ANNUAL DANISH INFORMATIVE INVENTORY REPORT TO UNECE

Emission inventories from the base year of the protocols to year 2010

Scientific Report from DCE – Danish Centre for Environment and Energy No. 18 2012

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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 2012. The report contains information on Denmark's emission inventories regarding emissions of (1) SO_X for the years 1980-2010, (2) NO_X, CO, NMVOC and NH_3 for the years 1985-2010, (3) Particulate matter: TSP, PM_{10}, $PM_{2.5}$ for the years 2000-2010, (4) Heavy Metals: Pb, Cd, Hg, As, Cr, Cu, Ni, Se and Zn for the years 1990-2010, (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 1990-2010. 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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Summary

I Background information on emission inventories

Annual report

This report is Denmark's Annual Informative Inventory Report (IIR) due March 15, 2012 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 2010.

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

The 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 2010, 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 2010, 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 28 % 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 2010. 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 2010, 45 % 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 72 % from 1985 to 2010. In the same period, the total emission decreased by 53 %. 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 (1.9 %) and stationary combustion (0.3 %). 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 (85 %) 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 (5 %), 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 36 % from 1985 to 2010. 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 55 % from 1985 to 2010, 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 45 % from 1990 to 2010, largely because of decreasing emissions from road transportation.

Particulate Matter (PM)

The particulate matter (PM) emission inventory has been reported for the years 2000-2010. 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 (71 %), road traffic (9 %) and other mobile sources (8 %). 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 (64 %) of the emissions. The $PM_{2.5}$ emission increased by 30 % from 2000 to 2010, due to an increasing wood consumption in the residential sector.

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 62 % 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 29 % to 91 % 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 2010) and the increase from 1990 to 2010 is caused by 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 53 % of the sectoral emission in 2010. The emission from non-industrial combustion is dominated by wood combustion in residential plants which accounts for 78 % of the sectoral emission in 2010. Emissions from combustion in residential plants have increased by 119 % 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. Non-industrial combustion is dominated by wood combustion in residential plants while emissions from the waste sector mainly stems from cremation. The variations in emissions from industrial processes are caused by a shut down in 2002 followed by re-opening and a second shut in 2005 down 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 has decreased the Pb emission from transport by 93 %. 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 2010 is almost constant. This is due to the shift towards unleaded gasoline, as this sector includes other mobile sources in household, gardening, agriculture, forestry, fishing and military, However this is counteracted by an increase in emission from residential plants. The decreasing emission from Energy industries (97 % from 1990 to 2010) is caused by the deceasing coal combustion.

Polycyclic aromatic hydrocarbons (PAHs)

The emission inventory for Polycyclic aromatic hydrocarbons (PAHs) 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 PAH emissions is combustion of wood in the residential sector making up 88 % of the total emission in 2010. 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 17 % from 1990 to 2010.

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 64 % of the national dioxin emission in 2010. The contribution to the total dioxin emission from the waste sector (24 % in 2010) stems from accidental fires, especially building fires. The emission of dioxins from energy industries owes mainly to the combustion of biomass such 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 2010. This is mainly due to combustion of municipal solid waste in heating and power plants. The HCB emission from stationary plants has decreased 81 % since 1990 mainly due to improved flue gas cleaning in MSW incineration plants. Wood combustion in households is an important source, too, and has increased by 302 % since 1990 due to increasing wood consumption.

III Recalculations and Improvements

Investigations and research carried out in Denmark and abroad produce new results and findings, which are given consideration and, to the extent possible, 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 (DEA). 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. This, however, does not include energy statistics for fuel consumption data for specific industries.

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 in-

dividual 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 1990-2009 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.

The disaggregation of emissions in *1A2 Manufacturing industries and construction* has been recalculated based on a new improved methodology. Thus, the estimated emissions in the subsectors are considerable, but the total emissions in sector 1A2 are relatively low.

The emissions from residential wood combustion have been recalculated based on improved technology disaggregation data. In addition the NMVOC emission factor has been improved for new stoves resulting in a decreased emission from this sector.

The NO_x emission factor for natural gas consumption in large power plants has been updated according to Danish legislation[1].

The NMVOC emission factor for refineries has been included or revised for several years. This results in improved time series but also in large relative changes for some years.

The PM_{10} and $PM_{2.5}$ emission factors for wood and straw have been recalculated to improve consistency with the TSP emission factor.

Mobile sources

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 1985-2009 has been updated based on new data prepared by DTU Transport. Important changes are a different split of total mileage between gasoline and diesel passenger cars based on data for the year 2008 from the Danish vehicle inspection and maintenance programme. Also updated mileage for foreign vehicles driven on Danish roads has been included.

Agriculture/forestry/fisheries

The sales distribution into engine sizes for harvesters has been updated for the years 2002, 2003 and 2009.

Military

Emission factors derived from the new road transport simulations have caused some emission changes from 1985-2009.

Aviation

Emission changes occur for the years 2007-2009, due to a correction in the representative aircraft type for new aircraft used for flying in Denmark. Due

[1] However, in general plant specific emission data are available.

to an error F28 was previously used as a representative aircraft type for the new aircraft types CRJ9, E70, E170 and E175. However, F28 is a very old aircraft which cannot represent these new aircraft types. Instead new fuel consumption and emission factors have been calculated for the CRJ9, E70, E170 and E175 jets.

Fugitive emissions

Refineries: Emissions of NMVOC have been changed for the years 1994-2000 and 2002-2009 according to VOC measurements carried out in 2001, as no further information on fugitive emissions from the refineries are or will become available for other historical years. This is the result of an extended communication with one refinery leading to a recommendation to use measured emissions, and not an estimated emission calculated by weighting the measured emissions by the annual processed crude oil amount as done in previous inventories. The fugitive emissions are more related to other conditions than the processed amounts. The split of VOC emissions provided by the refineries have been revised in order to apply a more similar approach for the two refineries. For both refineries annual emissions of NMVOC are not available, and emissions are based on the provided VOC emissions and assumptions for the part of VOC being NMVOC and CH_4, respectively. Assumptions are based on information from the refineries and on literature study of international proportions/conditions. In the previous inventory CH_4 was estimated as 10 % of VOC based on information from one refinery.

Updated SO_2 emissions for the years 2005-2009 provided by a refinery are included in the inventory.

Gas distribution: Emission factors for NMVOC for town gas distribution have been corrected for an error. Distribution of town gas is a minor source and the recalculation is insignificant for all years (< 0.001 % of the total fugitive NMVOC emission in 2009).

Offshore flaring: Activity data has been corrected for 2008 for two offshore installations. The calorific value has been corrected for the whole time series according to the average calorific value in the EU ETS reports for 2008-2010 which affects the emission factor for NO_x, NMVOC, CO, particulate matter, heavy metals, dioxin and PAHs. Further, the emission factors for CO and NMVOC have been corrected by including a conversion from m_s^3 (standard m^3) to m_n^3 (normal m^3). The activity data has been updated according to the latest figures from the Danish Energy Agency (DEA).

Industrial processes

Production of chemical ingredients and treatment of slaughterhouse waste are transferred from *Mineral products* to *Other production, consumption, storage, transportation or handling of bulk products* (NFR 2G).

The emission factors applied for NMVOC from refining of sugar within the sector *Other production* have been revised.

Solvent and other product use

Improvements and additions are continuously being implemented due to the comprehensiveness and complexity of the use and application of sol-

vents in industries and households. The main improvements in the 2011 reporting include the following:

- Inclusion of NMVOC use and calculations of NMVOC emissions for the time period 1990 to 1994
- Inclusion of Tobacco smoking and Combustion of Charcoal for Barbeques in Other Product Use

Agriculture

Compared with the previous NH_3 and PM emissions inventory (submission 2011), some changes and updates have been made. These changes cause a decrease in the NH_3 emission (1985 – 2009) and a decrease in the PM emission (2000 – 2009).

Emission of NH_3 has decreased 1-3% in the period 1985-2009 compared to the submission 2011. The main reason for the decrease is an adjustment of emission factors for synthetic fertilisers. The emission factors have been updated in cooperation with the Danish Plant Directorate.

The PM emission decreases because a technical error in the calculation of PM from animal husbandry has been corrected.

The calculation of number of produced bulls has been changed to being based on slaughtering data from Statistics Denmark instead of annual census. An error in the calculation of number of weaners and fattening pigs has been corrected. Furthermore, the time series of the distribution of animals on deferent housings types have been reviewed by experts. These changes in activity data have influence on both NH_3 and PM emissions.

The emission of NMVOC from crops has been recalculated for 2009 because of new data for agricultural land from Statistics Denmark.

Waste

Changes have been made to the methodology of accidental building and vehicle fires. For accidental building fires, the different building categories now also include additional buildings (sheds, greenhouses etc.) and container fires. Also there are now four damage categories; full, large, medium and small scale fires, corresponding to 100, 75, 30 and 5 % damage rate, respectively. The effect of these changes is a decrease in emissions between 4-9 % for particles and 44-47 % for NMVOC. Even though the number of included building fires is higher in this year's inventory, the total emissions are lowered. In earlier years buildings like carports, sheds and greenhouses were categorised as detached houses and emissions from these fires were calculated based on average floor space and content masses that were much too high. The addition of the category additional buildings is the main reason for the lowered total emissions from accidental building fires.

For accidental vehicle fires, similar changes were made. Last year the damage rate was set to 70 % for all fires, but this year the damage rate was divided in four damage categories according to the measure of fire extinguishing; full, large, medium and small scale fires, corresponding to 100, 75, 30 and 5 % damage rate, respectively. These new damage categories give an average burnout for all vehicle categories in 2007-2010 of 34 % and thereby a

reduction in emission of about 50 % compared with the 70 % burnout used in last year's inventory.

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 2012. Rapporten indeholder oplysninger om Danmarks opgørelser for alle år fra basisårene for protokollerne til 2010.

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 AU's 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 2010 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 2010 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 28 % 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 omkring 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 2010 stammede 45 % 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 72 % fra 1985 til 2010. I samme periode er den totale emission faldet med 53 %. 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 (1,9 %) 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 (85 %) 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 (5 %), 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 36 % fra 1985-2010. 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 emissio-

nerne 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 55 % fra 1985 til 2010, 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 kulilte(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 45 % fra 1990 til 2010 hovedsageligt pga. faldende emissioner fra vejtransport.

Partikler (PM)

Emissionsopgørelsen for partikler (Particulate Matter, forkortet PM) er blevet rapporteret for årene 2000-2010. 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 (71 %), vejtrafik (9 %) og andre mobile kilder (8 %). For den sidstes vedkommende er off-road-køretøjer i industrien samt landbrugs- og skovbrugsmaskiner de vigtigste kilder (hhv. 32 % og 37 %). I transportsektoren tegner udstødningsemissioner sig for størstedelen (64 %). $PM_{2.5}$-emissionen er steget med 30 % fra 2000 til 2010, hovedsageligt pga. det stigende træforbrug i husholdninger.

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 62 % 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 29 % til 91 % for henholdsvis Zn og Pb. Årsagen til de reducerede emissioner er hovedsageligt den øgede brug af røggasrensning på kraftværker og fjernvarmeværker (inklusive affaldsforbrændings-anlæg). 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 2010). Emissionen herfra er steget fra 1990 til 2010 pga. 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 53 % i 2010. Emissionen fra ikke-industriel forbrænding domineres af forbrænding af træ i hus-

holdningsanlæg (78 % i 2010). Emissionen fra stationære anlæg i husholdninger er faldet med 119 % 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 2010. 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 elektro-stålvalseværket 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 93 % fra 1990 til 2010. 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 1990-2010. 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 97 % 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 88 % af den samlede PAH-emission i 2010. De stigende emissioner skyldes øget forbrænding af træ i brændeovne og kedler i husholdningerne. Emissionen fra stationær forbrænding i husholdninger er steget med 17 % fra 1990 til 2010.

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 64 % af den nationale dioxin emission i 2010. Emissioner fra affaldssektoren udgør 24 % af den nationale total i 2010, 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 2010 stammer fra stationær forbrænding, hovedsageligt forbrænding af husholdningsaffald til el- og varmeproduktion. HCB-emissionen fra stationær forbrænding er faldet 81 % siden 1990, hovedsageligt pga. forbedret røggasrensning på affaldsforbrændings-

anlæg. Forbrænding i husholdninger er en anden vigtig kilde, der er steget 302 % 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

Den seneste officielle energistatistik er implementeret i opgørelsen. Opdateringen inkluderede ændringer til både transformation og slutforbrug samt en ændring i allokering af industriens energiforbrug. Der er for det meste tale om mindre ændringer.

Opsplitningen i industriens energiforbrug i undersektorer under NFR kategori 1A2 er blevet opdateret. Tidligere blev stort set alle emissioner rapporteret under 1A2f. Ændringerne for de enkelte undersektorer er derfor betydelige, men den samlede ændring er meget lille.

Emissionerne fra træfyring i husholdninger er blevet genberegnet på baggrund af forbedrede data om teknologifordelingen. Derudover er NMVOC emissionsfaktoren blevet opdateret baseret på nye forskningsresultater fra Sverige. Dette har medført et fald i emissionen.

NO_x emissionsfaktoren for naturgasforbrænding i kraftværker er blevet opdateret i forhold til gældende dansk lovgivning.[2]

NMVOC emissionsfaktoren for raffinaderier er blevet revideret for flere år i tidsserien. Dette har medført betydelige ændringer for sektoren i nogle år.

PM_{10} og $PM_{2.5}$ emissionsfaktorerne for træ og halm er blevet opdateret for at forbedre konsistensen med TSP emissionsfaktoren.

Transport

Vejtransport

Antallet af kørte kilometre er blevet opdateret for 1985-2009 baseret på nye data fra DTU Transport. Vigtige ændringer inkluderer et nyt split mellem kørte kilometre for benzin og diesel personbiler baseret på data fra lovplig-

[2] Generelt er der dog anlægsspecifikke emissionsfaktorer tilgængelige.

tige syn i 2008. Opdaterede oplysninger om kørte kilometre for udenlandske køretøjer i Danmark er også inkluderet.

Landbrugsmaskiner

Antallet af mejetærskere er blevet opdateret for 2002, 2003 og 2009.

Militær

Emissionsfaktorer afledt fra de nye modelsimulationer for vejtransport har medført små ændringer i emissionerne i perioden 1985-2009.

Luftfart

Der er foretaget ændringer for årene 2007-2009. Dette skyldes en korrektion i anvendelsen af en repræsentativ flytype for en ny flytype introduceret i Danmark. På grund af en fejl var F28 anvendt som repræsentativ flytype for CRJ9, E70, E170 og E175. F28 er imidlertid en meget gammel flytype, som ikke er repræsentativ for de nye flytyper. I stedet er nye brændselsforbrugs- og emissionsfaktorer beregnet for CRJ9, E70, E170 og E175.

Flygtige emissioner

Raffinaderier: Emissionerne af NMVOC er ændret for årene 1994-2000 og 2002-2009 i overensstemmelse med måleresultater fra 2001. Genberegningen er foretaget, da der ikke er andre oplysninger tilgængelige for andre historiske år end 2001. Beslutningen er truffet efter grundig dialog med det ene af de to danske raffinaderier, der førte til beslutningen om at anvende måleresultatet fremfor den tidligere anvendte metode med en beregnet emission ud fra den behandlede mængde råolie. Emissionerne er mere relateret til procesforhold end til den behandlede mængde råolie.

For begge raffinaderier er der ikke oplysninger om den årlige udledning af NMVOC, kun den totale mængde VOC. Tidligere opgørelser har antaget af 10 % af VOC var CH_4. Denne antagelse er ikke længere anvendt i stedet er splittet mellem CH_4 og NMVOC baseret på oplysninger fra raffinaderierne samt et litteraturstudie.

Et raffinaderi har ændret SO_2 emissionsoplysninger for 2005-2009, hvilket er afspejlet i emissionsopgørelsen.

Gas distribution: Emissionsfaktorer for NMVOC for bygasproduktion er blevet fejlrettet. Distribution af bygas er en meget lille kilde og genberegningen påvirker derfor kun den totale emission i ubetydeligt omfang.

Off-shore flaring: Aktivitetsdata for 2008 er blevet korrigeret for to platforme. Brændværdien er blevet opdateret for hele tidsserien baseret på den gennemsnitlige brændværdi rapporteret under EU ETS for årene 2008-2010. Dette påvirker emissionsfaktorerne for NO_x, NMVOC, CO, partikler, tungmetaller, dioxin og PAH. Emissionsfaktorerne for CO og NMVOC er derudover blevet korrigeret fra m_s^3 (standard m^3) til m_n^3 (normal m^3). Aktivitetsdata er opdateret i henhold til den nyeste energistatistik fra Energistyrelsen.

Industriprocesser

Produktion af ingredienser og behandling af slagteaffald er blevet flyttet fra NFR-kategorien 2A (Mineral products) til NFR kategori 2G (Other).

NMVOC-emissionsfaktoren for sukkerproduktion er revideret.

Opløsningsmidler og anden produktanvendelse

Opgørelsen af NMVOC emissioner fra anvendelsen af opløsningsmidler er blevet forbedret for perioden 1990-1994.

Emissioner fra anvendelse af tobak og grillkul er inkluderet i opgørelsen for første gang.

Landbrug

Sammenlignet med 2011-rapporteringen er der foretaget nogle opdateringer i opgørelserne af NH_3 og partikler. Disse ændringer har medført et fald i NH_3 emissionen for årene 1985-2009 og et fald i emissionen af partikler for årene 2000-2009.

Emissionen af NH_3 er faldet med 1-3 % i perioden 1985-2009 sammenlignet med 2011 afleveringen. Hoveårsagen for faldet er en justering af emissionsfaktorerne for handelsgødning. Emissionsfaktorerne er opdateret i dialog med Plantedirektoratet.

Partikelemissionen er faldet på grund af en fejlretning i beregningen af partikler fra husdyr.

Beregningen af antallet af tyre er blevet opdateret baseret på slagtedata fra Danmarks Statistik i stedet for den årlige tælling. Der er foretaget en fejlretning i forbindelse med beregningen af antallet af smågrise og slagtesvin. Tidsserien for staldtypefordelingen er blevet gennemgået, og mindre ændringer foretaget. Disse ændringer påvirker både emissionen af NH_3 og partikler.

Emissionen af NMVOC fra afgrøder er blevet genberegnet for 2009 på grund af nye data for landbrugsarealet fra Danmarks Statistik.

Affald

Der er foretaget metodeændringer for brande i bygninger og køretøjer. For bygningsbrande er der inkluderet yderligere bygningstyper (udhuse, drivhuse etc.) og containerbrande. Der er også ændret i skadeskategorierne, så der nu opereres med 4 kategorier svarende til 100, 75, 30 og 5 % skade. Effekten af disse ændringer er et fald i emissionerne, f.eks. for partikler mellem 4 og 9 % og for NMVOC mellem 44 og 47 %. I tidligere opgørelser blev brande i f.eks. carporte og skure regnet for husbrande, og emissionerne blev beregnet ud fra antagelse gældende for huse, hvilket medførte en overestimering af emissionerne. Indførslen af nye kategorier har bevirket at emissionerne er faldet i forhold til tidligere opgørelser.

For bilbrande er der fortaget en tilsvarende ændring. I tidligere opgørelser er det antaget, at alle bilbrande resulterede i 70 % skade. I denne opgørelse er der indført fire skadekategorier svarende til kategorierne for husbrande. Det vægtede skadesgennemsnit for perioden 2007-2010 er 34 % og dermed væsentligt lavere end den tidligere antagede skade på 70 %.

1 Introduction

1.1 Background information on emission inventories

The 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 party 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 lack of resources, it has not been possible to incorporate the new elements of the new reporting guidelines in this submission.

This report is Denmark's Annual Informative Inventory Report due March 15, 2012. The report contains information on Denmark's inventories for all years from the base years of the protocols to 2010.

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

The DCE-Danish Centre for Environment and Energy (DCE), 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 conven-

tion 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 (AU). 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-Danish Centre for Food and Agriculture, Aarhus University.

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.

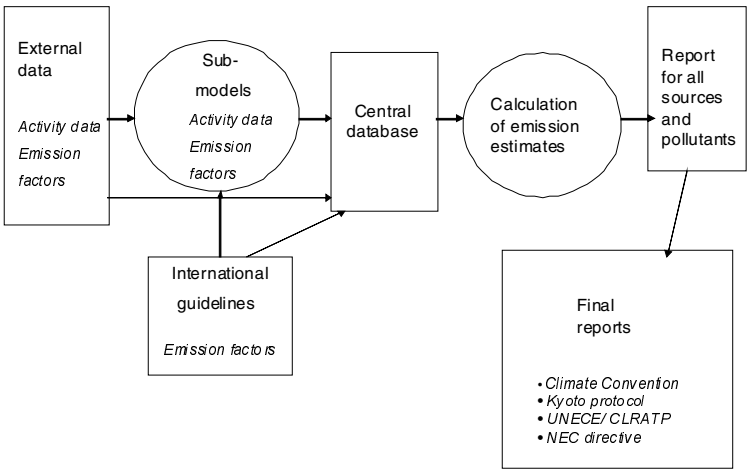

Figure 1.1 Schematic diagram of the process of inventory preparation.

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_All Sectors\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_All Sectors\Level_3b_Processes	(exe + mdb)	manual input and Importer2CRF
3 process	Importer2CRF	Help tool	I:\ROSPROJ\LUFT_EMI\Inventory\AllYears\8_All Sectors\Level_3b_Processes	MS Access	CRF Reporter, CollectEr2CRFand excel files
3 process	CollectER2CRF	Help tool	I:\ROSPROJ\LUFT_EMI\Inventory\AllYears\8_All Sectors\Level_3b_Processes	MS Access	NERIRep
2 process 3 store	NERIRep	Help tool	Working path: I:\ROSPROJ\LUFT_EMI\Inventory\AllYears\8_All Sectors\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_All Sectors\Level_2b_Processes	(exe +mdb)	manual input
2 store	dk1980.mdb.dkxxxx.mdb	Datastore	I:\ROSPROJ\LUFT_EMI\Inventory\AllYears\8_All Sectors\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 emis-

sion. 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 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. N_2O activity data are obtained from companies producing and selling N_2O for use primarily in anaesthesia.

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.

The historic NMVOC emissions for the period 1990-1994 are introduced in this reporting corresponding to the described method. Previously this period was inventoried as an extrapolation of historic 1995-present data.

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 Plant Directorate. 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 ans Agriculture at Aarhus University and the Danish Agricultural Advisory Service. From 2005 annual statistics covering housing types are available from the Danish Plant Directorate.

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

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.

Solid waste disposal on land and waste-water handling are only relevant in relation to the greenhouse gas emissions of CH_4 and N_2O. These categories are therefore not included in this inventory of LRTAP.

Waste Incineration covers the cremation of human bodies and animal carcasses. Both are calculated as en 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 is 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., 2011), 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 the sectors: stationary combustion, transport, industry and agriculture.

Table 1.2 Danish uncertainty estimates, 2010.

Pollutant	Uncertainty Total emission [%]	Trend 1990[1]-2010 [%]	Uncertainty Trend [%-age points]
SO_2	15	-92	±1.0
NO_x	38	-53	±8
NMVOC	23	-48	±11
CO	40	-45	±15
NH_3	28	-35	±15
TSP	263	9.2	±83
PM_{10}	305	11.3	±98
$PM_{2.5}$	365	15.8	±113
Arsenic	204	-77	±30
Cadmium	342	-80	±53
Chromium	256	-85	±32
Copper	936	36	±76
Mercury	129	-86	±11
Nickel	404	-77	±53
Lead	627	-91	±24
Selenium	155	-68	±19
Zinc	720	-28	±260
PCDD/F	701	-61	±219
Benzo(b)fluoranthene	928	117	±146
Benzo(k)fluoranthene	921	129	±206
Benzo(a)pyrene	948	128	120
Indeno(1,2,3-c,d)pyrene	937	94	±101
HCB	717	-81	±60

[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 2012 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.

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

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.

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 2010, 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.

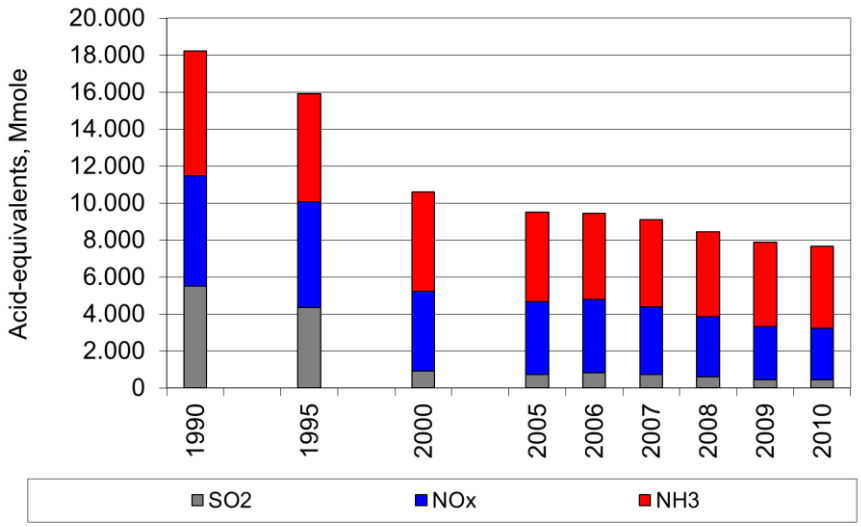


Figure 2.1 Emissions of NH_3, NO_X and SO_2 over time in acid equivalents.

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 28 % 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 2010. This is due to the use of residual oil with high sulphur content.

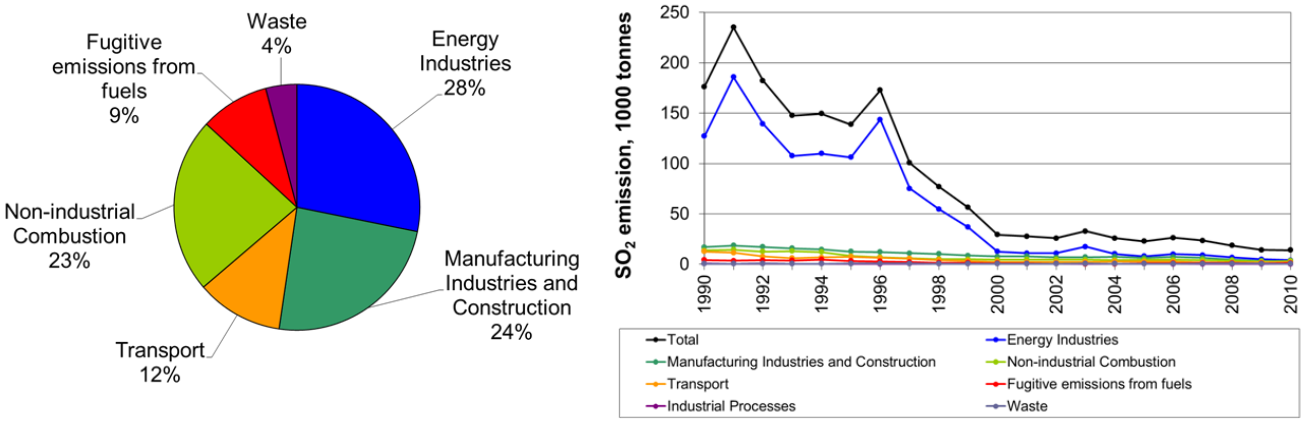


Figure 2.2 SO_2 emissions. Distribution according to the main sectors (2010) and time series for 1990 to 2010.

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 2010, 45 % 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 72 % from 1985 to 2010. In the same period, the total emission decreased by 53 %. 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.

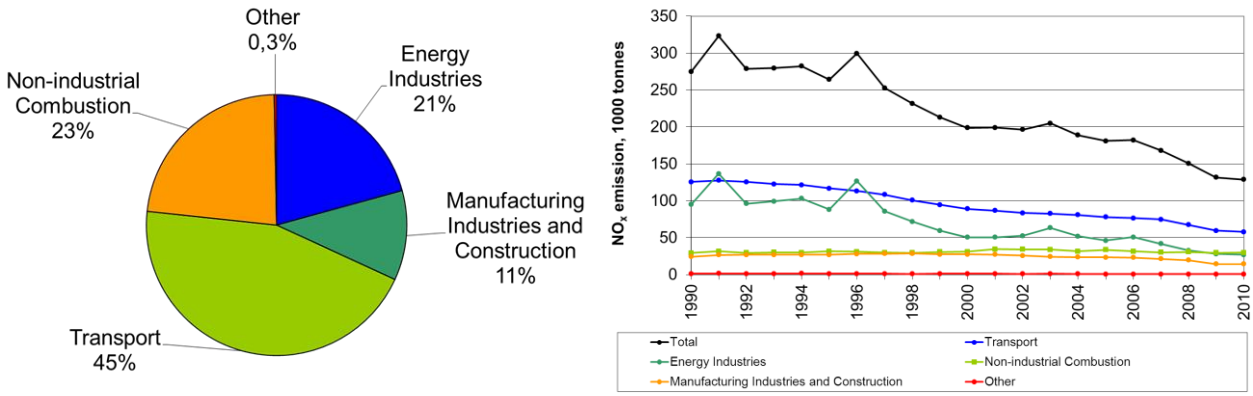


Figure 2.3 NO_X emissions. Distribution according to the main sectors (2010) and time series for 1990 to 2010.

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 (1.9 %) and stationary combustion (0.3 %). The share for road transport was increasing during the 1990'ties and early 2000s 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 (85 %) 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 (5 %), 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 36 % from 1985 to 2010. 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.

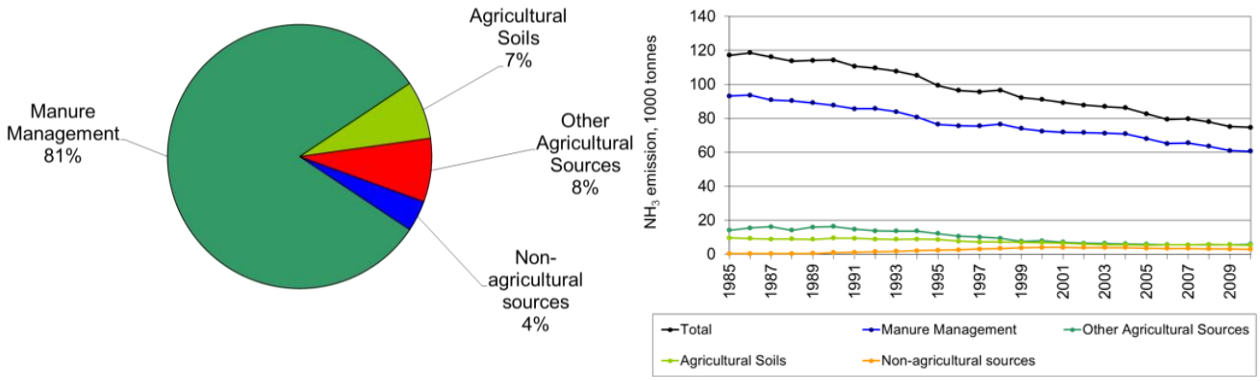


Figure 2.4 NH_3 emissions. Distribution on the main sectors (2010) and time series for 1985 to 2010.

2.3 Other air pollutants

2.3.1 Non-Methan Volatile Organic Compounds (NMVOC)

The emissions of Non-Methan 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 55 % from 1985 to 2010, largely due to the increased use of catalyst cars and reduced emissions from use of solvents.

