	69
SO_2	Civil aviation (International, Cruise)	[tonnes]	674	686	587	618	711	751	756	776	771	676	707	726
SO_2	Civil aviation (Domestic, LTO)	[tonnes]	15	16	13	12	10	10	11	13	13	13	14	13
SO_2	Civil aviation (Domestic, Cruise)	[tonnes]	34	36	32	32	31	33	34	38	38	36	35	33
SO_2	Road transport: Passenger cars	[tonnes]	207	204	207	212	214	42	43	45	46	44	44	43
SO_2	Road transport:Light duty vehicles	[tonnes]	50	51	53	57	62	13	14	15	14	14	13	12
SO_2	Road transport:Heavy duty vehicles	[tonnes]	94	96	96	101	103	21	22	22	21	18	19	19
SO_2	Road transport: Mopeds & motorcycles	[tonnes]	2	2	2	2	2	0	0	0	0	0	0	0
SO_2	Railways	[tonnes]	7	7	7	7	7	1	1	1	1	1	2	2
SO_2	International navigation (Shipping)	[tonnes]	55367	43830	30036	30982	26540	34283	50417	25652	19326	7383	8200	8853
SO_2	National navigation (Shipping)	[tonnes]	1844	1733	1582	1984	2319	2339	2431	1685	1513	1591	1439	1385
SO_2	Commercial/Institutional: Mobile	[tonnes]	3	3	4	4	5	1	1	1	1	1	1	1
SO_2	Residential: Household and gardening (mobile)	[tonnes]	1	1	2	2	2	0	0	0	0	0	0	0
SO_2	Agriculture/Forestry/Fishing: Off-road agricul-ture/forestry	[tonnes]	326	330	331	333	339	34	35	37	39	40	40	8

Continued														
SO_2	Agriculture/Forestry/Fishing: National fishing	[tonnes]	695	879	905	871	683	817	765	653	380	352	364	365
SO_2	Other, Mobile (military)	[tonnes]	27	12	19	17	46	57	26	40	19	25	20	37
NO_x	Manufacturing industries/Construction (mobile)	[tonnes]	12096	11869	11617	11214	10744	10664	10807	10667	9978	7137	8540	7947
NO_x	Civil aviation (International, LTO)	[tonnes]	1070	1059	1002	936	1027	1026	1000	1025	1078	923	951	1014
NO_x	Civil aviation (International, Cruise)	[tonnes]	8376	8542	7722	8149	9445	9998	10158	10376	10214	8920	9159	9452
NO_x	Civil aviation (Domestic, LTO)	[tonnes]	264	269	230	203	165	178	188	223	224	210	215	198
NO_x	Civil aviation (Domestic, Cruise)	[tonnes]	459	483	412	393	386	405	414	470	473	425	408	380
NO_x	Road transport: Passenger cars	[tonnes]	40013	36874	34669	32640	30300	27204	24652	23590	21994	19929	18722	17874
NO_x	Road transport:Light duty vehicles	[tonnes]	8180	8288	8347	8771	9231	9579	10000	10263	9438	8606	8187	7751
NO_x	Road transport:Heavy duty vehicles	[tonnes]	34009	34407	33213	33671	33592	32534	33110	31975	27258	22349	21485	20405
NO_x	Road transport: Mopeds & motorcycles	[tonnes]	94	95	99	101	105	113	126	139	144	142	144	144
NO_x	Railways	[tonnes]	3727	3396	3396	3540	3478	3724	3542	3555	2920	2603	2818	2501
NO_x	International navigation (Shipping)	[tonnes]	94441	75429	60383	65339	53439	56540	78012	83555	70401	35658	51065	52516
NO_x	National navigation (Shipping)	[tonnes]	8087	8197	8315	8443	8469	8634	8979	9054	9314	9529	9581	9086
NO_x	Commercial/Institutional: Mobile	[tonnes]	104	112	124	138	155	177	199	215	222	220	217	215
NO_x	Residential: Household and gardening (mobile)	[tonnes]	50	54	59	64	69	72	76	79	82	84	87	89
NO_x	Agriculture/Forestry/Fishing: Off-road agricul-ture/forestry	[tonnes]	13324	13630	13359	12961	12690	12233	11739	11379	10974	10506	10145	9833
NO_x	Agriculture/Forestry/Fishing: National fishing	[tonnes]	9483	12157	12677	12325	9757	11776	11093	9509	11088	10293	10670	10586
NO_x	Other, Mobile (military)	[tonnes]	526	663	463	510	1254	1292	602	758	485	715	448	778
NMVOC	Manufacturing industries/Construction (mobile)	[tonnes]	1926	1873	1815	1754	1676	1620	1583	1498	1357	976	1173	1115
NMVOC	Civil aviation (International, LTO)	[tonnes]	122	114	116	108	121	120	114	111	122	99	90	101
NMVOC	Civil aviation (International, Cruise)	[tonnes]	285	290	272	289	327	340	355	361	334	285	278	290
NMVOC	Civil aviation (Domestic, LTO)	[tonnes]	138	137	133	124	131	133	127	135	120	102	93	78
NMVOC	Civil aviation (Domestic, Cruise)	[tonnes]	18	18	18	19	27	32	29	29	26	24	16	12
NMVOC	Road transport: Passenger cars	[tonnes]	26023	24497	22021	20552	17579	16170	13931	12331	11167	9637	8895	7189
NMVOC	Road transport:Light duty vehicles	[tonnes]	1616	1689	1603	1611	1549	1554	1507	1431	1243	1093	1046	892
NMVOC	Road transport:Heavy duty vehicles	[tonnes]	1658	1592	1477	1440	1398	1315	1292	1178	924	706	629	554
NMVOC	Road transport: Mopeds & motorcycles	[tonnes]	4579	3613	3576	3427	3198	2968	2812	2644	2480	2259	2060	1871
NMVOC	Road transport: Gasoline evaporation	[tonnes]	10025	8621	7729	6594	5624	4773	4033	3303	2675	2268	1826	1695
NMVOC	Railways	[tonnes]	253	248	243	223	217	235	230	231	205	174	189	175
NMVOC	International navigation (Shipping)	[tonnes]	3045	2433	1989	2130	1731	1792	2418	2563	2195	1160	1628	1668
NMVOC	National navigation (Shipping)	[tonnes]	1731	1702	1661	1602	1534	1423	1305	1190	1096	1013	937	842
NMVOC	Commercial/Institutional: Mobile	[tonnes]	2845	3504	4188	4897	5631	5775	5922	6022	5844	5159	4423	3636
NMVOC	Residential: Household and gardening (mobile)	[tonnes]	1757	1824	1894	1972	2053	2084	2115	2134	2109	2071	2032	1993
NMVOC	Agriculture/Forestry/Fishing: Off-road agricul-ture/forestry	[tonnes]	3011	2863	2663	2467	2286	2216	2194	2196	2166	2070	1931	1797
NMVOC	Agriculture/Forestry/Fishing: National fishing	[tonnes]	402	515	536	520	412	496	468	402	467	435	446	453

Continued														
NMVOC	Other, Mobile (military)	[tonnes]	55	53	45	45	100	106	51	68	40	55	40	59
CH_4	Manufacturing industries/Construction (mobile)	[tonnes]	50	49	48	47	46	45	44	43	40	30	37	36
CH_4	Civil aviation (International, LTO)	[tonnes]	12	12	12	11	12	12	12	12	13	10	10	11
CH_4	Civil aviation (International, Cruise)	[tonnes]	30	0	0	0	0	0	0	0	0	0	0	0
CH_4	Civil aviation (Domestic, LTO)	[tonnes]	4	4	3	3	3	4	3	4	3	3	2	2
CH_4	Civil aviation (Domestic, Cruise)	[tonnes]	2	0	0	0	0	0	0	0	0	0	0	0
CH_4	Road transport: Passenger cars	[tonnes]	1237	1144	1057	982	881	779	685	614	540	470	413	359
CH_4	Road transport:Light duty vehicles	[tonnes]	96	91	84	77	74	64	55	48	39	32	28	25
CH_4	Road transport:Heavy duty vehicles	[tonnes]	312	314	305	314	318	312	319	290	220	161	142	123
CH_4	Road transport: Mopeds & motorcycles	[tonnes]	143	127	127	124	119	115	114	113	109	102	99	94
CH_4	Railways	[tonnes]	10	10	9	9	8	9	9	9	8	7	7	7
CH_4	International navigation (Shipping)	[tonnes]	94	75	62	66	54	55	75	79	68	36	50	52
CH_4	National navigation (Shipping)	[tonnes]	33	33	34	34	35	35	35	35	35	35	35	34
CH_4	Commercial/Institutional: Mobile	[tonnes]	92	101	113	127	144	157	169	175	174	167	160	151
CH_4	Residential: Household and gardening (mobile)	[tonnes]	45	48	51	55	60	62	64	65	66	66	65	65
CH_4	Agriculture/Forestry/Fishing: Off-road agricul-ture/forestry	[tonnes]	75	74	73	72	72	75	83	91	96	101	99	97
CH_4	Agriculture/Forestry/Fishing: National fishing	[tonnes]	13	16	17	16	13	16	15	13	15	14	14	14
CH_4	Other, Mobile (military)	[tonnes]	5	6	5	5	12	12	6	7	4	5	3	6
CO	Manufacturing industries/Construction (mobile)	[tonnes]	8395	8227	8030	7842	7600	7497	7515	7383	7010	5123	6446	6292
CO	Civil aviation (International, LTO)	[tonnes]	640	626	635	638	705	701	650	669	789	663	668	724
CO	Civil aviation (International, Cruise)	[tonnes]	1150	1169	973	1030	1143	1206	1201	1237	1190	1027	1048	1066
CO	Civil aviation (Domestic, LTO)	[tonnes]	783	778	757	716	733	733	711	763	689	593	569	486
CO	Civil aviation (Domestic, Cruise)	[tonnes]	112	113	106	119	126	128	131	138	134	124	120	113
CO	Road transport: Passenger cars	[tonnes]	241097	230608	210481	200698	175449	167420	148317	133796	124053	108939	102541	84125
CO	Road transport:Light duty vehicles	[tonnes]	13510	14004	13098	12933	12306	12059	11423	10531	9131	8151	7799	6676
CO	Road transport:Heavy duty vehicles	[tonnes]	9034	8997	8831	9010	9075	8851	9095	8861	7653	6440	6410	6481
CO	Road transport: Mopeds & motorcycles	[tonnes]	12160	11086	11157	10942	10470	9994	9761	9524	9146	8467	8226	7890
CO	Railways	[tonnes]	694	637	627	611	599	648	626	629	526	450	481	398
CO	International navigation (Shipping)	[tonnes]	10044	8025	6562	7025	5709	5912	7977	8454	7243	3826	5371	5504
CO	National navigation (Shipping)	[tonnes]	6832	7034	7217	7408	7601	7631	7281	6915	6566	6212	5841	5421
CO	Commercial/Institutional: Mobile	[tonnes]	29423	32889	37681	43798	51239	58128	64197	67870	70290	72227	72338	72458
CO	Residential: Household and gardening (mobile)	[tonnes]	16451	17390	18463	19890	21444	22482	23547	24366	25092	25341	25616	25915
CO	Agriculture/Forestry/Fishing: Off-road agricul-ture/forestry	[tonnes]	24524	22761	20821	18971	17231	16035	15887	16837	17480	18027	17935	17885
CO	Agriculture/Forestry/Fishing: National fishing	[tonnes]	1317	1683	1750	1698	1344	1620	1527	1311	1529	1424	1471	1484
CO	Other, Mobile (military)	[tonnes]	399	308	311	302	705	797	379	537	306	414	311	495

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CO_2	Manufacturing industries/Construction (mobile)	[ktonnes]	877	886	895	905	910	948	1019	1087	1108	821	1037	1011
CO_2	Civil aviation (International, LTO)	[ktonnes]	239	237	218	205	221	221	213	218	231	198	206	217
CO_2	Civil aviation (International, Cruise)	[ktonnes]	2110	2147	1840	1936	2226	2353	2368	2429	2416	2118	2215	2275
CO_2	Civil aviation (Domestic, LTO)	[ktonnes]	48	50	42	38	30	33	35	41	42	41	45	42
CO_2	Civil aviation (Domestic, Cruise)	[ktonnes]	106	113	99	100	98	102	108	120	120	111	111	103
CO_2	Road transport: Passenger cars	[ktonnes]	6604	6509	6599	6761	6821	6776	6805	7185	7281	7040	6933	6766
CO_2	Road transport:Light duty vehicles	[ktonnes]	1580	1616	1667	1807	1964	2109	2272	2394	2291	2137	2083	1952
CO_2	Road transport:Heavy duty vehicles	[ktonnes]	2955	3040	3026	3178	3270	3269	3448	3544	3300	2914	3004	2981
CO_2	Road transport: Mopeds & motorcycles	[ktonnes]	63	58	60	60	59	59	61	64	65	62	61	59
CO_2	Railways	[ktonnes]	228	211	210	218	216	232	227	228	237	230	242	249
CO_2	International navigation (Shipping)	[ktonnes]	4168	3304	2691	2853	2299	2352	3136	3292	2809	1487	2063	2096
CO_2	National navigation (Shipping)	[ktonnes]	588	587	578	576	588	585	588	586	593	598	593	562
CO_2	Commercial/Institutional: Mobile	[ktonnes]	87	98	112	129	149	162	172	175	176	174	173	171
CO_2	Residential: Household and gardening (mobile)	[ktonnes]	43	46	49	53	57	59	61	62	63	63	63	63
CO_2	Agriculture/Forestry/Fishing: Off-road agricul-ture/forestry	[ktonnes]	1063	1074	1076	1079	1099	1112	1144	1210	1268	1283	1298	1332
CO_2	Agriculture/Forestry/Fishing: National fishing	[ktonnes]	552	696	716	689	540	647	606	517	601	557	575	577
CO_2	Other, Mobile (military)	[ktonnes]	111	97	89	92	239	271	126	175	108	160	107	193
N_2O	Manufacturing industries/Construction (mobile)	[tonnes]	37	38	38	38	39	40	43	46	47	35	44	43
N_2O	Civil aviation (International, LTO)	[tonnes]	15	14	13	13	14	14	13	13	14	12	12	13
N_2O	Civil aviation (International, Cruise)	[tonnes]	67	69	59	62	71	75	76	78	77	68	71	73
N_2O	Civil aviation (Domestic, LTO)	[tonnes]	4	4	5	5	5	5	5	5	5	4	5	5
N_2O	Civil aviation (Domestic, Cruise)	[tonnes]	3	4	3	3	3	3	3	4	4	4	4	3
N_2O	Road transport: Passenger cars	[tonnes]	267	258	255	252	245	232	222	225	221	211	206	206
N_2O	Road transport:Light duty vehicles	[tonnes]	29	35	40	45	52	58	64	68	66	62	62	61
N_2O	Road transport:Heavy duty vehicles	[tonnes]	118	123	121	127	131	130	136	140	131	115	119	123
N_2O	Road transport: Mopeds & motorcycles	[tonnes]	1	1	1	1	1	1	1	1	1	1	1	1
N_2O	Railways	[tonnes]	6	6	6	6	6	6	6	6	7	6	7	7
N_2O	International navigation (Shipping)	[tonnes]	262	208	170	180	145	148	197	207	177	94	130	132
N_2O	National navigation (Shipping)	[tonnes]	34	34	34	33	34	34	34	34	35	35	35	33
N_2O	Commercial/Institutional: Mobile	[tonnes]	1	1	2	2	2	2	3	3	3	3	3	3
N_2O	Residential: Household and gardening (mobile)	[tonnes]	1	1	1	1	1	1	1	1	1	1	1	1
N_2O	Agriculture/Forestry/Fishing: Off-road agricul-ture/forestry	[tonnes]	43	44	44	45	46	46	48	51	53	54	55	56
N_2O	Agriculture/Forestry/Fishing: National fishing	[tonnes]	35	44	45	44	34	41	38	33	38	35	36	36
N_2O	Other, Mobile (military)	[tonnes]	3	3	3	3	8	9	4	6	4	5	4	7
NH_3	Manufacturing industries/Construction (mobile)	[tonnes]	2	2	2	2	2	2	2	3	3	2	3	2
NH_3	Civil aviation (International, LTO)	[tonnes]	0	0	0	0	0	0	0	0	0	0	0	0

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NH_3	Civil aviation (International, Cruise)	[tonnes]	0	0	0	0	0	0	0	0	0	0	0	0
NH_3	Civil aviation (Domestic, LTO)	[tonnes]	0	0	0	0	0	0	0	0	0	0	0	0
NH_3	Civil aviation (Domestic, Cruise)	[tonnes]	0	0	0	0	0	0	0	0	0	0	0	0
NH_3	Road transport: Passenger cars	[tonnes]	2473	2480	2495	2473	2445	2313	2213	2133	1997	1832	1667	1542
NH_3	Road transport:Light duty vehicles	[tonnes]	58	72	78	79	80	77	75	69	59	55	51	46
NH_3	Road transport:Heavy duty vehicles	[tonnes]	12	12	12	13	13	13	14	14	13	12	12	12
NH_3	Road transport: Mopeds & motorcycles	[tonnes]	1	1	1	1	1	1	1	1	1	1	1	1
NH_3	Railways	[tonnes]	1	1	1	1	1	1	1	1	1	1	1	1
NH_3	International navigation (Shipping)	[tonnes]												
NH_3	National navigation (Shipping)	[tonnes]	0	0	0	0	0	0	0	0	0	0	0	0
NH_3	Commercial/Institutional: Mobile	[tonnes]	0	0	0	0	0	0	0	0	0	0	0	0
NH_3	Residential: Household and gardening (mobile)	[tonnes]	0	0	0	0	0	0	0	0	0	0	0	0
NH_3	Agriculture/Forestry/Fishing: Off-road agricul-ture/forestry	[tonnes]	3	3	3	3	3	3	3	3	4	4	4	4
NH_3	Agriculture/Forestry/Fishing: National fishing	[tonnes]	0	0	0	0	0	0	0	0	0	0	0	0
NH_3	Other, Mobile (military)	[tonnes]	0	0	0	0	1	1	0	0	1	1	0	0
TSP	Manufacturing industries/Construction (mobile)	[tonnes]	1135	1121	1098	1075	1037	1002	991	938	854	587	686	646
TSP	Civil aviation (International, LTO)	[tonnes]	4	4	4	3	4	4	3	4	4	3	3	4
TSP	Civil aviation (International, Cruise)	[tonnes]	34	35	30	31	36	38	38	39	39	34	36	37
TSP	Civil aviation (Domestic, LTO)	[tonnes]	2	2	2	1	1	1	1	2	1	1	1	1
TSP	Civil aviation (Domestic, Cruise)	[tonnes]	2	2	2	2	2	2	2	2	2	2	2	2
TSP	Road transport: Passenger cars	[tonnes]	902	839	788	798	766	755	723	737	745	684	683	628
TSP	Road transport:Light duty vehicles	[tonnes]	1286	1183	1061	1034	950	924	883	847	731	635	592	513
TSP	Road transport:Heavy duty vehicles	[tonnes]	1013	955	885	856	824	767	756	689	532	403	349	319
TSP	Road transport: Mopeds & motorcycles	[tonnes]	75	62	62	60	56	52	50	47	45	41	38	35
TSP	Road transport: Automobile tyre and brake wear	[tonnes]	1269	1273	1290	1341	1385	1394	1442	1512	1481	1396	1398	1422
TSP	Road transport: Automobile road abrasion	[tonnes]	982	985	995	1033	1063	1064	1098	1155	1137	1073	1079	1101
TSP	Railways	[tonnes]	141	125	124	119	115	124	120	120	101	84	95	78
TSP	International navigation (Shipping)	[tonnes]	8791	7143	4988	4501	3978	5761	7888	2365	1873	820	934	975
TSP	National navigation (Shipping)	[tonnes]	383	373	357	387	430	425	421	336	328	326	307	291
TSP	Commercial/Institutional: Mobile	[tonnes]	30	38	46	55	63	65	66	66	67	67	67	67
TSP	Residential: Household and gardening (mobile)	[tonnes]	11	11	12	13	13	13	14	14	14	14	14	15
TSP	Agriculture/Forestry/Fishing: Off-road agricul-ture/forestry	[tonnes]	1334	1280	1204	1135	1075	1011	955	914	872	831	793	762
TSP	Agriculture/Forestry/Fishing: National fishing	[tonnes]	172	218	224	216	169	203	190	162	175	162	167	168
TSP	Other, Mobile (military)	[tonnes]	17	34	16	19	41	36	16	16	13	20	10	16
PM_{10}	Manufacturing industries/Construction (mobile)	[tonnes]	1135	1121	1098	1075	1037	1002	991	938	854	587	686	646
PM_{10}	Civil aviation (International, LTO)	[tonnes]	4	4	4	3	4	4	3	4	4	3	3	4