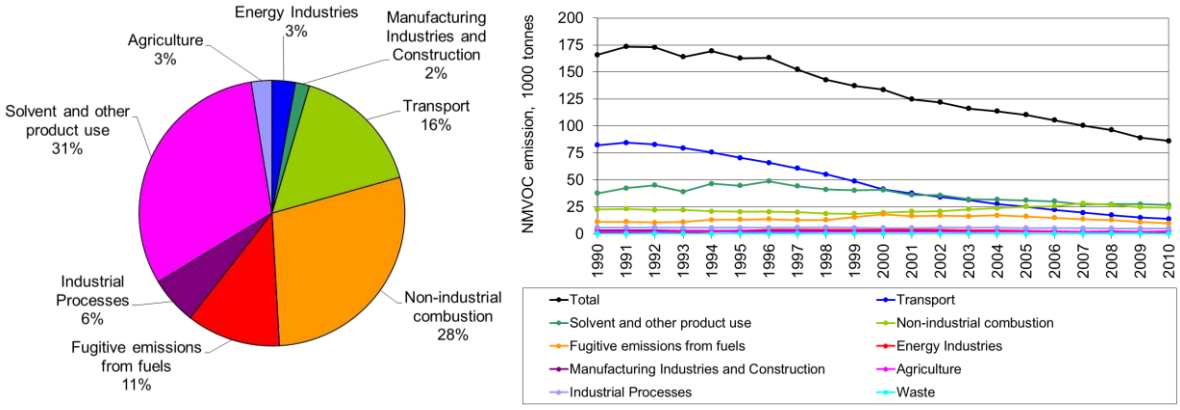


Figure 2.5 NMVOC emissions. Distribution according to the main sectors (2010) and time series for 1990 to 2010.

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 45 % from 1990 to 2010, largely because of decreasing emissions from road transportation.

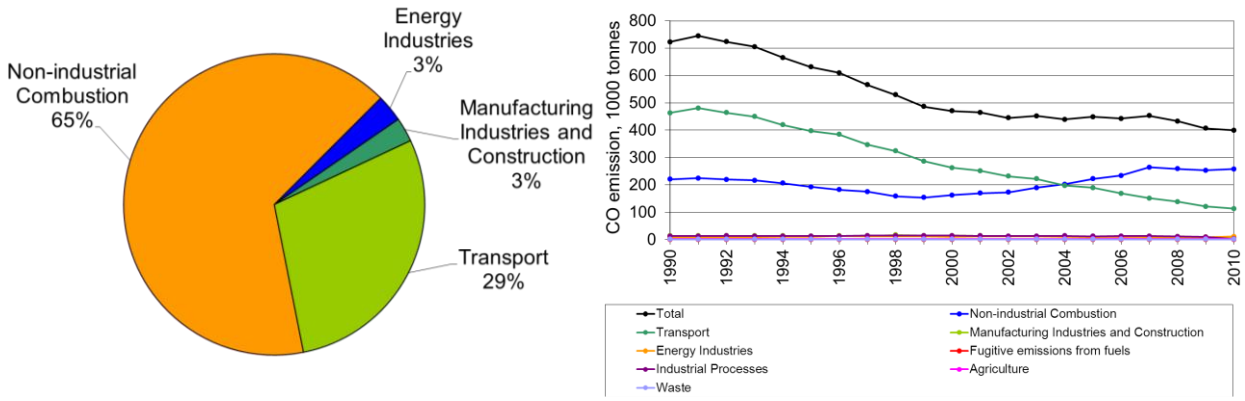


Figure 2.6 CO emissions. Distribution according to the main sectors (2010) and time series for 1990 to 2010.

2.3.3 Particulate Matter (PM)

The particulate matter (PM) emission inventory is reported for the years 2000-2010. 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 (71 %), road traffic (9 %) and other mobile sources (8 %). 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 (64 %) of the emissions. The $PM_{2.5}$ emission increased by 30 % from 2000 to 2010 due to an increasing wood consumption in the residential sector.

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 62 % of the TSP emission from road transport.

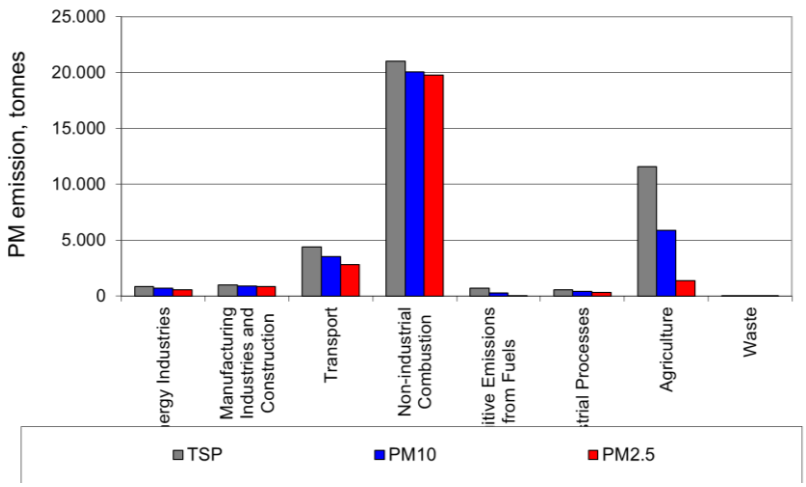


Figure 2.7 PM emissions per sector for 2010.

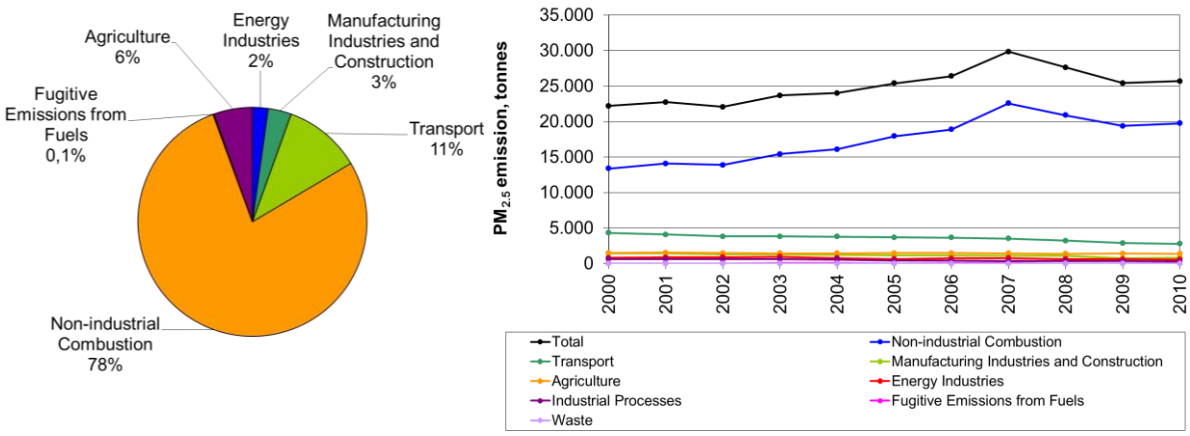


Figure 2.8 $PM_{2.5}$ emissions. Distribution according to the main sectors (2010) and time series for 2000 to 2010.

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 29 % to 91 % 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 2010) and the increase from 1990 to 2010 owe to increasing mileage.

Table 2.1 Emissions of heavy metals.

Heavy metals, kilogramme	As	Cd	Cr	Cu	Hg	Ni	Pb	Se	Zn
1990	1 301	985	5 992	36 745	3 062	20 583	125 075	4 925	52 066
2010	313	194	957	50 311	522	4 689	10 713	1 417	37 101
Reduction, %	76	80	84	-37	83	77	91	71	29

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 53 % of the sectoral emission in 2010. The emission from non-industrial combustion is dominated by wood combustion in residential plants which accounts for 78 % of the sectoral emission in 2010. Emissions from combustion in residential plants have increased by 119 % since 1990. The decreasing emission from energy industries are related to the decreasing combustion of coal.

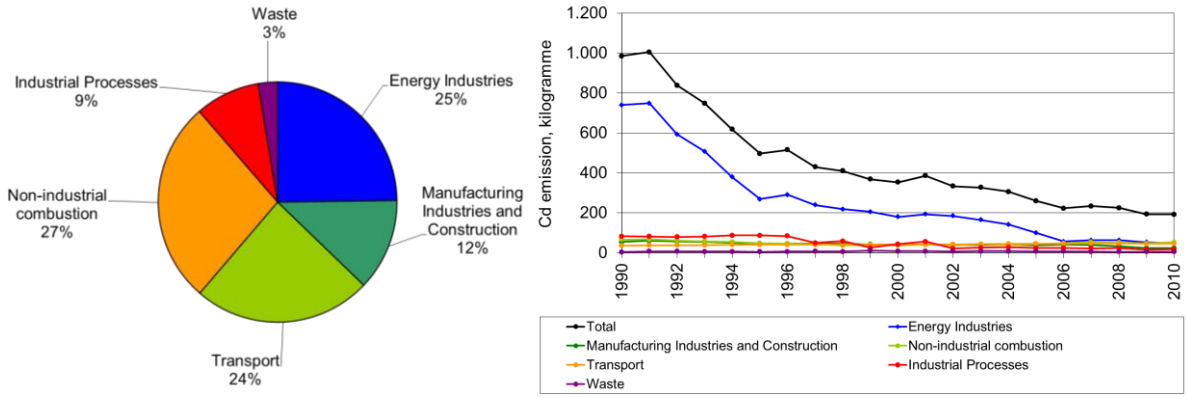


Figure 2.9 Cd emissions. Time series for 1990 to 2010 and distribution by main sector for 2010.

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. 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.

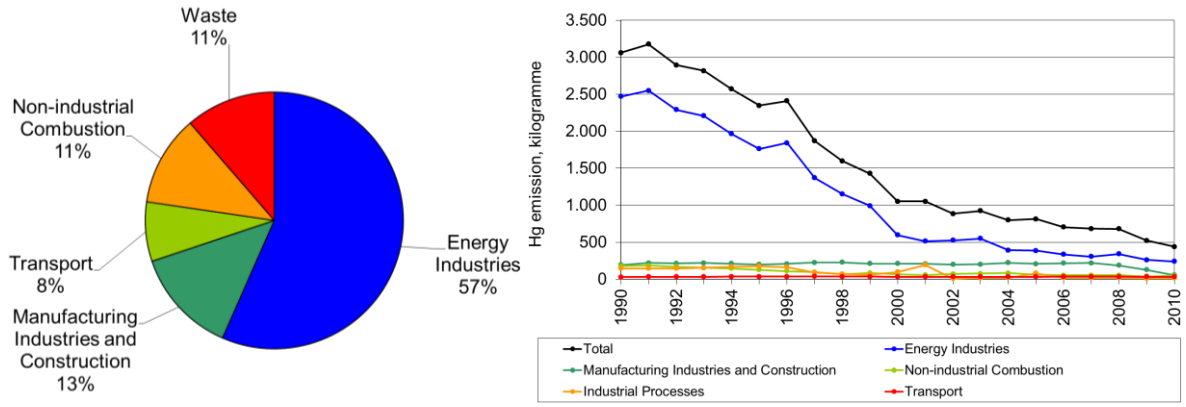


Figure 2.10 Hg emissions. Time series for 1990 to 2010 and distribution by main sector for 2010.

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 93 %. 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 2010 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 (97 % from 1990 to 2010) is caused by the deceasing coal combustion.

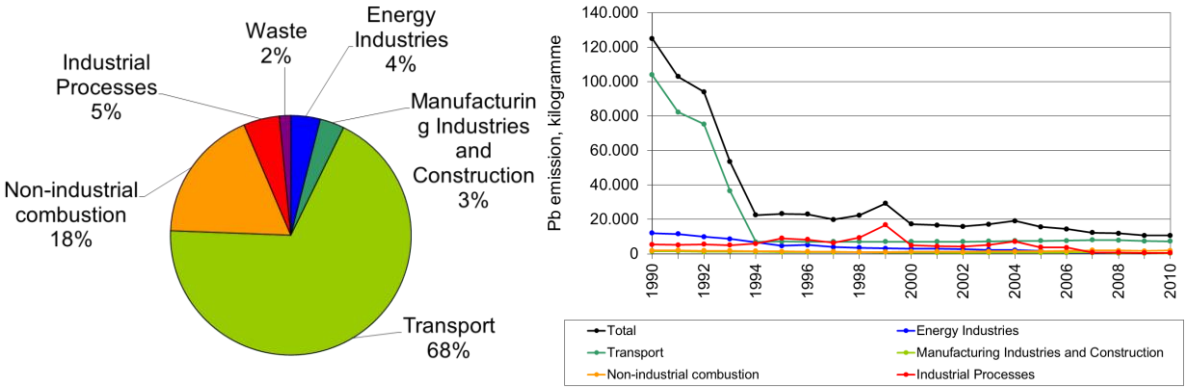


Figure 2.11 Pb emissions. Time series for 1990 to 2010 and distribution by main sector for 2010.

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)fluoran-thene and indeno-(1,2,3-cd)pyrene. Benzo(b)fluoran-thene and Benzo(a)pyrene contribute the major PAH emission by 31 % and 30 %, respectively.

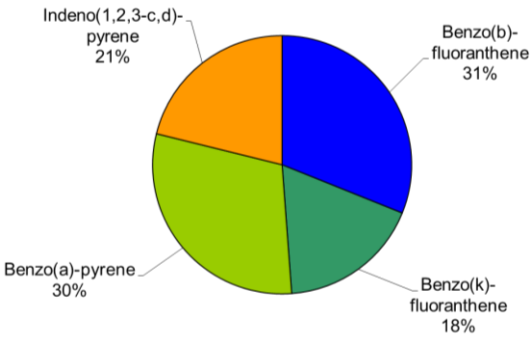


Figure 2.12 PAH emissions. Distribution according to the main sectors (2010) and time series for 1990 to 2010.

The most important source of PAH emissions is combustion of wood in the residential sector making up 88 % of the total emission in 2010. 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 17 % from 1990 to 2010.

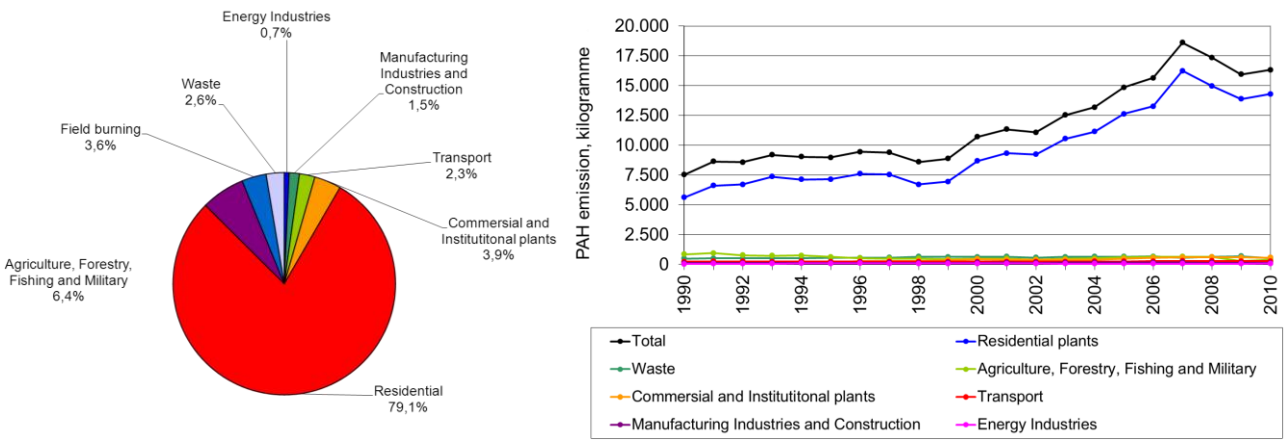


Figure 2.13 PAH emissions. Distribution according to the main sectors (2010) and time series for 1990 to 2010.

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 64 % of the national dioxin emission in 2010. The contribution to the total dioxin emission from the waste sector (24 % in 2010) owes to accidental fires, especially building fires. The emission of dioxins from energy industries owes mainly to the combustion of biomass as wood, wood waste and to a less extend agricultural waste.

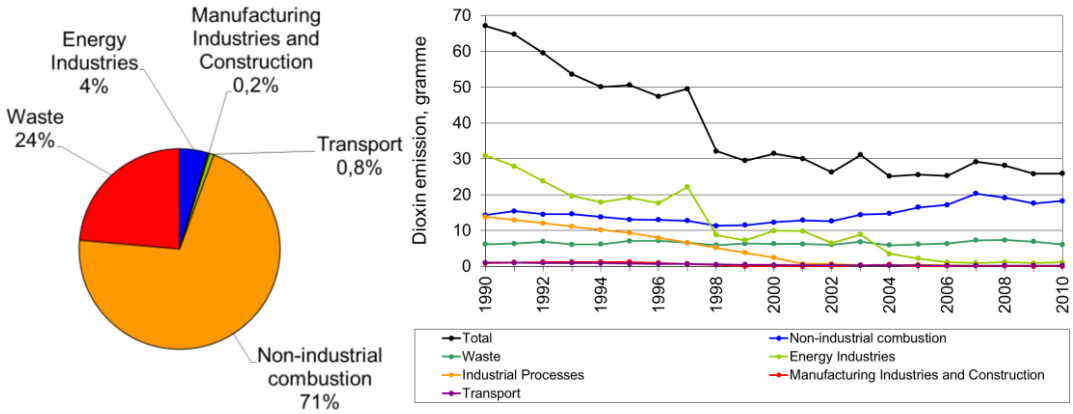


Figure 2.14 Emissions of dioxins and furans. Distribution according to the main sectors (2010) and time series for 1990 to 2010.

2.3.7 Hexachlorobenzene (HCB)

Stationary combustion accounts for 98 % of the estimated national hexachlorobenzene (HCB) emission in 2010. 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 302 % since 1990 due to increasing wood consumption. The HCB emission from stationary plants has decreased 81 % 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.

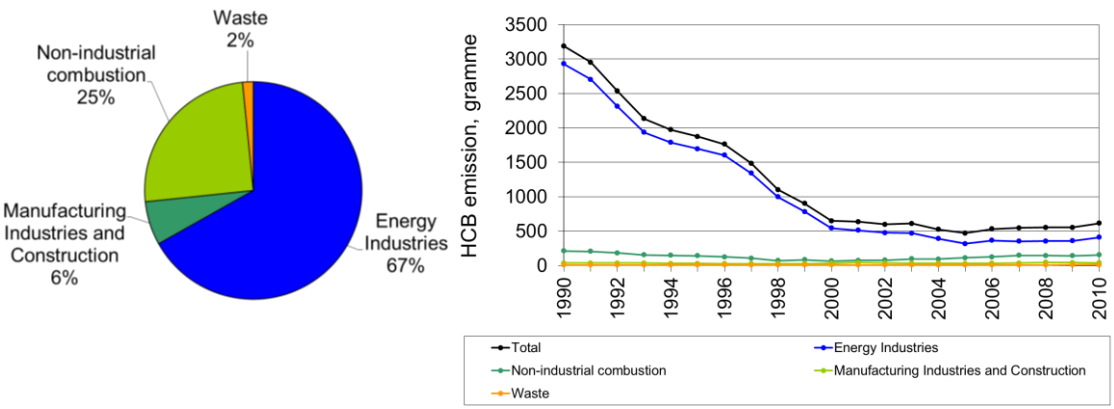


Figure 2.15 HCB emissions. Distribution according to the main sectors (2010) and time series for 1990 to 2010.

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)

Although industrial combustion forms part of stationary combustion, detailed documentation for some of the specific industries is discussed in the industry chapters. The emissions are reported in NFR sector 1A2. Emissions from facilities with only fuel consumption in the industrial sector are included in the data presented in Chapter *3.2 Stationary Combustion*.

Table 3.1 shows detailed source categories for the energy sector and plant category in which the sector is discussed in this report.

Table 3.1 NFR source categories for the energy sector.

NFR id	NFR sector name	NERI documentation
1	Energy	Stationary combustion, Transport, Fugitive, Industry
1A	Fuel Combustion Activities	Stationary combustion, Transport, Industry
1A1	Energy Industries	Stationary combustion
1A1a	Electricity and Heat Production	Stationary combustion
1A1b	Petroleum Refining	Stationary combustion
1A1c	Solid Fuel Transf./Other Energy Industries	Stationary combustion
1A2	Fuel Combustion Activities/Industry (ISIC)	Stationary combustion, Transport, Industry
1A2a	Iron and Steel	Stationary combustion, Industry
1A2b	Non-Ferrous Metals	Stationary combustion, Industry
1A2c	Chemicals	Stationary combustion, Industry
1A2d	Pulp, Paper and Print	Stationary combustion, Industry
1A2e	Food Processing, Beverages and Tobacco	Stationary combustion, Industry
1A2f	Other (please specify)	Stationary combustion, Transport, Industry
1A3	Transport	Transport
1A3a	Civil Aviation	Transport
1A3b	Road Transportation	Transport
1A3c	Railways	Transport
1A3d	Navigation	Transport
1A3e	Other (please specify)	Transport
1A4	Other Sectors	Stationary combustion, Transport
1A4a	Commercial/Institutional	Stationary combustion, Transport
1A4b	Residential	Stationary combustion, Transport
1A4c	Agriculture/Forestry/Fishing	Stationary combustion, Transport
1A5	Other (please specify)	Stationary combustion, Transport
1A5a	Stationary	Stationary combustion
1A5b	Mobile	Transport
1B	Fugitive Emissions from Fuels	Fugitive
1B1	Solid Fuels	Fugitive
1B1a	Coal Mining	Fugitive
1B1a1	Underground Mines	Fugitive
1B1a2	Surface Mines	Fugitive
1B1b	Solid Fuel Transformation	Fugitive
1B1c	Other (please specify)	Fugitive
1B2	Oil and Natural Gas	Fugitive
1B2a	Oil	Fugitive
1B2a2	Production	Fugitive
1B2a3	Transport	Fugitive
1B2a4	Refining/Storage	Fugitive
1B2a5	Distribution of oil products	Fugitive
1B2a6	Other	Fugitive
1B2b	Natural Gas	Fugitive
1B2b1	Production/processing	Fugitive
1B2b2	Transmission/distribution	Fugitive
1B2c	Venting and Flaring	Fugitive
1B2c1	Venting and Flaring Oil	Fugitive
1B2c2	Venting and Flaring Gas	Fugitive
1B2d	Other	Fugitive

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

Table 3.2 SO_2, NO_x, NMVOC, CO and PM emission from the energy sector, 2010.

	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	26.7	2.4	3.9	0.01	0.6	0.7	0.9	11.5
1A2 Manufacturing industries and Construction	14.3	1.5	3.4	0.003	0.8	0.9	1.0	10.3
1A3 Transport	57.7	13.8	1.6	1.4	2.8	3.5	4.4	113.5
1A4 Other Sectors	29.2	24.4	3.2	0.2	19.8	20.1	21.0	257.8
1A5 Other	0.4	0.04	0.02	0.0003	0.01	0.01	0.01	0.3
1B1 Fugitive Emissions from fuels, Solid Fuels	NA	NA	NA	NA	0.0	0.3	0.7	NA
1B2 Fugitive Emissions from fuels, Oil and Natural gas	0.2	9.8	1.3	NA	0.03	0.3	0.7	0.2
Energy, Total	128.6	52.1	13.4	1.6	24.0	25.7	28.6	394

Table 3.3 HM emissions from the energy sector, 2010.

	Pb	Cd	Hg	As	Cr	Cu	Ni	Se	Zn
	Mg	Mg	Mg	Mg	Mg	Mg	Mg	Mg	Mg
1A1 Energy Industries	0.4	0.05	0.2	0.1	0.2	0.2	0.5	1.1	0.5
1A2 Manufacturing industries and Construction	0.4	0.02	0.1	0.1	0.1	0.1	1.5	0.1	1.4
1A3 Transport	7.3	0.05	0.03	0.04	0.2	46.8	2.0	0.1	26.8
1A4 Other Sectors	1.8	0.1	0.05	0.05	0.1	0.4	0.4	0.1	5.5
1A5 Other	0.1	0.0001	0.0001	0.000001	0.0004	0.0003	0.0001	0.000001	0.02
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	0.001	0.003	0.001	0.001	0.004	0.002	0.006	0.0001	0.1
Energy, Total	9.99	0.17	0.38	0.27	0.62	47.46	4.39	1.37	34.35

Table 3.4 PAH, dioxin and HCB emission from the energy sector, 2010.

	benzo(a)-pyrene	benzo(b)-fluoranthene	benzo(k)-fluoranthene	Indeno-(1,2,3-c,d)-pyrene	Dioxin	HCB
	Mg	Mg	Mg	Mg	g I-Teq	kg
1A1 Energy Industries	0.01	0.04	0.02	0.01	1.2	0.4
1A2 Manufacturing industries and Construction	0.02	0.1	0.02	0.01	0.1	0.04
1A3 Transport	0.1	0.1	0.1	0.1	0.2	NE
1A4 Other Sectors	4.7	4.7	2.7	3.2	18.3	0.2
1A5 Other	0.0002	0.0003	0.0003	0.0002	0.0005	NE
1B1 Fugitive Emissions from fuels, Solid Fuels	NA	NA	NA	NA	NA	NA
1B2 Fugitive Emissions from fuels, Oil and Natural gas	0.000004	0.000005	0.000005	0.000005	0.0001	NE
Energy, Total	4.74	4.90	2.80	3.33	19.70	4.74

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

Emission source categories and fuel consumption data are presented in this chapter.

Emission source categories

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.

Fuel consumption data

In 2010, the total fuel consumption for stationary combustion plants was 552 PJ of which 423 PJ was fossil fuels and 129 PJ was biomass.

Fuel consumption distributed according to the stationary combustion subcategories is shown in Figure 3.1 and Figure 3.2. 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*.

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

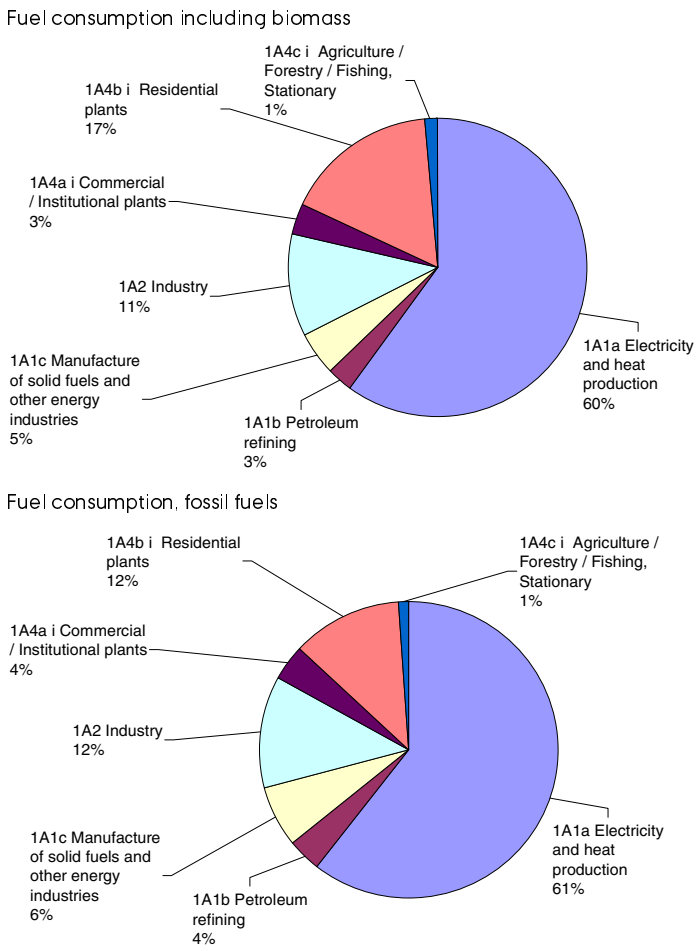


Figure 3.1 Fuel consumption of stationary combustion source categories, 2010 (based on DEA (2011a)).

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).

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

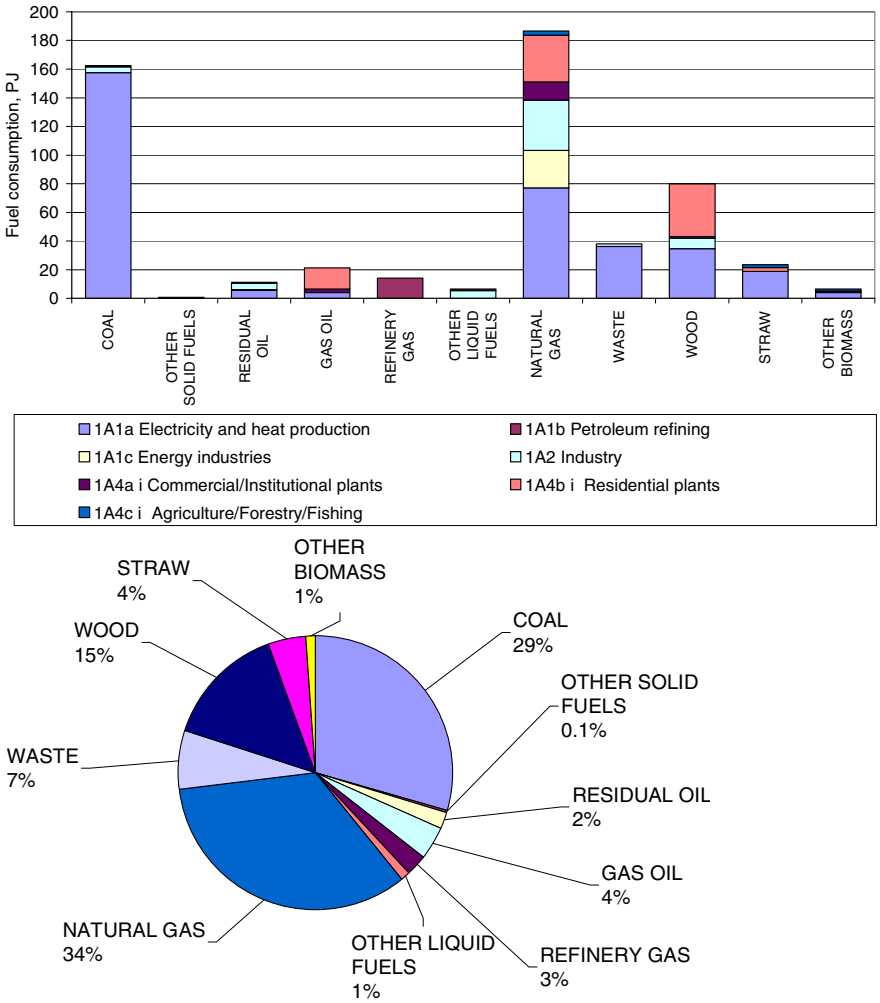


Figure 3.2 Fuel consumption of stationary combustion 2010, disaggregated to fuel type (based on DEA, 2011a).

Fuel consumption time series for stationary combustion plants are presented in Figure 3.3[2]. The fuel consumption for stationary combustion was 11 % higher in 2010 than in 1990, while the fossil fuel consumption was 8 % lower and the biomass fuel consumption 3.2 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.

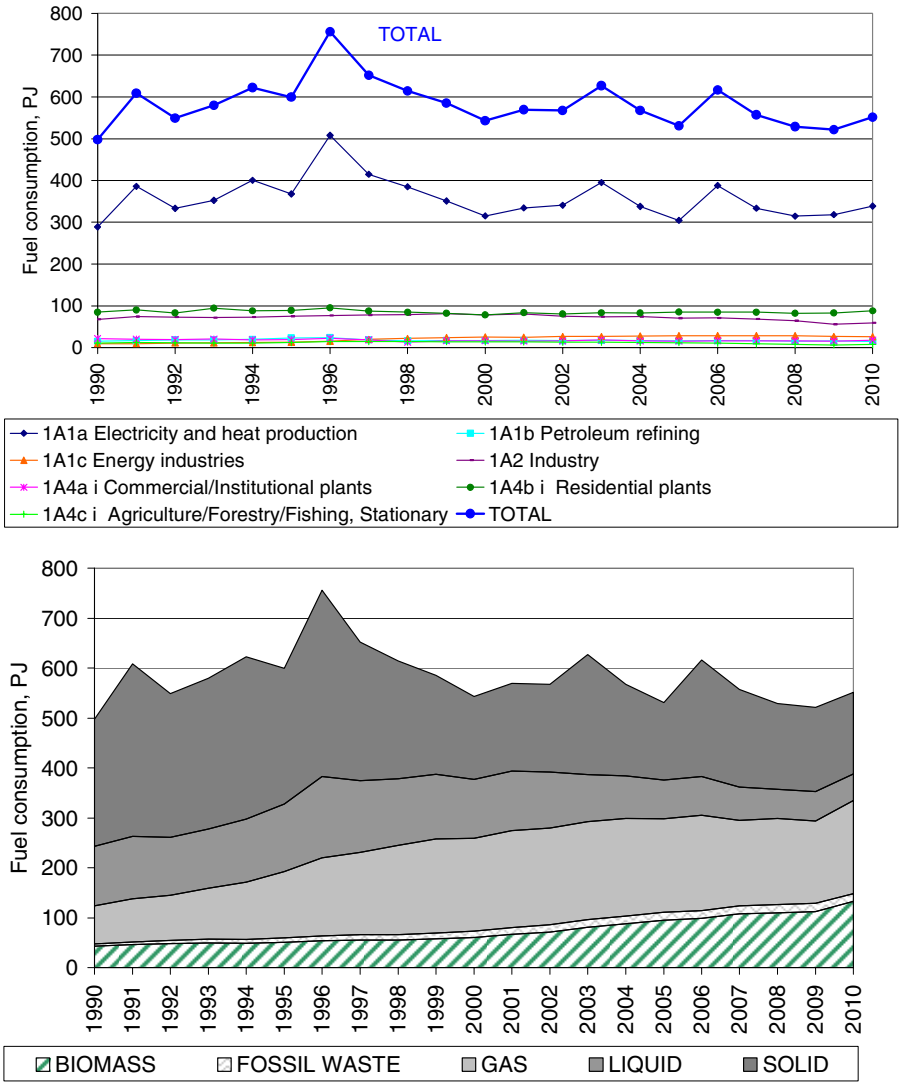


Figure 3.3 Fuel consumption time series, stationary combustion (based on DEA, 2011a).

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 3.4. 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 2010, the net electricity export was 4.1 PJ, whereas there was a 1.2 PJ electricity import in 2009. 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 3.4. The corrections are included here to explain the fluctuations in the time series for fuel rate and emissions.

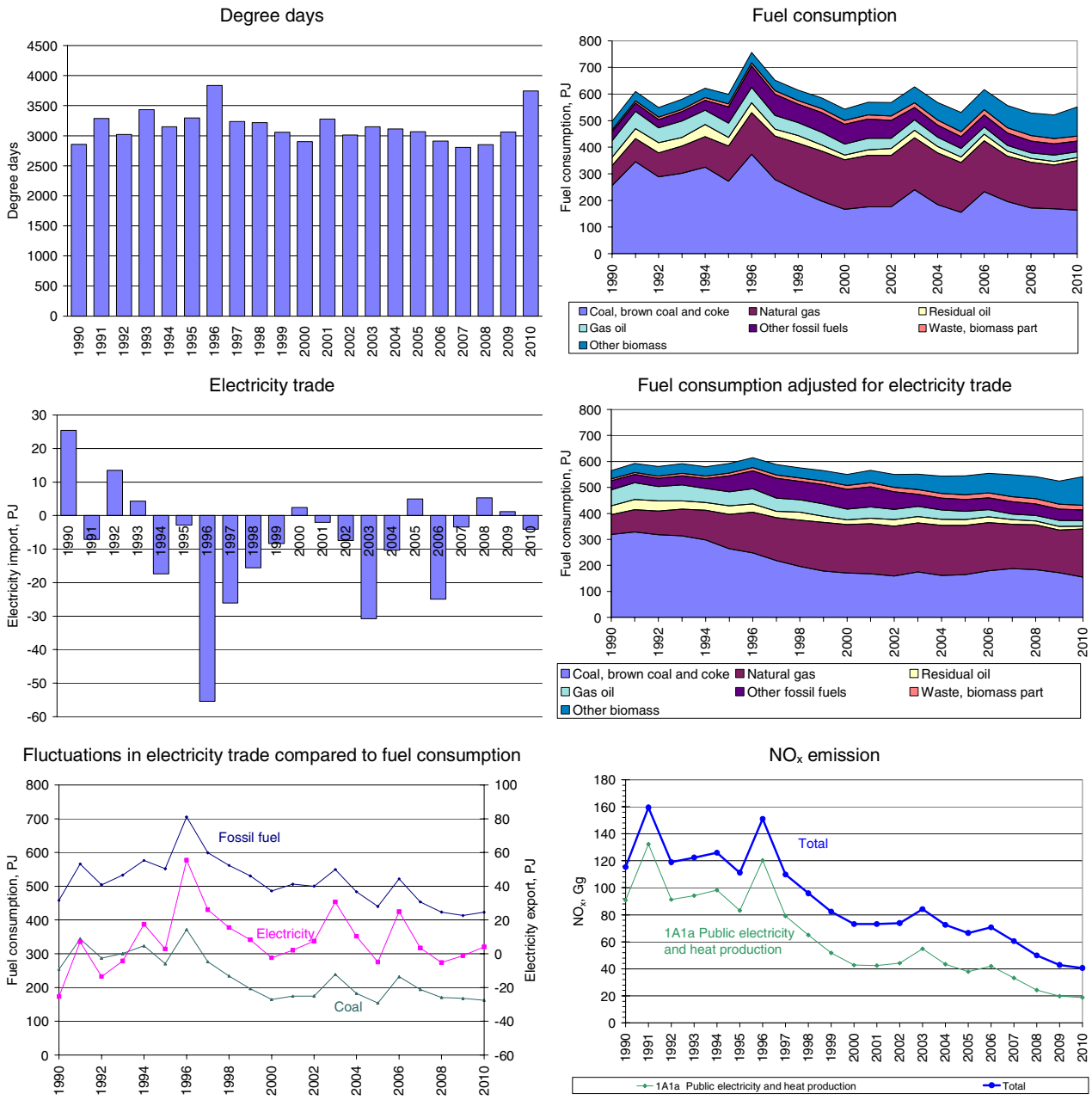


Figure 3.4 Comparison of time series fluctuations for electricity trade, fuel consumption and NO_x emission (based on DEA 2011b).

Fuel consumption time series for the subcategories to stationary combustion are shown in Figure 3.5 – 3.7.

Fuel consumption for *Energy Industries* fluctuates due to electricity trade as discussed above. The fuel consumption in 2010 was 21 % 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* 2010 added up to 75 PJ, which is 4.9 times the level in 1990 and a 31 % increase since 2009.

The fuel consumption in *Industry* was 12 % lower in 2010 than in 1990 (Figure 3.6). The fuel consumption in industrial plants has decreased considerably as a result of the financial crisis. However, the fuel consumption has in-

creased 6 % since 2009. The biomass fuel consumption in *Industry* in 2010 added up to 9 PJ which is a 42 % increase since 1990.

The fuel consumption in *Other Sectors* decreased 3 % since 1990 (Figure 3.7) and increased 8 % since 2009. The biomass fuel consumption in *Other sectors* in 2010 added up to 45 PJ which is 2.4 times the consumption in 1990 and a 6 % increase since 2009. Wood consumption in residential plants in 2010 was 2.3 times the consumption in year 2000.

Time series for subcategories are shown in Chapter 3.2.3.

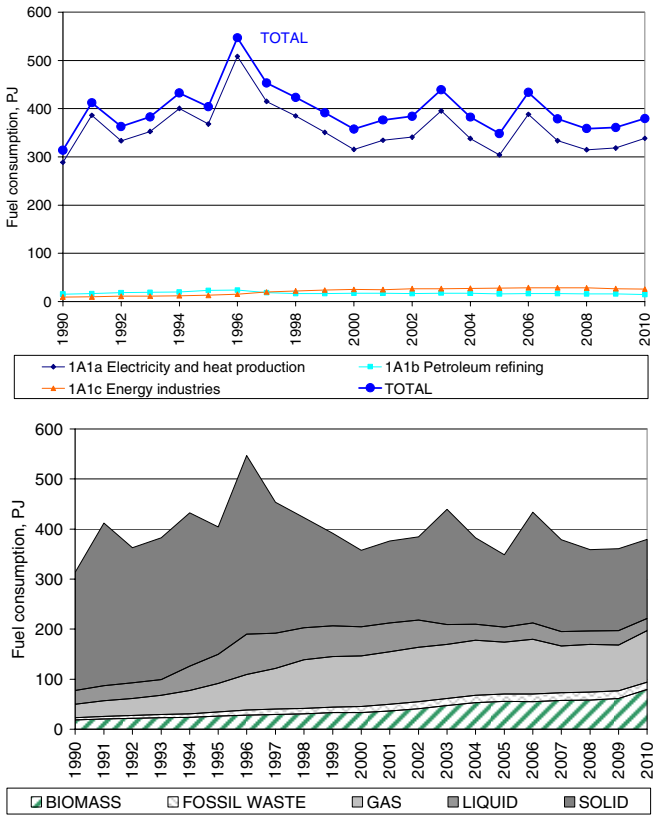


Figure 3.5 Fuel consumption time series for subcategories - 1A1 Energy Industries.

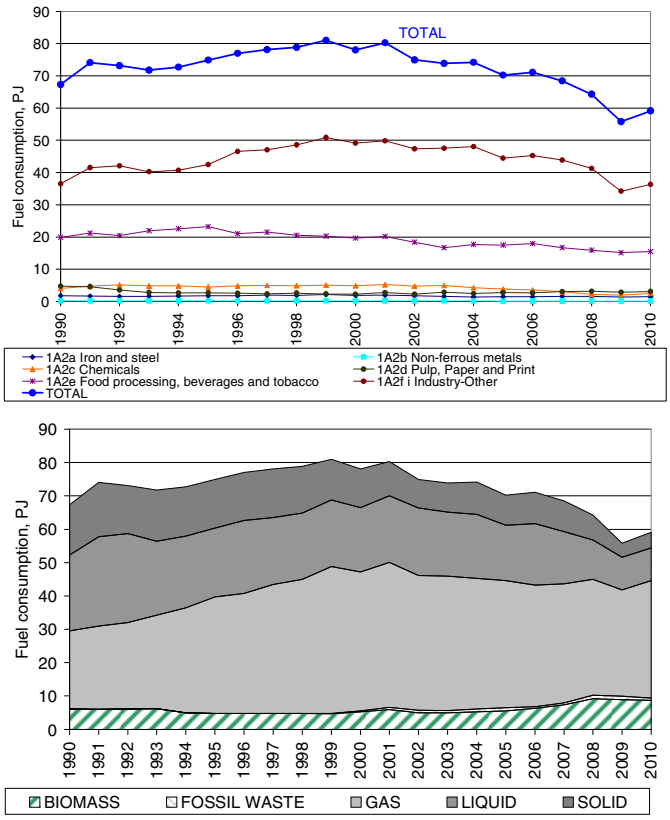


Figure 3.6 Fuel consumption time series for subcategories - 1A2 Industry.

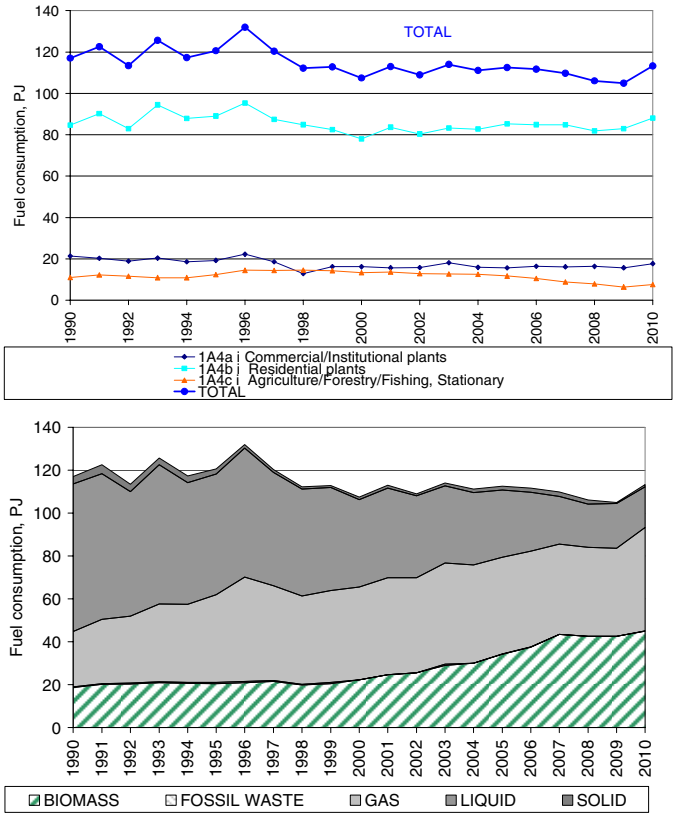


Figure 3.7 Fuel consumption time series for subcategories - 1A4 Other Sectors.

3.2.2 Emissions

SO_2

Stationary combustion is the most important emission source for SO_2 accounting for 72 % of the national emission. Table 3.5 presents the SO_2 emission inventory for the stationary combustion subcategories.

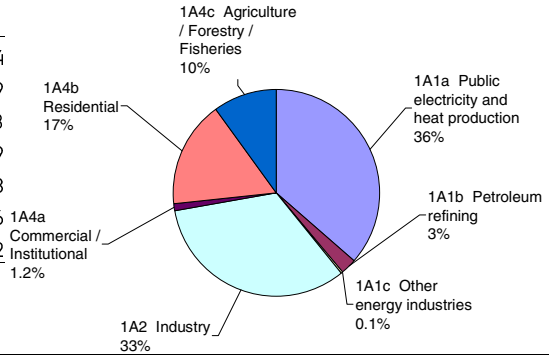
Electricity and heat production is the largest emission source accounting for 36 % of the emission. However, the SO_2 emission share is lower than the fuel consumption share for this source category, which is 60 %. This is a result of effective flue gas desulphurisation equipment installed in power plants combusting coal. In the Danish inventory, the source category *Electricity and heat production* is further disaggregated. Figure 3.8 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 is 33 %, 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.

Time series for SO_2 emission from stationary combustion are shown in Figure 3.9. The SO_2 emission from stationary combustion plants has decreased by 93 % 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 36 % 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 3.2.3.

Table 3.5 SO_2 emission from stationary combustion plants, 2010[1].

SO_2, Mg	
1A1a Public electricity and heat production	3664
1A1b Petroleum refining	269
1A1c Other energy industries	8
1A2 Industry	3349
1A4a Commercial/Institutional	123
1A4b Residential	1666
1A4c Agriculture/Forestry/Fisheries	1012
Total	10091



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

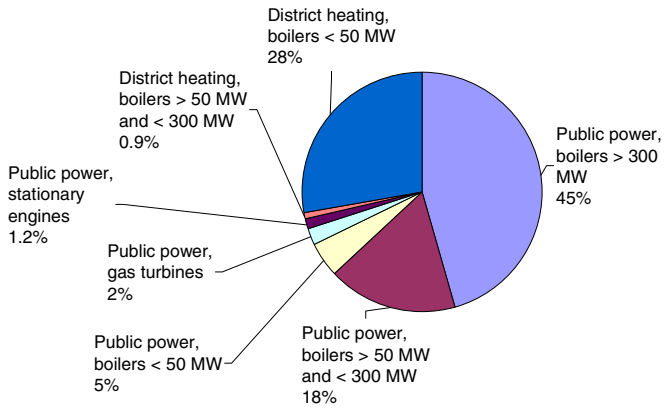


Figure 3.8 Disaggregated SO_2 emissions from 1A1a Energy and heat production.

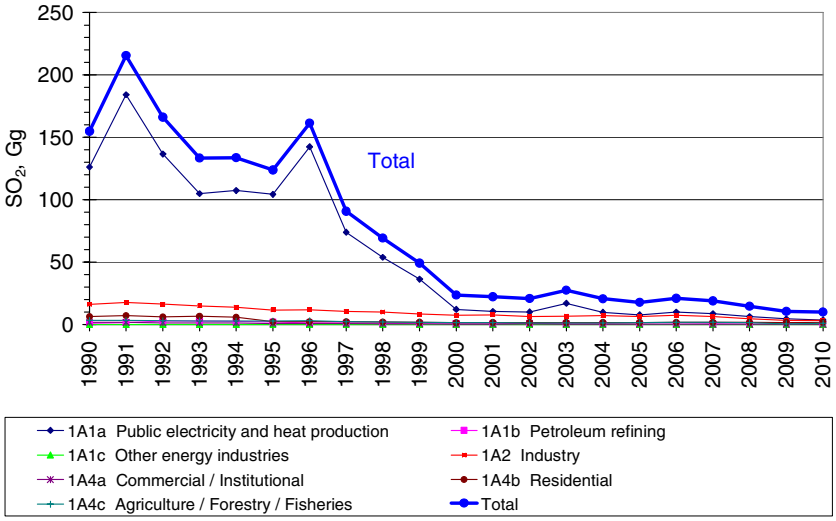


Figure 3.9 SO_2 emission time series for stationary combustion.

NO_x

Stationary combustion accounts for 32 % of the national NO_x emission. Table 3.6 shows the NO_x emission inventory for stationary combustion subcategories.

Electricity and heat production is the largest emission source accounting for 46 % of the emission from stationary combustion plants. The emission from public power boilers > 300 MW_{th} accounts for 32 % of the emission in this subcategory.

Industrial combustion plants are also an important emission source accounting for 14 % of the emission. The main industrial emission source is cement production, which accounts for 37 % of the emission.

Residential plants account for 16 % of the NO_x emission. The fuel origin of this emission is mainly wood accounting for 67 % of the residential plant emission.

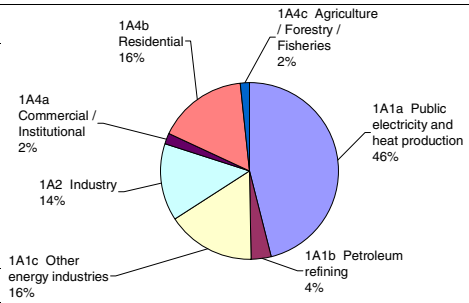
Other energy industries, which is mainly off-shore gas turbines accounts for 16 % of the NO_x emission.

Time series for NO_x emission from stationary combustion are shown in Figure 3.10. NO_x emission from stationary combustion plants has decreased by 65 % 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 3.6 NO_x emission from stationary combustion plants, 2010[1].

NO_x, Mg		
1A1a	Public electricity and heat production	18674
1A1b	Petroleum refining	1544
1A1c	Other energy industries	6490
1A2	Industry	5768
1A4a	Commercial/Institutional	837
1A4b	Residential	6615
1A4c	Agriculture/Forestry/Fisheries	687
Total		40613



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

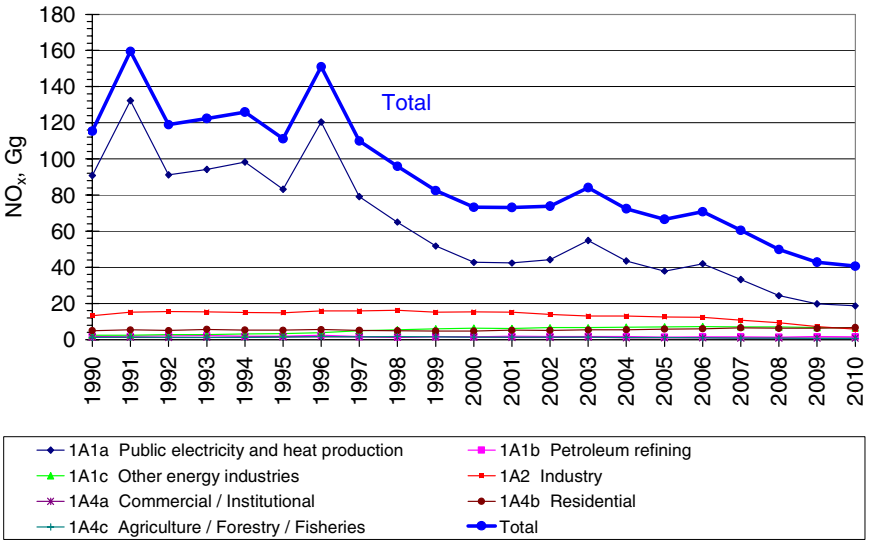


Figure 3.10 NO_x emission time series for stationary combustion.

NMVOC

Stationary combustion plants account for 21 % of the national NMVOC emission. Table 3.7 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 3.11.

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 3.11). The gas engines are either natural gas or biogas fuelled.

Time series for NMVOC emission from stationary combustion are shown in Figure 3.12. The emission has increased by 32 % 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.

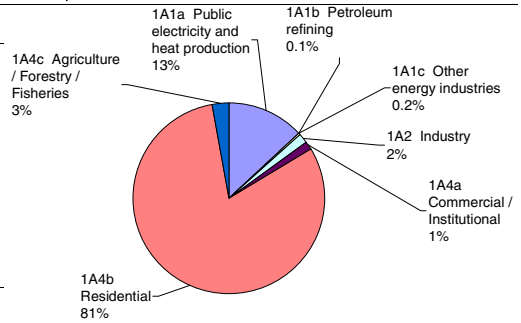
The emission from residential plants increased 30 % since 1990. The NMVOC emission from wood combustion in 2010 was 2.6 times the 1990 level due to increased wood consumption. However, the emission factor has decreased since 1990 due to installation of modern stoves and boilers with improved combustion technology. Further the emission from straw combustion in farmhouse boilers has decreased (76 %) 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 decrease of the NMVOC emission since 2007 is a result of both a decline of the consumption of wood in residential plants and a decreasing emission factor for firewood combustion in residential plants. The small increase in 2010 is a result of increased wood consumption in residential plants compared to 2009.

Table 3.7 NMVOC emission from stationary combustion plants, 2010[1)].

NMVOC, Mg	
1A1a Public electricity and heat production	2383
1A1b Petroleum refining	21
1A1c Other energy industries	42
1A2 Industry	301
1A4a Commercial/Institutional	262
1A4b Residential	14860
1A4c Agriculture/Forestry/Fisheries	485
Total	18354



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

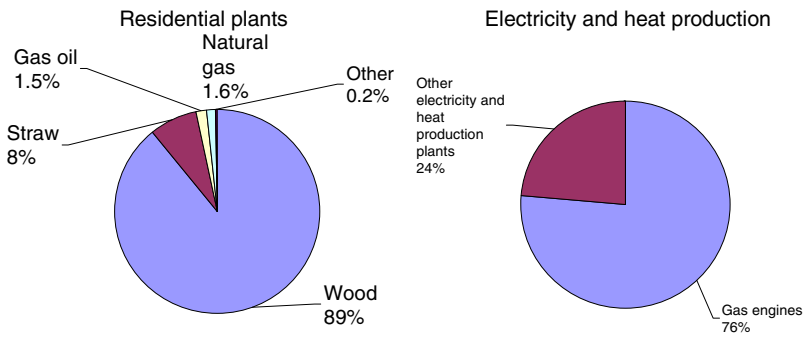


Figure 3.11 NMVOC emission from Residential plants and from Electricity and heat production, 2010.

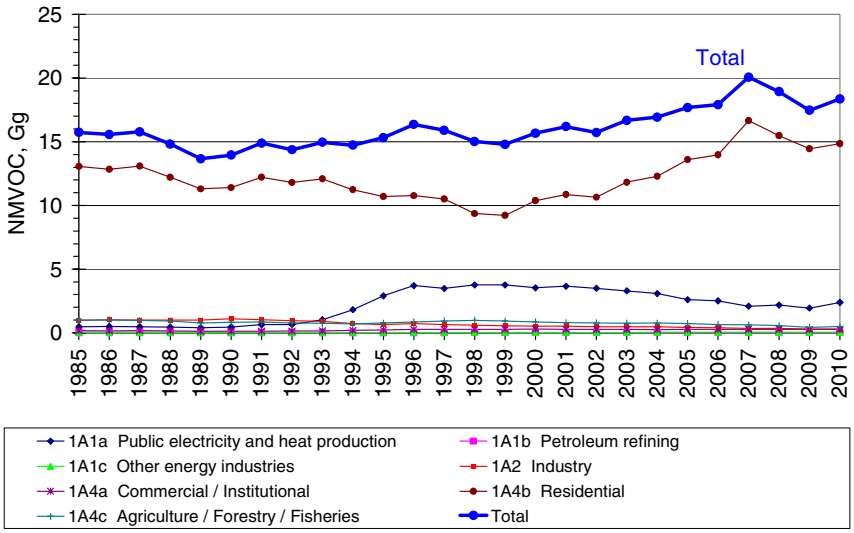


Figure 3.12 NMVOC emission time series for stationary combustion.

CO

Stationary combustion accounts for 39 % of the national CO emission. Table 3.8 presents the CO emission inventory for stationary combustion subcategories.

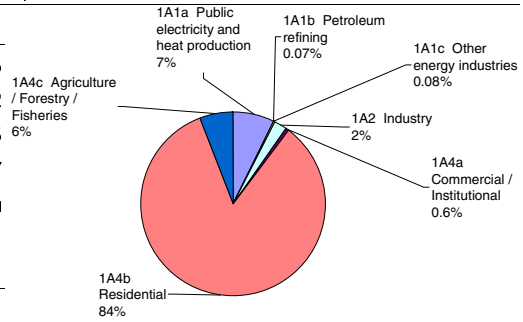
Residential plants are the largest emission source, accounting for 84 % of the emission. Wood combustion accounts for 90 % of the emission from residential plants, see Figure 3.13. This is in spite of the fact that the fuel consumption share is only 42 %. Combustion of straw is also a considerable emission source whereas the emission from other fuels used in residential plants is almost negligible.

Time series for CO emission from stationary combustion are shown in Figure 3.14. The emission has increased by 17 % from 1990. The time series for CO from stationary combustion plants follow the time series for CO emission from residential plants. The decreased wood consumption in residential plants in 2007-2009 and the increase in 2010 is reflected in the time series for CO emission.

The consumption of wood in residential plants in 2010 was 4.4 times the 1990 level. However, the CO emission factor for wood has decreased since 1990 causing the CO emission from wood combustion in residential plants in 2010 to be only 3.0 times the 1990 level. Both straw consumption and CO emission factor for residential plants have decreased since 1990.

Table 3.8 CO emission from stationary combustion plants, 2010[1].

CO, Mg	
1A1a Public electricity and heat production	11256
1A1b Petroleum refining	102
1A1c Other energy industries	125
1A2 Industry	3817
1A4a Commercial/Institutional	904
1A4b Residential	130609
1A4c Agriculture/Forestry/Fisheries	8914
Total	155728



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

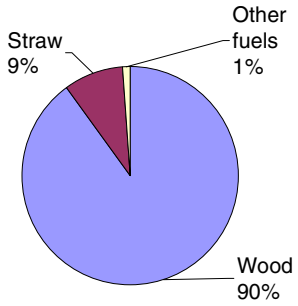
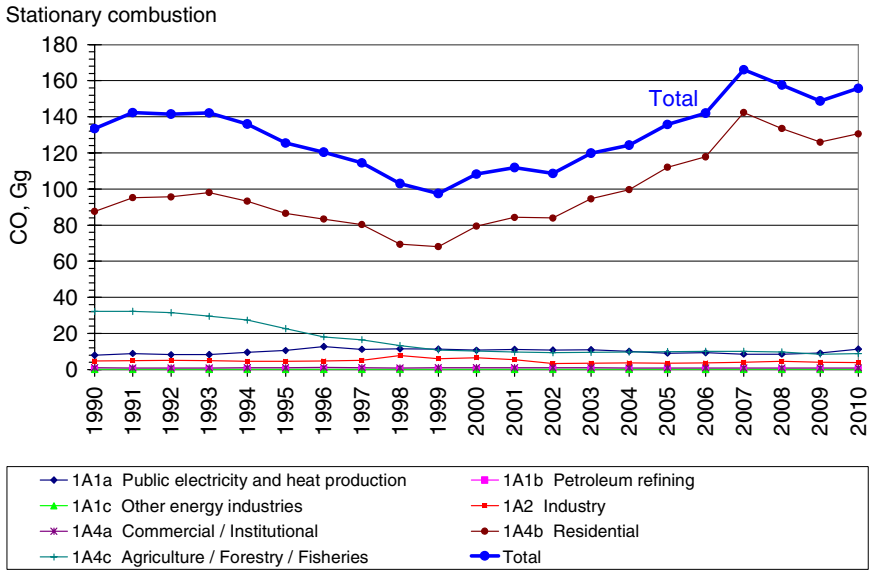


Figure 3.13 CO emission sources, residential plants, 2010.



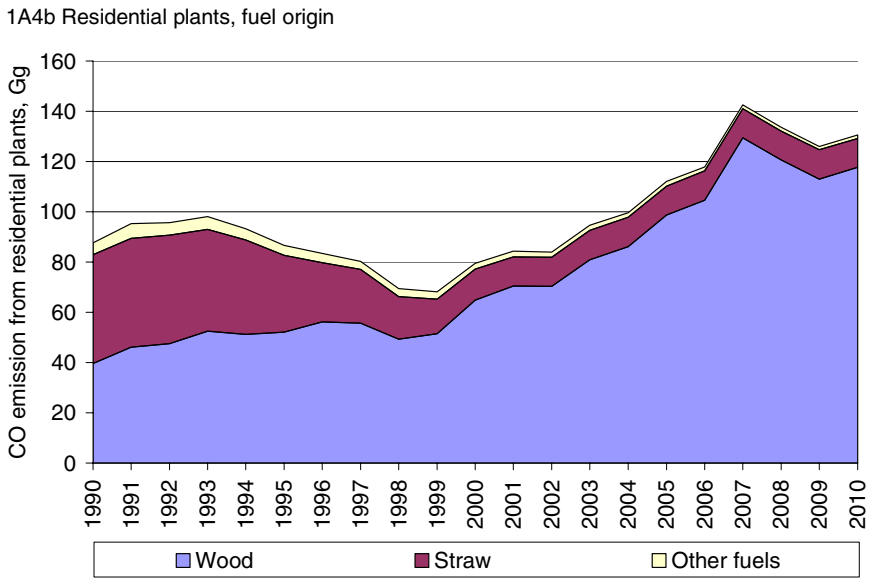


Figure 3.14 CO emission time series for stationary combustion.

Particulate matter (PM)

TSP from stationary combustion accounts for 53 % of the national emission. The emission shares for PM_{10} and $PM_{2.5}$ are 63 % and 76 %, respectively.