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PM_{10}	Civil aviation (International, Cruise)	[tonnes]	34	35	30	31	36	38	38	39	39	34	36	37
PM_{10}	Civil aviation (Domestic, LTO)	[tonnes]	2	2	2	1	1	1	1	2	1	1	1	1
PM_{10}	Civil aviation (Domestic, Cruise)	[tonnes]	2	2	2	2	2	2	2	2	2	2	2	2
PM_{10}	Road transport: Passenger cars	[tonnes]	902	839	788	798	766	755	723	737	745	684	683	628
PM_{10}	Road transport:Light duty vehicles	[tonnes]	1286	1183	1061	1034	950	924	883	847	731	635	592	513
PM_{10}	Road transport:Heavy duty vehicles	[tonnes]	1013	955	885	856	824	767	756	689	532	403	349	319
PM_{10}	Road transport: Mopeds & motorcycles	[tonnes]	75	62	62	60	56	52	50	47	45	41	38	35
PM_{10}	Road transport: Automobile tyre and brake wear	[tonnes]	942	945	957	994	1026	1033	1068	1118	1095	1032	1033	1051
PM_{10}	Road transport: Automobile road abrasion	[tonnes]	491	492	498	517	532	532	549	578	569	537	539	551
PM_{10}	Railways	[tonnes]	141	125	124	119	115	124	120	120	101	84	95	78
PM_{10}	International navigation (Shipping)	[tonnes]	8703	7072	4938	4456	3938	5703	7809	2341	1854	812	925	965
PM_{10}	National navigation (Shipping)	[tonnes]	381	371	355	384	427	422	418	334	325	324	305	289
PM_{10}	Commercial/Institutional: Mobile	[tonnes]	30	38	46	55	63	65	66	66	67	67	67	67
PM_{10}	Residential: Household and gardening (mobile)	[tonnes]	11	11	12	13	13	13	14	14	14	14	14	15
PM_{10}	Agriculture/Forestry/Fishing: Off-road agricul-ture/forestry	[tonnes]	1334	1280	1204	1135	1075	1011	955	914	872	831	793	762
PM_{10}	Agriculture/Forestry/Fishing: National fishing	[tonnes]	171	216	222	214	167	201	188	160	173	160	166	166
PM_{10}	Other, Mobile (military)	[tonnes]	17	34	16	19	41	36	16	16	13	20	10	16
$PM_{2.5}$	Manufacturing industries/Construction (mobile)	[tonnes]	1135	1121	1098	1075	1037	1002	991	938	854	587	686	646
$PM_{2.5}$	Civil aviation (International, LTO)	[tonnes]	4	4	4	3	4	4	3	4	4	3	3	4
$PM_{2.5}$	Civil aviation (International, Cruise)	[tonnes]	34	35	30	31	36	38	38	39	39	34	36	37
$PM_{2.5}$	Civil aviation (Domestic, LTO)	[tonnes]	2	2	2	1	1	1	1	2	1	1	1	1
$PM_{2.5}$	Civil aviation (Domestic, Cruise)	[tonnes]	2	2	2	2	2	2	2	2	2	2	2	2
$PM_{2.5}$	Road transport: Passenger cars	[tonnes]	902	839	788	798	766	755	723	737	745	684	683	628
$PM_{2.5}$	Road transport:Light duty vehicles	[tonnes]	1286	1183	1061	1034	950	924	883	847	731	635	592	513
$PM_{2.5}$	Road transport:Heavy duty vehicles	[tonnes]	1013	955	885	856	824	767	756	689	532	403	349	319
$PM_{2.5}$	Road transport: Mopeds & motorcycles	[tonnes]	75	62	62	60	56	52	50	47	45	41	38	35
$PM_{2.5}$	Road transport: Automobile tyre and brake wear	[tonnes]	519	520	527	548	566	570	590	618	606	571	572	582
$PM_{2.5}$	Road transport: Automobile road abrasion	[tonnes]	265	266	269	279	287	287	297	312	307	290	291	297
$PM_{2.5}$	Railways	[tonnes]	141	125	124	119	115	124	120	120	101	84	95	78
$PM_{2.5}$	International navigation (Shipping)	[tonnes]	8659	7036	4913	4434	3918	5675	7770	2330	1845	808	920	960
$PM_{2.5}$	National navigation (Shipping)	[tonnes]	379	370	354	383	425	421	417	333	324	323	304	288
$PM_{2.5}$	Commercial/Institutional: Mobile	[tonnes]	30	38	46	55	63	65	66	66	67	67	67	67
$PM_{2.5}$	Residential: Household and gardening (mobile)	[tonnes]	11	11	12	13	13	13	14	14	14	14	14	15
$PM_{2.5}$	Agriculture/Forestry/Fishing: Off-road agricul-ture/forestry	[tonnes]	1334	1280	1204	1135	1075	1011	955	914	872	831	793	762
$PM_{2.5}$	Agriculture/Forestry/Fishing: National fishing	[tonnes]	170	215	221	213	167	199	187	159	172	159	165	165
$PM_{2.5}$	Other, Mobile (military)	[tonnes]	17	34	16	19	41	36	16	16	13	20	10	16

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Arsenic	Manufacturing industries/Construction (mobile)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Arsenic	Civil aviation (International, LTO)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Arsenic	Civil aviation (International, Cruise)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Arsenic	Civil aviation (Domestic, LTO)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Arsenic	Civil aviation (Domestic, Cruise)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Arsenic	Road transport: Passenger cars	[kg]	1	1	1	1	1	1	1	1	1	1	0	0
Arsenic	Road transport:Light duty vehicles	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Arsenic	Road transport:Heavy duty vehicles	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Arsenic	Road transport: Mopeds & motorcycles	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Arsenic	Road transport: Automobile tyre and brake wear	[kg]	5	5	5	6	6	6	6	6	6	6	6	6
Arsenic	Road transport: Automobile road abrasion	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Arsenic	Railways	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Arsenic	International navigation (Shipping)	[kg]	422	329	227	257	213	250	381	424	326	127	205	221
Arsenic	National navigation (Shipping)	[kg]	24	23	23	28	28	28	30	30	31	33	35	33
Arsenic	Commercial/Institutional: Mobile	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Arsenic	Residential: Household and gardening (mobile)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Arsenic	Agriculture/Forestry/Fishing: Off-road agricul-ture/forestry	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Arsenic	Agriculture/Forestry/Fishing: National fishing	[kg]	9	11	11	11	9	10	10	8	9	9	9	9
Arsenic	Other, Mobile (military)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Cadmium	Manufacturing industries/Construction (mobile)	[kg]	2	2	2	2	2	2	3	3	3	2	3	3
Cadmium	Civil aviation (International, LTO)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Cadmium	Civil aviation (International, Cruise)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Cadmium	Civil aviation (Domestic, LTO)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Cadmium	Civil aviation (Domestic, Cruise)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Cadmium	Road transport: Passenger cars	[kg]	24	24	24	25	25	25	25	27	27	26	27	27
Cadmium	Road transport:Light duty vehicles	[kg]	4	4	4	5	5	6	6	6	6	6	6	6
Cadmium	Road transport:Heavy duty vehicles	[kg]	6	6	6	6	6	6	7	7	6	5	6	6
Cadmium	Road transport: Mopeds & motorcycles	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Cadmium	Road transport: Automobile tyre and brake wear	[kg]	6	6	6	6	6	6	7	7	7	6	6	7
Cadmium	Road transport: Automobile road abrasion	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Cadmium	Railways	[kg]	1	1	1	1	1	1	1	1	1	1	1	1
Cadmium	International navigation (Shipping)	[kg]	29	23	17	18	15	17	24	27	21	9	14	15
Cadmium	National navigation (Shipping)	[kg]	3	2	2	3	3	3	3	3	3	3	3	3
Cadmium	Commercial/Institutional: Mobile	[kg]	0	0	0	0	1	1	1	1	1	1	1	1
Cadmium	Residential: Household and gardening (mobile)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Cadmium	Agriculture/Forestry/Fishing: Off-road agricul-ture/forestry	[kg]	3	3	3	3	3	3	3	3	3	3	3	3

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Cadmium	Agriculture/Forestry/Fishing: National fishing	[kg]	2	2	2	2	2	2	2	2	2	2	2	2
Cadmium	Other, Mobile (military)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Chromium	Manufacturing industries/Construction (mobile)	[kg]	7	7	7	8	8	8	9	9	9	7	9	9
Chromium	Civil aviation (International, LTO)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Chromium	Civil aviation (International, Cruise)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Chromium	Civil aviation (Domestic, LTO)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Chromium	Civil aviation (Domestic, Cruise)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Chromium	Road transport: Passenger cars	[kg]	40	39	41	43	44	45	46	50	53	53	54	57
Chromium	Road transport:Light duty vehicles	[kg]	14	14	14	16	17	18	20	21	21	20	19	19
Chromium	Road transport:Heavy duty vehicles	[kg]	22	23	23	24	24	24	25	26	24	21	22	23
Chromium	Road transport: Mopeds & motorcycles	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Chromium	Road transport: Automobile tyre and brake wear	[kg]	57	57	58	60	62	62	64	67	65	61	61	62
Chromium	Road transport: Automobile road abrasion	[kg]	19	20	20	21	21	21	22	23	23	21	21	22
Chromium	Railways	[kg]	2	2	2	2	2	2	2	2	2	2	2	2
Chromium	International navigation (Shipping)	[kg]	179	140	100	111	92	106	157	174	136	56	87	93
Chromium	National navigation (Shipping)	[kg]	13	12	12	14	14	14	15	15	15	16	17	16
Chromium	Commercial/Institutional: Mobile	[kg]	0	0	1	1	1	1	1	1	1	1	1	1
Chromium	Residential: Household and gardening (mobile)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Chromium	Agriculture/Forestry/Fishing: Off-road agricul-ture/forestry	[kg]	9	9	9	9	10	10	10	11	11	11	11	12
Chromium	Agriculture/Forestry/Fishing: National fishing	[kg]	7	9	9	9	7	8	8	7	8	7	7	7
Chromium	Other, Mobile (military)	[kg]	0	1	0	0	1	1	0	0	0	1	0	1
Copper	Manufacturing industries/Construction (mobile)	[kg]	6	6	6	6	6	6	7	7	7	5	7	6
Copper	Civil aviation (International, LTO)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Copper	Civil aviation (International, Cruise)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Copper	Civil aviation (Domestic, LTO)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Copper	Civil aviation (Domestic, Cruise)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Copper	Road transport: Passenger cars	[kg]	87	86	87	89	90	88	88	91	91	88	86	86
Copper	Road transport:Light duty vehicles	[kg]	11	11	12	13	14	15	16	17	16	15	15	14
Copper	Road transport:Heavy duty vehicles	[kg]	16	16	16	17	17	17	18	18	17	15	16	16
Copper	Road transport: Mopeds & motorcycles	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Copper	Road transport: Automobile tyre and brake wear	[kg]	36661	36356	37188	38456	39797	40225	41221	43290	43014	41438	40947	41505
Copper	Road transport: Automobile road abrasion	[kg]	10	10	10	10	11	11	11	12	11	11	11	11
Copper	Railways	[kg]	1	1	1	1	1	1	1	1	1	1	2	2
Copper	International navigation (Shipping)	[kg]	422	329	227	257	213	250	381	424	326	127	205	221
Copper	National navigation (Shipping)	[kg]	25	24	24	29	29	29	31	30	32	34	36	34
Copper	Commercial/Institutional: Mobile	[kg]	1	1	1	2	2	2	2	2	2	2	2	2

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Copper	Residential: Household and gardening (mobile)	[kg]	1	1	1	1	1	1	1	1	1	1	1	1
Copper	Agriculture/Forestry/Fishing: Off-road agricul-ture/forestry	[kg]	7	7	7	7	7	7	7	8	8	8	8	9
Copper	Agriculture/Forestry/Fishing: National fishing	[kg]	9	11	11	11	9	10	10	8	9	9	9	9
Copper	Other, Mobile (military)	[kg]	0	0	0	0	1	1	0	0	0	1	0	1
Mercury	Manufacturing industries/Construction (mobile)	[kg]	1	1	1	1	1	1	2	2	2	1	2	2
Mercury	Civil aviation (International, LTO)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Mercury	Civil aviation (International, Cruise)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Mercury	Civil aviation (Domestic, LTO)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Mercury	Civil aviation (Domestic, Cruise)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Mercury	Road transport: Passenger cars	[kg]	17	17	17	17	17	17	17	17	17	17	16	16
Mercury	Road transport:Light duty vehicles	[kg]	3	3	3	3	4	4	4	4	4	4	4	3
Mercury	Road transport:Heavy duty vehicles	[kg]	5	5	5	5	6	5	6	6	6	5	5	5
Mercury	Road transport: Mopeds & motorcycles	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Mercury	Road transport: Automobile tyre and brake wear	[kg]												
Mercury	Road transport: Automobile road abrasion	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Mercury	Railways	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Mercury	International navigation (Shipping)	[kg]	42	34	30	31	24	23	27	27	25	17	21	20
Mercury	National navigation (Shipping)	[kg]	7	7	7	6	6	6	6	6	6	6	6	6
Mercury	Commercial/Institutional: Mobile	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Mercury	Residential: Household and gardening (mobile)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Mercury	Agriculture/Forestry/Fishing: Off-road agricul-ture/forestry	[kg]	2	2	2	2	2	2	2	2	2	2	2	2
Mercury	Agriculture/Forestry/Fishing: National fishing	[kg]	9	11	11	11	9	10	10	8	9	9	9	9
Mercury	Other, Mobile (military)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Nickel	Manufacturing industries/Construction (mobile)	[kg]	2	2	2	2	2	2	3	3	3	2	3	3
Nickel	Civil aviation (International, LTO)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Nickel	Civil aviation (International, Cruise)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Nickel	Civil aviation (Domestic, LTO)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Nickel	Civil aviation (Domestic, Cruise)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Nickel	Road transport: Passenger cars	[kg]	28	27	28	29	29	29	29	30	30	30	29	30
Nickel	Road transport:Light duty vehicles	[kg]	4	5	5	5	6	6	6	7	6	6	6	6
Nickel	Road transport:Heavy duty vehicles	[kg]	6	6	6	6	7	6	7	7	6	6	6	6
Nickel	Road transport: Mopeds & motorcycles	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Nickel	Road transport: Automobile tyre and brake wear	[kg]	73	73	74	77	80	80	82	86	84	79	79	81
Nickel	Road transport: Automobile road abrasion	[kg]	16	16	16	16	17	17	17	18	18	17	17	17
Nickel	Railways	[kg]	1	1	1	1	1	1	1	1	1	1	1	1
Nickel	International navigation (Shipping)	[kg]	23829	18510	12366	14147	11846	14256	22148	24842	18832	6924	11521	12574

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Nickel	National navigation (Shipping)	[kg]	1068	1036	1026	1374	1367	1371	1494	1477	1583	1685	1809	1749
Nickel	Commercial/Institutional: Mobile	[kg]	0	0	0	1	1	1	1	1	1	1	1	1
Nickel	Residential: Household and gardening (mobile)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Nickel	Agriculture/Forestry/Fishing: Off-road agricul-ture/forestry	[kg]	3	3	3	3	3	3	3	3	3	3	3	3
Nickel	Agriculture/Forestry/Fishing: National fishing	[kg]	12	15	16	15	12	14	13	11	13	12	13	13
Nickel	Other, Mobile (military)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Lead	Manufacturing industries/Construction (mobile)	[kg]	13	13	13	13	13	14	15	16	16	12	15	15
Lead	Civil aviation (International, LTO)	[kg]	118	114	113	106	111	117	22	10	113	52	10	52
Lead	Civil aviation (International, Cruise)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Lead	Civil aviation (Domestic, LTO)	[kg]	1369	1343	1328	1252	1304	1297	1245	1329	1182	991	929	776
Lead	Civil aviation (Domestic, Cruise)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Lead	Road transport: Passenger cars	[kg]	82	81	84	88	91	92	94	102	106	106	109	115
Lead	Road transport:Light duty vehicles	[kg]	24	24	25	27	30	32	34	37	36	34	34	33
Lead	Road transport:Heavy duty vehicles	[kg]	34	36	35	37	38	38	39	40	37	33	34	36
Lead	Road transport: Mopeds & motorcycles	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Lead	Road transport: Automobile tyre and brake wear	[kg]	4796	4753	4865	5031	5208	5265	5396	5671	5641	5439	5372	5445
Lead	Road transport: Automobile road abrasion	[kg]	46	46	47	49	50	50	52	54	53	50	51	52
Lead	Railways	[kg]	3	3	3	3	3	4	3	3	4	3	4	4
Lead	International navigation (Shipping)	[kg]	210	166	126	137	112	121	172	186	151	70	103	108
Lead	National navigation (Shipping)	[kg]	21	20	20	21	21	21	22	22	22	23	23	22
Lead	Commercial/Institutional: Mobile	[kg]	1	1	1	1	2	2	2	2	2	2	2	2
Lead	Residential: Household and gardening (mobile)	[kg]	0	0	1	1	1	1	1	1	1	1	1	1
Lead	Agriculture/Forestry/Fishing: Off-road agricul-ture/forestry	[kg]	16	16	16	16	16	17	17	18	19	19	19	20
Lead	Agriculture/Forestry/Fishing: National fishing	[kg]	17	22	23	22	17	20	19	16	19	18	18	18
Lead	Other, Mobile (military)	[kg]	114	89	106	79	84	60	47	81	40	66	80	49
Selenium	Manufacturing industries/Construction (mobile)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Selenium	Civil aviation (International, LTO)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Selenium	Civil aviation (International, Cruise)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Selenium	Civil aviation (Domestic, LTO)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Selenium	Civil aviation (Domestic, Cruise)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Selenium	Road transport: Passenger cars	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Selenium	Road transport:Light duty vehicles	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Selenium	Road transport:Heavy duty vehicles	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Selenium	Road transport: Mopeds & motorcycles	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Selenium	Road transport: Automobile tyre and brake wear	[kg]	25	25	26	27	28	28	29	30	30	28	28	28
Selenium	Road transport: Automobile road abrasion	[kg]	0	0	0	0	0	0	0	0	0	0	0	0

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Selenium	Railways	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Selenium	International navigation (Shipping)	[kg]	421	331	252	274	224	243	345	372	302	140	207	216
Selenium	National navigation (Shipping)	[kg]	39	38	37	39	40	40	41	40	42	43	43	41
Selenium	Commercial/Institutional: Mobile	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Selenium	Residential: Household and gardening (mobile)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Selenium	Agriculture/Forestry/Fishing: Off-road agriculture/forestry	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Selenium	Agriculture/Forestry/Fishing: National fishing	[kg]	35	44	45	43	34	41	38	33	38	35	36	36
Selenium	Other, Mobile (military)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Zinc	Manufacturing industries/Construction (mobile)	[kg]	438	443	447	452	455	474	510	544	555	411	519	506
Zinc	Civil aviation (International, LTO)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Zinc	Civil aviation (International, Cruise)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Zinc	Civil aviation (Domestic, LTO)	[kg]	5	5	5	5	5	5	5	5	4	4	3	3
Zinc	Civil aviation (Domestic, Cruise)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Zinc	Road transport: Passenger cars	[kg]	4774	4725	4842	4976	5072	5009	5037	5297	5388	5292	5299	5428
Zinc	Road transport:Light duty vehicles	[kg]	846	863	897	978	1062	1133	1213	1294	1245	1190	1172	1158
Zinc	Road transport:Heavy duty vehicles	[kg]	1146	1190	1178	1239	1277	1260	1315	1343	1246	1100	1148	1191
Zinc	Road transport: Mopeds & motorcycles	[kg]	16	16	17	17	17	17	18	19	19	19	19	20
Zinc	Road transport: Automobile tyre and brake wear	[kg]	16578	16578	16847	17501	18078	18224	18811	19746	19428	18420	18389	18693
Zinc	Road transport: Automobile road abrasion	[kg]	74	74	75	78	80	80	83	87	86	81	82	83
Zinc	Railways	[kg]	115	106	106	110	109	117	114	115	119	116	122	126
Zinc	International navigation (Shipping)	[kg]	973	766	588	637	519	560	788	848	692	326	478	497
Zinc	National navigation (Shipping)	[kg]	142	143	143	149	152	152	153	152	154	156	157	151
Zinc	Commercial/Institutional: Mobile	[kg]	60	68	77	89	103	112	119	121	122	121	119	118
Zinc	Residential: Household and gardening (mobile)	[kg]	29	32	34	36	39	41	42	43	44	44	43	43
Zinc	Agriculture/Forestry/Fishing: Off-road agriculture/forestry	[kg]	543	548	549	550	559	566	583	617	646	654	662	679
Zinc	Agriculture/Forestry/Fishing: National fishing	[kg]	87	110	113	109	85	102	96	82	95	88	91	91
Zinc	Other, Mobile (military)	[kg]	14	32	16	22	53	48	24	26	25	45	25	44
Dioxins/furans	Manufacturing industries/Construction (mobile)	[g]	0	0	0	0	0	0	0	0	0	0	0	0
Dioxins/furans	Civil aviation (International, LTO)	[g]	0	0	0	0	0	0	0	0	0	0	0	0
Dioxins/furans	Civil aviation (International, Cruise)	[g]	0	0	0	0	0	0	0	0	0	0	0	0
Dioxins/furans	Civil aviation (Domestic, LTO)	[g]	0	0	0	0	0	0	0	0	0	0	0	0
Dioxins/furans	Civil aviation (Domestic, Cruise)	[g]	0	0	0	0	0	0	0	0	0	0	0	0
Dioxins/furans	Road transport: Passenger cars	[g]	0	0	0	0	0	0	0	0	0	0	0	0
Dioxins/furans	Road transport:Light duty vehicles	[g]	0	0	0	0	0	0	0	0	0	0	0	0
Dioxins/furans	Road transport:Heavy duty vehicles	[g]	0	0	0	0	0	0	0	0	0	0	0	0
Dioxins/furans	Road transport: Mopeds & motorcycles	[g]	0	0	0	0	0	0	0	0	0	0	0	0

Continued														
Dioxins/furans	Railways	[g]	0	0	0	0	0	0	0	0	0	0	0	0
Dioxins/furans	International navigation (Shipping)	[g]	1	1	0	0	0	0	1	1	0	0	0	0
Dioxins/furans	National navigation (Shipping)	[g]	0	0	0	0	0	0	0	0	0	0	0	0
Dioxins/furans	Commercial/Institutional: Mobile	[g]	0	0	0	0	0	0	0	0	0	0	0	0
Dioxins/furans	Residential: Household and gardening (mobile)	[g]	0	0	0	0	0	0	0	0	0	0	0	0
Dioxins/furans	Agriculture/Forestry/Fishing: Off-road agriculture/forestry	[g]	0	0	0	0	0	0	0	0	0	0	0	0
Dioxins/furans	Agriculture/Forestry/Fishing: National fishing	[g]	0	0	0	0	0	0	0	0	0	0	0	0
Dioxins/furans	Other, Mobile (military)	[g]	0	0	0	0	0	0	0	0	0	0	0	0
Flouranthene	Manufacturing industries/Construction (mobile)	[kg]	48	48	49	49	50	52	56	60	61	45	57	56
Flouranthene	Civil aviation (International, LTO)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Flouranthene	Civil aviation (International, Cruise)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Flouranthene	Civil aviation (Domestic, LTO)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Flouranthene	Civil aviation (Domestic, Cruise)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Flouranthene	Road transport: Passenger cars	[kg]	398	375	369	375	381	383	392	450	487	488	518	554
Flouranthene	Road transport:Light duty vehicles	[kg]	175	176	183	200	215	232	250	270	259	242	235	229
Flouranthene	Road transport:Heavy duty vehicles	[kg]	80	81	81	85	87	87	92	95	88	78	81	83
Flouranthene	Road transport: Mopeds & motorcycles	[kg]	8	8	8	8	8	9	9	10	10	10	10	10
Flouranthene	Railways	[kg]	4	4	4	4	4	4	4	4	5	4	5	5
Flouranthene	International navigation (Shipping)	[kg]	298	238	208	215	171	164	203	205	187	114	149	147
Flouranthene	National navigation (Shipping)	[kg]	52	51	50	49	50	50	49	49	50	50	49	46
Flouranthene	Commercial/Institutional: Mobile	[kg]	5	6	7	8	9	10	10	10	10	10	10	10
Flouranthene	Residential: Household and gardening (mobile)	[kg]	3	3	3	3	3	3	4	4	4	4	4	4
Flouranthene	Agriculture/Forestry/Fishing: Off-road agriculture/forestry	[kg]	63	63	63	63	65	65	67	71	75	75	76	78
Flouranthene	Agriculture/Forestry/Fishing: National fishing	[kg]	55	70	72	69	54	65	61	52	60	56	58	58
Flouranthene	Other, Mobile (military)	[kg]	2	4	2	3	6	6	3	3	3	5	3	5
Benzo(b) flouranthene	Manufacturing industries/Construction (mobile)	[kg]	6	6	6	6	6	6	7	7	7	5	7	7
Benzo(b) flouranthene	Civil aviation (International, LTO)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Benzo(b) flouranthene	Civil aviation (International, Cruise)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Benzo(b) flouranthene	Civil aviation (Domestic, LTO)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Benzo(b) flouranthene	Civil aviation (Domestic, Cruise)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Benzo(b) flouranthene	Road transport: Passenger cars	[kg]	32	31	31	32	32	32	33	36	38	38	39	41
Benzo(b) flouranthene	Road transport:Light duty vehicles	[kg]	11	11	11	12	13	14	16	17	16	15	15	14
Benzo(b) flouranthene	Road transport:Heavy duty vehicles	[kg]	20	21	20	21	22	22	23	24	22	20	20	21
Benzo(b) flouranthene	Road transport: Mopeds & motorcycles	[kg]	1	1	1	1	1	1	1	1	1	1	1	1
Benzo(b) flouranthene	Railways	[kg]	1	1	1	1	1	1	1	1	1	1	1	1
Benzo(b) flouranthene	International navigation (Shipping)	[kg]	21	17	15	16	12	11	13	12	12	8	10	10

Continued														
Benzo(b) flouranthene	National navigation (Shipping)	[kg]	4	4	4	4	4	4	4	4	4	4	4	4
Benzo(b) flouranthene	Commercial/Institutional: Mobile	[kg]	0	0	0	0	0	0	0	1	1	0	0	0
Benzo(b) flouranthene	Residential: Household and gardening (mobile)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Benzo(b) flouranthene	Agriculture/Forestry/Fishing: Off-road agriculture/forestry	[kg]	7	7	7	7	7	8	8	8	9	9	9	9
Benzo(b) flouranthene	Agriculture/Forestry/Fishing: National fishing	[kg]	5	6	6	6	5	6	5	4	5	5	5	5
Benzo(b) flouranthene	Other, Mobile (military)	[kg]	0	0	0	0	1	1	0	0	0	1	0	1
Benzo(k) flouranthene	Manufacturing industries/Construction (mobile)	[kg]	6	5	5	6	6	6	6	7	7	5	6	6
Benzo(k) flouranthene	Civil aviation (International, LTO)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Benzo(k) flouranthene	Civil aviation (International, Cruise)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Benzo(k) flouranthene	Civil aviation (Domestic, LTO)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Benzo(k) flouranthene	Civil aviation (Domestic, Cruise)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Benzo(k) flouranthene	Road transport: Passenger cars	[kg]	31	30	30	31	32	32	33	37	39	38	39	41
Benzo(k) flouranthene	Road transport:Light duty vehicles	[kg]	10	10	10	11	12	13	14	15	15	14	13	13
Benzo(k) flouranthene	Road transport:Heavy duty vehicles	[kg]	30	30	30	32	33	33	34	35	33	29	30	31
Benzo(k) flouranthene	Road transport: Mopeds & motorcycles	[kg]	0	0	0	0	0	0	0	0	1	0	0	0
Benzo(k) flouranthene	Railways	[kg]	1	1	1	1	1	1	1	1	1	1	1	1
Benzo(k) flouranthene	International navigation (Shipping)	[kg]	10	8	7	7	6	5	6	6	6	4	5	5
Benzo(k) flouranthene	National navigation (Shipping)	[kg]	2	2	2	2	2	2	2	2	2	2	2	2
Benzo(k) flouranthene	Commercial/Institutional: Mobile	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Benzo(k) flouranthene	Residential: Household and gardening (mobile)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Benzo(k) flouranthene	Agriculture/Forestry/Fishing: Off-road agriculture/forestry	[kg]	7	7	7	7	7	7	7	8	8	8	8	9
Benzo(k) flouranthene	Agriculture/Forestry/Fishing: National fishing	[kg]	2	3	3	3	2	3	2	2	2	2	2	2
Benzo(k) flouranthene	Other, Mobile (military)	[kg]	0	0	0	0	1	1	0	0	0	1	0	1
Benzo(a) pyrene	Manufacturing industries/Construction (mobile)	[kg]	3	3	3	3	3	3	3	4	4	3	3	3
Benzo(a) pyrene	Civil aviation (International, LTO)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Benzo(a) pyrene	Civil aviation (International, Cruise)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Benzo(a) pyrene	Civil aviation (Domestic, LTO)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Benzo(a) pyrene	Civil aviation (Domestic, Cruise)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Benzo(a) pyrene	Road transport: Passenger cars	[kg]	31	30	30	31	32	33	34	38	40	40	42	44
Benzo(a) pyrene	Road transport:Light duty vehicles	[kg]	12	12	12	14	15	16	17	18	17	16	16	15
Benzo(a) pyrene	Road transport:Heavy duty vehicles	[kg]	4	4	4	4	4	4	4	4	4	4	4	4
Benzo(a) pyrene	Road transport: Mopeds & motorcycles	[kg]	0	0	0	0	0	0	1	1	1	1	1	1
Benzo(a) pyrene	Railways	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Benzo(a) pyrene	International navigation (Shipping)	[kg]	6	4	4	4	3	3	4	4	3	2	3	3
Benzo(a) pyrene	National navigation (Shipping)	[kg]	1	1	1	1	1	1	1	1	1	1	1	1
Benzo(a) pyrene	Commercial/Institutional: Mobile	[kg]	0	0	0	0	0	0	0	0	0	0	0	0

Continued														
Benzo(a) pyrene	Residential: Household and gardening (mobile)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Benzo(a) pyrene	Agriculture/Forestry/Fishing: Off-road agricul-ture/forestry	[kg]	4	4	4	4	4	4	4	4	4	4	4	5
Benzo(a) pyrene	Agriculture/Forestry/Fishing: National fishing	[kg]	1	1	1	1	1	1	1	1	1	1	1	1
Benzo(a) pyrene	Other, Mobile (military)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Benzo(g,h,i) perylene	Manufacturing industries/Construction (mobile)	[kg]	5	5	5	5	5	6	6	6	7	5	6	6
Benzo(g,h,i) perylene	Civil aviation (International, LTO)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Benzo(g,h,i) perylene	Civil aviation (International, Cruise)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Benzo(g,h,i) perylene	Civil aviation (Domestic, LTO)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Benzo(g,h,i) perylene	Civil aviation (Domestic, Cruise)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Benzo(g,h,i) perylene	Road transport: Passenger cars	[kg]	66	63	63	65	66	66	68	75	80	79	82	86
Benzo(g,h,i) perylene	Road transport:Light duty vehicles	[kg]	23	23	24	26	28	31	33	35	34	32	31	30
Benzo(g,h,i) perylene	Road transport:Heavy duty vehicles	[kg]	3	3	3	3	3	3	3	4	3	3	3	3
Benzo(g,h,i) perylene	Road transport: Mopeds & motorcycles	[kg]	1	1	1	1	1	1	1	1	1	1	1	1
Benzo(g,h,i) perylene	Railways	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
Benzo(g,h,i) perylene	International navigation (Shipping)	[kg]	40	32	31	31	24	21	23	21	22	17	20	19
Benzo(g,h,i) perylene	National navigation (Shipping)	[kg]	8	8	8	7	7	7	7	7	7	7	7	6
Benzo(g,h,i) perylene	Commercial/Institutional: Mobile	[kg]	1	1	1	1	1	2	2	2	2	2	2	2
Benzo(g,h,i) perylene	Residential: Household and gardening (mobile)	[kg]	0	0	0	0	1	1	1	1	1	1	1	1
Benzo(g,h,i) perylene	Agriculture/Forestry/Fishing: Off-road agricul-ture/forestry	[kg]	7	7	7	7	7	7	7	8	8	8	8	8
Benzo(g,h,i) perylene	Agriculture/Forestry/Fishing: National fishing	[kg]	11	13	14	13	10	12	12	10	12	11	11	11
Benzo(g,h,i) perylene	Other, Mobile (military)	[kg]	0	0	0	0	1	1	0	0	0	1	0	0
indeno(1,2,3-c,d) pyrene	Manufacturing industries/Construction (mobile)	[kg]	3	3	3	3	3	3	3	4	4	3	3	3
indeno(1,2,3-c,d) pyrene	Civil aviation (International, LTO)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
indeno(1,2,3-c,d) pyrene	Civil aviation (International, Cruise)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
indeno(1,2,3-c,d) pyrene	Civil aviation (Domestic, LTO)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
indeno(1,2,3-c,d) pyrene	Civil aviation (Domestic, Cruise)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
indeno(1,2,3-c,d) pyrene	Road transport: Passenger cars	[kg]	34	34	34	36	37	37	38	42	45	44	45	47
indeno(1,2,3-c,d) pyrene	Road transport:Light duty vehicles	[kg]	11	11	12	13	14	15	16	17	17	16	15	15
indeno(1,2,3-c,d) pyrene	Road transport:Heavy duty vehicles	[kg]	5	5	5	6	6	6	6	6	6	5	5	5
indeno(1,2,3-c,d) pyrene	Road transport: Mopeds & motorcycles	[kg]	0	0	0	0	0	0	0	0	1	0	0	0
indeno(1,2,3-c,d) pyrene	Railways	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
indeno(1,2,3-c,d) pyrene	International navigation (Shipping)	[kg]	33	26	25	25	20	17	19	17	18	14	17	16
indeno(1,2,3-c,d) pyrene	National navigation (Shipping)	[kg]	7	7	6	6	6	6	6	6	6	6	5	5
indeno(1,2,3-c,d) pyrene	Commercial/Institutional: Mobile	[kg]	0	0	0	0	0	1	1	1	1	1	1	1
indeno(1,2,3-c,d) pyrene	Residential: Household and gardening (mobile)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0
indeno(1,2,3-c,d) pyrene	Agriculture/Forestry/Fishing: Off-road agricul/forestry	[kg]	4	4	4	4	4	4	4	4	5	5	5	5

Continued														
indeno(1,2,3-c,d) pyrene	Agriculture/Forestry/Fishing: National fishing	[kg]	9	11	11	11	9	10	10	8	10	9	9	9
indeno(1,2,3-c,d) pyrene	Other, Mobile (military)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0

Annex 2B-17: Uncertainty estimates

SO_2

Source category	Gas	Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data	Input data	Input data	Input data							
		Mg SO_2	Mg SO_2	%	%	%	%	%	%	%	%	%
Road Transportation	SO_2	5767	74	2	50	50,040	1,891	-0,0396557	0,0046	-1,9827863	0,0131397	1,9828298
Other mobile sources	SO_2	10186	1887	10	50	50,990	49,063	0,0395466	0,1183	1,977329	1,6729805	2,5901146
Total	SO_2	15952,627	1961,2663				2410,799					10,640308
Total uncertainties					**Year (%):**		**49,100**			**Trend (%):**		**3,262**

NO_x

Source category	Gas	Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data	Input data	Input data	Input data							
		Gg Nox	Gg Nox	%	%	%	%	%	%	%	%	%
Road Transportation	Nox	109036	46175	2	50	50,040	26,131	-0,0833662	0,2860	-4,16831	0,8090376	4,2460982
Other mobile sources	Nox	52394	42247	10	100	100,499	48,017	0,0836578	0,2617	8,3657768	3,7010638	9,1479012
Total	Nox	161429,43	88421,794				2988,494					101,71345
Total uncertainties					**Year (%):**		**54,667**			**Trend (%):**		**10,085**

NMVOC

Source category	Gas	Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emis-sion factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data Gg NMVOC	Input data Gg NMVOC	Input data %	Input data %	%	%	%	%	%	%	%
Road Transportation	NMVOC	78131	12201	2	50	50,040	27,196	-0,0710551	0,1312	-3,5527564	0,371141	3,5720896
Other mobile sources	NMVOC	14852	10248	10	100	100,499	45,878	0,0715379	0,1102	7,1537915	1,5587014	7,3216311
Total	NMVOC	92983,735	22449,528				2844,471					66,366107
Total uncertainties					**Year (%):**		**53,334**			**Trend (%):**		**8,147**

CO

Source category	Gas	Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emis-sion factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data Gg CO	Input data Gg CO	Input data %	Input data %	%	%	%	%	%	%	%
Road Transportation	CO	464786	105172	2	50	50,040	22,231	-0,1424933	0,1805	-7,1246662	0,5105794	7,1429378
Other mobile sources	CO	117831	131559	10	100	100,499	55,850	0,1433402	0,2258	14,334017	3,1933946	14,685429
Total	CO	582617,1	236731,41				3613,484					266,68338
Total uncertainties					**Year (%):**		**60,112**			**Trend (%):**		**16,330**

NH_3

Source category	Gas	Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data	Input data	Input data	Input data							
		Gg NH_3	Gg NH_3	%	%	%	%	%	%	%	%	%
Road Transportation	NH_3	72	1601	2	1000	1000,002	994,992	1,523512	20,5996	1523,512	58,264574	1524,6257
Other mobile sources	NH_3	6	8	10	1000	1000,050	5,010	-1,5363215	0,1037	-1536,3215	1,4667398	1536,3222
Total	NH_3	77,736974	1609,4159				990035,083					4684769,4
Total uncertainties					**Year (%):**		**995,005**			**Trend (%):**		**2164,433**

TSP

Source category	Gas	Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data	Input data	Input data	Input data							
		Gg TSP	Gg TSP	%	%	%	%	%	%	%	%	%
Road Transportation	TSP	5528	4019	2	50	50,040	33,158	0,021565	0,4590	1,078249	1,2981603	1,6875548
Other mobile sources	TSP	3229	2046	10	100	100,499	33,906	-0,0216214	0,2337	-2,1621401	3,3047578	3,9492118
Total	TSP	8756,414	6065,1358				2249,030					18,444115
Total uncertainties					**Year (%):**		**47,424**			**Trend (%):**		**4,295**

Arsenic

Source category	Gas	Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data	Input data	Input data	Input data							
		kg	kg	%	%	%	%	%	%	%	%	%
Road Transportation	Arsenic	5	7	2	1000	1000,002	133,098	0,0440429	0,0857	44,042901	0,2424607	44,043569
Other mobile sources	Arsenic	71	43	10	1000	1000,050	866,946	-0,043663	0,5583	-43,662991	7,8960756	44,371216
Total	Arsenic	76,381539	49,194269				769309,924					3908,6408
Total uncertainties					**Year (%):**		**877,103**			**Trend (%):**		**62,519**

Cadmium

Source category	Gas	Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data	Input data	Input data	Input data							
		kg	kg	%	%	%	%	%	%	%	%	%
Road Transportation	Cadmium	32	46	2	1000	1000,002	788,375	0,1030157	1,0085	103,01574	2,8524923	103,05522
Other mobile sources	Cadmium	13	12	10	1000	1000,050	211,637	-0,1034415	0,2707	-103,44154	3,8285255	103,51237
Total	Cadmium	45,176433	57,790866				666325,949					21335,19
Total uncertainties					**Year (%):**		**816,288**			**Trend (%):**		**146,066**

Chromium

Source category	Gas	Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data	Input data	Input data	Input data							
		kg	kg	%	%	%	%	%	%	%	%	%
Road Transportation	Chromium	124	182	2	1000	1000,002	792,644	0,1337023	1,0070	133,70233	2,8481173	133,73266
Other mobile sources	Chromium	57	48	10	1000	1000,050	207,368	-0,1341999	0,2634	-134,19994	3,7253877	134,25164
Total	Chromium	180,94142	229,86549				671285,541					35907,926
Total uncertainties					**Year (%):**		**819,320**			**Trend (%):**		**189,494**

Copper

Source category	Gas	Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data	Input data	Input data	Input data							
		kg	kg	%	%	%	%	%	%	%	%	%
Road Transportation	Copper	28545	41633	2	1000	1000,002	998,473	0,0023061	1,4539	2,3061464	4,1123498	4,7148417
Other mobile sources	Copper	90	64	10	1000	1000,050	1,529	-0,0023291	0,0022	-2,3290629	0,031491	2,3292757
Total	Copper	28634,753	41696,838				996950,286					27,655258
Total uncertainties					**Year (%):**		**998,474**			**Trend (%):**		**5,259**

Mercury

Source category	Gas	Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data	Input data	Input data	Input data							
		kg	kg	%	%	%	%	%	%	%	%	%
Road Transportation	Mercury	21	24	2	1000	1000,002	548,469	0,0683129	0,5648	68,312873	1,5973601	68,331546
Other mobile sources	Mercury	22	20	10	1000	1000,050	451,554	-0,0682881	0,4649	-68,288142	6,5752139	68,603964
Total	Mercury	42,860667	44,133196				504719,906					9375,704
Total uncertainties					**Year (%):**		**710,436**			**Trend (%):**		**96,828**

Nickel

Source category	Gas	Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data	Input data	Input data	Input data							
		kg	kg	%	%	%	%	%	%	%	%	%
Road Transportation	Nickel	102	140	2	1000	1000,002	73,361	0,0241178	0,0402	24,117776	0,1137325	24,118044
Other mobile sources	Nickel	3382	1770	10	1000	1000,050	926,685	-0,0238929	0,5079	-23,892936	7,1828902	24,949275
Total	Nickel	3483,9596	1909,6194				864127,384					1204,1464
Total uncertainties					**Year (%):**		**929,585**			**Trend (%):**		**34,701**

Lead

Source category	Gas	Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data	Input data	Input data	Input data							
		kg	kg	%	%	%	%	%	%	%	%	%
Road Transportation	Lead	101368	5681	2	1000	1000,002	855,794	-0,0078193	0,0549	-7,8192621	0,155181	7,8208018
Other mobile sources	Lead	2179	957	10	1000	1000,050	144,214	0,0078941	0,0092	7,8941475	0,1307456	7,8952302
Total	Lead	103547,4	6638,41				753181,966					123,4996
Total uncertainties					**Year (%):**		**867,861**			**Trend (%):**		**11,113**

Selenium

Source category	Gas	Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data	Input data	Input data	Input data							
		kg	kg	%	%	%	%	%	%	%	%	%
Road Transportation	Selenium	21	29	2	1000	1000,002	272,345	0,0919703	0,2275	91,970286	0,6434319	91,972537
Other mobile sources	Selenium	107	77	10	1000	1000,050	727,692	-0,0913538	0,6078	-91,353844	8,5956856	91,757346
Total	Selenium	127,27237	106,30988				603707,595					16878,358
Total uncertainties					**Year (%):**		**776,986**			**Trend (%):**		**129,917**

Zinc

Source category	Gas	Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data	Input data	Input data	Input data							
		kg	kg	%	%	%	%	%	%	%	%	%
Road Transportation	Zinc	18592	26572	2	1000	1000,002	937,830	0,0247407	1,3149	24,740669	3,7191009	25,018641
Other mobile sources	Zinc	1616	1762	10	1000	1000,050	62,175	-0,0249483	0,0872	-24,948334	1,2327631	24,978773
Total	Zinc	20208,723	28334,049				883390,613					1249,8715
Total uncertainties					**Year (%):**		**939,889**			**Trend (%):**		**35,354**

Dioxins

Source category	Gas	Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data	Input data	Input data	Input data							
		g dioxins	g dioxins	%	%	%	%	%	%	%	%	%
Road Transportation	Dioxins	1	0	2	1000	1000,002	354,675	-0,1213053	0,1020	-121,30525	0,2884521	121,3056
Other mobile sources	Dioxins	0	0	10	1000	1000,050	645,358	0,1219827	0,1856	121,98267	2,624182	122,01089
Total	Dioxins	1,1745721	0,3377375				542281,554					29601,706
Total uncertainties					**Year (%):**		**736,398**			**Trend (%):**		**172,051**

Flouranthene

Source category	Gas	Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data	Input data	Input data	Input data							
		kg	kg	%	%	%	%	%	%	%	%	%
Road Transportation	Flouranthene	855	876	2	1000	1000,002	770,103	0,0039371	0,7842	3,9371096	2,2181044	4,5189401
Other mobile sources	Flouranthene	261	261	10	1000	1000,050	229,910	-0,003958	0,2341	-3,9580223	3,3108644	5,1602097
Total	Flouranthene	1116,4817	1136,9489				645916,752					47,048583
Total uncertainties					**Year (%):**		**803,689**			**Trend (%):**		**6,859**

Benzo(b) flouranthene

Source category	Gas	Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data	Input data	Input data	Input data							
		kg	kg	%	%	%	%	%	%	%	%	%
Road Transportation	Benzo(b) flouranthene	69	77	2	1000	1000,002	743,152	0,0287353	0,7981	28,735286	2,2572561	28,823808
Other mobile sources	Benzo(b) flouranthene	27	27	10	1000	1000,050	256,862	-0,0288592	0,2758	-28,859187	3,9007824	29,12162
Total	Benzo(b) flouranthene	96,299788	103,41514				618253,593					1678,8807
Total uncertainties					**Year (%):**		**786,291**			**Trend (%):**		**40,974**

Benzo(k) flouranthene

Source category	Gas	Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data	Input data	Input data	Input data							
		kg	kg	%	%	%	%	%	%	%	%	%
Road Transportation	Benzo(k) flouranthene	69	85	2	1000	1000,002	800,351	0,0451723	0,9421	45,172291	2,6647514	45,250821
Other mobile sources	Benzo(k) flouranthene	21	21	10	1000	1000,050	199,661	-0,0454081	0,2350	-45,408145	3,3236769	45,529622
Total	Benzo(k) flouranthene	90,168213	106,14163				680425,585					4120,5833
Total uncertainties					**Year (%):**		**824,879**			**Trend (%):**		**64,192**

Benzo(a) pyrene

Source category	Gas	Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data	Input data	Input data	Input data							
		kg	kg	%	%	%	%	%	%	%	%	%
Road Transportation	Benzo(a) pyrene	49	64	2	1000	1000,002	856,181	0,041216	1,0665	41,216046	3,0165866	41,32629
Other mobile sources	Benzo(a) pyrene	11	11	10	1000	1000,050	143,828	-0,0414817	0,1792	-41,481682	2,5336259	41,558985
Total	Benzo(a) pyrene	59,705685	74,374108				753732,382					3435,0115
Total uncertainties					**Year (%):**		**868,178**			**Trend (%):**		**58,609**

Benzo(g,h,i) perylene

Source category	Gas	Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data	Input data	Input data	Input data							
		kg	kg	%	%	%	%	%	%	%	%	%
Road Transportation	Benzo(g,h,i) perylene	104	121	2	1000	1000,002	776,159	0,0400194	0,8567	40,019429	2,4231026	40,09272
Other mobile sources	Benzo(g,h,i) perylene	37	35	10	1000	1000,050	223,853	-0,0402107	0,2471	-40,21073	3,4940863	40,362253
Total	Benzo(g,h,i) perylene	140,72025	155,32213				652533,730					3236,5376
Total uncertainties					**Year (%):**		**807,796**			**Trend (%):**		**56,891**

Indeno(1,2,3-c,d) pyrene

Source category	Gas	Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data	Input data	Input data	Input data							
		kg	kg	%	%	%	%	%	%	%	%	%
Road Transportation	indeno(1,2,3-c,d) pyrene	47	67	2	1000	1000,002	741,215	0,1095722	0,9411	109,57219	2,6619553	109,60452
Other mobile sources	indeno(1,2,3-c,d) pyrene	25	24	10	1000	1000,050	258,799	-0,1099093	0,3286	-109,90929	4,6469564	110,00748
Total	indeno(1,2,3-c,d) pyrene	71,711905	91,054955				616376,998					24114,797
Total uncertainties					**Year (%):**		**785,097**			**Trend (%):**		**155,289**

Annex 2C - Agriculture

Table 2C.1a Nitrogen excretion rates in average, 1985 – 2011, kg N per head per year.