Table 3.9 and Figure 3.15 show the PM emission inventory for the stationary combustion subcategories. Residential plants are the largest emission source

accounting for 94 % 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, 90 % of the $PM_{2.5}$ emission from stationary combustion is emitted from residential wood combustion. This corresponds to 68 % of the national emission. A literature review (Nielsen et al., 2003) and a Nordic Project (Sternhufvud et al., 2004) have demonstrated that the emission factor uncertainty for residential combustion of wood in stoves and boilers is notably high.

Figure 3.16 shows the fuel consumption and the $PM_{2.5}$ emission of residential plants. Wood combustion accounts for 97 % of the $PM_{2.5}$ emission from residential plants in spite of a wood consumption share of 42 %.

Emission inventories for PM have only been reported for the years 2000-2010. Time series for PM emission from stationary combustion are shown in Figure 3.17. The emission of TSP, PM_{10} and $PM_{2.5}$ has increased 44 %, 46 % and 50 %, 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 decreased wood consumption in residential plants in 2007-2009 and the increase in 2010 has resulted in a decrease of PM emission from stationary combustion in 2007-2009 and in an increase in 2010.

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

Table 3.9 PM emission from stationary combustion plants, 2010[1)].

		TSP, Mg	PM_{10}, Mg	$PM_{2.5}$, Mg
1A1a	Public electricity and heat production	761	592	473
1A1b	Petroleum refining	94	90	87
1A1c	Other energy industries	3	2	1
1A2	Industry	299	220	150
1A4a	Commercial/Institutional	159	157	149
1A4b	Residential	19317	18396	18143
1A4c	Agriculture/Forestry/Fisheries	494	462	433
Total		21126	19919	19436

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

TSP

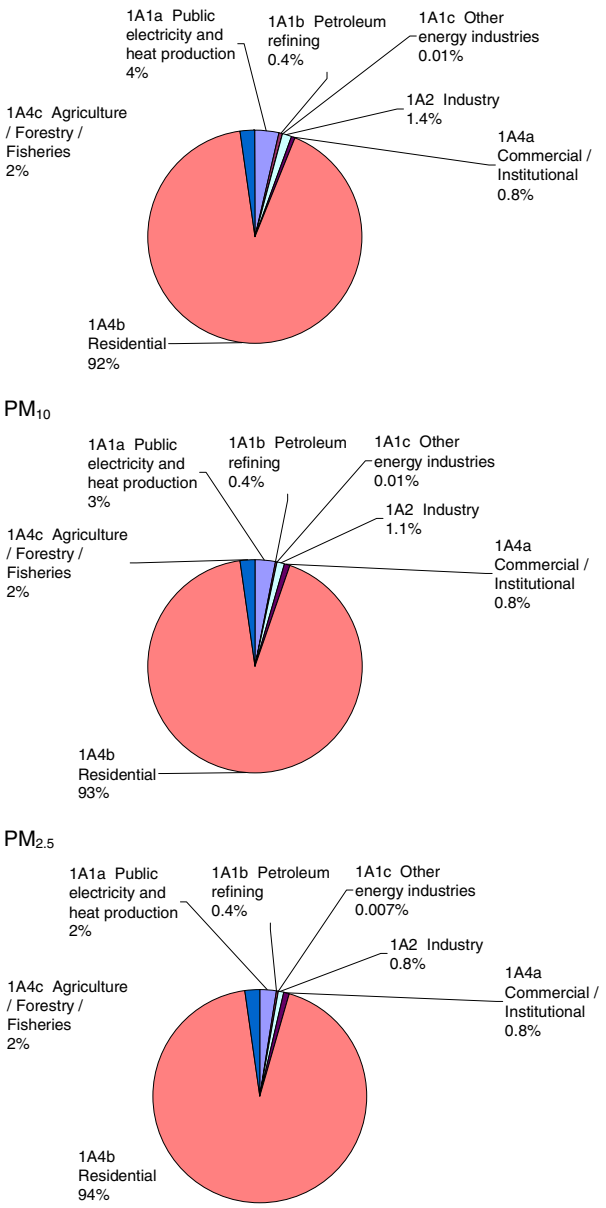


Figure 3.15 PM emission sources, stationary combustion plants, 2010.

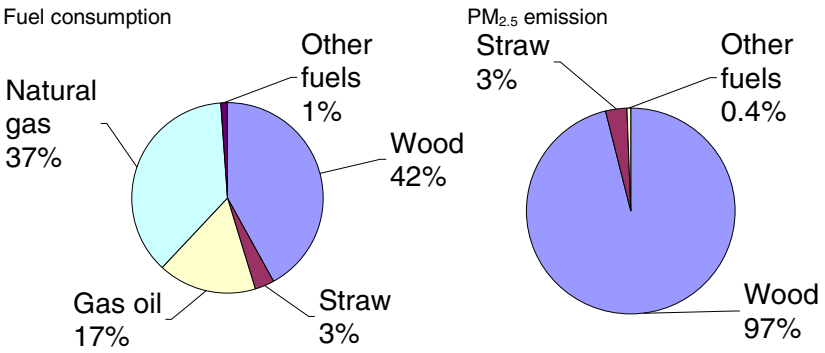


Figure 3.16 Fuel consumption and $PM_{2.5}$ emission from residential plants.

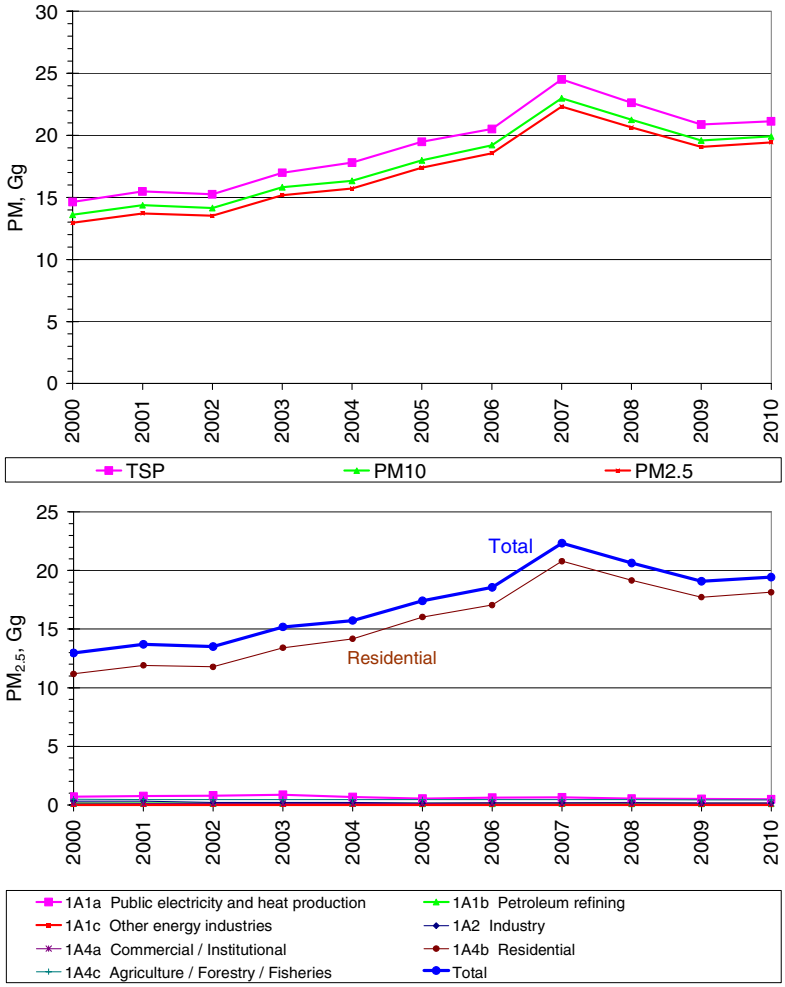


Figure 3.17 PM emission time series for stationary combustion.

Heavy metals

Stationary combustion plants are among the most important emission sources for heavy metals. For Cu, Zn and Pb the emission share from stationary combustion plants is below 50 %, but for all other heavy metals, the emission share is more than 50 %.

Table 3.10 and Figure 3.18 present the heavy metal emission inventory for the stationary combustion subcategories. The source categories *Public electricity and heat production, Residential* and *Industry* have the highest emission shares. The emission share for MSW incineration plants, that was formerly a major emission source, is now below 10 % for all HMs. The emission share for MSW incineration plants has decreased considerably since the year 2000.

Table 3.10 Heavy metal emission from stationary combustion plants, 2010[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	85	27	184	162	217	349	361	1049	472
1A1b Petroleum refining	28	21	21	41	20	185	61	98	68
1A1c Other energy industries	3	0	0	0	3	0	0	0	0
1A2 Industry	69	21	71	93	55	1536	335	72	879
1A4a Commercial/Institutional	3	0	3	4	6	15	4	1	13
1A4b Residential	25	41	86	323	22	89	1596	20	4084
1A4c Agriculture/Forestry/Fisheries	9	5	20	37	9	236	204	26	498
Total	222	115	386	659	331	2410	2561	1266	6015
Emission share from stationary combustion	74%	60%	44%	1%	75%	52%	24%	80%	16%

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

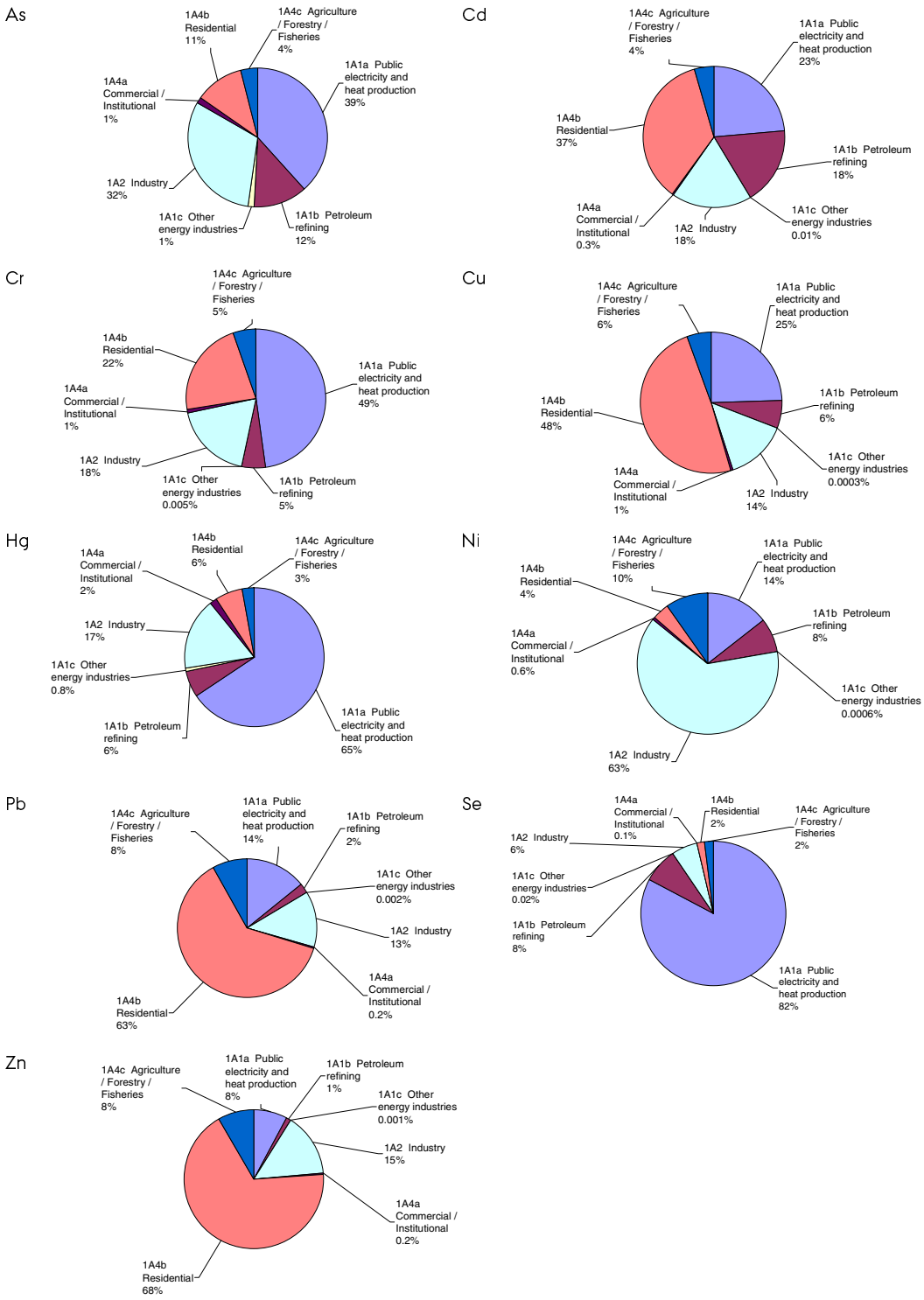


Figure 3.18 Heavy metal emission sources, stationary combustion plants, 2010.

Time series for heavy metal emissions are provided in Figure 3.19. Emissions of all heavy metals have decreased considerably (68 % - 93 %) since 1990, see Table 3.11. 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 3.11 Decrease in heavy metal emission 1990-2010.

Pollutant	Decrease since 1990, %
As	81
Cd	86
Cr	93
Cu	82
Hg	88
Ni	85
Pb	83
Se	68
Zn	75

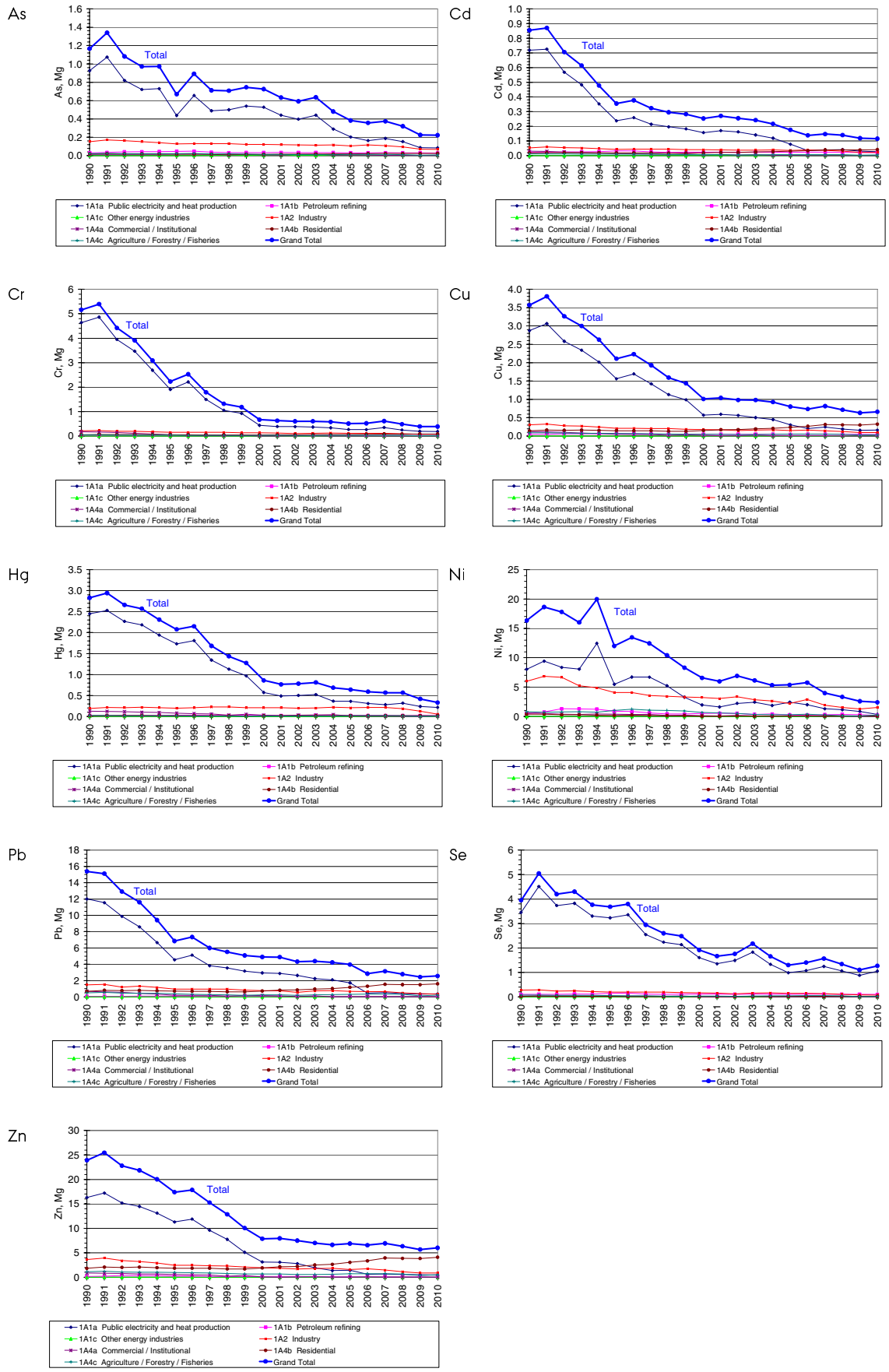


Figure 3.19 Heavy metal emission time series, stationary combustion plants.

PAH

Stationary combustion plants accounted for more than 93 % of the PAH emission in 2010.

Table 3.12 and Figure 3.20 present the PAH emission inventories for the stationary combustion subcategories. Residential combustion is the largest emission source accounting for more than 91 % of the emission. Combustion of wood is the predominant source, accounting for more than 99 % of the PAH emission from residential plants, see Figure 3.21.

Time series for PAH emissions are presented in Figure 3.22. The increasing (103 % - 148 %) 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 3.22. The decrease in residential wood combustion in 2007-2009 and the increase in 2010 is reflected in the PAH emission time series.

Table 3.12 PAH emission from stationary combustion plants, 2010[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	9	36	21	7
1A1b Petroleum refining	0	0	0	0
1A1c Other energy industries	0	0	0	0
1A2 Industry	17	63	14	4
1A4a Commercial/Institutional	167	220	73	119
1A4b Residential	4378	4376	2563	2976
1A4c Agriculture/Forestry/Fisheries	100	110	24	133
Total	4672	4804	2695	3239
Emission share from stationary combustion	95 %	95 %	93 %	94 %

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

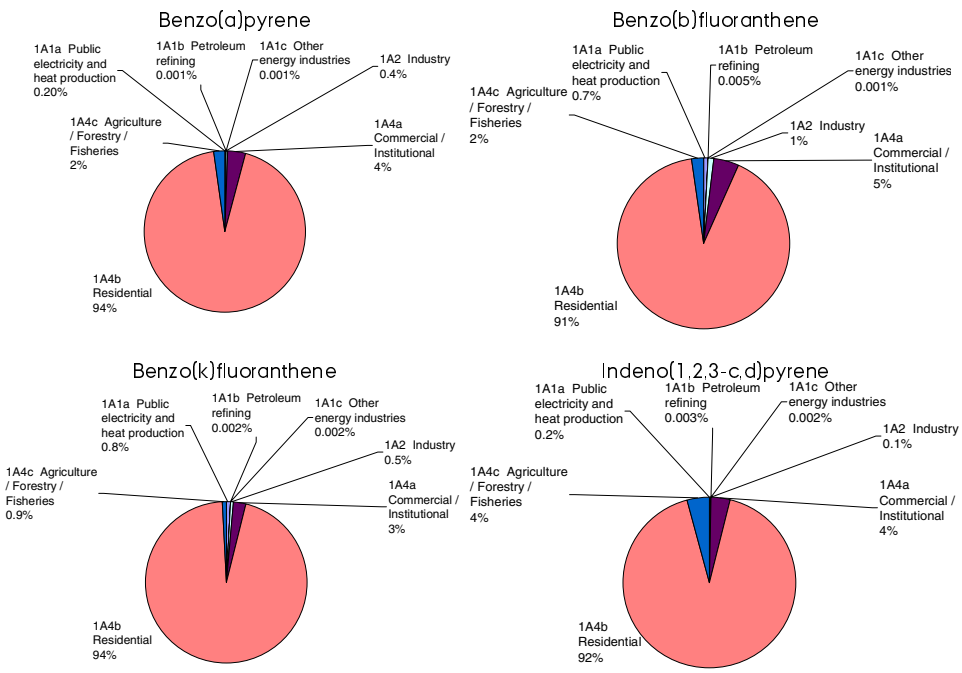


Figure 3.20 PAH emission sources, stationary combustion plants, 2010.

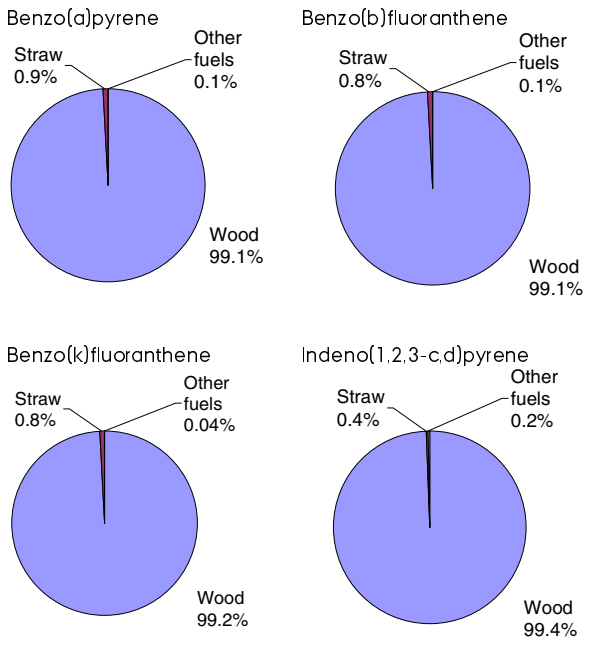


Figure 3.21 PAH emission from residential combustion plants (stationary), fuel origin.

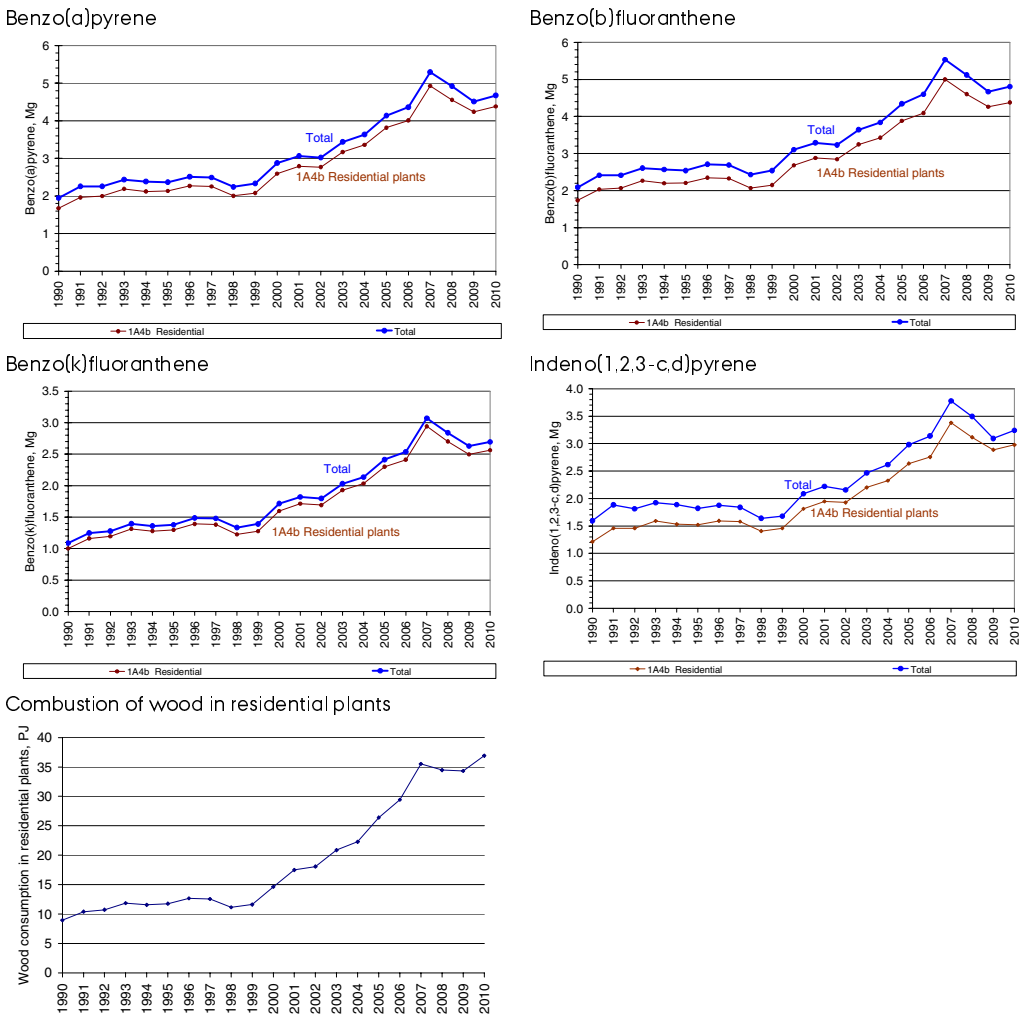


Figure 3.22 PAH emission time series, stationary combustion plants. Comparison with wood consumption in residential plants.

Dioxin

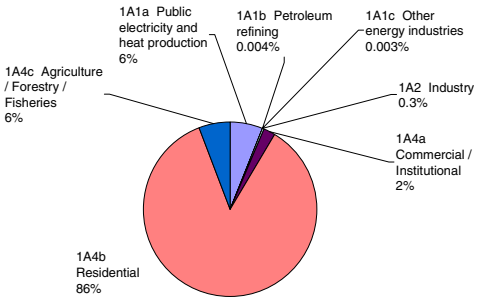
Stationary combustion plants accounted for 75 % of the national dioxin emission in 2010.

Table 3.13 presents the dioxin emission inventories for the stationary combustion subcategories. In 2010, the emission from residential plants accounts for 86 % of the emission. Combustion of wood is the predominant source accounting for 90 % of the emission from residential plants (Figure 3.23).

Time series for dioxin emission are presented in Figure 3.24. The dioxin emission has decreased 58 % 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 3.13 Dioxin emission from stationary combustion plants, 2010[1].

Dioxin, g I-teq	
1A1a Public electricity and heat production	1.2
1A1b Petroleum refining	0.0
1A1c Other energy industries	0.0
1A2 Industry	0.0
1A4a Commercial/Institutional	0.4
1A4b Residential	16.6
1A4c Agriculture/Forestry/Fisheries	1.1
Total	19.4



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

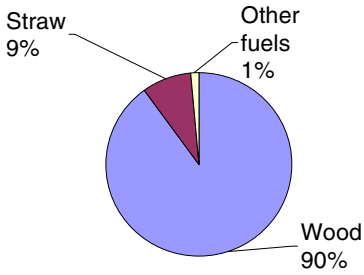


Figure 3.23 Dioxin emission from residential plants, fuel origin.

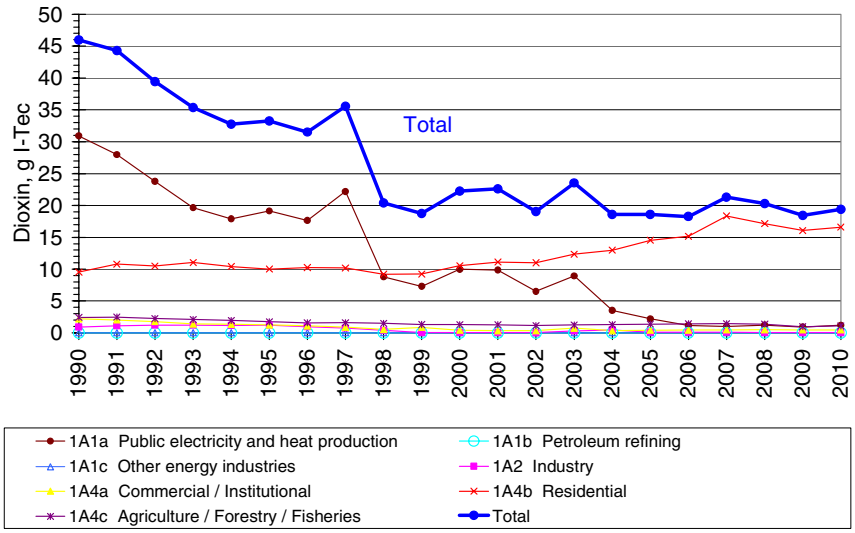


Figure 3.24 Dioxin emission time series, stationary combustion plants.

HCB

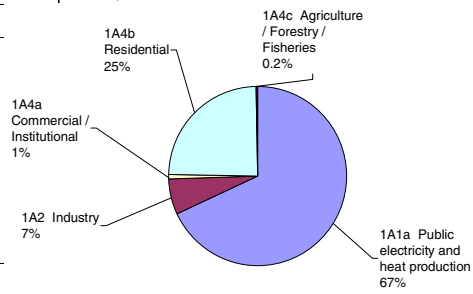
The HCB emission has been estimated only for stationary combustion plants and cremation. Stationary plants accounted for more than 98 % of the estimated national HCB emission in 2010.

Table 3.14 shows the HCB emission inventory for the stationary combustion subcategories. *Public electricity and heat production* account for 67 % of the emission. Residential plants account for 25 % of the emission.

Time series for HCB emission are presented in Figure 3.25. The HCB emission has decreased 81 % 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 3.14 HCB emission from stationary combustion plants, 2010[1)].

HCB, kg	
1A1a Public electricity and heat production	0.410
1A1b Petroleum refining	0.000
1A1c Other energy industries	0.040
1A2 Industry	0.004
1A4a Commercial/Institutional	0.148
1A4b Residential	0.001
1A4c Agriculture/Forestry/Fisheries	0.604
Total	0.410



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

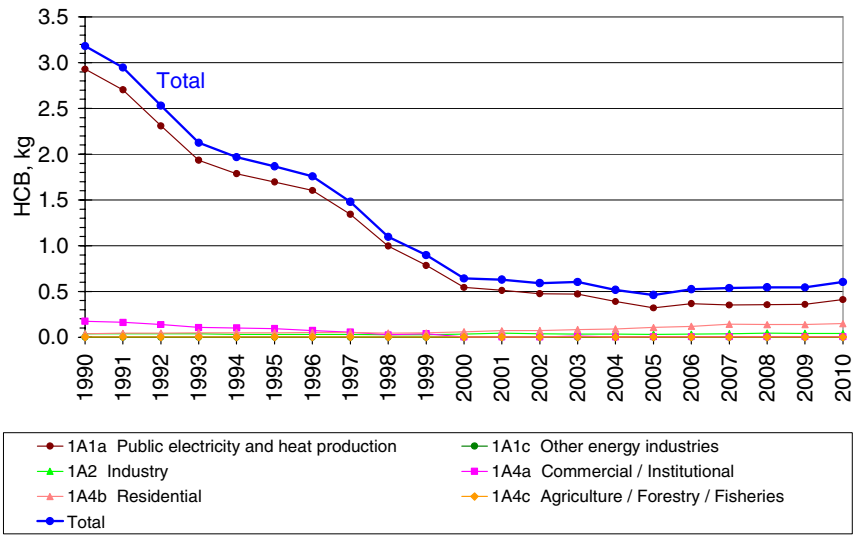


Figure 3.25 HCB emission time series, stationary combustion plants.