Livestock categories:	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Dairy Cattle	121.49	123.66	125.82	128.05	130.33	129.49	128.63	127.76	126.89	126.06	125.23	125.08	124.94	124.82
Non-Dairy Cattle	34.72	35.14	35.16	35.37	35.26	35.59	36.06	36.65	36.26	36.17	36.26	36.01	36.59	35.95
Sheep	21.04	21.04	21.04	21.04	21.04	21.18	21.33	21.47	21.61	21.76	21.90	20.11	18.32	16.53
Goats	21.04	21.04	21.04	21.04	21.04	21.18	21.33	21.47	21.61	21.76	21.90	20.11	18.32	16.53
Horses	45.07	45.07	45.07	45.07	45.07	44.15	43.23	42.31	41.40	40.48	39.56	39.56	39.56	39.56
Swine	12.88	12.94	12.72	12.66	12.35	11.84	11.50	11.16	10.45	10.48	9.70	9.92	9.67	9.63
Laying hens	0.56	0.61	0.66	0.68	0.72	0.72	0.74	0.71	0.76	0.75	0.76	0.77	0.75	0.77
Broilers	0.40	0.40	0.42	0.50	0.49	0.55	0.56	0.48	0.47	0.55	0.50	0.46	0.49	0.50
Turkeys	1.25	1.25	1.25	1.25	1.25	1.31	1.38	1.45	1.52	1.59	1.66	1.77	1.89	2.00
Other poultry	0.31	0.31	0.30	0.32	0.34	0.30	0.32	0.28	0.30	0.34	0.40	0.33	0.32	0.34
Other	5.33	5.24	5.15	5.07	4.97	4.95	4.88	4.85	4.82	4.76	4.71	4.72	4.70	4.69
N-excretion, total (M kg N/year)	257	260	262	264	266	265	263	262	259	258	256	252	249	244

Continued

Livestock categories:	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Dairy Cattle	124.60	125.31	125.31	127.16	129.79	131.56	133.30	134.66	137.58	137.98	138.12	138.63	138.47
Non-Dairy Cattle	36.43	36.39	35.86	37.45	37.29	38.86	40.88	43.33	44.79	45.53	44.81	43.15	44.11
Sheep	14.75	16.95	16.95	16.95	16.95	16.95	16.95	16.95	16.95	16.95	16.95	16.95	16.95
Goats	14.75	16.95	16.95	16.36	16.36	16.36	15.83	15.74	15.64	16.32	16.37	16.40	16.43
Horses	39.56	39.56	39.56	39.56	39.56	39.56	39.56	39.56	39.56	39.56	39.56	39.56	39.56
Swine	9.98	9.61	9.53	9.91	9.51	9.69	9.19	8.52	8.54	8.63	8.33	7.81	7.98
Laying hens	0.77	0.75	0.77	0.79	0.90	0.91	0.95	1.13	0.97	0.89	0.90	0.80	0.78
Broilers	0.48	0.45	0.48	0.49	0.58	0.68	0.58	0.47	0.53	0.63	0.40	0.47	0.44
Turkeys	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63
Other poultry	0.35	0.32	0.36	0.36	0.31	0.28	0.25	0.26	0.14	0.15	0.15	0.13	0.09
Other	4.69	4.68	4.67	4.66	4.66	5.14	5.42	5.22	5.22	5.32	5.55	5.85	5.68
N-excretion, total (M kg N/year)	241	246	245	249	251	255	257	260	265	266	265	264	265

Table 2C.1b Nitrogen excretion based on TAN, 2007-2011, kg N per head per year.

	2007	2008	2009	2010	2011
Cattle, Large breed					
Dairy cows	66.67	67.00	65.70	65.69	67.20
Bulls[a, c]	16.11	16.11	16.11	16.11	16.10
Heifers[b]	35.86	35.86	35.86	33.49	33.85
Pigs					
Sows	19.77	19.21	19.34	18.67	18.66
Fattening pigs[c]	2.04	2.03	1.96	1.87	1.86
Weaners[c]	0.31	0.33	0.31	0.29	0.29
Fur animals					
Mink	3.85	3.93	4.11	4.34	4.20

[a] 6 months to slaughter. Per produced animal.

[b] 6 months to calving.

[c] per produced animal.

Table 2C.2 Percentage distribution of housing type – dairy cattle and fattening pigs 1985 – 2011.

	1985	1986[1]	1987	1988	1989	1990	1991	1992	1993[1]	1994	1995	1996	1997	1998
Dairy cattle														
Tied-up stables	85	84	83	82	80	79	78	77	76	74	73	72	66	60
Loose-holdings with beds	14	15	15	16	17	18	18	19	20	21	21	22	26	30
Deep litter	1	2	2	2	3	3	4	4	5	5	6	6	8	10
Fattening pigs														
Full slatted floor	29	33	38	42	47	51	56	60	60	60	60	60	60	60
Partly slatted floor	30	29	27	26	24	23	21	20	21	23	24	25	26	28
Solid floor	40	36	33	29	26	22	19	15	14	12	11	9	8	6
Deep litter	1	2	2	3	3	4	4	5	5	5	5	6	6	6

Continued

	1999	2000	2001	2002	2003	2004	2005	2006	2007[1]	2008[1]	2009[1]	2010[1]	2011[1]
Dairy cattle													
Tied-up stables	60	46	40	35	26	22	20	18	17	14	12	12	10
Loose-holdings with beds	30	43	49	54	63	67	70	73	76	79	82	82	85
Deep litter	10	11	11	11	11	11	10	9	7	7	6	6	5
Fattening pigs													
Full slatted floor	60	58	57	56	55	53	53	53	53	53	54	54	53
Partly slatted floor	29	31	33	34	35	38	38	38	39	41	42	42	43
Solid floor	5	5	4	4	4	3	3	4	4	3	2	2	1
Deep litter	6	6	6	6	6	6	6	5	5	4	3	3	2

[1] Due to rounding of figures the sum can differ from 100 %.

Table 2C.3 Cover of slurry tanks 1985-2011, pct. with no or full cover

	1985-1999	2000-2001	2002	2003-2011
Cattle				
No cover	20 %	5 %	5 %	2 %
Full cover	80 %	95 %	95 %	98 %
Swine				
No cover	40 %	20 %	10 %	5 %
Full cover	60 %	80 %	90 %	95 %
Fur animals				
No cover	20 %	5 %	5 %	2 %
Full cover	80 %	95 %	95 %	98 %

Table 2C.4 Assumptions for synthetic fertiliser

EMEP/EEA fertiliser types[1]	Danish fertiliser types
Ammonium sulphate	Ammonium sulphate
Ammonium nitrate	Ammonium nitrate
Calcium ammonium nitrate	Calcium ammonium nitrate and other nitrate types
Anhydrous ammonia	Liquid ammonia
Urea	Urea
Nitrogen solutions	Other nitrogen fertiliser
Ammonium phosphates	Calcium and boron calcium nitrate
	Diammonphosphate
	Other NP fertiliser types
	Magnesium fertiliser
Other NK and NPK	NPK-fertiliser
	NK fertiliser

[1] EMEP/EEA emission inventory guidebook 2009, Table 3-2 Emission factors for total NH_3 emissions from soils due to N fertiliser volatilization

Table 2C.5 Emissions of pollutants from field burning of agricultural wastes, 1985-2011.

	Unit	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
NO_X	Gg	1.53	1.32	1.25	0.93	0.98	0.08	0.08	0.08	0.08	0.08	0.09	0.09	0.10	0.12
CO	Gg	37.58	32.29	30.67	22.93	24.13	1.89	1.97	1.88	2.06	1.98	2.24	2.23	2.37	2.98
NMVOC	Gg	4.02	3.45	3.28	2.45	2.58	0.20	0.21	0.20	0.22	0.21	0.24	0.24	0.25	0.32
SO_2	Gg	0.19	0.16	0.16	0.12	0.12	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02
NH_3	Gg	1.53	1.32	1.25	0.93	0.98	0.08	0.08	0.08	0.08	0.08	0.09	0.09	0.10	0.12
TSP	Mg	3.70	3.18	3.02	2.26	2.38	0.19	0.19	0.19	0.20	0.20	0.22	0.22	0.23	0.29
PM_{10}	Mg	3.70	3.18	3.02	2.26	2.38	0.19	0.19	0.19	0.20	0.20	0.22	0.22	0.23	0.29
$PM_{2.5}$	Mg	3.51	3.01	2.86	2.14	2.25	0.18	0.18	0.18	0.19	0.19	0.21	0.21	0.22	0.28
Pb	Mg	0.55	0.47	0.45	0.34	0.35	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.04
Cd	Mg	0.03	0.03	0.03	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hg	Mg	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
As	Mg	0.04	0.03	0.03	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cr	Mg	0.14	0.12	0.11	0.09	0.09	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Cu	Mg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ni	Mg	0.11	0.10	0.09	0.07	0.07	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Se	Mg	0.02	0.02	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Zn	Mg	0.02	0.02	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DIOX	g I-Teq	0.38	0.32	0.31	0.23	0.24	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03
Benzo(a)pyrene	Mg	1.78	1.53	1.45	1.08	1.14	0.09	0.09	0.09	0.10	0.09	0.11	0.11	0.11	0.14
Benzo(b)fluoranthene	Mg	1.74	1.50	1.42	1.06	1.12	0.09	0.09	0.09	0.10	0.09	0.10	0.10	0.11	0.14
Benzo(k)fluoranthene	Mg	0.68	0.59	0.56	0.42	0.44	0.03	0.04	0.03	0.04	0.04	0.04	0.04	0.04	0.05
Indeno(1,2,3-cd)pyrene	Mg	0.65	0.56	0.53	0.40	0.42	0.03	0.03	0.03	0.04	0.03	0.04	0.04	0.04	0.05

Table 2C.5 Emissions of pollutants from field burning of agricultural wastes, 1985-2011 - Continued

Continued	Unit	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
NO_X	Gg	0.12	0.11	0.12	0.10	0.12	0.13	0.13	0.13	0.11	0.10	0.12	0.09	0.09
CO	Gg	2.83	2.79	2.93	2.44	2.93	3.07	3.12	3.16	2.73	2.53	2.98	2.17	2.15
NMVOC	Gg	0.30	0.30	0.31	0.26	0.31	0.33	0.33	0.34	0.29	0.27	0.32	0.23	0.23
SO_2	Gg	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.01	0.01	0.02	0.01	0.01
NH_3	Gg	0.12	0.11	0.12	0.10	0.12	0.13	0.13	0.13	0.11	0.10	0.12	0.09	0.09
TSP	Mg	0.28	0.27	0.29	0.24	0.29	0.30	0.31	0.31	0.27	0.25	0.29	0.21	0.21
PM_{10}	Mg	0.28	0.27	0.29	0.24	0.29	0.30	0.31	0.31	0.27	0.25	0.29	0.21	0.21
$PM_{2.5}$	Mg	0.26	0.26	0.27	0.23	0.27	0.29	0.29	0.30	0.26	0.24	0.28	0.20	0.20
Pb	Mg	0.04	0.04	0.04	0.04	0.04	0.05	0.05	0.05	0.04	0.04	0.04	0.03	0.03
Cd	Mg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hg	Mg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
As	Mg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cr	Mg	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Cu	Mg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ni	Mg	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Se	Mg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Zn	Mg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DIOX	g I-Teq	0.03	0.03	0.03	0.02	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.02	0.02
Benzo(a)pyrene	Mg	0.13	0.13	0.14	0.12	0.14	0.15	0.15	0.15	0.13	0.12	0.14	0.10	0.10
Benzo(b)fluoranthene	Mg	0.13	0.13	0.14	0.11	0.14	0.14	0.14	0.15	0.13	0.12	0.14	0.10	0.10
Benzo(k)fluoranthene	Mg	0.05	0.05	0.05	0.04	0.05	0.06	0.06	0.06	0.05	0.05	0.05	0.04	0.04
Indeno(1,2,3-cd)pyrene	Mg	0.05	0.05	0.05	0.04	0.05	0.05	0.05	0.05	0.05	0.04	0.05	0.04	0.04

Table 2C.6: Activity data for field burning of agricultural wastes, 1985-2011, tonnes.

	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Straw from grass seed production	37 230	40 539	43 783	48 221	52 588	35 012	36 986	36 969	39 964	38 579	43 688	43 482	46 193	59 797
Bales of wet straw	796 728	676 008	636 901	460 594	482 902	7 032	6 727	4 826	5 672	5 429	6 118	6 044	6 309	6 298

Continued

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Straw from grass seed production	56 927	55 748	58 969	48 400	59 583	62 657	63 626	64 911	55 553	50 552	59 852	42 755	42 296
Bales of wet straw	5 859	6 100	6 027	5 667	5 414	5 488	5 524	5 239	5 146	5 662	6 280	5 469	5 436

References

EMEP/EEA Air Pollutant Emission Inventory Guidebook, 2009: Available at: http://www.eea.europa.eu/publications/emep-eea-emission-inventory-guidebook-2009 (03-12-2012)

Annex 2D - Waste

Annex 2D-1 Human cremation activity data, 1980-2011

Table 2D-1 shows the development in total number of nationally deceased persons, number of cremations and the development in the fraction of cremated corpses from the total number of deceased. Data for the total number of nationally deceased persons are collected from Statistics Denmark, 2012. The data describing the number of cremations and the cremation fraction in the period 1984-2011 are gathered from the Association of Danish Crematoria (DKL, 2012). By assuming that the development of the cremation fraction is constant back to the year 1980, the fraction from 1980-1983 can be calculated from the trend of the development of 1984-2009. An estimation of the number of yearly cremations from 1980-1983 is then found by multiplying the calculated cremation fraction with the number of nationally deceased persons.

Table 2D-1 Data human cremations (DKL 2012, Statistics Denmark 2012).

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Nationally deceased	55939	56359	55368	57156	57109	58378	58100	58136	58984	59397
Cremations	33986	34556	34256	35681	34811	36705	36805	37652	38711	39231
Cremation fraction, %	60.8	61.3	61.9	62.4	61.0	62.8	62.8	64.7	65.6	66.1
Continued	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Nationally deceased	60926	59581	60821	62809	61099	63127	61043	59898	58453	59179
Cremations	40991	40666	41455	43194	42762	43847	43262	42891	41660	42299
Cremation fraction, %	67.3	68.3	68.2	68.8	70.0	69.5	70.8	71.6	69.1	74.4
Continued	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Nationally deceased	57998	58355	58610	57574	55806	54962	55477	55604	54591	54872
Cremations	41651	41707	42539	41997	41555	40758	41233	41766	41788	42408
Cremation fraction, %	71.8	71.5	72.6	72.9	74.5	74.2	74.3	75.1	76.6	77.3
Continued	2010	2011								
Nationally deceased	54368	52516								
Cremations	42050	41248								
Cremation fraction, %	77.3	78.6								

Annex 2D-2 Animal cremation activity data, 1980-2011

Table 2D-2 Activity data. Source: direct contact with all Danish pet crematoria.

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Crematorium A, Mg	-	-	-	-	-	-	-	-	-	-
Crematorium B, Mg	50	60	70	80	90	100	110	120	130	140
Crematorium C, Mg	-	-	-	-	-	-	-	-	-	-
Total, Mg	50	60	70	80	90	100	110	120	130	140
Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Crematorium A, Mg	-	-	-	-	-	-	-	-	-	-
Crematorium B, Mg	150	160	170	180	190	200	210	220	235	368
Crematorium C, Mg	-	-	-	-	-	-	-	-	-	-
Total, Mg	150	160	170	180	190	200	210	220	235	368
Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Crematorium A, Mg	-	-	-	-	-	-	300	450	450	450
Crematorium B, Mg	443	452	451	462	571	762	798	802	848	853
Crematorium C, Mg	-	-	-	-	-	-	18	32	40	36
Total, Mg	443	452	451	462	571	762	1116	1284	1338	1339

Year	2010	2011
Crematorium A, Mg	475	220
Crematorium B, Mg	934	959
Crematorium C, Mg	40	40
Total, Mg	1449	1219

Annex 2D-3 Emissions from human cremation, 1980-2011

Table 2D-3a Total national emissions from incineration of corpses – 1980 to 1989.

	Unit	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
SO_2	Mg	3.83	3.90	3.86	4.02	3.92	4.14	4.15	4.25	4.36	4.42
NO_X	Mg	28.04	28.51	28.26	29.44	28.72	30.28	30.36	31.06	31.94	32.37
NMVOC	Mg	0.442	0.449	0.445	0.464	0.453	0.477	0.478	0.489	0.503	0.510
CO	Mg	0.340	0.346	0.343	0.357	0.348	0.367	0.368	0.377	0.387	0.392
TSP	Mg	1.31	1.33	1.32	1.38	1.34	1.42	1.42	1.45	1.49	1.51
PM_{10}	Mg	1.18	1.20	1.19	1.24	1.21	1.27	1.28	1.31	1.34	1.36
$PM_{2.5}$	Mg	1.18	1.20	1.19	1.24	1.21	1.27	1.28	1.31	1.34	1.36
As	kg	0.46	0.47	0.47	0.49	0.47	0.50	0.50	0.51	0.53	0.53
Cd	kg	0.17	0.17	0.17	0.18	0.18	0.18	0.19	0.19	0.19	0.20
Cr	kg	0.46	0.47	0.46	0.48	0.47	0.50	0.50	0.51	0.52	0.53
Cu	kg	0.42	0.43	0.43	0.44	0.43	0.46	0.46	0.47	0.48	0.49
Hg	kg	38.03	38.67	38.33	39.93	38.95	41.07	41.18	42.13	43.32	43.90
Ni	kg	0.59	0.60	0.59	0.62	0.60	0.64	0.64	0.65	0.67	0.68
Pb	kg	1.02	1.04	1.03	1.07	1.05	1.10	1.11	1.13	1.16	1.18
Se	kg	0.67	0.68	0.68	0.71	0.69	0.73	0.73	0.74	0.77	0.78
Zn	kg	5.44	5.53	5.49	5.71	5.57	5.88	5.89	6.03	6.20	6.28
HCB	g	5.15	5.24	5.19	5.41	5.28	5.56	5.58	5.71	5.87	5.95
PCDD/F	mg	11.90	12.09	11.99	12.49	12.18	12.85	12.88	13.18	13.55	13.73
benzo(b)flouranthene	g	0.25	0.25	0.25	0.26	0.25	0.26	0.27	0.27	0.28	0.28
benzo(k)flouranthene	g	0.22	0.22	0.22	0.23	0.22	0.24	0.24	0.24	0.25	0.25
benzo(a)pyrene	g	0.45	0.46	0.45	0.47	0.46	0.48	0.49	0.50	0.51	0.52
indeno(1.2.3-c-d)pyrene	g	0.24	0.24	0.24	0.25	0.24	0.26	0.26	0.26	0.27	0.27
PCB	g	14.05	14.29	14.17	14.76	14.40	15.18	15.22	15.57	16.01	16.22

Table 2D-3b Total national emissions from incineration of corpses – 1990 to 1999.