NH_3

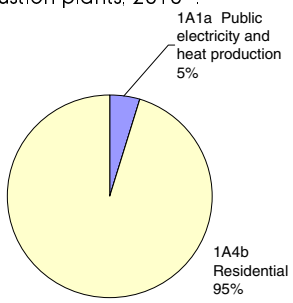
Stationary combustion plants accounted for only 0.3 % of the national NH_3 emission in 2010.

Table 3.15 shows the NH_3 emission inventory for the stationary combustion subcategories. Residential plants account for 95 % of the emission. Wood combustion accounts for 95 % of the emission from residential plants.

Time series for the NH_3 emission are presented in Figure 3.26. The NH_3 emission has increased to 3.1 times the 1990 level.

Table 3.15 NH_3 emission from stationary combustion plants, 2010[1].

NH_3, Mg		
1A1a	Public electricity and heat production	10
1A1b	Petroleum refining	-
1A1c	Other energy industries	-
1A2	Industry	
1A4a	Commercial/Institutional	-
1A4b	Residential	196
1A4c	Agriculture/Forestry/Fisheries	-
Total		206



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

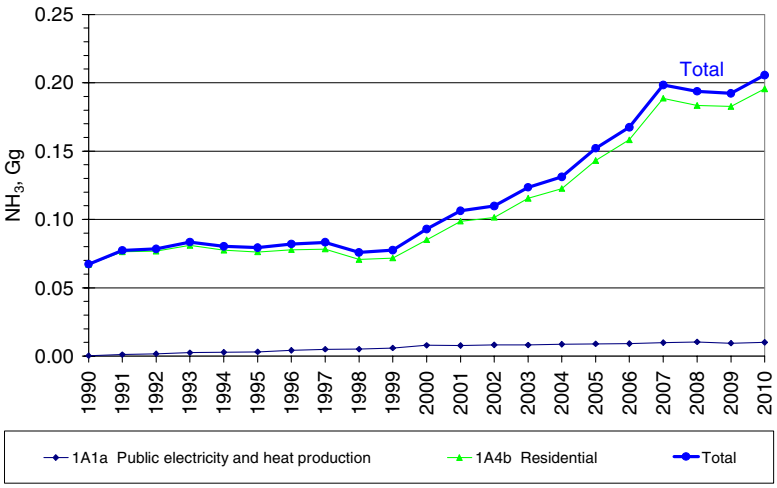


Figure 3.26 NH_3 emission time series, stationary combustion plants.

3.2.3 Sectoral trend

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 3.27 – 3.31 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.

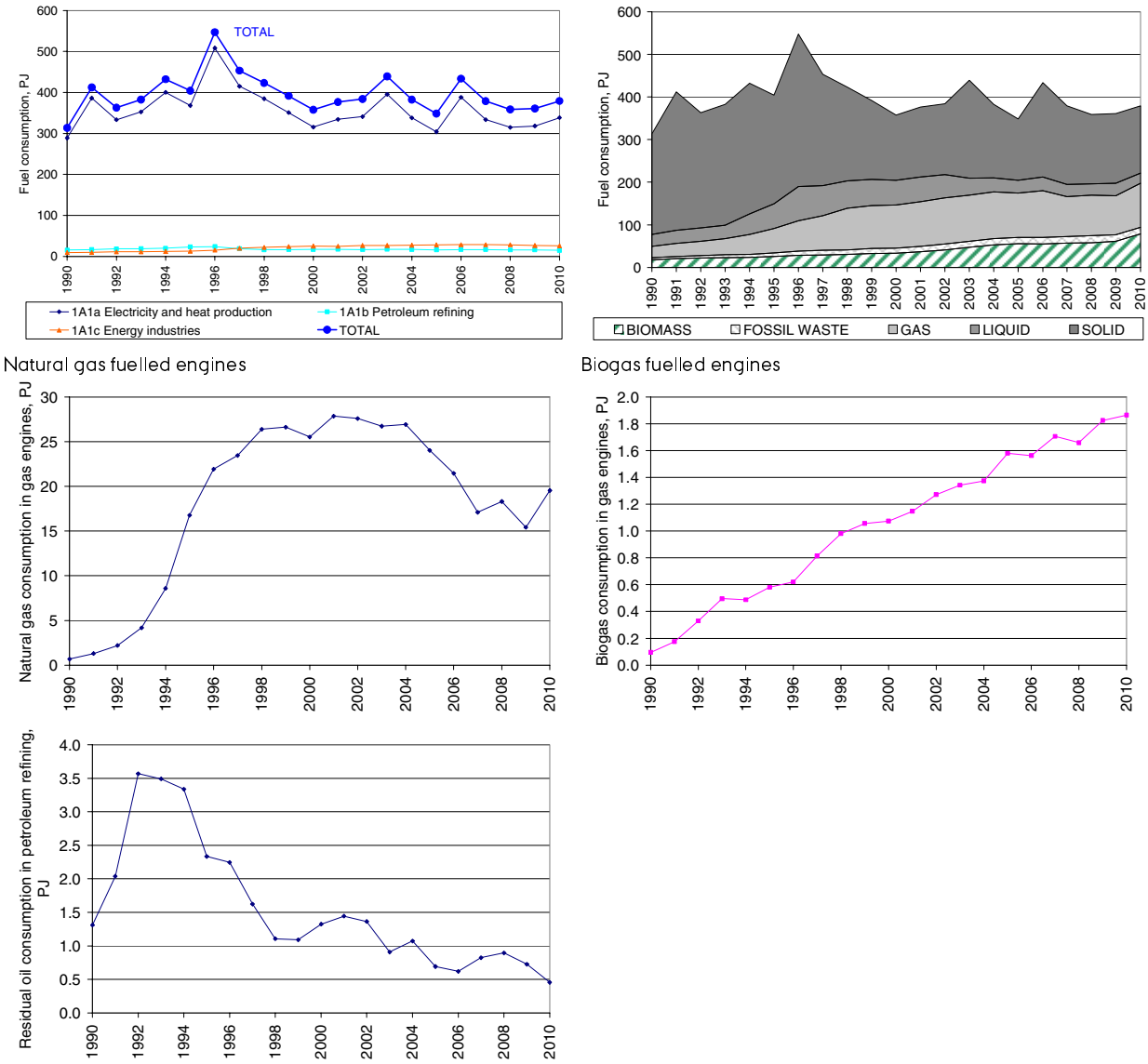


Figure 3.27 Time series for fuel consumption, 1A1 Energy industries.

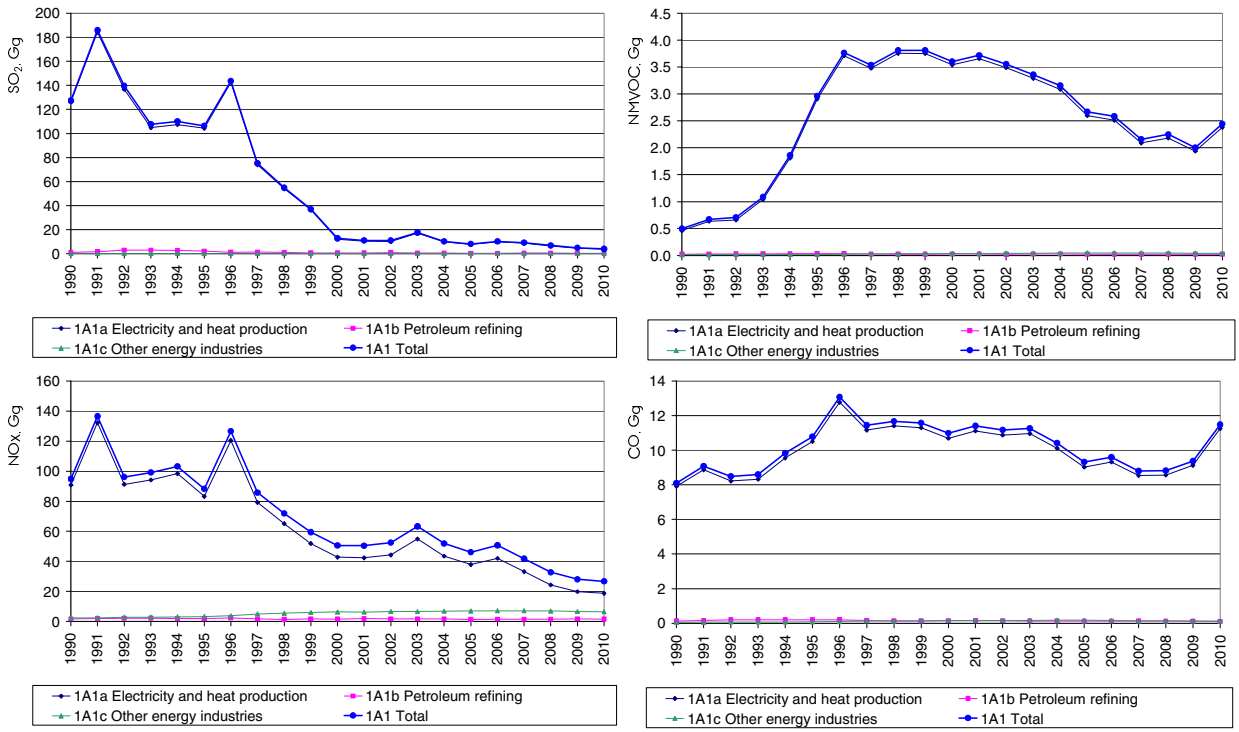


Figure 3.28 Time series for SO_2, NO_x, NMVOC and CO emission, 1A1 Energy industries.

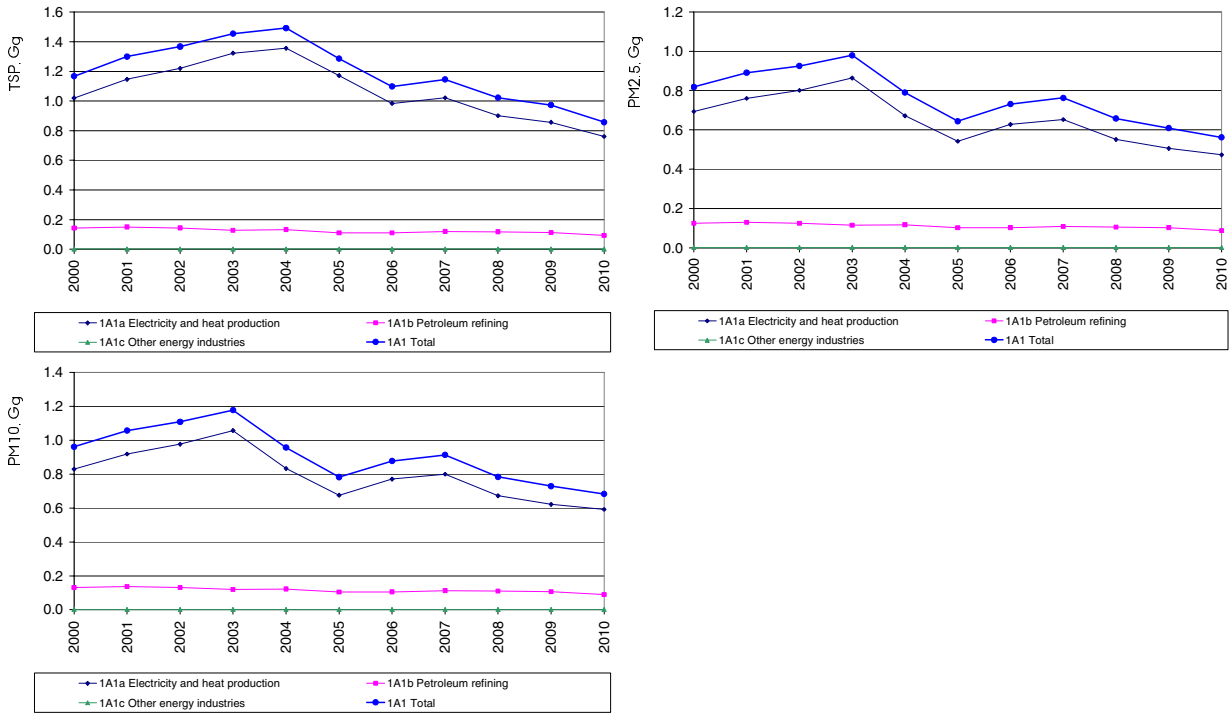


Figure 3.29 Time series for PM emission, 1A1 Energy industries.

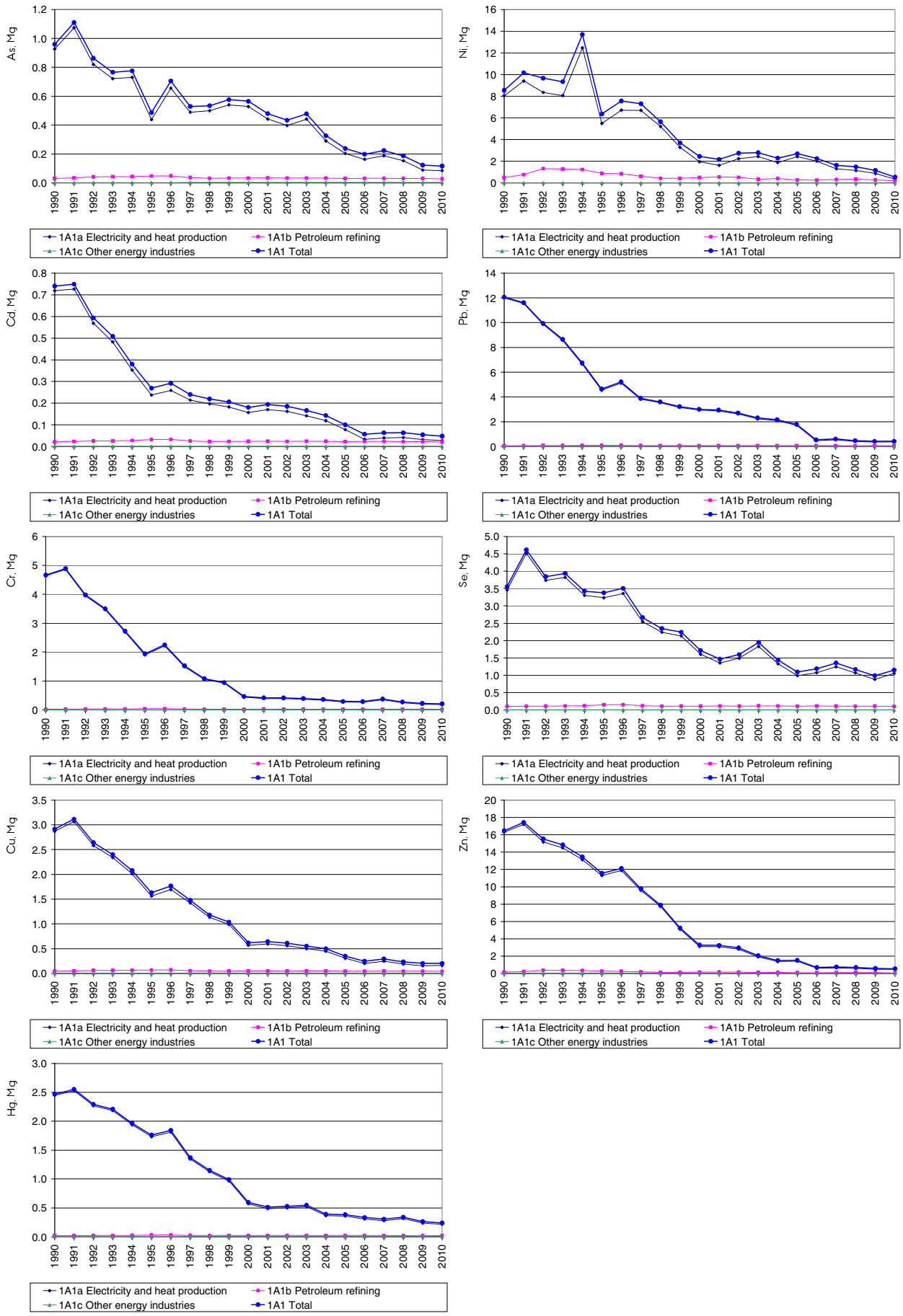


Figure 3.30 Time series for HM emission, 1A1 Energy industries.

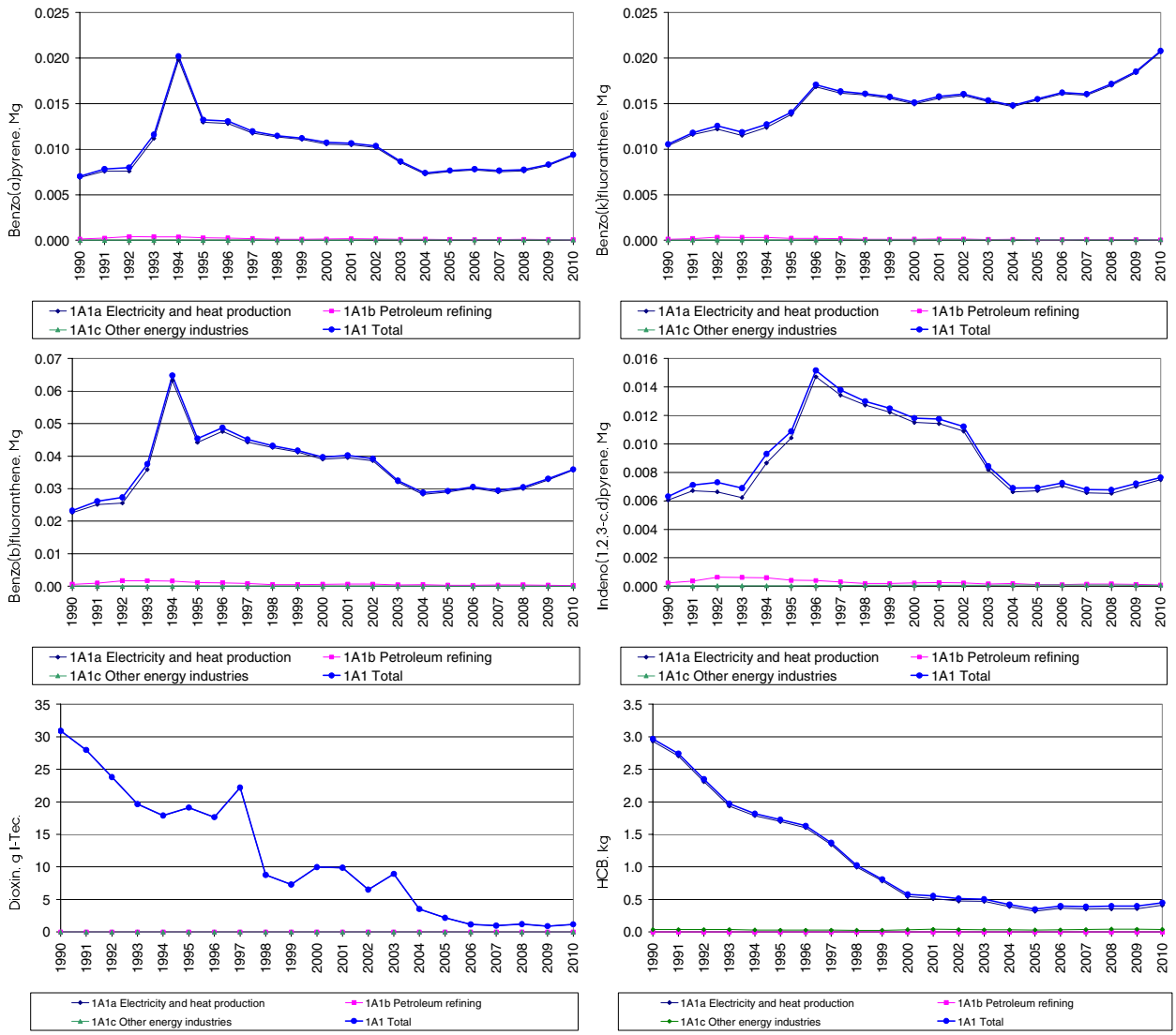


Figure 3.31 Time series for PAH, dioxin and HCB emission, 1A1 Energy industries.

1A1a Electricity and heat production

Public electricity and heat production is the largest source category regarding fuel consumption for stationary combustion. Figure 3.32 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 3 % higher in 2010 than in 1990. As discussed in Chapter 3.2.1 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 2010 was 33 % 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 3.27). The consumption of waste and biomass has increased.

The SO_2 emission has decreased 97 % from 1990 to 2009. This decrease is a result of both lower sulphur content in fuels and installation and improved performance of desulphurisation plants.

The NO_x emission has decreased 79 % due to installation of low NO_x burners, selective catalytic reduction (SCR) units and selective non-catalytic re-

duction (SNCR) units. The fluctuations in time series follow the fluctuations in fuel consumption and electricity trade.

The emission of NMVOC in 2010 was 5.2 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 and the increase in 2010 compared to 2009 are results of the time series for natural gas consumption in gas engines (Figure 3.27).

The CO emission was 42 % higher in 2010 than in 1990. The fluctuations follow the fluctuations of the fuel consumption. In addition, the emission from gas engines is considerable.

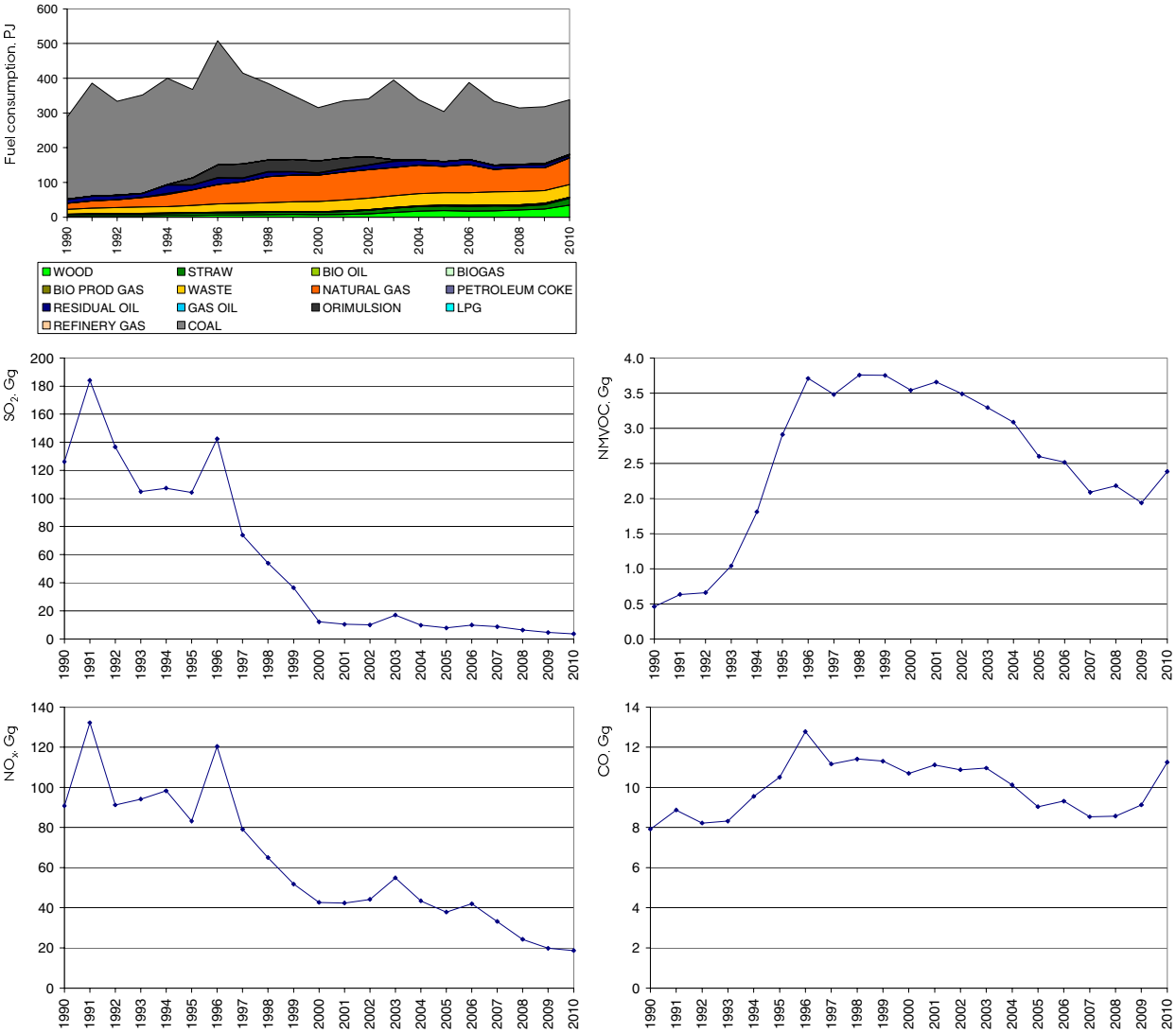


Figure 3.32 Time series for 1A1a Electricity and heat production.

1A1b Petroleum refining

Petroleum refining is a small source category regarding both fuel consumption and emissions for stationary combustion. Presently only two refineries are operating in Denmark. Figure 3.33 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 decreased 4 % since 1990.

The emission of SO_2 has shown a pronounced decrease (75 %) since 1990, mainly because decreased consumption of residual oil (65%) also shown in Figure 3.33. The increase in SO_2 emission in 1990-1992 also follows the residual oil consumption. The NO_x emission in 2010 was 4 % lower in 2010 than in 1990. In recent years, data for both SO_2 and NO_x are plant specific data stated by the refineries.

The NMVOC emission time series have been recalculated this year. Inconsistencies have been corrected.

A description of the Danish emission inventory for fugitive emissions from fuels is given in Plejdrup et al. (2010) and in Chapter 3.4.

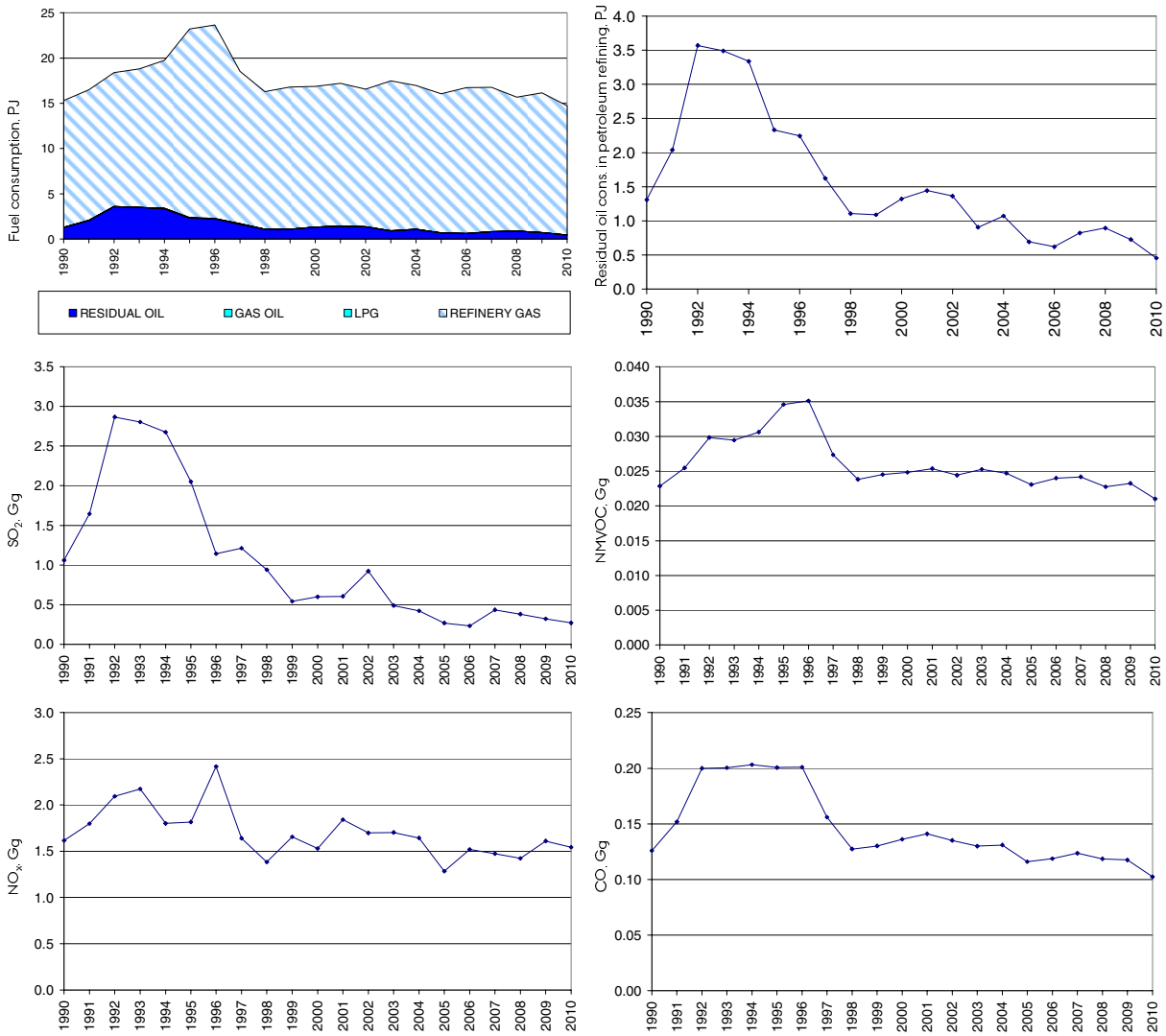


Figure 3.33 Time series for 1A1 b Petroleum refining.

1A1c Other energy industries

The source category *Other energy industries* comprises natural gas consumption in the off-shore industry. Gas turbines are the main plant type. Figure 3.34 shows the time series for fuel consumption and emissions.

The fuel consumption in 2010 was 2.7 times the consumption in 1990. The fuel consumption has decreased since 2008.

The emissions follow the increase of fuel consumption.