	Unit	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
SO_2	Mg	4.62	4.59	4.67	4.87	4.82	4.94	4.88	4.84	4.70	4.77
NO_X	Mg	33.82	33.55	34.20	35.64	35.28	36.17	35.69	35.39	34.37	34.90
NMVOC	Mg	0.533	0.529	0.539	0.562	0.556	0.570	0.562	0.558	0.542	0.550
CO	Mg	0.410	0.407	0.415	0.432	0.428	0.438	0.433	0.429	0.417	0.423
TSP	Mg	1.58	1.57	1.60	1.67	1.65	1.69	1.67	1.65	1.61	1.63
PM_{10}	Mg	1.42	1.41	1.44	1.50	1.48	1.52	1.50	1.49	1.45	1.47
$PM_{2.5}$	Mg	1.42	1.41	1.44	1.50	1.48	1.52	1.50	1.49	1.45	1.47
As	kg	0.56	0.55	0.56	0.59	0.58	0.60	0.59	0.58	0.57	0.58
Cd	kg	0.21	0.20	0.21	0.22	0.22	0.22	0.22	0.22	0.21	0.21
Cr	kg	0.56	0.55	0.56	0.59	0.58	0.59	0.59	0.58	0.56	0.57
Cu	kg	0.51	0.51	0.52	0.54	0.53	0.55	0.54	0.53	0.52	0.53
Hg	kg	45.87	45.51	46.39	48.33	47.85	49.06	48.41	48.00	46.62	47.33
Ni	kg	0.71	0.70	0.72	0.75	0.74	0.76	0.75	0.74	0.72	0.73
Pb	kg	1.23	1.22	1.24	1.30	1.28	1.32	1.30	1.29	1.25	1.27
Se	kg	0.81	0.80	0.82	0.85	0.85	0.87	0.86	0.85	0.82	0.84
Zn	kg	6.56	6.51	6.64	6.92	6.85	7.02	6.93	6.87	6.67	6.77
HCB	g	6.21	6.16	6.28	6.55	6.48	6.65	6.56	6.50	6.31	6.41
PCDD/F	mg	14.35	14.23	14.51	15.12	14.97	15.35	15.14	15.01	14.58	14.80
benzo(b)flouranthene	g	0.30	0.29	0.30	0.31	0.31	0.32	0.31	0.31	0.30	0.31
benzo(k)flouranthene	g	0.26	0.26	0.27	0.28	0.28	0.28	0.28	0.28	0.27	0.27
benzo(a)pyrene	g	0.54	0.54	0.55	0.57	0.56	0.58	0.57	0.57	0.55	0.56
indeno(1.2.3-c-d)pyrene	g	0.29	0.28	0.29	0.30	0.30	0.31	0.30	0.30	0.29	0.30
PCB	g	16.95	16.82	17.14	17.86	17.68	18.13	17.89	17.74	17.23	17.49

Table 2D-3c Total national emissions from incineration of corpses – 2000 to 2009.

	Unit	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
SO_2	Mg	4.70	4.70	4.80	4.74	4.69	4.60	4.65	4.71	4.71	4.78
NO_X	Mg	34.36	34.41	35.09	34.65	34.28	33.63	34.02	34.46	34.48	34.99
NMVOC	Mg	0.541	0.542	0.553	0.546	0.540	0.530	0.536	0.543	0.543	0.551
CO	Mg	0.417	0.417	0.425	0.420	0.416	0.408	0.412	0.418	0.418	0.424
TSP	Mg	1.61	1.61	1.64	1.62	1.60	1.57	1.59	1.61	1.61	1.64
PM_{10}	Mg	1.45	1.45	1.48	1.46	1.44	1.41	1.43	1.45	1.45	1.47
$PM_{2.5}$	Mg	1.45	1.45	1.48	1.46	1.44	1.41	1.43	1.45	1.45	1.47
As	kg	0.57	0.57	0.58	0.57	0.57	0.55	0.56	0.57	0.57	0.58
Cd	kg	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21
Cr	kg	0.56	0.57	0.58	0.57	0.56	0.55	0.56	0.57	0.57	0.58
Cu	kg	0.52	0.52	0.53	0.52	0.52	0.51	0.51	0.52	0.52	0.53
Hg	kg	46.61	46.67	47.60	46.99	46.50	45.61	46.14	46.74	46.76	47.45
Ni	kg	0.72	0.72	0.74	0.73	0.72	0.71	0.71	0.72	0.72	0.73
Pb	kg	1.25	1.25	1.28	1.26	1.25	1.22	1.24	1.25	1.25	1.27
Se	kg	0.82	0.82	0.84	0.83	0.82	0.81	0.82	0.83	0.83	0.84
Zn	kg	6.67	6.68	6.81	6.72	6.65	6.53	6.60	6.69	6.69	6.79
HCB	g	6.31	6.32	6.45	6.37	6.30	6.18	6.25	6.33	6.33	6.43
PCDD/F	mg	14.58	14.60	14.89	14.70	14.54	14.27	14.43	14.62	14.63	14.84
benzo(b)flouranthene	g	0.30	0.30	0.31	0.30	0.30	0.29	0.30	0.30	0.30	0.31
benzo(k)flouranthene	g	0.27	0.27	0.27	0.27	0.27	0.26	0.27	0.27	0.27	0.27
benzo(a)pyrene	g	0.55	0.55	0.56	0.55	0.55	0.54	0.54	0.55	0.55	0.56
indeno(1.2.3-c-d)pyrene	g	0.29	0.29	0.30	0.29	0.29	0.28	0.29	0.29	0.29	0.30
PCB	g	17.22	17.25	17.59	17.37	17.18	16.86	17.05	17.27	17.28	17.54

Table 2D-3d Total national emissions from incineration of corpses – 2010 to 2011.

	Unit	2010	2011
SO_2	Mg	4.74	4.65
NO_X	Mg	34.69	34.03
NMVOC	Mg	0.547	0.536
CO	Mg	0.421	0.412
TSP	Mg	1.62	0.02
PM_{10}	Mg	1.46	0.01
$PM_{2.5}$	Mg	1.46	0.01
As	kg	0.57	0.01
Cd	kg	0.21	0.004
Cr	kg	0.57	0.01
Cu	kg	0.52	0.01
Hg	kg	47.05	0.46
Ni	kg	0.73	0.01
Pb	kg	1.26	0.02
Se	kg	0.83	0.02
Zn	kg	6.73	0.13
HCB	g	6.37	6.25
PCDD/F	mg	14.72	3.61
benzo(b)flouranthene	g	0.30	0.30
benzo(k)flouranthene	g	0.27	0.27
benzo(a)pyrene	g	0.56	0.54
indeno(1.2.3-c-d)pyrene	g	0.29	0.29
PCB	g	17.39	17.06

Annex 2D-4 Emissions from animal cremation, 1980-2011

Table 2D-4a Total national emissions from incineration of carcasses – 1980 to 1989.

Pollutant name	unit	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
SO_2	Mg	0.09	0.10	0.12	0.14	0.16	0.17	0.19	0.21	0.23	0.24
NO_X	Mg	0.63	0.76	0.89	1.02	1.14	1.27	1.40	1.52	1.65	1.78
NMVOC	Mg	0.10	0.12	0.14	0.16	0.18	0.20	0.22	0.24	0.26	0.28
CO	Mg	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.02
NH_3	Mg	0.10	0.11	0.13	0.15	0.17	0.19	0.21	0.23	0.25	0.27
TSP	Mg	0.11	0.13	0.15	0.17	0.20	0.22	0.24	0.26	0.28	0.31
PM_{10}	Mg	0.08	0.09	0.11	0.12	0.14	0.15	0.17	0.18	0.20	0.21
$PM_{2.5}$	Mg	0.07	0.08	0.09	0.10	0.12	0.13	0.14	0.16	0.17	0.18
As	kg	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.03	0.03	0.03
Cd	kg	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Cr	kg	0.004	0.004	0.005	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Cu	kg	0.001	0.001	0.001	0.002	0.002	0.002	0.002	0.002	0.003	0.003
Ni	kg	0.003	0.004	0.004	0.005	0.01	0.01	0.01	0.01	0.01	0.01
Pb	kg	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.03
Se	kg	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.04	0.04	0.04
Zn	kg	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.03
HCB	g	0.12	0.14	0.16	0.19	0.21	0.23	0.26	0.28	0.30	0.33
PCDD/F	mg	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20	1.30	1.40
benzo(b)flouranthene	g	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02
benzo(k)flouranthene	g	0.005	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
benzo(a)pyrene	g	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.03	0.03
indeno(1,2,3-c-d)pyrene	g	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
PCB	g	0.32	0.38	0.45	0.51	0.57	0.64	0.70	0.76	0.83	0.89

Table 2D-4b Total national emissions from incineration of carcasses – 1990 to 1999.

	unit	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
SO_2	Mg	0.26	0.28	0.29	0.31	0.33	0.35	0.36	0.38	0.41	0.64
NO_X	Mg	1.90	2.03	2.16	2.28	2.41	2.54	2.67	2.79	2.98	4.67
NMVOC	Mg	0.30	0.32	0.34	0.36	0.38	0.40	0.42	0.44	0.47	0.74
CO	Mg	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.03	0.04	0.06
NH_3	Mg	0.29	0.30	0.32	0.34	0.36	0.38	0.40	0.42	0.45	0.70
TSP	Mg	0.33	0.35	0.37	0.39	0.41	0.44	0.46	0.48	0.51	0.80
PM_{10}	Mg	0.23	0.24	0.26	0.28	0.29	0.31	0.32	0.34	0.36	0.56
$PM_{2.5}$	Mg	0.20	0.21	0.22	0.24	0.25	0.26	0.28	0.29	0.31	0.48
As	kg	0.03	0.03	0.04	0.04	0.04	0.04	0.04	0.05	0.05	0.08
Cd	kg	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.004
Cr	kg	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.03
Cu	kg	0.003	0.003	0.003	0.004	0.004	0.004	0.004	0.004	0.005	0.01
Ni	kg	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02
Pb	kg	0.03	0.03	0.03	0.03	0.03	0.04	0.04	0.04	0.04	0.07
Se	kg	0.05	0.05	0.05	0.05	0.06	0.06	0.06	0.07	0.07	0.11
Zn	kg	0.03	0.03	0.03	0.03	0.04	0.04	0.04	0.04	0.04	0.07
HCB	g	0.35	0.37	0.40	0.42	0.44	0.47	0.49	0.51	0.55	0.86
PCDD/F	mg	1.50	1.60	1.70	1.80	1.90	2.00	2.10	2.20	2.35	3.68
benzo(b)flouranthene	g	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.04
benzo(k)flouranthene	g	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.04
benzo(a)pyrene	g	0.03	0.03	0.03	0.04	0.04	0.04	0.04	0.04	0.05	0.07
indeno(1,2,3-c-d)pyrene	g	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.04
PCB	g	0.95	1.02	1.08	1.15	1.21	1.27	1.34	1.40	1.49	2.34

Table 2D-4c Total national emissions from incineration of carcasses – 2000 to 2009.

	unit	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
SO_2	Mg	0.77	0.78	0.78	0.80	0.99	1.32	1.94	2.23	2.32	2.32
NO_X	Mg	5.63	5.74	5.73	5.86	7.25	9.68	14.17	16.30	16.99	16.99
NMVOC	Mg	0.89	0.90	0.90	0.92	1.14	1.52	2.23	2.57	2.68	2.68
CO	Mg	0.07	0.07	0.07	0.07	0.09	0.12	0.17	0.20	0.21	0.21
NH_3	Mg	0.84	0.86	0.86	0.88	1.09	1.45	2.12	2.44	2.54	2.54
TSP	Mg	0.97	0.99	0.98	1.01	1.25	1.66	2.43	2.80	2.92	2.92
PM_{10}	Mg	0.68	0.69	0.69	0.71	0.87	1.17	1.71	1.96	2.05	2.05
$PM_{2.5}$	Mg	0.58	0.59	0.59	0.60	0.75	1.00	1.46	1.68	1.75	1.75
As	kg	0.09	0.09	0.09	0.10	0.12	0.16	0.23	0.27	0.28	0.28
Cd	kg	0.004	0.005	0.005	0.005	0.01	0.01	0.01	0.01	0.01	0.01
Cr	kg	0.03	0.03	0.03	0.03	0.04	0.05	0.08	0.09	0.09	0.09
Cu	kg	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.03	0.03	0.03
Ni	kg	0.03	0.03	0.03	0.03	0.03	0.05	0.07	0.08	0.08	0.08
Pb	kg	0.08	0.08	0.08	0.08	0.10	0.14	0.20	0.23	0.24	0.24
Se	kg	0.13	0.14	0.14	0.14	0.17	0.23	0.34	0.39	0.41	0.41
Zn	kg	0.08	0.09	0.09	0.09	0.11	0.14	0.21	0.24	0.25	0.25
HCB	g	1.03	1.05	1.05	1.08	1.33	1.78	2.60	2.99	3.12	3.12
PCDD/F	mg	4.43	4.52	4.51	4.62	5.71	7.62	11.16	12.84	13.38	13.39
benzo(b)flouranthene	g	0.05	0.05	0.05	0.05	0.06	0.08	0.12	0.14	0.15	0.15
benzo(k)flouranthene	g	0.04	0.04	0.04	0.05	0.06	0.08	0.11	0.13	0.13	0.13
benzo(a)pyrene	g	0.09	0.09	0.09	0.09	0.12	0.15	0.23	0.26	0.27	0.27
indeno(1,2,3-c-d)pyrene	g	0.05	0.05	0.05	0.05	0.06	0.08	0.12	0.14	0.14	0.14
PCB	g	2.82	2.88	2.87	2.94	3.63	4.85	7.10	8.17	8.51	8.52

Table 2D-4d Total national emissions from incineration of carcasses – 2010 to 2011.

	unit	2010	2011
SO_2	Mg	2.51	2.11
NO_X	Mg	18.39	15.47
NMVOC	Mg	2.90	2.44
CO	Mg	0.22	0.19
NH_3	Mg	2.75	2.32
TSP	Mg	3.16	2.66
PM_{10}	Mg	2.22	1.86
$PM_{2.5}$	Mg	1.90	1.60
As	kg	0.30	0.25
Cd	kg	0.01	0.01
Cr	kg	0.10	0.09
Cu	kg	0.03	0.02
Ni	kg	0.09	0.07
Pb	kg	0.26	0.22
Se	kg	0.44	0.37
Zn	kg	0.28	0.23
HCB	g	3.38	2.84
PCDD/F	mg	14.49	12.19
benzo(b)flouranthene	g	0.16	0.14
benzo(k)flouranthene	g	0.14	0.12
benzo(a)pyrene	g	0.29	0.25
indeno(1,2,3-c-d)pyrene	g	0.16	0.13
PCB	g	9.22	7.75

Annex 2D-5 Compost production activity data, 1985-2011

Table 2D-5 Activity data composting, Gg.

	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Composting of garden and park waste	130	161	193	225	256	288	320	351	383	414
Composting of organic waste from households and other sources	5	7	9	11	13	16	19	23	26	29
Composting of sludge	NAV	NAV	NAV	NAV	NAV	NAV	NAV	NAV	NAV	NAV
Home composting of garden and vegetable food waste	19	19	19	20	20	20	20	20	20	21
Total	154	187	221	256	289	324	359	394	429	464
Continued	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Composting of garden and park waste	376	452	528	551	634	677	630	685	716	682
Composting of organic waste from households and other sources	40	38	47	43	49	47	52	63	66	53
Composting of sludge	7	6	7	57	134	218	211	348	336	53
Home composting of garden and vegetable food waste	21	21	21	21	21	21	21	22	22	22
Total	444	517	603	672	838	963	914	1118	1140	810
Continued	2005	2006	2007	2008	2009	2010	2011			
Composting of garden and park waste	737	782	876	795	847	877	901			
Composting of organic waste from households and other sources	45	48	44	46	70	58	59			
Composting of sludge	50	67	91	94	107	120	132			
Home composting of garden and vegetable food waste	22	22	22	22	23	23	23			
Total	854	919	1033	957	1047	1078	1115			

NAV = Not available.

Annex 2D-6 Emissions from composting, 1985-2011

Table 2D-6 National emissions from composting. Mg.

	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
CO	74.6	92.0	110.0	128.1	145.5	163.5	181.5	198.9	216.9	234.5
NH_3	99.3	120.4	142.2	164.6	185.6	207.7	229.8	251.5	273.5	295.6
Continued	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
CO	213.1	255.8	298.6	311.5	358.2	382.4	356.0	387.0	404.4	385.3
NH_3	274.1	323.6	376.6	391.6	450.0	479.6	450.0	493.4	514.5	481.8
Continued	2005	2006	2007	2008	2009	2010	2011			
CO	416.2	441.5	494.4	448.8	478.2	495.0	508.5			
NH_3	515.5	546.5	607.8	555.1	597.8	614.2	630.6			

Annex 2D-7 Occurrence of all fires, building and vehicle fires, 1980-2011

Table 2D-7 Occurrence of all fires and building fires.

Year	All fires	Building fires	Vehicle fires
1980	17 751	10 621	3497
1981	17 751	10 621	3497
1982	17 751	10 621	3497
1983	17 751	10 621	3497
1984	17 751	10 621	3497
1985	17 751	10 621	3497
1986	17 751	10 621	3497
1987	17 751	10 621	3497
1988	17 751	10 621	3497
1989	18 784	11 239	3700
1990	17 025	10 187	3354
1991	17 589	10 524	3465
1992	19 124	11 443	3767
1993	16 803	10 054	3310
1994	16 918	10 123	3333
1995	19 543	11 694	3850
1996	19 756	11 821	3892
1997	18 236	10 911	3592
1998	16 320	9 765	3215
1999	17 538	10 494	3455
2000	17 174	10 276	3383
2001	16 894	10 108	3328
2002	16 362	9 790	3223
2003	18 443	11 035	3633
2004	15 927	9 530	3137
2005	16 551	9 903	3260
2006	16 965	10 151	3342
2007	18 263	12 527	3223
2008	20 643	12 124	4068
2009	18 930	10 652	3930
2010	16 728	9 325	3459
2011	16 157	11 447	3255

Annex 2D-8 Accidental building fires full scale equivalent activity data, 1980-2011

Table 2D-8 Accidental building fires full scale equivalent activity data, 1980-2011

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Container fires	782	782	782	782	782	782	782	782	782	827
Detached house fires	810	810	810	810	810	810	810	810	810	857
Undetached house fires	240	240	240	240	240	240	240	240	240	254
Apartment building fires	383	383	383	383	383	383	383	383	383	405
Industry building fire	334	334	334	334	334	334	334	334	334	353
Additional building fires	455	455	455	455	455	455	455	455	455	482
Continued	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Container fires	750	775	842	740	745	861	870	803	719	772
Detached house fires	777	802	873	767	772	892	901	832	745	800
Undetached house fires	231	238	259	228	229	265	268	247	221	237
Apartment building fires	367	379	412	362	365	421	426	393	352	378
Industry building fire	320	331	360	316	318	368	372	343	307	330
Additional building fires	437	451	490	431	434	501	507	468	418	450
Continued	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Container fires	756	744	721	812	701	729	747	958	962	799
Detached house fires	784	771	747	841	727	755	774	757	886	876
Undetached house fires	233	229	222	250	216	224	230	343	278	208
Apartment building fires	370	364	353	398	343	357	366	405	433	413
Industry building fire	323	318	308	347	300	311	319	435	346	344
Additional building fires	440	433	420	473	408	424	435	483	523	466
Continued	2010	2011								
Container fires	594	729								
Detached house fires	833	818								
Undetached house fires	194	206								
Apartment building fires	348	362								
Industry building fire	281	334								
Additional building fires	429	740								

Annex 2D-9 Emission factors for accidental detached house fires, 1980-2010

Table 2D-9a Emission factors for accidental detached building fires, 1980-1989.

Detached houses		1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
SO_2	kg	247.1	247.1	247.2	247.3	247.3	247.9	249.1	250.2	250.9	251.0
NO_X	kg	18.5	18.5	18.5	18.5	18.5	18.5	18.6	18.7	18.8	18.8
NMVOC	kg	92.3	92.3	92.4	92.4	92.4	92.6	93.1	93.5	93.8	93.8
CO	kg	258.5	258.5	258.6	258.7	258.7	259.4	260.6	261.8	262.5	262.6
TSP	kg	143.8	143.8	143.8	143.8	143.8	143.8	143.8	143.8	143.8	143.8
PM_{10}	kg	143.8	143.8	143.8	143.8	143.8	143.8	143.8	143.8	143.8	143.8
$PM_{2.5}$	kg	143.8	143.8	143.8	143.8	143.8	143.8	143.8	143.8	143.8	143.8
As	g	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Cd	g	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Cr	g	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3
Cu	g	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Hg	g	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Pb	g	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
PCDD/F	mg	3.2	3.2	3.2	3.2	3.2	3.2	3.3	3.3	3.3	3.3
Benzo[b]fluoranthene	g	11.7	11.7	11.7	11.7	11.7	11.7	11.8	11.8	11.9	11.9
Benzo[k]fluoranthene	g	4.1	4.1	4.1	4.1	4.1	4.1	4.2	4.2	4.2	4.2
Benzo[a]pyrene	g	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.5	7.5	7.5
Indeno[1,2,3-cd]pyrene	g	8.0	8.0	8.0	8.0	8.0	8.0	8.1	8.1	8.1	8.1

Table 2D-9b Emission factors for accidental detached building fires, 1990-1999.

Detached houses		1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
SO_2	kg	250.5	249.8	249.1	249.7	249.0	248.5	248.1	248.9	248.4	248.7
NO_X	kg	18.7	18.7	18.6	18.7	18.6	18.6	18.5	18.6	18.6	18.6
NMVOC	kg	93.6	93.3	93.1	93.3	93.0	92.9	92.7	93.0	92.8	92.9
CO	kg	262.0	261.3	260.6	261.2	260.5	260.0	259.6	260.4	259.8	260.1
TSP	kg	143.8	143.8	143.8	143.8	143.8	143.8	143.8	143.8	143.8	143.8
PM_{10}	kg	143.8	143.8	143.8	143.8	143.8	143.8	143.8	143.8	143.8	143.8
$PM_{2.5}$	kg	143.8	143.8	143.8	143.8	143.8	143.8	143.8	143.8	143.8	143.8
As	g	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Cd	g	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Cr	g	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3
Cu	g	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Hg	g	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Pb	g	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
PCDD/F	mg	3.3	3.3	3.3	3.3	3.3	3.2	3.2	3.3	3.2	3.3
Benzo[b]fluoranthene	g	11.9	11.8	11.8	11.8	11.8	11.8	11.7	11.8	11.8	11.8
Benzo[k]fluoranthene	g	4.2	4.2	4.2	4.2	4.2	4.1	4.1	4.2	4.1	4.1
Benzo[a]pyrene	g	7.5	7.5	7.4	7.5	7.4	7.4	7.4	7.4	7.4	7.4
Indeno[1,2,3-cd]pyrene	g	8.1	8.1	8.1	8.1	8.1	8.0	8.0	8.1	8.0	8.1

Table 2D-9c Emission factors for accidental detached building fires, 2000-2009.

Detached houses		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
SO_2	kg	250.7	256.2	258.4	260.0	261.0	260.3	261.9	256.9	258.2	259.5
NO_X	kg	18.7	19.1	19.3	19.4	19.5	19.4	19.6	19.2	19.3	19.4
NMVOC	kg	93.7	95.7	96.5	97.2	97.5	97.2	97.8	96.0	96.5	96.9
CO	kg	262.3	268.0	270.3	272.0	273.1	272.3	274.0	268.7	270.1	271.4
TSP	kg	143.8	143.8	143.8	143.8	143.8	143.8	143.8	143.8	143.8	143.8
PM_{10}	kg	143.8	143.8	143.8	143.8	143.8	143.8	143.8	143.8	143.8	143.8
$PM_{2.5}$	kg	143.8	143.8	143.8	143.8	143.8	143.8	143.8	143.8	143.8	143.8
As	g	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Cd	g	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Cr	g	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3
Cu	g	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Hg	g	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Pb	g	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
PCDD/F	mg	3.3	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4
Benzo[b]fluoranthene	g	11.9	12.1	12.2	12.3	12.4	12.3	12.4	12.2	12.2	12.3
Benzo[k]fluoranthene	g	4.2	4.3	4.3	4.3	4.4	4.3	4.4	4.3	4.3	4.3
Benzo[a]pyrene	g	7.5	7.7	7.7	7.8	7.8	7.8	7.8	7.7	7.7	7.8
Indeno[1,2,3-cd]pyrene	g	8.1	8.3	8.4	8.4	8.5	8.4	8.5	8.3	8.4	8.4

Table 2D-9d Emission factors for accidental detached building fires, 2010.

Detached houses		2010
SO_2	kg	261.5
NO_x	kg	19.5
NMVOC	kg	97.7
CO	kg	273.6
TSP	kg	143.8
PM_{10}	kg	143.8
$PM_{2.5}$	kg	143.8
As	g	1.35
Cd	g	0.85
Cr	g	1.29
Cu	g	2.99
Hg	g	0.85
Pb	g	0.42
PCDD/F	mg	3.4
Benzo[b]fluoranthene	g	12.4
Benzo[k]fluoranthene	g	4.4
Benzo[a]pyrene	g	7.8
Indeno[1.2.3-cd]pyrene	g	8.5

Annex 2D-10 Emission factors for accidental undetached house fires, 1980-2010

Table 2D-10a Emission factors for accidental undetached building fires, 1980-1989.

Undetached houses		1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
SO_2	kg	208.2	208.3	208.4	208.1	208.1	208.0	207.8	207.6	207.4	207.0
NO_X	kg	15.6	15.6	15.6	15.6	15.5	15.5	15.5	15.5	15.5	15.5
NMVOC	kg	77.8	77.8	77.9	77.8	77.7	77.7	77.7	77.6	77.5	77.4
CO	kg	217.8	217.9	218.0	217.8	217.7	217.6	217.4	217.2	216.9	216.6
TSP	kg	61.6	61.6	61.6	61.6	61.6	61.6	61.6	61.6	61.6	61.6
PM_{10}	kg	61.6	61.6	61.6	61.6	61.6	61.6	61.6	61.6	61.6	61.6
$PM_{2.5}$	kg	61.6	61.6	61.6	61.6	61.6	61.6	61.6	61.6	61.6	61.6
As	g	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Cd	g	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Cr	g	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Cu	g	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3
Hg	g	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Pb	g	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
PCDD/F	mg	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7
Benzo[b]fluoranthene	g	9.9	9.9	9.9	9.9	9.8	9.8	9.8	9.8	9.8	9.8
Benzo[k]fluoranthene	g	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Benzo[a]pyrene	g	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2
Indeno[1,2,3-cd]pyrene	g	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7

Table 2D-10b Emission factors for accidental undetached building fires, 1990-1999.

Undetached houses		1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
SO_2	kg	206.6	206.2	206.1	206.1	206.1	206.4	206.8	207.5	208.2	209.1
NO_X	kg	15.4	15.4	15.4	15.4	15.4	15.4	15.5	15.5	15.6	15.6
NMVOC	kg	77.2	77.1	77.0	77.0	77.0	77.1	77.3	77.5	77.8	78.1
CO	kg	216.2	215.8	215.7	215.6	215.7	216.0	216.4	217.1	217.8	218.7
TSP	kg	61.6	61.6	61.6	61.6	61.6	61.6	61.6	61.6	61.6	61.6
PM_{10}	kg	61.6	61.6	61.6	61.6	61.6	61.6	61.6	61.6	61.6	61.6
$PM_{2.5}$	kg	61.6	61.6	61.6	61.6	61.6	61.6	61.6	61.6	61.6	61.6
As	g	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Cd	g	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Cr	g	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Cu	g	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3
Hg	g	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Pb	g	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
PCDD/F	mg	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7
Benzo[b]fluoranthene	g	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.9	9.9
Benzo[k]fluoranthene	g	3.4	3.4	3.4	3.4	3.4	3.4	3.5	3.5	3.5	3.5
Benzo[a]pyrene	g	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2
Indeno[1,2,3-cd]pyrene	g	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.8

Table 2D-10c Emission factors for accidental undetached building fires, 2000-2009.

Undetached houses		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
SO_2	kg	209.8	210.1	210.5	210.8	211.2	210.5	211.2	212.0	212.8	213.8
NO_X	kg	15.7	15.7	15.7	15.8	15.8	15.7	15.8	15.8	15.9	16.0
NMVOC	kg	78.4	78.5	78.7	78.8	78.9	78.6	78.9	79.2	79.5	79.9
CO	kg	219.5	219.8	220.3	220.6	220.9	220.2	221.0	221.8	222.7	223.6
TSP	kg	61.6	61.6	61.6	61.6	61.6	61.6	61.6	61.6	61.6	61.6
PM_{10}	kg	61.6	61.6	61.6	61.6	61.6	61.6	61.6	61.6	61.6	61.6
$PM_{2.5}$	kg	61.6	61.6	61.6	61.6	61.6	61.6	61.6	61.6	61.6	61.6
As	g	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Cd	g	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Cr	g	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Cu	g	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3
Hg	g	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Pb	g	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
PCDD/F	mg	2.7	2.7	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8
Benzo[b]fluoranthene	g	9.9	9.9	10.0	10.0	10.0	10.0	10.0	10.0	10.1	10.1
Benzo[k]fluoranthene	g	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.6	3.6
Benzo[a]pyrene	g	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.4	6.4
Indeno[1,2,3-cd]pyrene	g	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.9	6.9	6.9

Table 2D-10d Emission factors for accidental undetached building fires, 2010.

Undetached houses		2010
SO_2	kg	214.6
NO_x	kg	16.0
NMVOC	kg	80.2
CO	kg	224.5
TSP	kg	61.6
PM_{10}	kg	61.6
$PM_{2.5}$	kg	61.6
As	g	0.6
Cd	g	0.4
Cr	g	0.6
Cu	g	1.3
Hg	g	0.4
Pb	g	0.2
PCDD/F	mg	2.8
Benzo[b]fluoranthene	g	10.2
Benzo[k]fluoranthene	g	3.6
Benzo[a]pyrene	g	6.4
Indeno[1.2.3-cd]pyrene	g	6.9

Annex 2D-11 Emission factors for accidental apartment building fires, 1980-2010

Table 2D-11a Emission factors for accidental apartment building fires, 1980-1989.

Apartment buildings		1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
SO_2	kg	119.4	119.4	119.5	119.6	119.8	120.1	120.3	120.4	120.3	120.2
NO_X	kg	8.9	8.9	8.9	8.9	9.0	9.0	9.0	9.0	9.0	9.0
NMVOC	kg	44.6	44.6	44.6	44.7	44.8	44.9	45.0	45.0	45.0	44.9
CO	kg	124.9	124.9	125.0	125.2	125.4	125.6	125.9	125.9	125.9	125.8
TSP	kg	43.78	43.78	43.78	43.78	43.78	43.78	43.78	43.78	43.78	43.78
PM_{10}	kg	43.78	43.78	43.78	43.78	43.78	43.78	43.78	43.78	43.78	43.78
$PM_{2.5}$	kg	43.780	43.78	43.78	43.78	43.78	43.78	43.78	43.78	43.78	43.78
As	g	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Cd	g	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Cr	g	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Cu	g	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Hg	g	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Pb	g	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
PCDD/F	mg	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6
Benzo[b]fluoranthene	g	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7
Benzo[k]fluoranthene	g	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Benzo[a]pyrene	g	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
Indeno[1,2,3-cd]pyrene	g	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9

Table 2D-11b Emission factors for accidental apartment building fires, 1990-1999.

Apartment buildings		1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
SO_2	kg	120.2	120.2	120.3	120.3	120.3	120.4	120.4	120.4	120.4	120.4
NO_X	kg	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0
NMVOC	kg	44.9	44.9	45.0	44.9	45.0	45.0	45.0	45.0	45.0	45.0
CO	kg	125.8	125.8	125.9	125.8	125.9	125.9	126.0	125.9	126.0	126.0
TSP	kg	43.78	43.78	43.78	43.78	43.78	43.78	43.78	43.78	43.78	43.78
PM_{10}	kg	43.78	43.78	43.78	43.78	43.78	43.78	43.78	43.78	43.78	43.78
$PM_{2.5}$	kg	43.78	43.78	43.78	43.78	43.78	43.78	43.78	43.78	43.78	43.78
As	g	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Cd	g	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Cr	g	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Cu	g	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Hg	g	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Pb	g	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
PCDD/F	mg	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6
Benzo[b]fluoranthene	g	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7
Benzo[k]fluoranthene	g	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Benzo[a]pyrene	g	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
Indeno[1,2,3-cd]pyrene	g	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9

Table 2D-11c Emission factors for accidental apartment building fires, 2000-2009.

Apartment buildings		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
SO_2	kg	120.5	120.5	120.6	120.8	121.1	121.4	121.9	122.4	122.9	123.3
NO_X	kg	9.0	9.0	9.0	9.0	9.1	9.1	9.1	9.1	9.2	9.2
NMVOC	kg	45.0	45.0	45.1	45.1	45.3	45.4	45.5	45.7	45.9	46.1
CO	kg	126.0	126.1	126.2	126.4	126.7	127.0	127.5	128.0	128.6	129.0
TSP	kg	43.78	43.78	43.78	43.78	43.78	43.78	43.78	43.78	43.78	43.78
PM_{10}	kg	43.78	43.78	43.78	43.78	43.78	43.78	43.78	43.78	43.78	43.78
$PM_{2.5}$	kg	43.78	43.78	43.78	43.78	43.78	43.78	43.78	43.78	43.78	43.78
As	g	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Cd	g	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Cr	g	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Cu	g	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Hg	g	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Pb	g	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
PCDD/F	mg	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6
Benzo[b]fluoranthene	g	5.7	5.7	5.7	5.7	5.7	5.7	5.8	5.8	5.8	5.8
Benzo[k]fluoranthene	g	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.1
Benzo[a]pyrene	g	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.7	3.7	3.7
Indeno[1,2,3-cd]pyrene	g	3.9	3.9	3.9	3.9	3.9	3.9	3.9	4.0	4.0	4.0

Table 2D-11d Emission factors for accidental apartment building fires, 2010.

Apartment buildings		2010
SO_2	kg	123.5
NO_x	kg	9.2
NMVOC	kg	46.1
CO	kg	129.2
TSP	kg	43.78
PM_{10}	kg	43.78
$PM_{2.5}$	kg	43.78
As	g	0.4
Cd	g	0.3
Cr	g	0.4
Cu	g	0.9
Hg	g	0.3
Pb	g	0.1
PCDD/F	mg	1.6
Benzo[b]fluoranthene	g	5.8
Benzo[k]fluoranthene	g	2.1
Benzo[a]pyrene	g	3.7
Indeno[1.2.3-cd]pyrene	g	4.0

Annex 2D-12 Average building floor space, 1980-2011

Table 2D-12 Average floor space in building types.

Year	Detached	Undetached	Apartment
1980	154	130	74
1981	154	130	74
1982	154	130	74
1983	154	130	74
1984	154	130	75
1985	154	130	75
1986	155	129	75
1987	156	129	75
1988	156	129	75
1989	156	129	75
1990	156	129	75
1991	156	128	75
1992	155	128	75
1993	155	128	75
1994	155	128	75
1995	155	129	75
1996	155	129	75
1997	155	129	75
1998	155	130	75
1999	155	130	75
2000	156	131	75
2001	160	131	75
2002	161	131	75
2003	162	131	75
2004	163	132	75
2005	162	131	76
2006	163	132	76
2007	160	132	76
2008	161	133	77
2009	162	133	77
2010	163	134	77
2011	164	132	78

Annex 2D-13 Emissions from building fires, 1980-2011

Table 2D-13a National emissions from building fires, 1980-1989.

	unit	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
SO_2	Mg	580.42	580.47	580.55	580.65	580.69	581.31	582.33	583.17	583.66	617.57
NO_x	Mg	32.91	32.91	32.92	32.92	32.93	32.97	33.05	33.11	33.15	35.07
NMVOC	Mg	153.34	153.36	153.39	153.43	153.45	153.68	154.06	154.37	154.56	163.53
CO	Mg	460.67	460.72	460.81	460.92	460.96	461.60	462.67	463.55	464.07	491.00
TSP	Mg	175.77	175.77	175.77	175.77	175.77	175.77	175.77	175.77	175.77	186.00
PM_{10}	Mg	175.77	175.77	175.77	175.77	175.77	175.77	175.77	175.77	175.77	186.00
$PM_{2.5}$	Mg	175.77	175.77	175.77	175.77	175.77	175.77	175.77	175.77	175.77	186.00
As	kg	1.65	1.65	1.65	1.65	1.65	1.65	1.65	1.65	1.65	1.74
Cd	kg	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.10
Cr	kg	1.57	1.57	1.57	1.57	1.57	1.57	1.57	1.57	1.57	1.66
Cu	kg	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.87
Hg	kg	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.10
Pb	kg	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.54
PCDD/F	g I-TEQ	6.21	6.21	6.21	6.21	6.21	6.22	6.23	6.24	6.25	6.61
Benzo(b)fluoranthene	kg	20.84	20.84	20.85	20.85	20.85	20.88	20.93	20.97	20.99	22.21
Benzo(k)fluoranthene	kg	7.35	7.35	7.35	7.35	7.35	7.36	7.38	7.39	7.40	7.83
Benzo(a)pyrene	kg	13.16	13.16	13.17	13.17	13.17	13.19	13.22	13.24	13.26	14.03
Indeno(1,2,3-cd)pyrene	kg	14.26	14.26	14.26	14.27	14.27	14.29	14.32	14.35	14.36	15.20

Table 2D-13b National emissions from building fires, 1990-1999.

	unit	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
SO_2	Mg	559.3	577.1	626.9	551.2	554.5	640.2	647.0	598.0	535.0	575.3
NO_x	Mg	31.8	32.8	35.6	31.3	31.5	36.3	36.7	33.9	30.4	32.6
NMVOC	Mg	148.0	152.7	165.8	145.8	146.7	169.3	171.0	158.2	141.5	152.2
CO	Mg	444.5	458.6	497.9	438.0	440.5	508.4	513.7	475.1	424.9	457.1
TSP	Mg	168.6	174.2	189.4	166.4	167.5	193.5	195.6	180.6	161.6	173.7
PM_{10}	Mg	168.6	174.2	189.4	166.4	167.5	193.5	195.6	180.6	161.6	173.7
$PM_{2.5}$	Mg	168.6	174.2	189.4	166.4	167.5	193.5	195.6	180.6	161.6	173.7
As	kg	1.58	1.63	1.78	1.56	1.57	1.81	1.83	1.69	1.52	1.63
Cd	kg	1.00	1.03	1.12	0.98	0.99	1.14	1.16	1.07	0.95	1.03
Cr	kg	1.51	1.56	1.70	1.49	1.50	1.73	1.75	1.62	1.45	1.55
Cu	kg	3.51	3.62	3.94	3.46	3.48	4.02	4.07	3.76	3.36	3.61
Hg	kg	1.00	1.03	1.12	0.98	0.99	1.14	1.16	1.07	0.95	1.03
Pb	kg	0.49	0.51	0.55	0.49	0.49	0.57	0.57	0.53	0.47	0.51
PCDD/F	g I-TEQ	6.0	6.2	6.7	5.9	5.9	6.9	6.9	6.4	5.7	6.2
Benzo(b)fluoranthene	kg	20.1	20.7	22.5	19.8	19.9	23.0	23.2	21.5	19.2	20.7
Benzo(k)fluoranthene	kg	7.1	7.3	7.9	7.0	7.0	8.1	8.2	7.6	6.8	7.3
Benzo(a)pyrene	kg	12.7	13.1	14.2	12.5	12.6	14.5	14.7	13.6	12.1	13.1
Indeno(1,2,3-cd)pyrene	kg	13.8	14.2	15.4	13.6	13.6	15.7	15.9	14.7	13.2	14.1

Table 2D-13c National emissions from building fires, 2000-2009.

	unit	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
SO_2	Mg	565.2	560.2	544.4	615.2	532.1	552.4	567.8	683.6	638.3	615.9
NO_x	Mg	32.1	31.9	31.0	35.1	30.4	31.5	32.4	37.4	37.2	35.2
NMVOC	Mg	149.7	148.9	144.8	163.8	141.8	147.2	151.4	173.5	172.2	164.6
CO	Mg	449.5	446.6	434.4	491.3	425.2	441.2	453.9	524.1	520.8	493.0
TSP	Mg	170.1	167.3	162.0	182.6	157.7	163.9	168.0	182.3	195.9	185.2
PM_{10}	Mg	170.1	167.3	162.0	182.6	157.7	163.9	168.0	182.3	195.9	185.2
$PM_{2.5}$	Mg	170.1	167.3	162.0	182.6	157.7	163.9	168.0	182.3	195.9	185.2
As	kg	1.59	1.57	1.52	1.71	1.48	1.54	1.57	1.71	1.84	1.74
Cd	kg	1.00	0.99	0.96	1.08	0.93	0.97	0.99	1.08	1.16	1.09
Cr	kg	1.52	1.50	1.45	1.63	1.41	1.47	1.50	1.63	1.75	1.66
Cu	kg	3.54	3.48	3.37	3.80	3.28	3.41	3.49	3.79	4.07	3.85
Hg	kg	1.00	0.99	0.96	1.08	0.93	0.97	0.99	1.08	1.16	1.09
Pb	kg	0.50	0.49	0.47	0.53	0.46	0.48	0.49	0.53	0.57	0.54
PCDD/F	g I-TEQ	6.1	6.0	5.8	6.6	5.7	5.9	6.1	7.1	7.1	6.6
Benzo(b)fluoranthene	kg	20.3	20.2	19.7	22.2	19.2	20.0	20.5	23.7	23.6	22.3
Benzo(k)fluoranthene	kg	7.2	7.1	6.9	7.8	6.8	7.0	7.2	8.4	8.3	7.9
Benzo(a)pyrene	kg	12.8	12.8	12.4	14.0	12.1	12.6	13.0	15.0	14.9	14.1
Indeno(1,2,3-cd)pyrene	kg	13.9	13.8	13.4	15.2	13.2	13.7	14.0	16.2	16.1	15.3

Table 2D-13d National emissions from building fires, 2010-2011.

	unit	2010	2011
SO_2	Mg	543.0	598.2
NO_x	Mg	31.5	33.7
NMVOC	Mg	149.1	158.0
CO	Mg	441.3	471.6
TSP	Mg	168.8	173.0
PM_{10}	Mg	168.8	173.0
$PM_{2.5}$	Mg	168.8	173.0
As	kg	1.58	1.62
Cd	kg	1.00	1.02
Cr	kg	1.51	1.55
Cu	kg	3.51	3.60
Hg	kg	1.00	1.02
Pb	kg	0.49	0.51
PCDD/F	g I-TEQ	5.9	6.3
Benzo(b)fluoranthene	kg	20.0	21.3
Benzo(k)fluoranthene	kg	7.0	7.5
Benzo(a)pyrene	kg	12.6	13.5
Indeno(1,2,3-cd)pyrene	kg	13.7	14.6

Annex 2D-14 Full scale vehicle fires, 1980-2011

Table 2D-14a Number of nationally registered vehicles and full scale equivalent vehicle fires.

	Passenger Cars		Buses		Light Duty Vehicles		Heavy Duty Vehicles	
	Registered	FSE	Registered	FSE fires	Registered	FSE fires	Registered	FSE fires
1980	1475109	429	8070	12	99168	10	47428	60
1981	1496849	436	8070	12	109874	11	47428	60
1982	1518590	442	8070	12	120579	12	47428	60
1983	1540331	448	8070	12	131285	13	47428	60
1984	1562072	455	8070	12	141991	14	47428	60
1985	1564449	455	8010	12	147877	14	46962	60
1986	1617832	471	8105	12	165547	16	48431	61
1987	1645057	479	8110	12	179328	17	48382	61
1988	1654128	481	8093	12	187221	18	46980	60
1989	1655005	482	8031	12	190569	19	46386	59
1990	1645587	479	8109	12	192321	19	45664	58
1991	1649301	480	9989	14	197439	19	45494	58
1992	1659929	483	11259	16	202806	20	45510	58
1993	1679055	489	13513	19	211759	21	46228	59
1994	1672177	487	14261	20	219642	21	47329	60
1995	1733405	504	14371	21	228076	22	48077	61
1996	1793158	522	14594	21	234406	23	48319	61
1997	1841075	536	14690	21	240763	23	48785	62
1998	1878032	546	14894	21	249463	24	49697	63
1999	1906153	555	14953	21	259215	25	50443	64
2000	1916686	558	15051	22	272387	27	50227	64
2001	1932741	562	15005	22	283031	28	49885	63
2002	1946353	566	14971	21	295581	29	49208	62
2003	1948967	567	14989	22	309614	30	48653	62
2004	1967643	573	14997	22	336038	33	48318	61
2005	2012399	586	15131	22	372674	36	49311	63
2006	2064005	601	15180	22	414454	40	50691	64
2007	2151344	518	15013	16	402464	19	51758	46
2008	2187294	666	14854	24	398718	44	50606	71
2009	2201821	729	14794	23	373694	48	46585	67
2010	2247021	646	14577	23	362389	38	44812	60
2011	2282304	584	13915	13	343372	43	43639	54

Table 2D-14b Number of nationally registered vehicles and full scale equivalent vehicle fires.