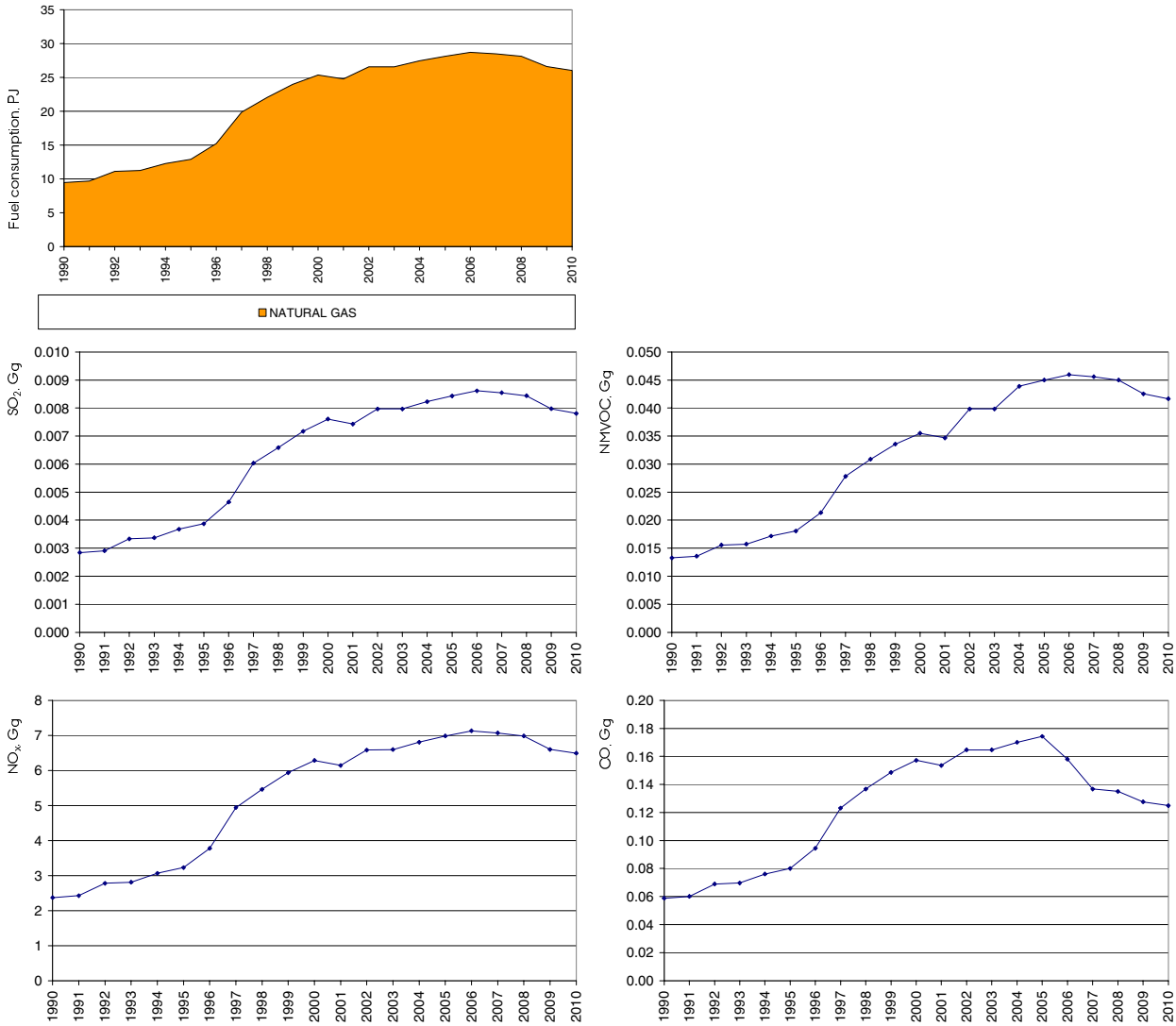


Figure 3.34 Time series for 1A1 c Other energy industries.

1A2 Industry

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

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 3.35 - 3.39 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 12 % lower in 2010 than in 1990. The fuel consumption has decreased considerably (17 %) since 2006 but however increased since 2009. The consumption of 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 27 % since 1990.

The SO_2 emission has decreased 79 % since 1990. This is mainly a result of lower consumption of residual oil in the industrial sector (Figure 3.35). 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 56 % since 1990 due to the reduced emission from industrial boilers in general. Cement production is the main emission source accounting for more than 50 % of the emission except in 2010. The NO_x emission from cement production was 67 % of the 1990 emission level whereas the fuel consumption was only 5 % lower. The reduced emission is a result of installation of SCR on all production units in 2004-2007 and improved performance of the SCR units in recent years. In 2010, the declining production rate also contributes to the reduced emission.

The NMVOC emission has decreased 73 % 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 3.35). The NMVOC emission factor for gas engines is much higher than for boilers regardless of the fuel.

The CO emission in 2010 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 time series for dioxin from *Industry – Other* is not correct. The inconsistent data for the cement production plant Aalborg Portland will be corrected in the next inventory.

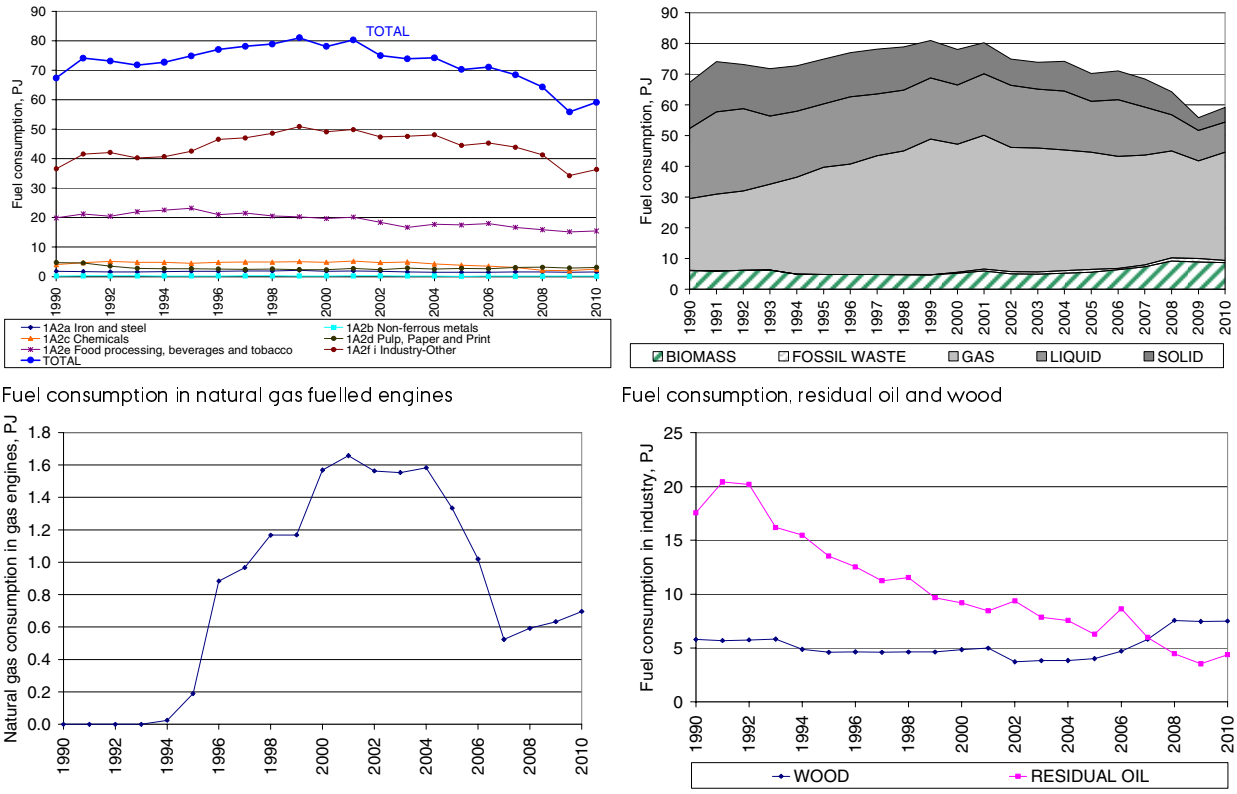


Figure 3.35 Time series for fuel consumption, 1A2 Industry.

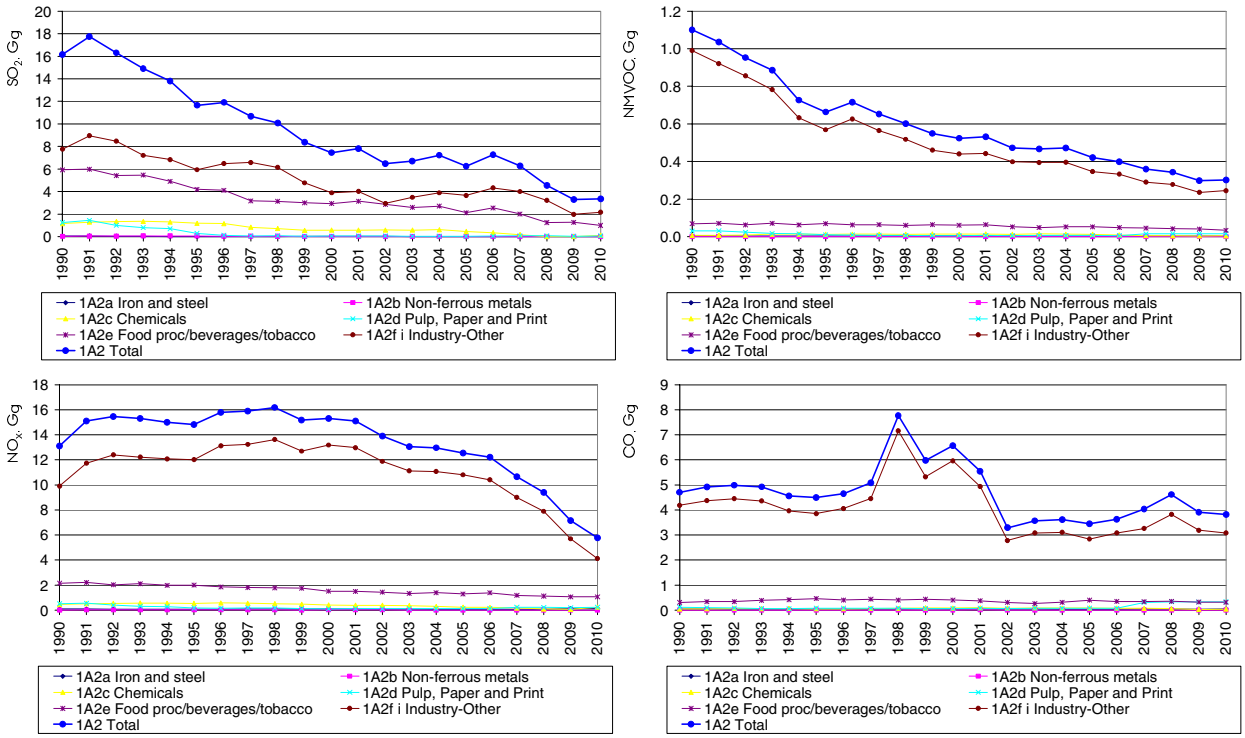


Figure 3.36 Time series for SO_2, NO_x, NMVOC and CO emission, 1A2 Industry.

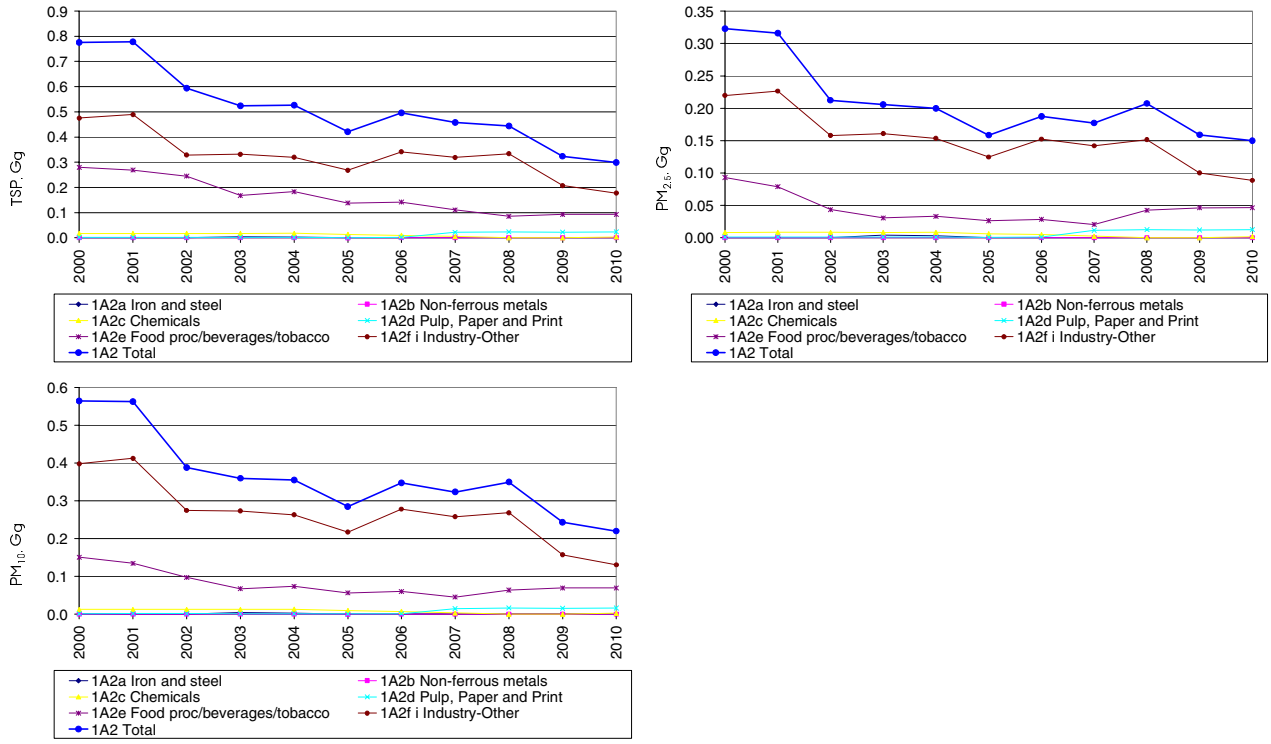


Figure 3.37 Time series for PM emission, 1A2 Industry.

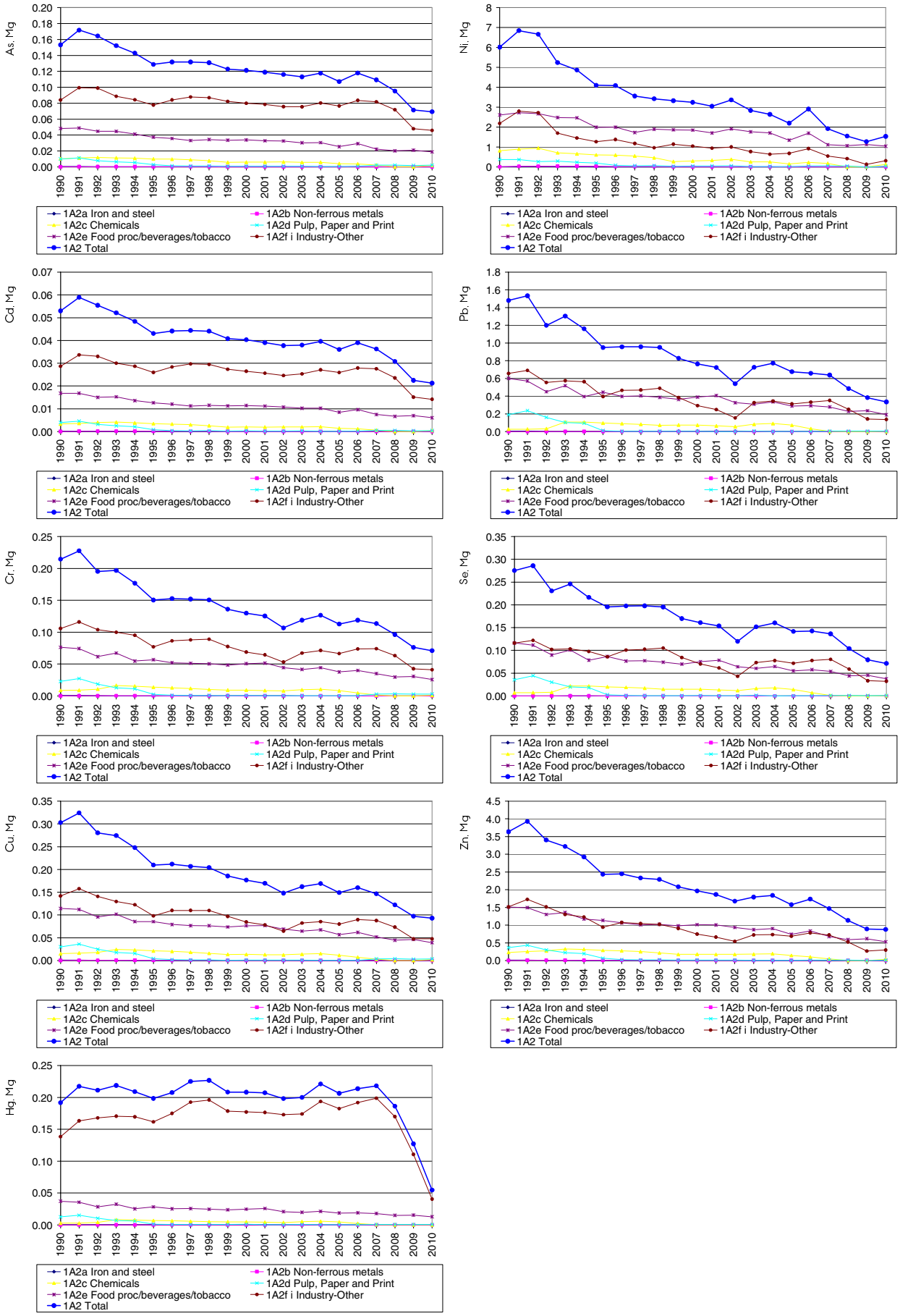


Figure 3.38 Time series for HM emission, 1A2 Industry.

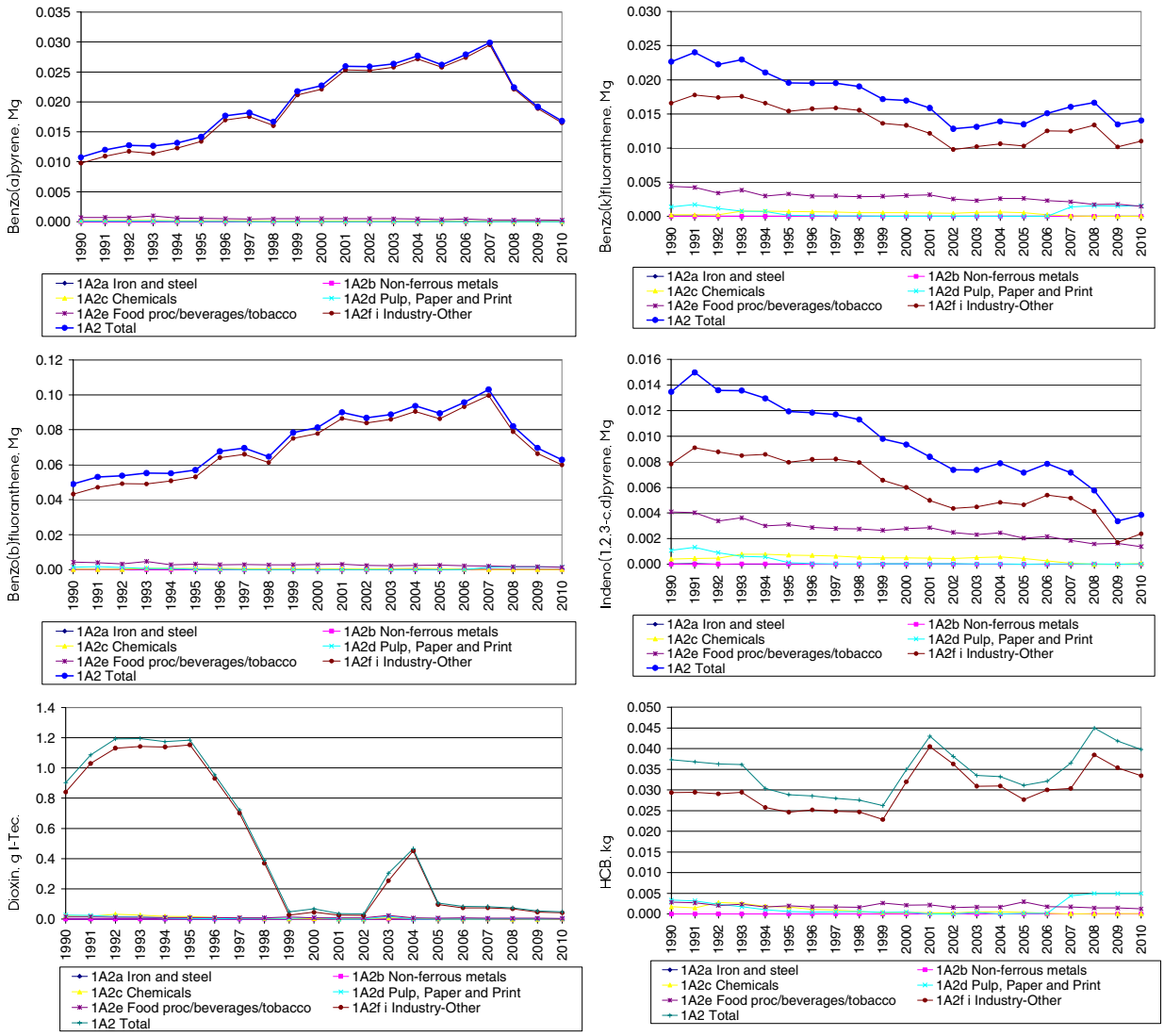


Figure 3.39 Time series for PAH, dioxin and HCB emission, 1A2 Industry.

1A2a Iron and steel

Iron and steel is a very small emission source category. Figure 3.40 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.

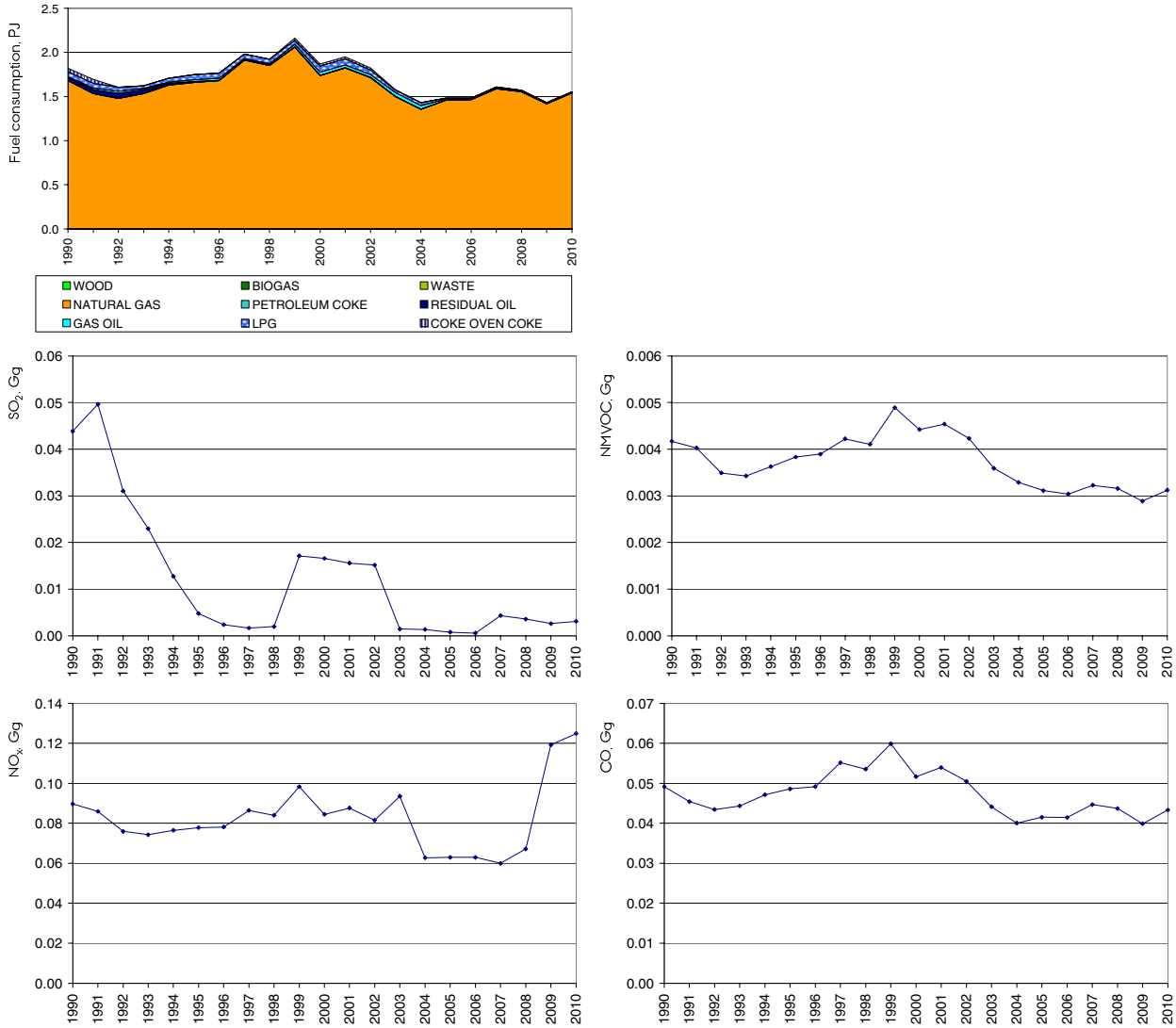


Figure 3.40 Time series for 1A2a Iron and steel.

1A2b Non-ferrous metals

Non-ferrous metals is a very small emission source category. Figure 3.41 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.

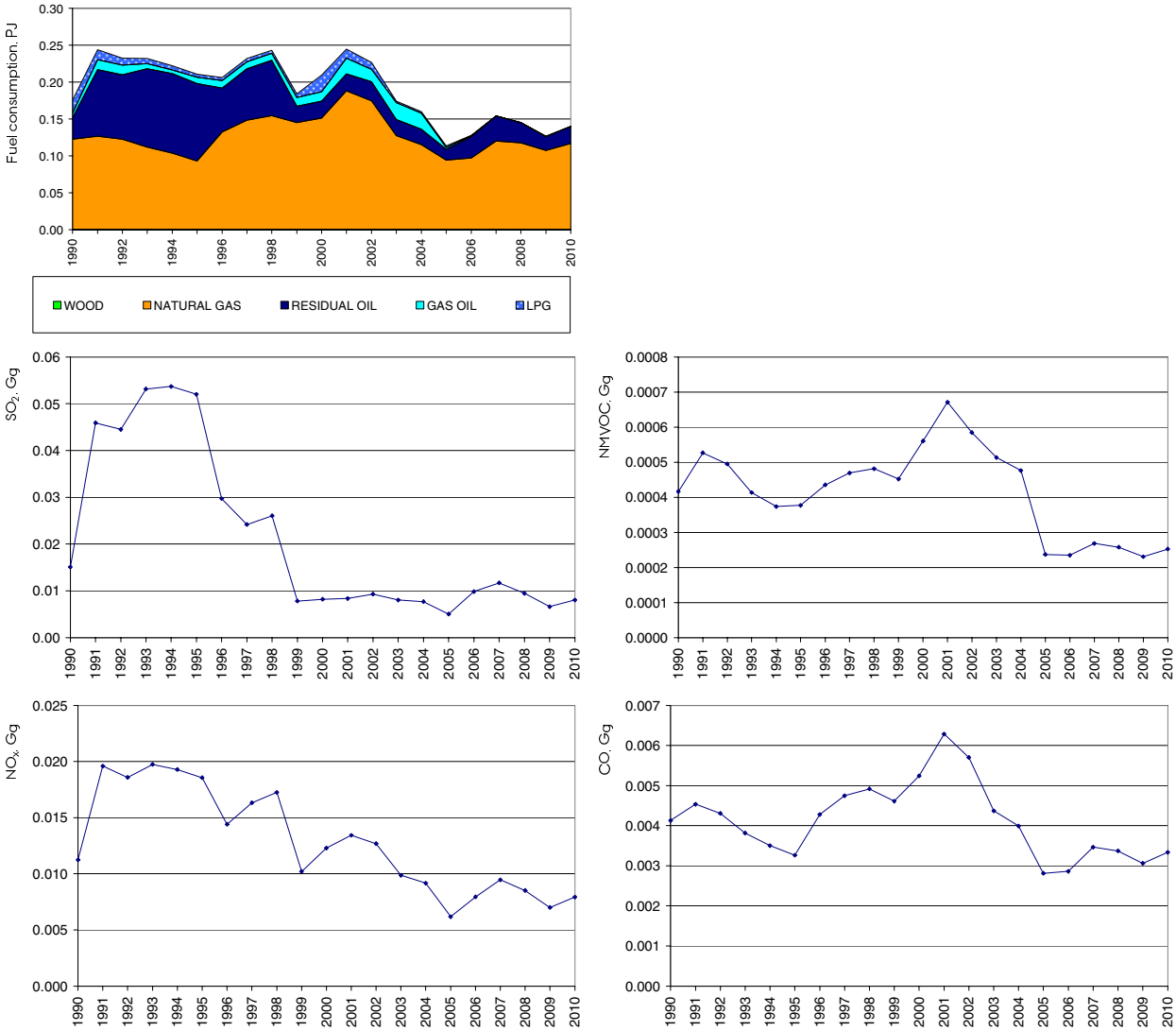


Figure 3.41 Time series for 1A2b Non-ferrous metals.

1A2c Chemicals

Chemicals is a minor emission source category. Figure 3.42 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.

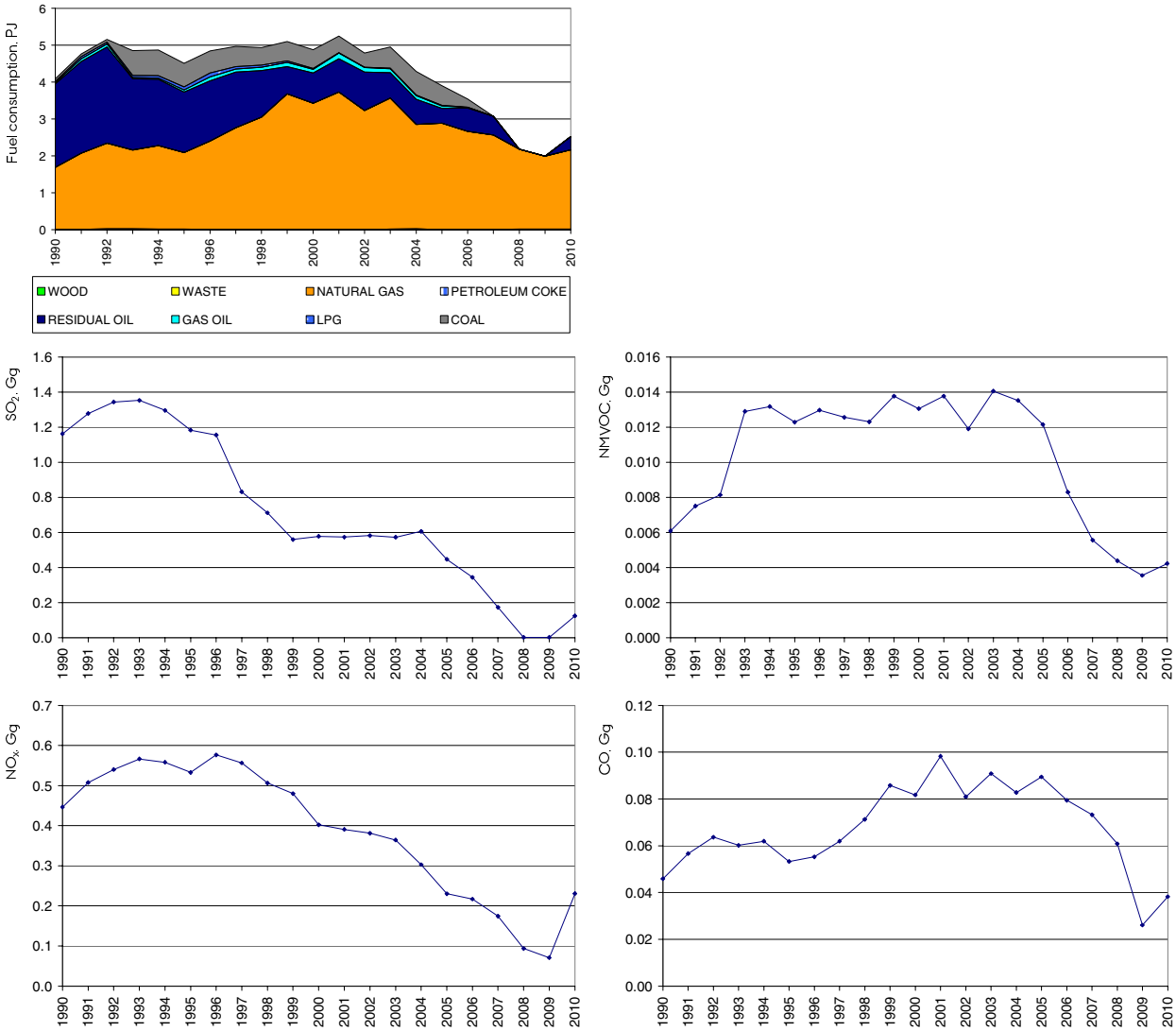


Figure 3.42 Time series for 1A2c Chemicals.