	Motorcycles/Mopeds		Caravans		Train		Ship	
	Registered	FSE fires	Registered	FSE fires	Registered	FSE fires	Registered	FSE fires
1980	220273	78			7284	9	2222	25
1981	214104	76			7284	9	2222	25
1982	207934	73			7284	9	2222	25
1983	201764	71			7284	9	2222	25
1984	195594	69			7284	9	2222	25
1985	191478	68			7284	9	2222	25
1986	179940	64			7284	9	2222	25
1987	174515	62			7284	9	2222	25
1988	168509	60			7284	9	2222	25
1989	166296	59			7284	9	2222	25
1990	163133	58	86257	24	7156	9	2324	26
1991	162357	57	88278	24	7212	9	2312	26
1992	157912	56	90299	25	7438	9	2307	26
1993	155325	55	93150	26	7496	9	2140	24
1994	153365	54	94551	26	7117	8	2027	22
1995	165272	58	95831	26	6854	8	1911	21
1996	178188	63	97592	27	6631	8	1841	20
1997	191772	68	99931	27	6428	8	1761	19
1998	205129	72	102302	28	5861	7	1696	19
1999	219577	78	104852	29	5525	7	1695	19
2000	233309	82	106935	29	4907	6	1759	19
2001	243020	86	108924	30	4561	5	1797	20
2002	253375	90	110995	30	4169	5	1878	21
2003	256438	91	113338	31	4048	5	1838	20
2004	263472	93	116930	32	3273	4	1783	20
2005	273904	97	121350	33	3195	4	1792	20
2006	287366	102	126011	35	3002	4	1789	20
2007	302475	99	131708	36	2617	2	1755	20
2008	308538	122	136905	45	2588	3	1728	20
2009	307335	128	140366	34	2489	5	1742	22
2010	301562	83	142354	37	2740	2	1773	16
2011	295488	91	142764	34	2943	3	1768	21

Table 2D-14c Number of nationally registered vehicles and full scale equivalent vehicle fires

	Airplane		Tractor		Combined Harvester		Bicycle	Other Transport	Machine
	Registered	FSE	Registered	FSE	Registered	FSE	FSE	FSE	FSE
1980	1060	1	143927	87	40557	66			
1981	1060	1	137756	83	40138	65			
1982	1060	1	135632	82	38953	63			
1983	1060	1	133733	80	38084	62			
1984	1060	1	131835	79	37215	60			
1985	1060	1	133027	80	37484	61			
1986	1060	1	136669	82	36532	59			
1987	1060	1	133075	80	35681	58			
1988	1060	1	137764	83	36625	59			
1989	1060	1	137678	83	34562	56			
1990	1055	1	135980	82	35118	57			
1991	1059	1	135887	82	34066	55			
1992	1066	1	132136	80	32923	53			
1993	1059	1	133891	81	32777	53			
1994	1063	1	127764	77	31022	50			
1995	1058	1	134277	81	29291	47			
1996	1088	1	124708	75	29736	48			
1997	1094	1	128391	77	26576	43			
1998	1091	1	119719	72	26484	43			
1999	1087	1	120314	72	23853	39			
2000	1070	1	115692	70	24128	39			
2001	1089	1	114369	69	23589	38			
2002	1149	1	112742	68	23065	37			
2003	1083	1	111023	67	22537	37			
2004	1055	1	109610	66	22076	36			
2005	1073	1	107867	65	21436	35			
2006	1039	1	105865	64	20976	34			
2007	1058	1	106025	52	20507	19	2	85	75
2008	1077	1	106025	62	20046	34	4	97	135
2009	1122	1	106025	64	19584	43	3	93	111
2010	1152	1	106025	77	19354	32	4	58	94
2011	1132	0	106025	59	19354	21	3	50	111

Annex 2D-15 Average vehicle weight, 1980-2011

Table 2D-15 Average weight of different vehicle categories, kg.

	Cars	Buses	Vans	Trucks	Motorcycles/ Mopeds
1980	850	10000	2000	15000	80
1981	850	10000	2000	15000	80
1982	850	10000	2000	15000	80
1983	850	10000	2000	15000	80
1984	850	10000	2000	15000	80
1985	850	10000	2000	15000	80
1986	850	10000	2000	15000	80
1987	850	10000	2000	15000	80
1988	850	10000	2000	15000	80
1989	850	10000	2000	15000	80
1990	850	10000	2000	15000	80
1991	850	10000	2000	15000	80
1992	850	10000	2000	15000	80
1993	901	10068	2297	14732	106
1994	908	10512	2382	14674	107
1995	923	10807	2492	14801	107
1996	935	10899	2638	14928	107
1997	948	10950	2746	14987	107
1998	964	10960	2848	15111	107
1999	982	11140	2964	15223	107
2000	999	11195	3103	15214	107
2001	1012	11312	3238	14888	108
2002	1024	11387	3333	14486	108
2003	1039	11479	3442	14026	109
2004	1052	11572	3561	13599	110
2005	1068	11560	3793	13258	111
2006	1086	11684	4120	13179	113
2007	1105	11753	4505	13268	114
2008	1122	11700	4710	13246	116
2009	1134	11642	4682	12802	116
2010	1144	11804	4498	11883	117
2011	1154	11907	4296	11291	118

Annex 2D-16 Accidental vehicle fires activity data, 1980-2011

Table 2D-16a Burnt mass of different vehicle categories, Mg, 1980-1989.

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Passenger cars	365	370	376	381	386	387	400	407	409	409
Buses	116	116	116	116	116	115	116	116	116	115
Light duty vehicles	19	21	23	26	28	29	32	35	36	37
Heavy duty vehicles	902	902	902	902	902	893	921	920	894	882
Motorcycle, moped	6	6	6	6	6	5	5	5	5	5
Other transport	-	-	-	-	-	-	-	-	-	-
Caravan	-	-	-	-	-	-	-	-	-	-
Train	130	130	130	130	130	130	130	130	130	130
Ship	246	246	246	246	246	246	246	246	246	246
Airplane	12	12	12	12	12	12	12	12	12	12
Bicycle	-	-	-	-	-	-	-	-	-	-
Tractor	173	166	163	161	159	160	165	160	166	166
Combine harvester	986	976	947	926	905	911	888	867	890	840
Machine	-	-	-	-	-	-	-	-	-	-
Total	2955	2945	2921	2905	2889	2888	2915	2899	2904	2842

Table 2D-16b Burnt mass of different vehicle categories, Mg, 1990-1999.

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Passenger cars	407	408	411	440	442	466	488	508	527	545
Buses	116	143	162	195	215	223	228	231	234	239
Light duty vehicles	37	38	40	47	51	55	60	64	69	75
Heavy duty vehicles	869	866	866	864	881	903	915	927	952	974
Motorcycle, moped	5	5	4	6	6	6	7	7	8	8
Other transport	-	-	-	-	-	-	-	-	-	-
Caravan	18	19	19	21	21	22	23	23	24	25
Train	128	129	133	132	125	121	118	115	106	100
Ship	257	256	255	238	236	228	222	213	205	209
Airplane	12	12	12	11	11	11	12	12	12	12
Bicycle	-	-	-	-	-	-	-	-	-	-
Tractor	164	164	159	185	183	201	198	212	205	215
Combine harvester	854	828	800	782	738	702	719	645	648	588
Machine	-	-	-	-	-	-	-	-	-	-
Total	2866	2866	2860	2922	2908	2939	2990	2959	2992	2991

Table 2D-16c Burnt mass of different vehicle categories, Mg, 2000-2009.

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Passenger cars	557	569	580	589	602	626	652	572	748	827
Buses	242	244	245	247	249	251	255	182	283	264
Light duty vehicles	82	89	96	104	117	138	166	86	207	223
Heavy duty vehicles	969	942	904	865	833	829	847	608	936	863
Motorcycle, moped	9	9	10	10	10	11	11	11	14	15
Other transport	-	-	-	-	-	-	-	47	54	53
Caravan	26	27	28	29	30	32	34	36	45	34
Train	89	81	72	68	53	51	47	33	39	63
Ship	218	225	236	233	228	229	231	234	230	253
Airplane	12	12	12	11	10	10	10	8	13	13
Bicycle	-	-	-	-	-	-	-	0	0	0
Tractor	216	223	226	230	235	246	263	235	290	301
Combine harvester	595	569	541	512	486	460	448	255	450	552
Machine	-	-	-	-	-	-	-	33	61	50
Total	3015	2990	2951	2899	2855	2883	2965	2339	3371	3512

Table 2D-16d Burnt mass of different vehicle categories, Mg, 2010-2011.

	2010	2011
Passenger cars	739	674
Buses	266	160
Light duty vehicles	171	185
Heavy duty vehicles	715	606
Motorcycle, moped	10	11
Other transport	33	29
Caravan	38	35
Train	24	28
Ship	189	249
Airplane	7	3
Bicycle	0	0
Tractor	347	254
Combine harvester	378	242
Machine	43	51
Total	2960	2526

Annex 2D-17 Emissions from accidental vehicle fires, 1980-2011

Table 2D-17a National emissions from vehicle fires – 1980 to 1989.

	unit	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
SO_2	Mg	14.78	14.72	14.60	14.52	14.44	14.44	14.58	14.49	14.52	14.21
NO_X	Mg	5.91	5.89	5.84	5.81	5.78	5.78	5.83	5.80	5.81	5.68
NMVOC	Mg	25.12	25.03	24.83	24.69	24.55	24.55	24.78	24.64	24.68	24.16
CO	Mg	186.18	185.53	184.01	182.99	181.98	181.97	183.66	182.62	182.95	179.07
TSP	Mg	6.06	6.04	5.99	5.95	5.92	5.92	5.98	5.94	5.95	5.83
PM_{10}	Mg	6.06	6.04	5.99	5.95	5.92	5.92	5.98	5.94	5.95	5.83
$PM_{2.5}$	Mg	6.06	6.04	5.99	5.95	5.92	5.92	5.98	5.94	5.95	5.83
As	kg	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Cd	kg	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.26
Cr	kg	0.59	0.59	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.57
Cu	kg	4.43	4.42	4.38	4.36	4.33	4.33	4.37	4.35	4.36	4.26
Ni	kg	0.44	0.44	0.44	0.44	0.43	0.43	0.44	0.43	0.44	0.43
Pb	kg	130.03	129.57	128.51	127.81	127.10	127.09	128.27	127.54	127.77	125.06
Zn	kg	511.24	509.46	505.29	502.51	499.72	499.69	504.35	501.47	502.39	491.72
PCDD/F	g I-TEQ	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.11
Benzo(b)fluoranthene	kg	47.73	47.56	47.17	46.91	46.65	46.65	47.08	46.81	46.90	45.90
Benzo(k)fluoranthene	kg	47.73	47.56	47.17	46.91	46.65	46.65	47.08	46.81	46.90	45.90
Benzo(a)pyrene	kg	43.44	43.29	42.94	42.70	42.46	42.46	42.85	42.61	42.69	41.78
Indeno(1.2.3-cd)pyrene	kg	68.86	68.61	68.05	67.68	67.30	67.30	67.93	67.54	67.66	66.23

Table 2D-17b National emissions from vehicle fires – 1990 to 1999.

	unit	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
SO_2	Mg	14.33	14.33	14.30	14.61	14.54	14.70	14.95	14.80	14.96	14.95
NO_X	Mg	5.73	5.73	5.72	5.84	5.82	5.88	5.98	5.92	5.98	5.98
NMVOC	Mg	24.36	24.36	24.31	24.84	24.72	24.98	25.41	25.15	25.43	25.42
CO	Mg	180.57	180.57	180.18	184.09	183.23	185.18	188.34	186.42	188.49	188.40
TSP	Mg	5.88	5.88	5.86	5.99	5.96	6.03	6.13	6.07	6.13	6.13
PM_{10}	Mg	5.88	5.88	5.86	5.99	5.96	6.03	6.13	6.07	6.13	6.13
$PM_{2.5}$	Mg	5.88	5.88	5.86	5.99	5.96	6.03	6.13	6.07	6.13	6.13
As	kg	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Cd	kg	0.26	0.26	0.26	0.27	0.27	0.27	0.28	0.27	0.28	0.28
Cr	kg	0.57	0.57	0.57	0.58	0.58	0.59	0.60	0.59	0.60	0.60
Cu	kg	4.30	4.30	4.29	4.38	4.36	4.41	4.48	4.44	4.49	4.49
Ni	kg	0.43	0.43	0.43	0.44	0.44	0.44	0.45	0.44	0.45	0.45
Pb	kg	126.11	126.12	125.84	128.57	127.97	129.33	131.54	130.20	131.64	131.58
Zn	kg	495.84	495.86	494.79	505.52	503.15	508.51	517.20	511.91	517.59	517.37
PCDD/F	g I-TEQ	0.11	0.11	0.11	0.12	0.12	0.12	0.12	0.12	0.12	0.12
Benzo(b)fluoranthene	kg	46.29	46.29	46.19	47.19	46.97	47.47	48.28	47.79	48.32	48.30
Benzo(k)fluoranthene	kg	46.29	46.29	46.19	47.19	46.97	47.47	48.28	47.79	48.32	48.30
Benzo(a)pyrene	kg	42.13	42.13	42.04	42.95	42.75	43.21	43.95	43.50	43.98	43.96
Indeno(1.2.3-cd)pyrene	kg	66.78	66.78	66.64	68.08	67.77	68.49	69.66	68.94	69.71	69.68

Table 2D-17c National emissions from vehicle fires – 2000 to 2009.

	unit	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
SO_2	Mg	15.08	14.95	14.75	14.49	14.28	14.42	14.82	11.70	16.85	17.56
NO_X	Mg	6.03	5.98	5.90	5.80	5.71	5.77	5.93	4.68	6.74	7.02
NMVOC	Mg	25.63	25.42	25.08	24.64	24.27	24.51	25.20	19.88	28.65	29.85
CO	Mg	189.95	188.37	185.90	182.61	179.87	181.64	186.77	147.38	212.37	221.24
TSP	Mg	6.18	6.13	6.05	5.94	5.85	5.91	6.08	4.80	6.91	7.20
PM_{10}	Mg	6.18	6.13	6.05	5.94	5.85	5.91	6.08	4.80	6.91	7.20
$PM_{2.5}$	Mg	6.18	6.13	6.05	5.94	5.85	5.91	6.08	4.80	6.91	7.20
As	kg	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.03	0.05	0.05
Cd	kg	0.28	0.28	0.27	0.27	0.26	0.27	0.27	0.22	0.31	0.32
Cr	kg	0.60	0.60	0.59	0.58	0.57	0.58	0.59	0.47	0.67	0.70
Cu	kg	4.52	4.49	4.43	4.35	4.28	4.32	4.45	3.51	5.06	5.27
Ni	kg	0.45	0.45	0.44	0.43	0.43	0.43	0.44	0.35	0.51	0.53
Pb	kg	132.67	131.56	129.83	127.54	125.62	126.86	130.44	102.93	148.32	154.52
Zn	kg	521.62	517.28	510.48	501.45	493.93	498.79	512.88	404.70	583.18	607.54
PCDD/F	g I-TEQ	0.12	0.12	0.12	0.12	0.11	0.12	0.12	0.09	0.13	0.14
Benzo(b)fluoranthene	kg	48.69	48.29	47.65	46.81	46.11	46.56	47.88	37.78	54.44	56.72
Benzo(k)fluoranthene	kg	48.69	48.29	47.65	46.81	46.11	46.56	47.88	37.78	54.44	56.72
Benzo(a)pyrene	kg	44.32	43.95	43.38	42.61	41.97	42.38	43.58	34.39	49.55	51.62
Indeno(1.2.3-cd)pyrene	kg	70.25	69.67	68.75	67.54	66.52	67.18	69.08	54.51	78.54	81.83

Table 2D-17d National emissions from vehicle fires – 2010 to 2011.

	unit	2010	2011
SO_2	Mg	14.80	12.63
NO_X	Mg	5.92	5.05
NMVOC	Mg	25.16	21.47
CO	Mg	186.51	159.15
TSP	Mg	6.07	5.18
PM_{10}	Mg	6.07	5.18
$PM_{2.5}$	Mg	6.07	5.18
As	kg	0.04	0.04
Cd	kg	0.27	0.23
Cr	kg	0.59	0.51
Cu	kg	4.44	3.79
Ni	kg	0.44	0.38
Pb	kg	130.26	111.15
Zn	kg	512.16	437.03
PCDD/F	g I-TEQ	0.12	0.10
Benzo(b)fluoranthene	kg	47.81	40.80
Benzo(k)fluoranthene	kg	47.81	40.80
Benzo(a)pyrene	kg	43.52	37.13
Indeno(1.2.3-cd)pyrene	kg	68.98	58.86

Annex 2E - Solvents and Other Product Use

Annex 2E-1 NMVOC emissions, 1985-2011

Table 2E-1a NMVOC emissions (Gg per year), 1985-1998.

	1985	1990	1991	1992	1993	1994	1995	1996	1997	1998
Paint application (3A)	5.11	5.11	5.83	6.37	5.74	6.38	5.90	7.13	6.05	5.95
Degreasing and dry cleaning (3B)	7.1E-05	7.1E-05	6.6E-05	6.3E-05	7.3E-05	9.4E-05	7.7E-05	7.4E-05	4.5E-05	5.5E-05
Chemical products, manufacturing and processing (3C)	8.14	8.14	9.32	9.13	7.15	9.25	9.32	9.48	8.04	7.66
Other (3D)	24.9	24.8	27.8	30.0	26.6	31.4	30.0	32.9	30.7	28.0
Total NMVOC	38.0	38.0	43.0	45.5	40.0	47.1	45.3	49.5	44.8	41.6

Table 2E-1b NMVOC emissions (Gg per year), 1999-2008.

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Paint application (3A)	6.43	6.40	5.25	5.18	4.99	4.66	4.32	3.73	3.23	3.38
Degreasing and dry cleaning (3B)	3.5E-05	2.9E-05	1,3E-05	3.0E-05	2.9E-05	2,4E-05	1.8E-05	1.5E-05	2.2E-05	1.5E-05
Chemical products, manufacturing	7.31	6.96	6.28	6.58	4.96	6.06	6.25	6.02	6.12	5.91
Other (3D)	27.0	27.9	24.9	24.5	22.6	21.5	20.9	20.9	18.1	18.5
Total NMVOC	40.8	41.2	36.4	36.2	32.5	32.3	31.5	30.7	27.5	27.8

Table 2E-1c NMVOC emissions (Gg per year), 2009-2011.

	2009	2010	2011
Paint application (3A)	2.85	2.75	2.87
Degreasing and dry cleaning (3B)	1.3E-05	1.2E-05	1.1E-05
Chemical products, manufacturing and processing (3C)	4.99	5.05	4.81
Other (3D)	19.8	19.5	19.3
Total NMVOC	27.6	27.3	27.0

Annex 2E-2 Activity data for NMVOC use, 1985-2011

Table 2E-2a Activity data for NMVOC use (Gg per year), 1985-1999.

	1985	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Paint application (3A)	83.2	83.2	96.5	103	90.4	95.7	92.1	110	95.5	97.6	101
Degreasing and dry cleaning (3B)	1.41	1.41	1.31	1.25	1.45	1.88	1.53	1.48	0.892	1.10	0,690
Chemical products, manufacturing and processing (3C)	406	406	455	569	388	466	504	523	519	528	488
Other (3D)	197	197	224	234	202	239	247	260	249	234	226
Total NMVOC	688	688	776	907	682	803	845	895	865	860	815

Table 2E-2b Activity data for NMVOC use (Gg per year), 2000-2009.

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Paint application (3A)	105	86.4	86.7	79.8	77.7	75.2	64.7	57.3	58.1	48.7
Degreasing and dry cleaning (3B)	0.586	0.251	0,597	0.578	0.481	0.366	0.292	0.433	0.299	0.263
Chemical products, manufacturing and processing (3C)	567	551	540	513	634	740	749	814	771	683
Other (3D)	230	206	218	185	182	204	180	162	169	179
Total NMVOC	903	844	846	779	894	1020	994	1030	998	911

Table 2E-2c Activity data for NMVOC use (Gg per year), 2010-2011.

	2010	2011
Paint application (3A)	45.8	43.8
Degreasing and dry cleaning (3B)	0.247	0.224
Chemical products, manufacturing and processing (3C)	641	640
Other (3D)	170	169
Total NMVOC	857	853

Annex 2E-3 Emissions from use of fireworks, 1985-2011

Table 2E-3a Emissions from use of fireworks, 1985-1999.

	Unit	1985	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
SO_2	Mg	1.9	2.5	3.3	3.5	3.1	3.8	5.8	5.3	4.2	6.8	12.9
CO	Mg	6.9	8.8	11.7	12.6	11.2	13.5	20.7	19.0	14.9	24.3	46.0
TSP	Mg	39.7	50.7	67.1	72.6	64.1	77.8	118.9	109.1	85.8	139.7	264.6
PM_{10}	Mg	19.8	25.4	33.6	36.3	32.1	38.9	59.4	54.5	42.9	69.9	132.3
$PM_{2.5}$	Mg	13.9	17.8	23.5	25.4	22.4	27.2	41.6	38.2	30.0	48.9	92.6
As	kg	1.3	1.7	2.3	2.4	2.2	2.6	4.0	3.7	2.9	4.7	8.9
Cd	kg	0.7	0.9	1.1	1.2	1.1	1.3	2.0	1.8	1.4	2.3	4.4
Cr	kg	15.6	19.9	26.3	28.5	25.2	30.5	46.6	42.8	33.7	54.8	103.8
Cu	kg	444	568	752	813	718	872	1332	1222	962	1566	2966
Hg	kg	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.1	0.2	0.4
Ni	kg	30.0	38.4	50.8	54.9	48.5	58.9	89.9	82.5	64.9	105.7	200.2
Pb	kg	2200	2814	3724	4025	3557	4318	6595	6050	4762	7753	14681
Zn	kg	260	333	440	476	420	510	779	715	563	916	1735

Table 2E-3b Emissions from use of fireworks, 2000-2009.

	Unit	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
SO_2	Mg	9.4	7.4	9.2	11.7	16.7	7.1	8.1	8.7	8.5	10.4
CO	Mg	33.5	26.4	32.7	41.8	59.6	25.4	29.0	30.9	30.1	37.1
TSP	Mg	192.5	151.9	187.9	240.0	342.7	146.1	166.9	177.4	173.2	213.4
PM_{10}	Mg	96.3	76.0	93.9	120.0	171.4	73.0	83.5	88.7	86.6	106.7
$PM_{2.5}$	Mg	67.4	53.2	65.8	84.0	119.9	51.1	58.4	62.1	60.6	74.7
As	kg	6.5	5.1	6.3	8.1	11.5	4.9	5.6	6.0	5.8	7.2
Cd	kg	3.2	2.6	3.2	4.0	5.8	2.5	2.8	3.0	2.9	3.6
Cr	kg	75.5	59.6	73.7	94.2	134.5	57.3	65.5	69.6	68.0	83.7
Cu	kg	2157	1703	2106	2690	3840	1637	1871	1988	1941	2392
Hg	kg	0.3	0.2	0.3	NO	NO	NO	NO	NO	NO	NO
Ni	kg	145.6	114.9	142.1	181.6	259.3	110.5	126.3	134.2	131.1	161.5
Pb	kg	3237	2554	3159	4035	5762	2456	2807	NO	NO	NO
Zn	kg	1262	996	1232	1574	2247	958	1095	1163	1136	1399

Table 2E-3c Emissions from use of fireworks, 2010-2011.

	Unit	2010	2011
SO_2	Mg	10.5	9.2
CO	Mg	37.4	32.7
TSP	Mg	214.9	187.
PM_{10}	Mg	107.4	93.8
$PM_{2.5}$	Mg	75.2	65.7
As	kg	7.2	6.3
Cd	kg	3.6	3.2
Cr	kg	84.3	73.6
Cu	kg	2408	2103
Hg	kg	NO	NO
Ni	kg	162.6	142.
Pb	kg	NO	NO
Zn	kg	1409	1230

Annex 2E-4 Emissions from tobacco smoking, 1985-2011

Table 2E-4a Emission from tobacco smoking, 1985-1999.

	Unit	1985	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
SO_2	Mg	5.04	4.64	4.35	4.39	4.19	4.14	4.14	4.00	4.05	4.03	4.07
NO_X	Mg	22.50	20.74	19.45	19.63	18.73	18.52	18.52	17.88	18.11	17.99	18.18
CO	Mg	688.49	634.49	594.98	600.60	573.16	566.71	566.55	546.99	553.93	550.51	556.08
NH_3	Mg	51.83	47.76	44.79	45.21	43.15	42.66	42.65	41.18	41.70	41.44	41.86
TSP	Mg	170.86	157.46	147.65	149.05	142.24	140.64	140.60	135.74	137.46	136.62	138.00
PM_{10}	Mg	170.86	157.46	147.65	149.05	142.24	140.64	140.60	135.74	137.46	136.62	138.00
$PM_{2.5}$	Mg	170.86	157.46	147.65	149.05	142.24	140.64	140.60	135.74	137.46	136.62	138.00
As	kg	1.99	1.83	1.72	1.73	1.65	1.64	1.63	1.58	1.60	1.59	1.60
Cd	kg	0.20	0.18	0.17	0.17	0.17	0.16	0.16	0.16	0.16	0.16	0.16
Cr	kg	4.42	4.08	3.82	3.86	3.68	3.64	3.64	3.51	3.56	3.54	3.57
Cu	kg	1.90	1.75	1.64	1.66	1.58	1.56	1.56	1.51	1.53	1.52	1.53
Hg	kg	0.07	0.07	0.06	0.07	0.06	0.06	0.06	0.06	0.06	0.06	0.06
Ni	kg	0.40	0.37	0.35	0.35	0.33	0.33	0.33	0.32	0.32	0.32	0.32
Pb	kg	8.05	7.42	6.95	7.02	6.70	6.62	6.62	6.39	6.47	6.43	6.50
Se	kg	0.10	0.09	0.09	0.09	0.08	0.08	0.08	0.08	0.08	0.08	0.08
Zn	kg	20.12	18.54	17.38	17.55	16.75	16.56	16.55	15.98	16.19	16.09	16.25
PCDD/Fs	mg	1.25	1.15	1.08	1.09	1.04	1.03	1.03	0.99	1.01	1.00	1.01
Benzo[b]fluoranthene	kg	0.56	0.52	0.49	0.49	0.47	0.46	0.46	0.45	0.45	0.45	0.45
Benzo[k]fluoranthene	kg	0.56	0.52	0.49	0.49	0.47	0.46	0.46	0.45	0.45	0.45	0.45
Benzo[a]pyrene	kg	1.39	1.28	1.20	1.21	1.15	1.14	1.14	1.10	1.12	1.11	1.12
Indeno[1,2,3-	kg	0.56	0.52	0.49	0.49	0.47	0.46	0.46	0.45	0.45	0.45	0.45

Table 2E-4b Emission from tobacco smoking, 2000-2009.

	Unit	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
SO_2	Mg	4.58	4.40	4.38	4.55	4.46	4.18	4.17	3.94	3.86	3.79
NO_X	Mg	20.47	19.66	19.57	20.34	19.94	18.69	18.63	17.62	17.27	16.93
CO	Mg	626.22	601.43	598.62	622.15	610.13	571.84	569.91	539.22	528.25	518.06
NH_3	Mg	47.14	45.28	45.06	46.84	45.93	43.05	42.90	40.59	39.77	39.00
TSP	Mg	155.41	149.25	148.55	154.39	151.41	141.91	141.43	133.81	131.09	128.56
PM_{10}	Mg	155.41	149.25	148.55	154.39	151.41	141.91	141.43	133.81	131.09	128.56
$PM_{2.5}$	Mg	155.41	149.25	148.55	154.39	151.41	141.91	141.43	133.81	131.09	128.56
As	kg	1.81	1.74	1.73	1.80	1.76	1.65	1.64	1.56	1.52	1.49
Cd	kg	0.18	0.17	0.17	0.18	0.18	0.17	0.17	0.16	0.15	0.15
Cr	kg	4.02	3.86	3.85	4.00	3.92	3.67	3.66	3.46	3.39	3.33
Cu	kg	1.73	1.66	1.65	1.72	1.68	1.58	1.57	1.49	1.46	1.43
Hg	kg	0.07	0.07	0.07	0.07	0.07	0.06	0.06	0.06	0.06	0.06
Ni	kg	0.36	0.35	0.35	0.36	0.35	0.33	0.33	0.31	0.31	0.30
Pb	kg	7.32	7.03	7.00	7.27	7.13	6.68	6.66	6.30	6.17	6.05
Se	kg	0.09	0.09	0.09	0.09	0.09	0.08	0.08	0.08	0.08	0.08
Zn	kg	18.30	17.57	17.49	18.18	17.83	16.71	16.65	15.76	15.44	15.14
PCDD/Fs	mg	1.14	1.09	1.09	1.13	1.11	1.04	1.03	0.98	0.96	0.94
Benzo[b]fluoranthene	kg	0.51	0.49	0.49	0.51	0.50	0.47	0.47	0.44	0.43	0.42
Benzo[k]fluoranthene	kg	0.51	0.49	0.49	0.51	0.50	0.47	0.47	0.44	0.43	0.42
Benzo[a]pyrene	kg	1.26	1.21	1.21	1.25	1.23	1.15	1.15	1.09	1.06	1.04
Indeno[1,2,3-	kg	0.51	0.49	0.49	0.51	0.50	0.47	0.47	0.44	0.43	0.42

Table 2E-4c Emission from tobacco smoking, 2010-2011.

	Unit	2010	2011
SO_2	Mg	3.69	3.19
NO_X	Mg	16.48	14.27
CO	Mg	504.28	436.46
NH_3	Mg	37.96	32.86
TSP	Mg	125.14	108.31
PM_{10}	Mg	125.14	108.31
$PM_{2.5}$	Mg	125.14	108.31
As	kg	1.46	1.26
Cd	kg	0.15	0.13
Cr	kg	3.24	2.80
Cu	kg	1.39	1.20
Hg	kg	0.05	0.05
Ni	kg	0.29	0.25
Pb	kg	5.89	5.10
Se	kg	0.07	0.06
Zn	kg	14.73	12.75
PCDD/Fs	mg	0.92	0.79
Benzo[b]fluoranthene	kg	0.41	0.36
Benzo[k]fluoranthene	kg	0.41	0.36
Benzo[a]pyrene	kg	1.02	0.88
Indeno[1,2,3-	kg	0.41	0.36

Annex 2E-5 Emissions from barbequing 1985-2011

Table 2E-5a Emissions from barbequing, 1985-1999

	Unit	1985	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
SO_2	Mg	13.53	22.23	19.22	29.58	21.89	18.59	24.47	31.48	41.81	31.72	33.98
NO_X	Mg	13.09	21.52	18.60	28.63	21.18	17.99	23.69	30.46	40.47	30.70	32.88
CO	Mg	916.49	1506.2	1301.8	2003.9	1482.9	1259.4	1658.0	2132.3	2832.6	2149.0	2301.9
TSP	Mg	10.47	17.21	14.88	22.90	16.95	14.39	18.95	24.37	32.37	24.56	26.31
PM_{10}	Mg	10.47	17.21	14.88	22.90	16.95	14.39	18.95	24.37	32.37	24.56	26.31
$PM_{2.5}$	Mg	10.47	17.21	14.88	22.90	16.95	14.39	18.95	24.37	32.37	24.56	26.31
As	kg	0.41	0.68	0.59	0.91	0.67	0.57	0.75	0.96	1.28	0.97	1.04
Cd	kg	0.15	0.25	0.22	0.34	0.25	0.21	0.28	0.36	0.48	0.36	0.39
Cr	kg	61.10	100.41	86.79	133.59	98.86	83.96	110.53	142.15	188.84	143.27	153.46
Hg	kg	0.28	0.47	0.40	0.62	0.46	0.39	0.51	0.66	0.88	0.67	0.71
Ni	kg	0.57	0.93	0.81	1.24	0.92	0.78	1.03	1.32	1.75	1.33	1.42
Pb	kg	19.42	31.92	27.59	42.46	31.42	26.69	35.13	45.18	60.02	45.54	48.78
Se	kg	2.84	4.66	4.03	6.20	4.59	3.90	5.13	6.60	8.77	6.65	7.12
Zn	kg	60.66	99.70	86.17	132.64	98.16	83.36	109.74	141.14	187.49	142.24	152.36
PCDD/Fs	g	0.05	0.08	0.07	0.10	0.07	0.06	0.08	0.11	0.14	0.11	0.12

Table 2E-5b Emissions from barbequing, 2000-2009

	Unit	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
SO_2	Mg	41.41	33.78	50.83	62.12	50.25	46.27	61.28	37.67	32.19	37.85
NO_X	Mg	40.07	32.69	49.19	60.11	48.63	44.77	59.30	36.45	31.15	36.63
CO	Mg	2805.1	2288.4	3443.4	4207.8	3404.3	3134.2	4151.0	2551.8	2180.5	2564.2
TSP	Mg	32.06	26.15	39.35	48.09	38.91	35.82	47.44	29.16	24.92	29.31
PM_{10}	Mg	32.06	26.15	39.35	48.09	38.91	35.82	47.44	29.16	24.92	29.31
$PM_{2.5}$	Mg	32.06	26.15	39.35	48.09	38.91	35.82	47.44	29.16	24.92	29.31
As	kg	1.27	1.04	1.56	1.90	1.54	1.42	1.88	1.15	0.99	1.16
Cd	kg	0.47	0.39	0.58	0.71	0.58	0.53	0.70	0.43	0.37	0.43
Cr	kg	187.01	152.56	229.56	280.52	226.95	208.95	276.73	170.12	145.37	170.95
Hg	kg	0.87	0.71	1.07	1.30	1.05	0.97	1.28	0.79	0.67	0.79
Ni	kg	1.74	1.42	2.13	2.60	2.11	1.94	2.57	1.58	1.35	1.59
Pb	kg	59.44	48.49	72.97	89.17	72.14	66.42	87.96	54.07	46.21	54.34
Se	kg	8.68	7.08	10.66	13.02	10.54	9.70	12.85	7.90	6.75	7.94
Zn	kg	185.67	151.47	227.92	278.52	225.33	207.45	274.76	168.90	144.33	169.73
PCDD/Fs	g	0.14	0.11	0.17	0.21	0.17	0.16	0.21	0.13	0.11	0.13

Table 2E-5c Emissions from barbequing, 2010-2011

	Unit	2010	2011
SO_2	Mg	26.74	26.25
NO_X	Mg	25.87	25.41
CO	Mg	1811.2	1778.4
TSP	Mg	20.70	20.32
PM_{10}	Mg	20.70	20.32
$PM_{2.5}$	Mg	20.70	20.32
As	kg	0.82	0.80
Cd	kg	0.31	0.30
Cr	kg	120.74	118.56
Hg	kg	0.56	0.55
Ni	kg	1.12	1.10
Pb	kg	38.38	37.68
Se	kg	5.61	5.50
Zn	kg	119.88	117.71
PCDD/Fs	g	0.09	0.09

Annex 2E-6 Emissions from use of candles, 1985-2011

Table 2E-6a Emissions from use of candles, 1985-1999

	Unit	1985	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
CO	Mg	88.32	74.44	86.33	96.07	93.00	111.37	90.94	85.45	86.87	137.40	162.57
TSP	Mg	11.84	9.98	11.57	12.87	12.46	14.92	12.19	11.45	11.64	18.41	21.78
PCDD/Fs	mg	0.24	0.20	0.23	0.26	0.25	0.30	0.25	0.23	0.23	0.37	0.44
Flouranthene	g	327.68	276.18	320.27	356.42	345.04	413.18	337.40	317.01	322.28	509.76	603.13
Benzo[k]fluoranthene	g	40.98	34.54	40.06	44.58	43.15	51.68	42.20	39.65	40.31	63.75	75.43
Benzo[a]pyrene	g	32.77	27.62	32.03	35.64	34.50	41.32	33.74	31.70	32.23	50.98	60.31
Benzo[ghi]perylene	g	8.21	6.92	8.03	8.93	8.65	10.36	8.46	7.95	8.08	12.78	15.12
Indeno[1.2.3-cd]pyrene	g	8.21	6.92	8.03	8.93	8.65	10.36	8.46	7.95	8.08	12.78	15.12

Table 2E-6b Emissions from use of candles, 2000-2009

		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
CO	Mg	169.27	163.38	243.32	244.41	254.96	344.33	292.41	321.12	268.48	297.91
TSP	Mg	22.68	21.89	32.61	32.75	34.16	46.14	39.18	43.03	35.98	39.92
PCDD/Fs	mg	0.46	0.44	0.66	0.66	0.69	0.93	0.79	0.87	0.72	0.80
Flouranthene	g	628.00	606.13	902.72	906.74	945.89	1277.48	1084.83	1191.34	996.06	1105.25
Benzo[k]fluoranthene	g	78.54	75.81	112.90	113.40	118.30	159.77	135.68	149.00	124.58	138.23
Benzo[a]pyrene	g	62.80	60.61	90.27	90.67	94.59	127.75	108.48	119.13	99.61	110.53
Benzo[ghi]perylene	g	15.74	15.19	22.63	22.73	23.71	32.02	27.19	29.86	24.97	27.71
Indeno[1.2.3-cd]pyrene	g	15.74	15.19	22.63	22.73	23.71	32.02	27.19	29.86	24.97	27.71

Table 2E-6c Emissions from use of candles, 2010-2011.

		2010	2011
CO	Mg	375.78	299.51
TSP	Mg	50.35	40.13
PCDD/Fs	mg	1.01	0.81
Flouranthene	g	1394.14	1111.17
Benzo[k]fluoranthene	g	174.36	138.97
Benzo[a]pyrene	g	139.41	111.12
Benzo[ghi]perylene	g	34.95	27.85
Indeno[1.2.3-cd]pyrene	g	34.95	27.85

Annex 2E-7 Activity data for other product use, 1985-2011

Table 2E-7 Activity data for the national use of fireworks, tobacco, charcoal for BBQs and use of candles.

		1985	1990	1991	1992	1993	1994	1995	1996	1997	1998
Fireworks	Gg	1.0	1.3	1.7	1.8	1.6	2.0	3.0	2.8	2.2	3.5
Tobacco	Gg	12.5	11.5	10.8	10.9	10.4	10.3	10.3	9.9	10.1	10.0
BBQ	Gg	4.4	7.2	6.2	9.5	7.1	6.0	7.9	10.2	13.5	10.2
Candles	Gg	8.8	7.4	8.6	9.6	9.3	11.1	9.1	8.5	8.7	13.7
Continued		1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Fireworks	Gg	6.7	4.9	3.8	4.7	6.1	8.6	3.7	4.2	4.5	4.4
Tobacco	Gg	10.1	11.4	10.9	10.9	11.3	11.1	10.4	10.3	9.8	9.6
BBQ	Gg	11.0	13.4	10.9	16.4	20.0	16.2	14.9	19.8	12.2	10.4
Candles	Gg	16.3	16.9	16.3	24.3	24.4	25.5	34.4	29.2	32.1	26.8
Continued		2009	2010	2011							
Fireworks	Gg	5.4	5.4	4.7							
Tobacco	Gg	9.4	9.2	7.9							
BBQ	Gg	12.2	8.6	8.5							
Candles	Gg	29.8	37.6	30.0							

Annex 3 – Completeness and use of notation keys

1.1 Not estimated categories

The Danish air emission inventory is generally complete. However, some categories and/or pollutants are reported as NE (Not estimated).

Stationary combustion

NH_3 emissions from combustion for all sources except biomass and solid fuel appliances in sector 1A4b and waste incineration plants in sector 1A1a are not estimated, due to lack of available emission factors.

Mobile combustion

Mercury and PAH emissions from tire and brake wear are not estimated, due to lack of emission factors.

Arsenic and selenium from road abrasion are not estimated, due to lack of emission factors.

HCB emissions from transport and mobile sources are not estimated, due to lack of resources.

Industrial processes

- Emissions from quarrying and mining of minerals other than coal have not been estimated.
- Emissions from construction and demolition are not estimated.
- Emissions from storage, handling and transport of mineral products are not estimated
- Emissions from storage, handling and transport of chemical products have not been estimated.
- Emissions from storage, handling and transport of metal products have not been estimated.
- Emissions from pulp and paper production have not been estimated.
- Emissions from wood processing have not been estimated.
- Emissions from production of POPs have not been estimated due to lack of emission factors.
- Emissions from consumption of POPs and heavy metals have not been estimated.

Solvent and other product use

Emissions of POPs and heavy metals from solvent use. (Only NMVOC emissions are estimated from use of solvents)

Emissions from some product uses are not estimated, e.g. use of shoes.

Agriculture

NMVOC from animal husbandry and manure management has not been estimated, due to lack of resources.

NO_x emissions from agriculture have not been estimated, due to lack of resources.

PM emissions from fur farming and from agricultural field operations have not been estimated, due to lack of resources.

Waste

Emissions from solid waste disposal on land have not been estimated due to lack of resources.

Emissions from wastewater handling have not been estimated due to lack of resources.

Emissions from small scale waste burning have not been estimated due to lack of resources.

The emission of selenium and HCB from accidental fires has not been estimated due to lack of available emission factors.

1.2 Categories reported as IE (Included Elsewhere)

The table below indicates the categories where the notation key IE has been used in the reporting.

Table A3.1 List of categories reported as included elsewhere.

1 A 5 a Other stationary (including military)	1 A 4 a i Commercial / institutional: Stationary
2 A 1 Cement production	1 A 2 f i Manufacturing industries and construction, Other
2 A 2 Lime production	1 A 2 f i Manufacturing industries and construction, Other
2 A 3 Limestone and dolomite use	1 A 2 f i Manufacturing industries and construction, Other
2 A 4 Soda ash production and use	1 A 2 f i Manufacturing industries and construction, Other
6 C a Clinical waste incineration (d)	1 A 1 a Public electricity and heat production
6 C b Industrial waste incineration (d)	1 A 1 a Public electricity and heat production
6 C c Municipal waste incineration (d)	1 A 1 a Public electricity and heat production

Emissions from other stationary combustion including military (1A5a) have been reported as included elsewhere. Stationary fuel consumption is not available as an independent category in the Danish energy statistics. Fuel consumption and therefore also emissions are reported under commercial and institutional plants (1A4a i).

Emissions from cement production (2A1), lime production (2A2), limestone and dolomite use (2A3), and soda ash production and use (2A4) are included in manufacturing industries and construction (1A2f i). It is not possible to separate the process emissions from the energy related emissions.

Emissions from clinical, industrial and municipal waste incineration (6Ca, 6Cb and 6Cc) are reported under public electricity and heat production (1A1a). All incineration of these waste fractions in Denmark is done with energy recovery and therefore emissions and waste consumption are reported in the energy sector in accordance with the guidelines.

Annex 4 – Information on the energy balance

The official Danish energy balance is prepared by the Danish Energy Agency (DEA). The DEA is responsible for reporting of energy data to Eurostat and the IEA. DCE uses the energy balance as published by the DEA. However, some reallocations between sectors are made in connection with the bottom-up modelling done at DCE for different subsectors within transport and mobile sources. For a more in-depth discussion of the energy statistics please see Annex 2A-9. For information on the reallocation of fuels please see Chapter 3.3.

ANNUAL DANISH INFORMATIVE INVENTORY REPORT TO UNECE

Emission inventories from the base year of the protocols to year 2011

This report is a documentation report on the emission inventories for Denmark as reported to the UNECE Secretariat under the Convention on Long Range Transboundary Air Pollution due by 15 February 2013. The report contains information on Denmark's emission inventories regarding emissions of (1) SO_X for the years 1980-2011, (2) NO_X, CO, NMVOC and NH_3 for the years 1985-2011, (3) Particulate matter: TSP, PM_{10}, $PM_{2.5}$ for the years 2000-2011, (4) Heavy Metals: Pb, Cd, Hg, As, Cr, Cu, Ni, Se and Zn for the years 1990-2011, (5) Polyaromatic hydrocarbons (PAH): Benzo(a) pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene and indeno(1,2,3-cd)pyrene, PCDD/F and HCB for the years 1990-2011. Further, the report contains information on background data for emissions inventory.

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