1A2d Pulp, paper and print

Pulp, paper and print is a minor emission source category. Figure 3.43 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.

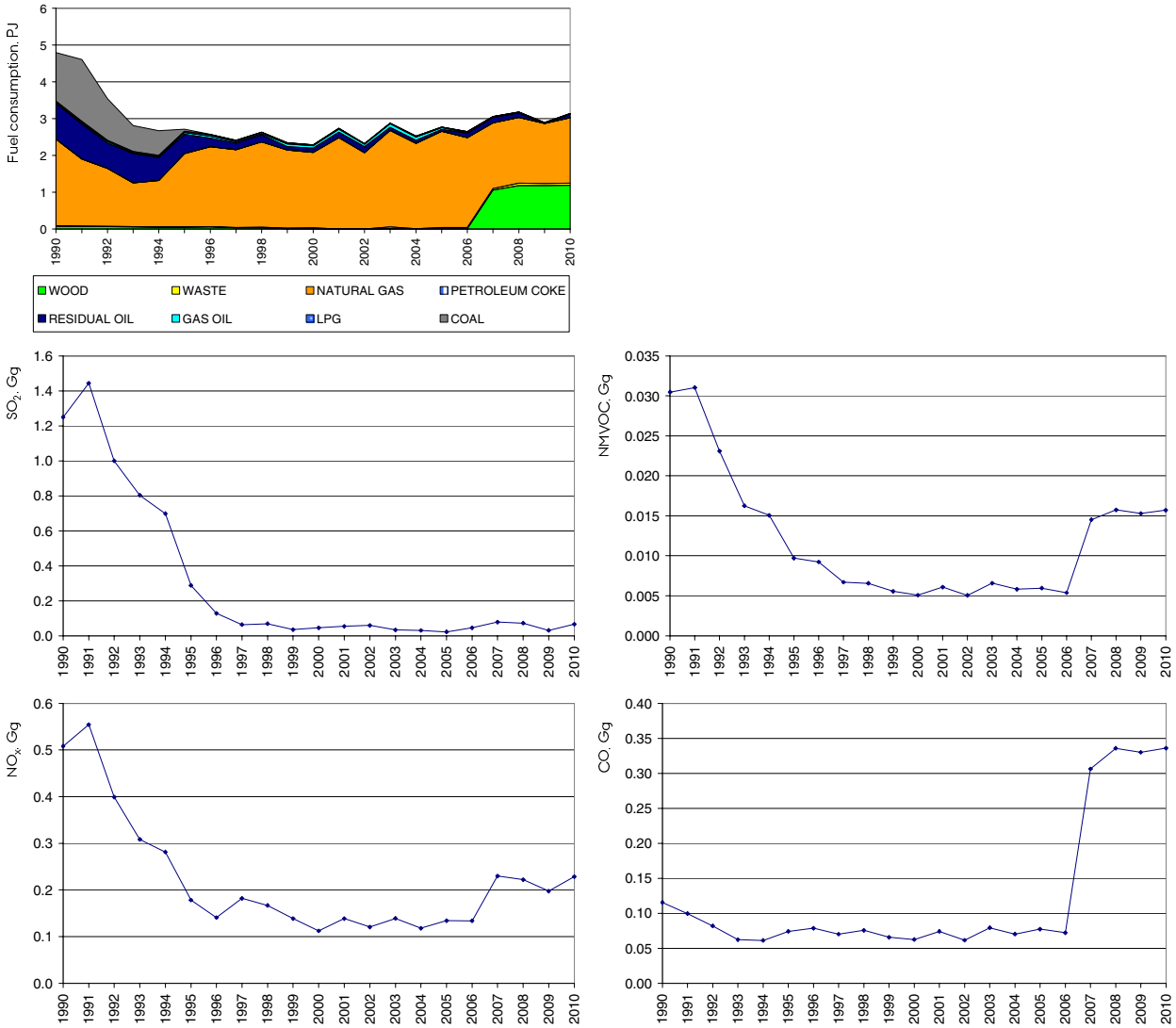


Figure 3.43 Time series for 1A2d Pulp, paper and print.

1A2e Food processing, beverages and tobacco

Food processing, beverages and tobacco is a considerable industrial subsector. Figure 3.44 shows the time series for fuel consumption and emissions of SO_2, NO_x, NMVOC and CO.

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

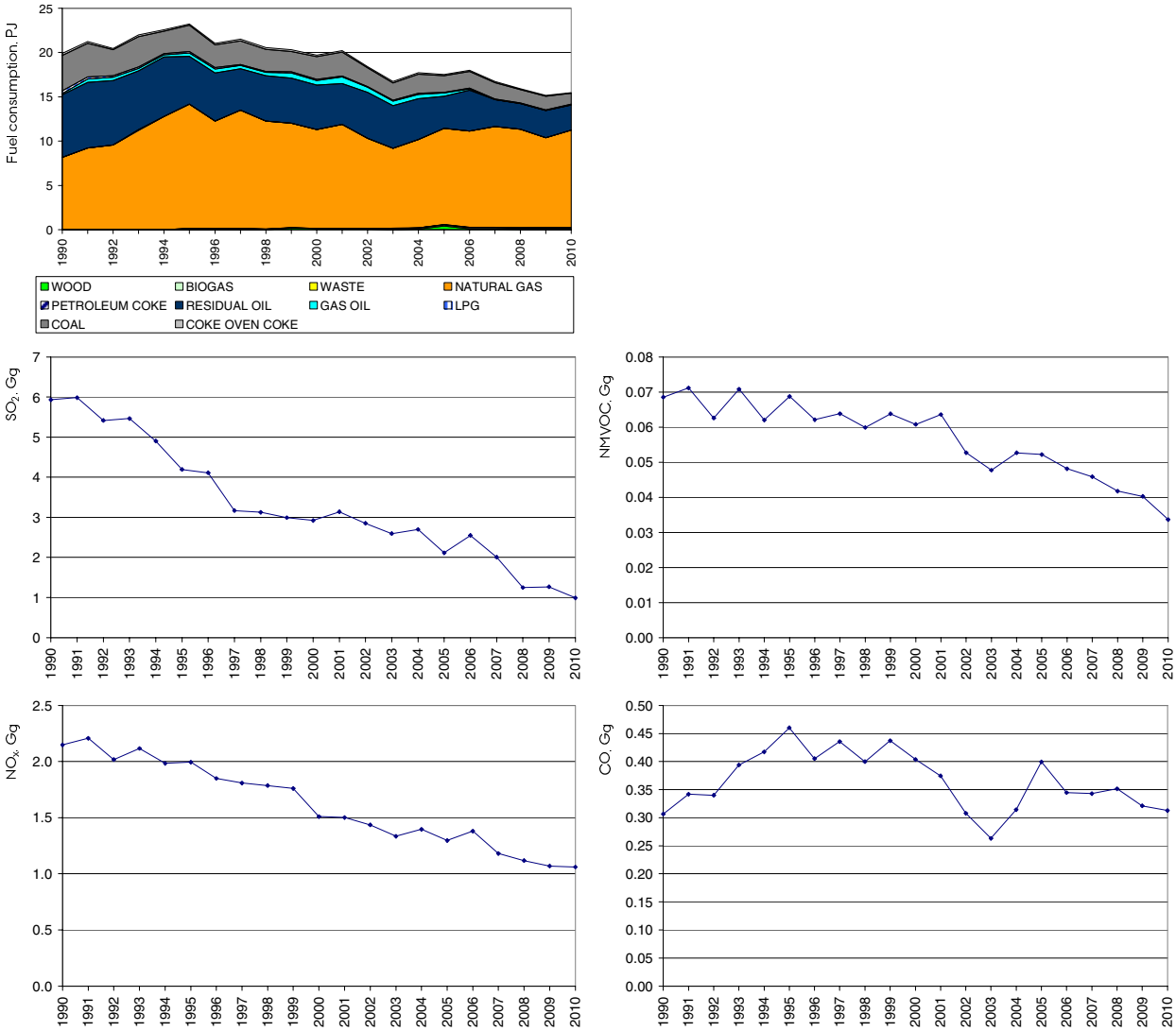


Figure 3.44 Time series for 1A2e Food processing, beverages and tobacco.

1A2f Industry – other

Industry - other is a considerable industrial subsector. Figure 3.45 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 (page 83).

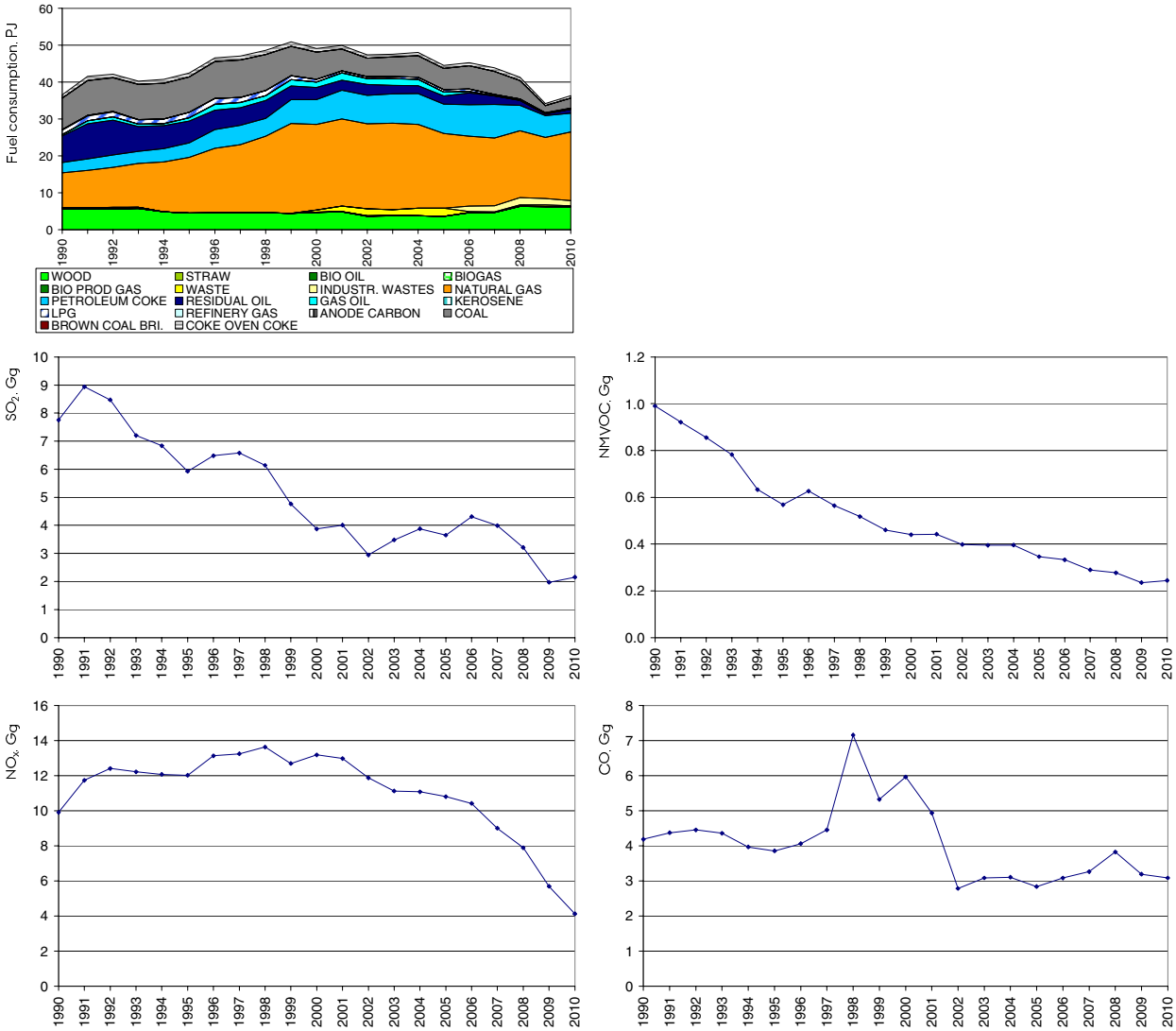


Figure 3.45 Time series for 1A2f Industry - other.

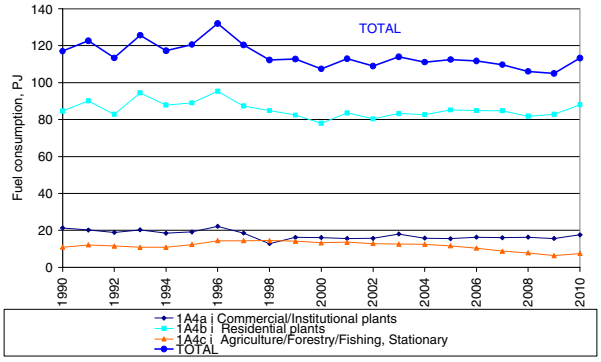
1A4 Other Sectors

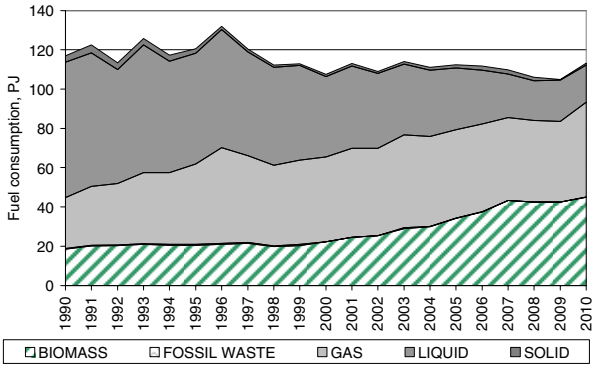
The emission source category *1A4 Other Sectors* consists of the subcategories:

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

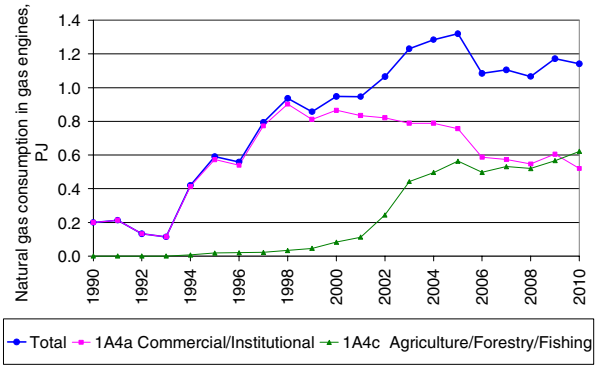
Figure 3.46 – 3.50 present time series for this emission source category. *Residential plants* is the largest subcategory accounting for the largest part of all emissions. Time series are discussed below for each subcategory.

1A4 Other Sectors

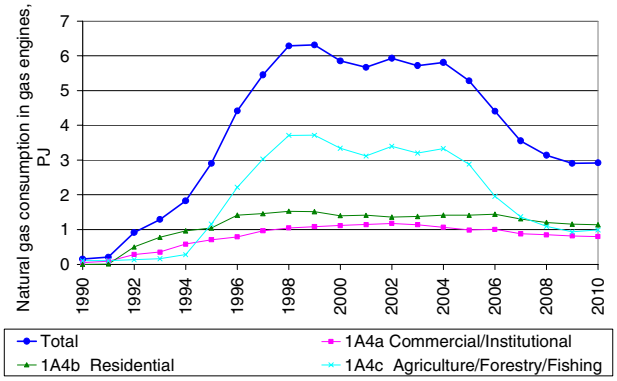




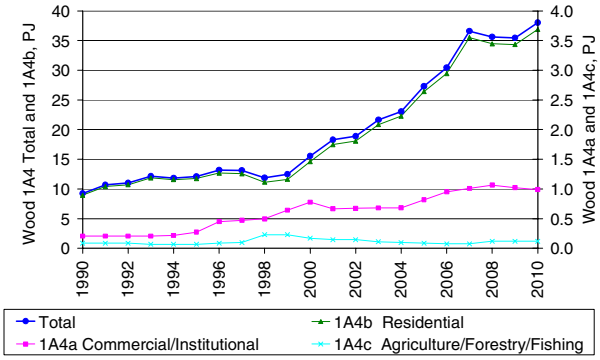
Gas engines, biogas (subsectors to Other Sectors)



Gas engines, natural gas (subsectors to Other Sectors)



Combustion of wood in Other Sectors



Combustion of straw in Other Sectors

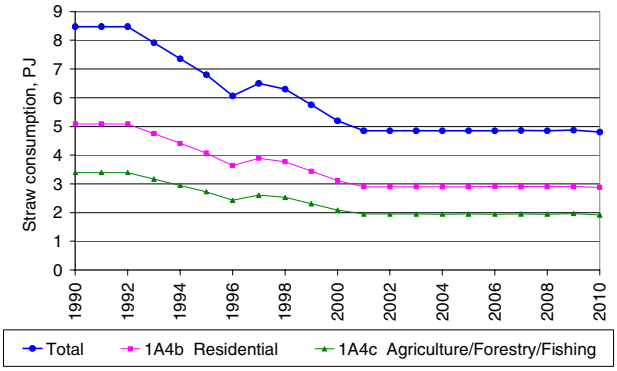


Figure 3.46 Time series for fuel consumption, 1A4 Other Sectors.

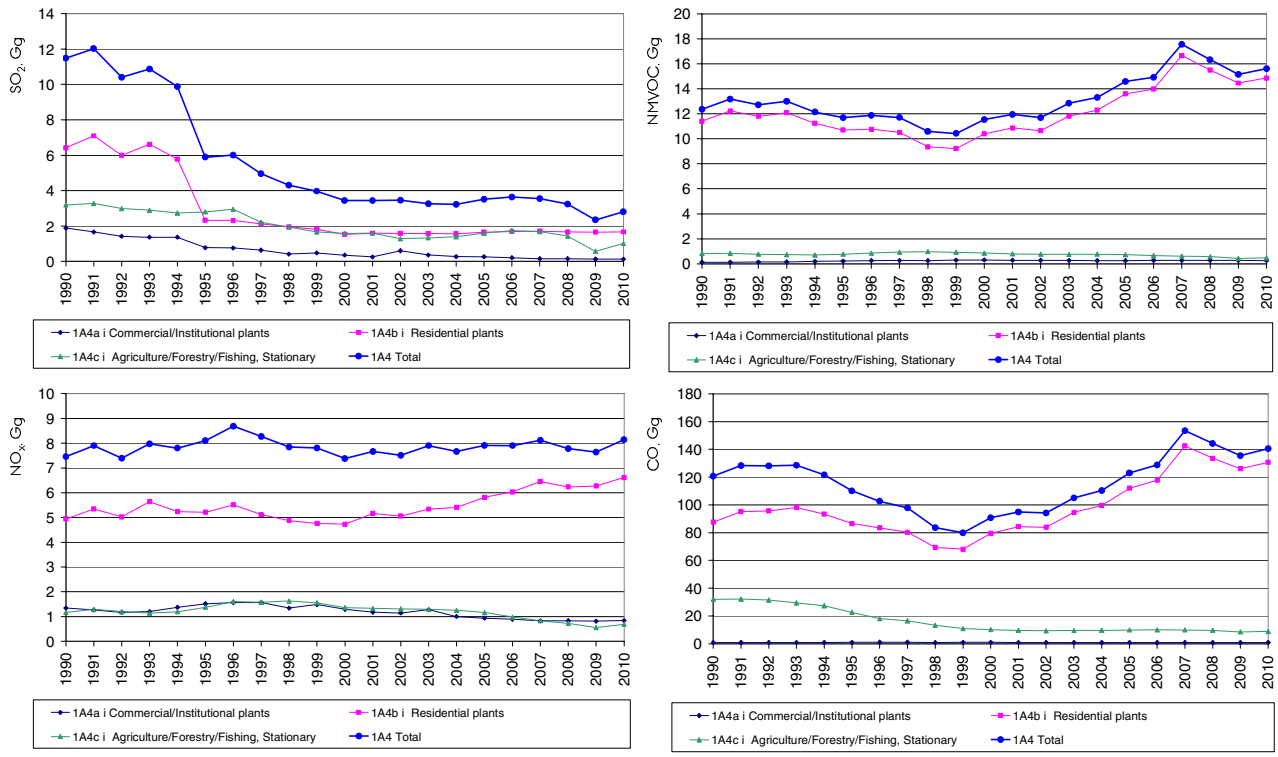


Figure 3.47 Time series for SO_2, NO_x, NMVOC and CO emission, 1A4 Other Sectors.

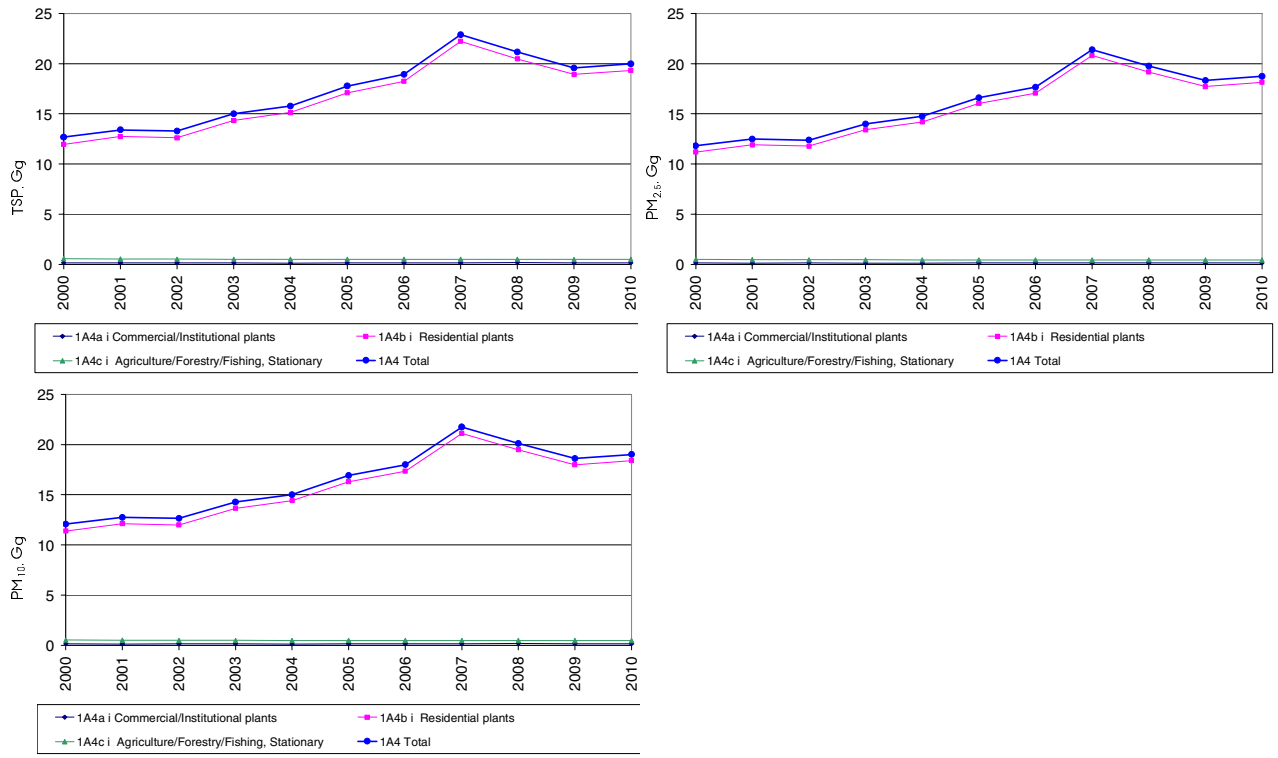


Figure 3.48 Time series for PM emission, 1A4 Other Sectors.

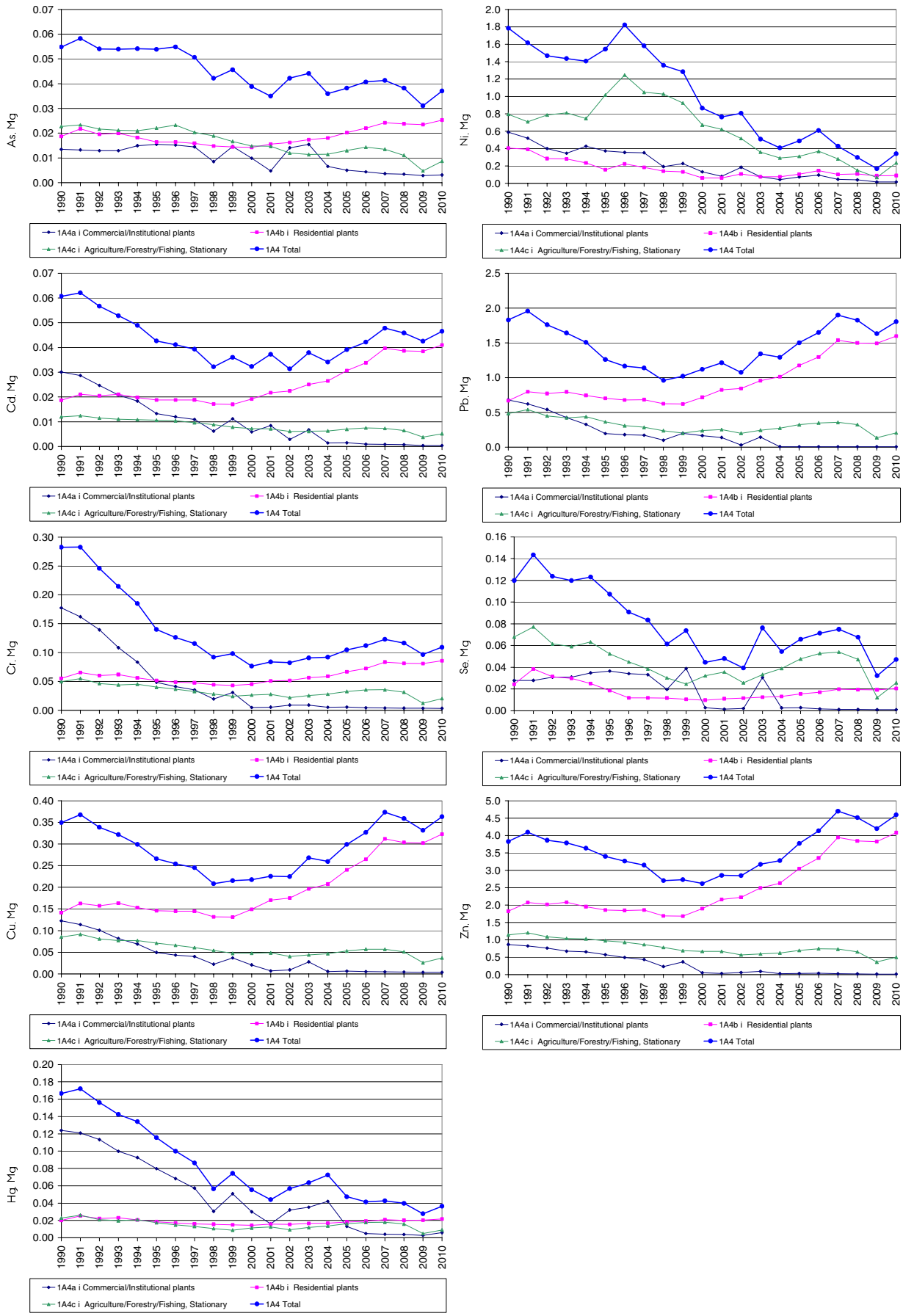


Figure 3.49 Time series for HM emission, 1A4 Other Sectors.

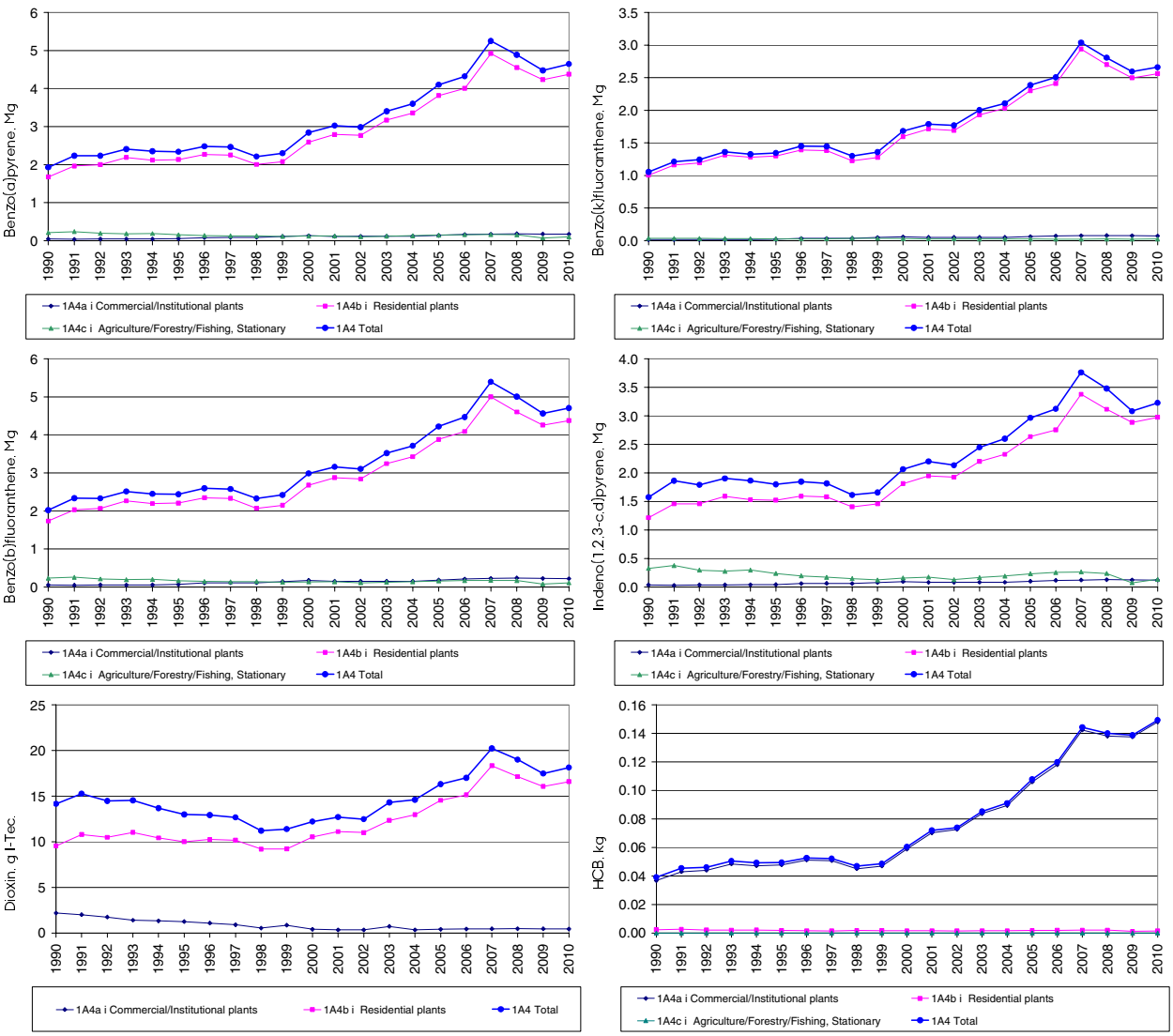


Figure 3.50 Time series for PAH, dioxin and HCB emission, 1A4 Other Sectors.

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 3.51 shows the time series for fuel consumption and emissions.

The fuel consumption in commercial/institutional plants has decreased 17 % 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 2010 was 4.8 times the consumption in 1990 (see Figure 3.46).

The SO_2 emission has decreased 93 % 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 38 % lower in 2010 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 2010 was 2.0 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 3.46) also contributes to the increased NMVOC emission.

The CO emission has decreased 5 % 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.

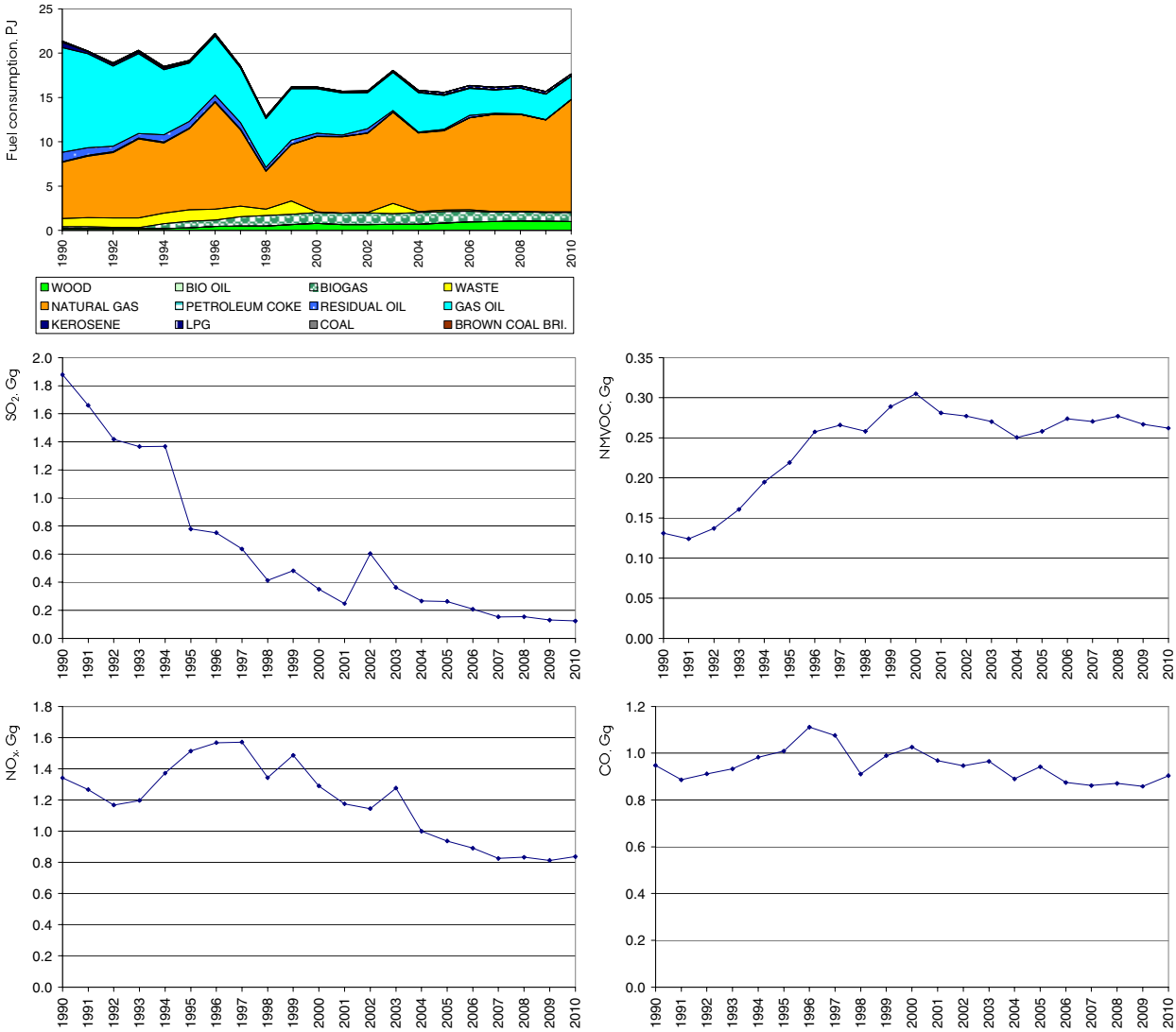


Figure 3.51 Time series for 1A4a Commercial /institutional.

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 3.52 shows the time series for fuel consumption and emissions.

For residential plants, the total fuel consumption has been rather stable, and in 2010, the consumption was 4 % higher than in 1990. However, the consumption of gas oil has decreased since 1990 whereas the consumption of

wood has increased considerably (4.1 times the 1990 level). The consumption of natural gas has also increased since 1990.

The large decrease (74 %) 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 34 % 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 30 % 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 49 % due to the increased use of wood that is the main source of emission. The emission from combustion of straw has decreased since 1990.

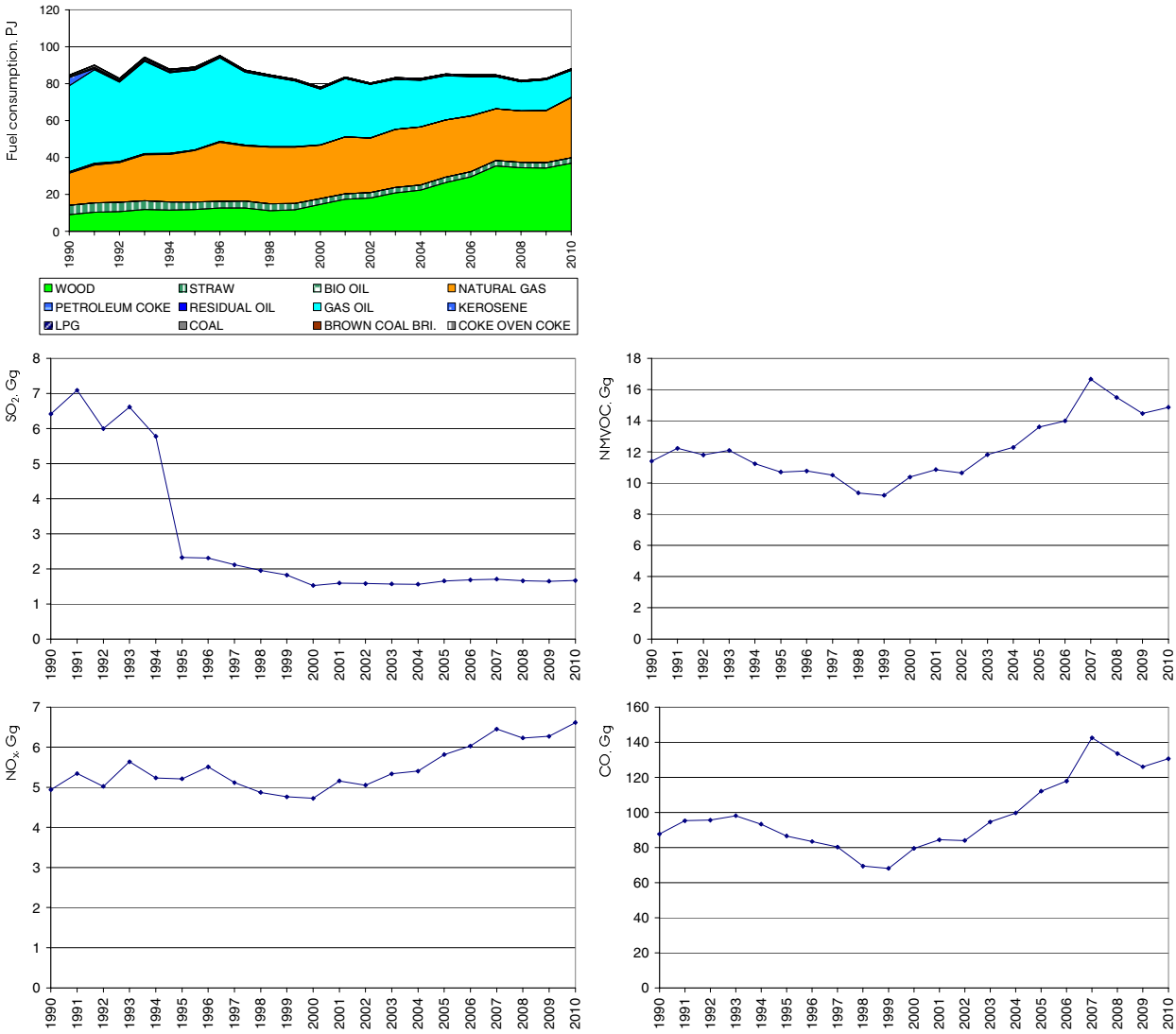


Figure 3.52 Time series for 1A4b Residential plants.

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 3.53 shows the time series for fuel consumption and emissions.

For plants in agriculture/forestry, the fuel consumption has decreased 31 % 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 3.46). 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 2010 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 41 % lower in 2010 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 72 % 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.

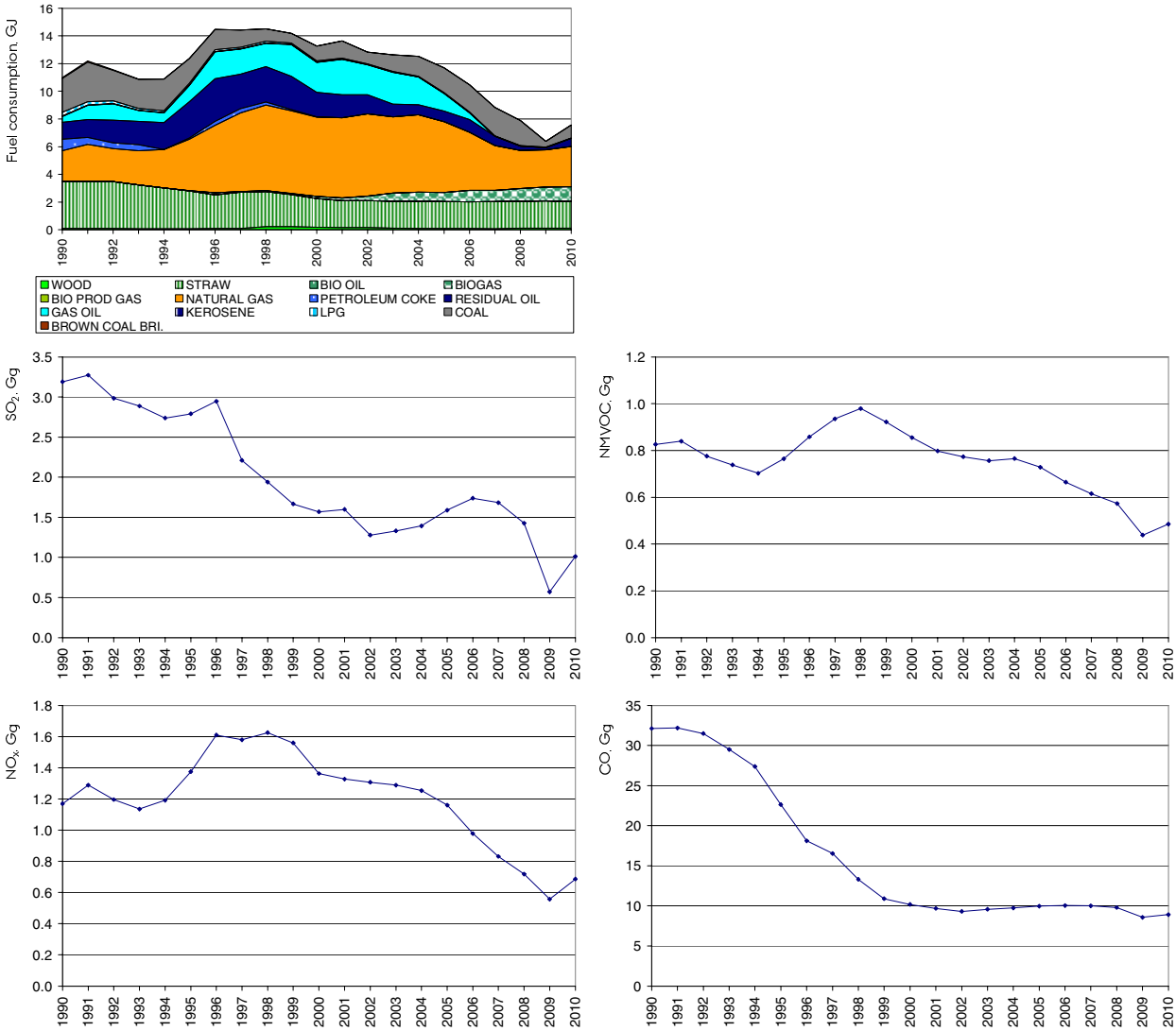


Figure 3.53 Time series for 1A4c Agriculture/Forestry.

3.2.4 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 2010, 77 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 obliged to report environmental data annually according to Danish law (DEPA 2010).
- 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 2010 inventory was 325 PJ. This corresponds to 59 % of the overall fuel consumption for stationary combustion.

A list of the large point sources for 2010 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 2010.

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.

SO_2 and NO_x emissions from large point sources are often plant-specific based on 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[3] (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 electricity suppliers

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

- 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 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 reportings to the energy statistics are 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 2011d).

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 2010) 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 2010c). 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 consump-

tion for non-energy purposes is relatively low, e.g. 11.1 PJ in 2010. 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 3.2.1.

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. 0.5 PJ in 2010. In 1990, the town gas consumption was 1.5 PJ and the consumption has been steadily decreasing through out 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 3.16 (KE, 2012).

Table 3.16 Composition of town gas currently used (KE, 2012).

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 3.17 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 3.17 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)[4] and IPCC Reference Manual (IPCC, 1996).

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:
  - Miljøstyrelsen, 2001 (DEPA).
  - Miljøstyrelsen, 1990 (DEPA).
  - Miljøstyrelsen, 2003 (DEPA).
- 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).

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

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

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), Miljøstyrelsen, Luftvejledningen (legislation from Danish Environmental Protection Agency).
  - DEPA (1990), Miljøstyrelsen, 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 2000-2010.

Heavy metals

Emission factors for 2010 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 1990-2010.

PAH

Emission factors 2010 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 2010. In general, emission factors for PAH are uncertain.

Dioxin

Emission factors 2010 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[5] 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 1990-2010.

HCB

Emission factors 2010 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/Corinair Guidebook (EEA, 2009). Time series have been estimated for waste incineration plants. All other emission factors have been considered constant in 1990-2010.

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 pro-

[5] 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.

gramme (Nielsen et al. 2010) and all other emission factors refer to the EMEP/EEA Guidebook (EEA 2009). Time series have not been estimated.

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.

3.2.5 Uncertainty

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

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 2010 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 3.18. The uncertainty for fuel consumption in stationary combustion plants is assumed to be 2 %.

Table 3.18 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 3.19. Detailed calculation sheets are provided in Annex 2A-7.

The total emission uncertainty is 7.6 % for SO_2, 17 % for NO_x, 43 % for NMVOC and 45 % for CO. For PM, heavy metals (except Se), HCB, dioxin and PAH the uncertainty estimates are larger than 100 %.

Table 3.19 Danish uncertainty estimates, tier 1 approach, 2010.

Pollutant	Uncertainty Total emission, %	Trend 1990-2010, %	Uncertainty Trend, %-age points
SO_2	7.6	-93	±0.4
NO_x	17	-65	±3
NMVOC	43	+32	±9
CO	45	+17	±3
NH_3	953	+206	±191
TSP [1)]	473	+44	±56
PM_{10} [1)]	477	+46	±49
$PM_{2.5}$ [1)]	482	+50	±39
As	177	-81	±24
Cd	406	-86	±45
Cr	289	-93	±17
Cu	552	-82	±84
Hg	133	-88	±6
Ni	156	-85	±8
Pb	705	-83	±98
Se	98	-68	±2
Zn	764	-75	±152
HCB	729	-81	±59
Dioxin	937	-58	±294
Benzo(b)fluoranthene	979	+130	±33
Benzo(k)fluoranthene	987	+148	±44
Benzo(a)pyrene	994	+140	±11
Indeno(1,2,3-c,d)pyrene	996	+103	±19

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

3.2.6 Source specific QA/QC and verification

A QA/QC plan for the Danish emission inventories has been implemented. 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). 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.

3.2.7 Source specific improvements and recalculations

For stationary combustion plants, the emission estimates for the years 1990-2009 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.

The disaggregation of emissions in *1A2 Manufacturing industries and construction* has been recalculated based on a new improved methodology. Thus, the estimated emissions in the subsectors are considerable, but the total emissions in sector 1A2 are relatively low.

The emissions from residential wood combustion have been recalculated based on improved technology disaggregation data. In addition the NMVOC emission factor has been improved for new stoves resulting in a decreased emission from this sector.

The NO_x emission factor for natural gas consumption in large power plants has been updated according to Danish legislation[6].

The NMVOC emission factor for refineries have been included or revised for several years. This results in improved time series but also in large relative changes for some years.

The PM_{10} and $PM_{2.5}$ emission factors for wood and straw have been recalculated to improve consistency with the TSP emission factor.

3.2.8 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 2012.

3) Implementation of emission factors from EEA (2009).

Some emission factors still refer to older versions of the EMEP/CORINAIR Guidebook. These emission factors will be updated according to EEA (2009).

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.

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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 3.20 below (mobile sources only).

Table 3.20 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 domestic cruise (080503). The fuel consumption and emission development

[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.

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 3.21 Fuel consumption (PJ) for domestic transport in 2010 in NFR sectors.

NFR ID	Fuel consumption (PJ)
Industry-Other (1A2f)	14.2
Civil Aviation (1A3a)	2.2
Road (1A3b)	165.6
Railways (1A3c)	3.3
Navigation (1A3d)	7.9
Comm./Inst. (1A4a)	2.4
Residential (1A4b)	0.9
Agri./for./fish. (1A4c)	25.2
Military (1A5)	1.5
Total	223.0

Table 3.21 shows the fuel consumption for domestic transport based on DEA statistics for 2010 in NFR sectors. The fuel consumption figures in time series 1985-2010 are given in Annex 2.B.16 (NFR format) and are shown for 2010 in Annex 2.B.15 (CollectER format). Road transport has a major share of the fuel consumption for domestic transport. In 2010 this sector's fuel consumption share is 74 %, while the fuel consumption shares for Agriculture/forestry/fisheries and Industry-Other are 11 and 6 %, respectively. For the remaining sectors the total fuel consumption share is 9 %.

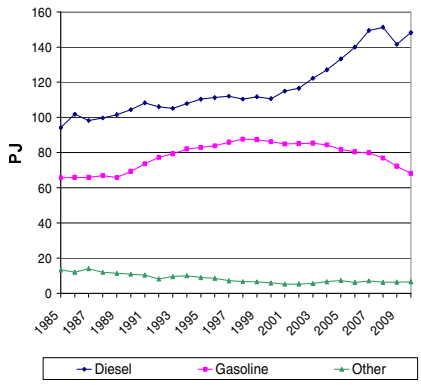


Figure 3.48 Fuel consumption pr fuel type for domestic transport 1985-2010.

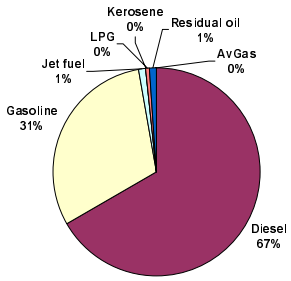


Figure 3.49 Fuel consumption share pr fuel type for domestic transport in 2010.

From 1985 to 2010, diesel and gasoline fuel consumption has increased by 57 % and 4 %, respectively, and in 2010 the fuel consumption shares for diesel and gasoline were 67 % and 31 %, respectively (Figures 3.48 and 3.49). Other fuels only have a 2 % share of the domestic transport total. 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.

Road transport

As shown in Figure 3.50, the fuel consumption for road transport[2] 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 slight 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 3.51).

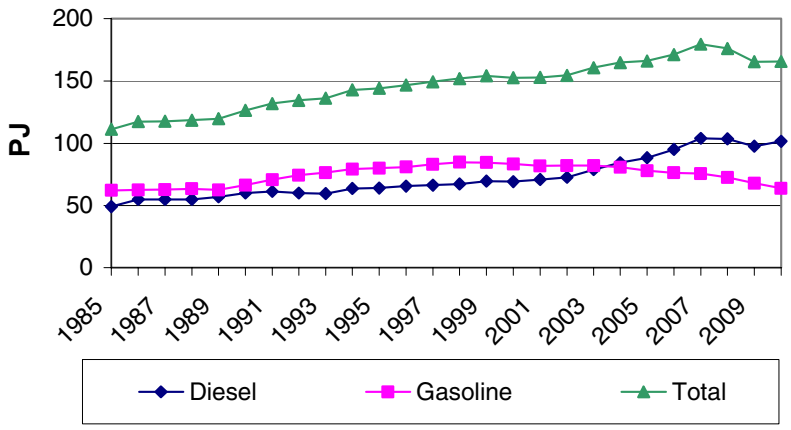


Figure 3.50 Fuel consumption pr fuel type and as totals for road transport 1985-2010.

[2] The gasoline and diesel fuel sums include small amounts of bio ethanol and bio diesel; 1.7 % and 0.02 %, respectively in 2010.

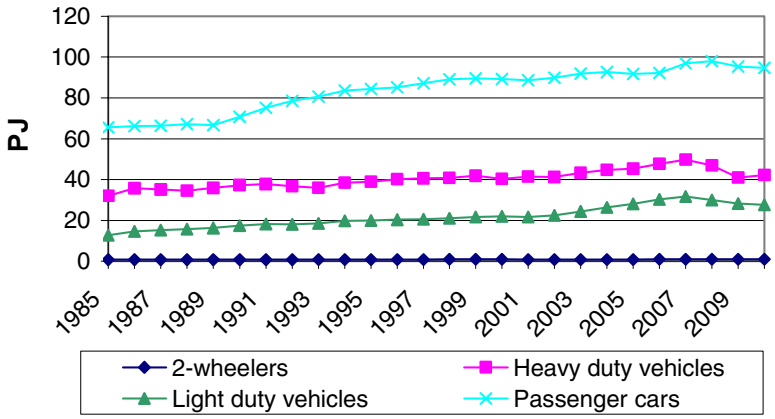


Figure 3.51 Total fuel consumption pr vehicle type for road transport 1985-2010.

As shown in Figure 3.52 fuel consumption for gasoline passenger cars dominates the overall gasoline consumption trend. The development in diesel fuel consumption in recent years (Figure 3.53) 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.

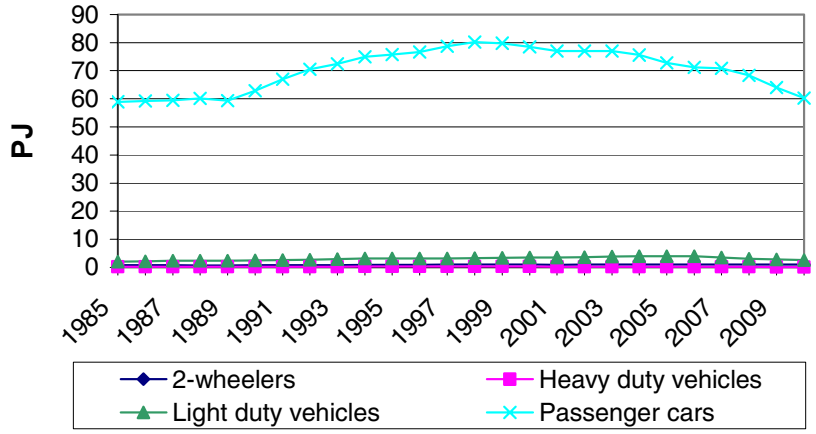


Figure 3.52 Gasoline fuel consumption pr vehicle type for road transport 1985-2010.

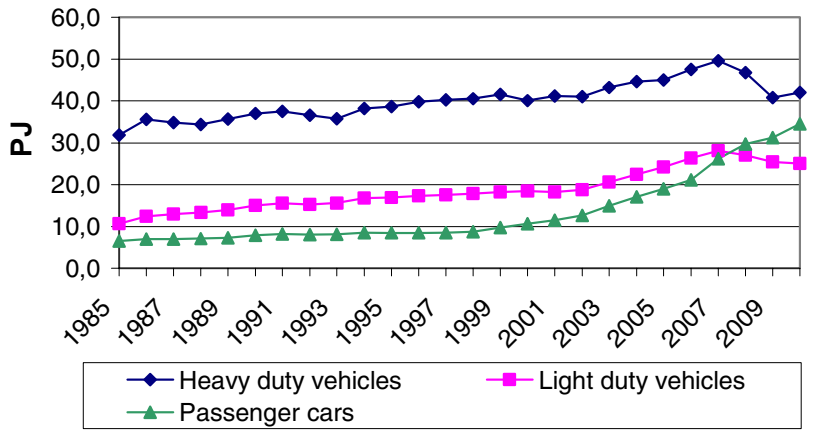


Figure 3.53 Diesel fuel consumption pr vehicle type for road transport 1985-2010.

In 2010, fuel consumption shares for gasoline passenger cars, heavy-duty vehicles, diesel passenger cars, diesel light duty vehicles and gasoline light duty vehicles were 36, 25, 21, 15 and 2 %, respectively (Figure 3.54).

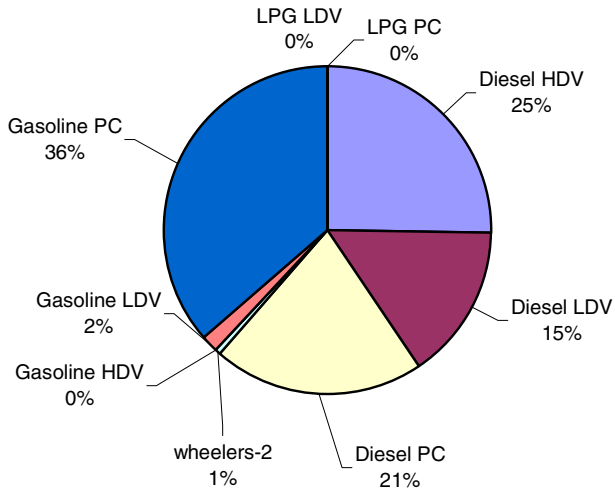


Figure 3.54 Fuel consumption share (PJ) pr vehicle type for road transport in 2010.

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 3.55, 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 1985-2010 time series are shown pr fuel type in Figures 3.56-3.59 for diesel, gasoline and jet fuel, respectively.

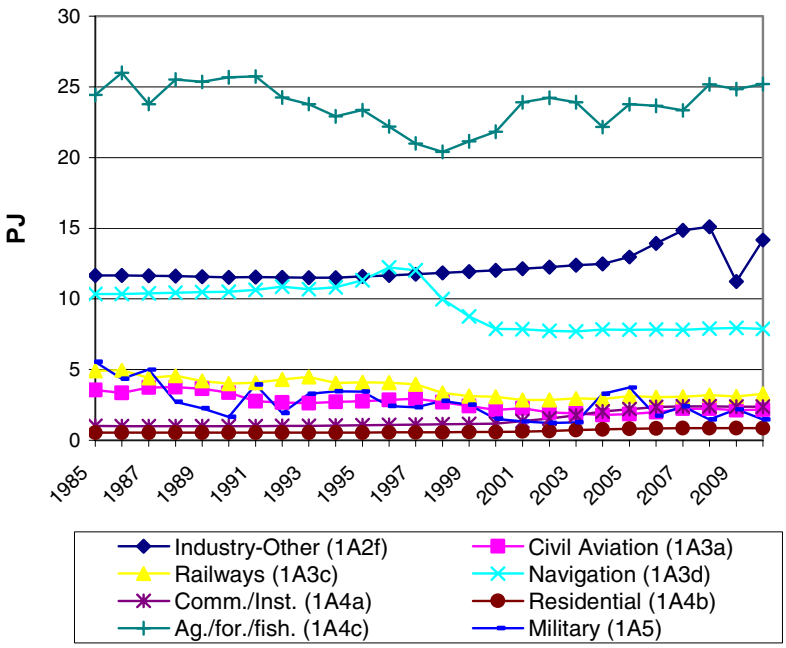


Figure 3.55 Total fuel consumption in CRF sectors for other mobile sources 1985-2010.

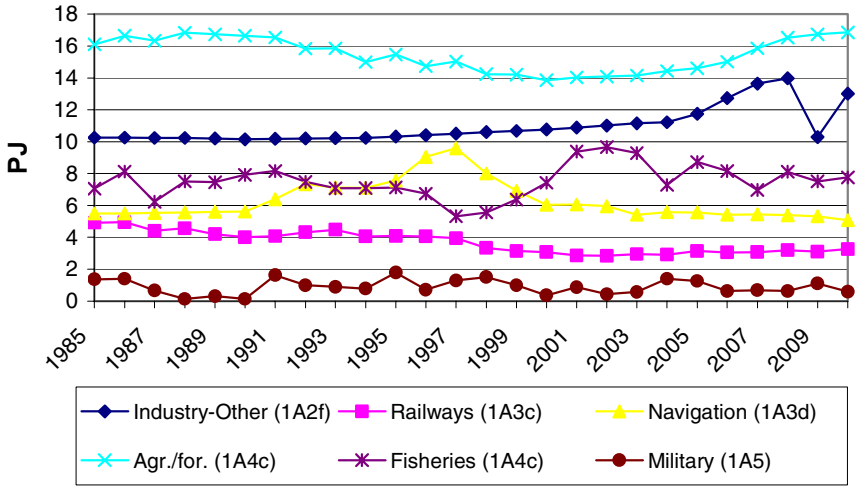


Figure 3.56 Diesel fuel consumption in CRF sectors for other mobile sources 1985-2010.

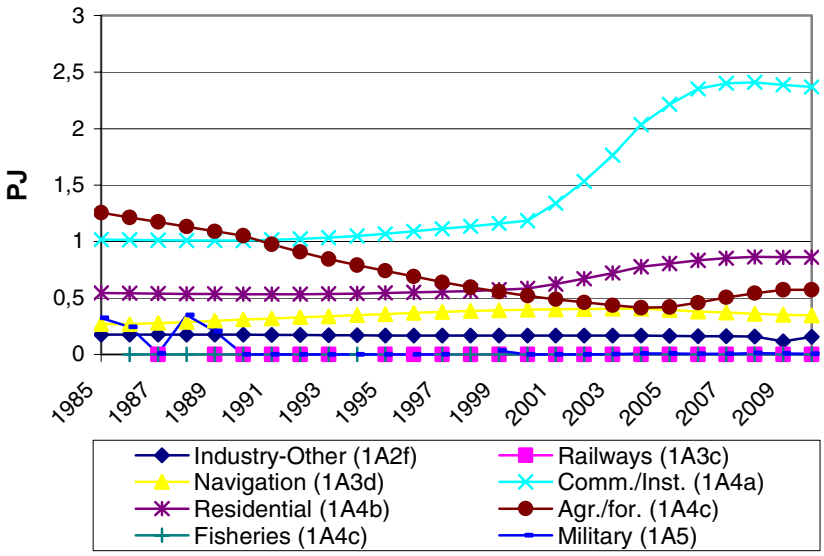


Figure 3.57 Gasoline fuel consumption in CRF sectors for other mobile source 1985-2010.

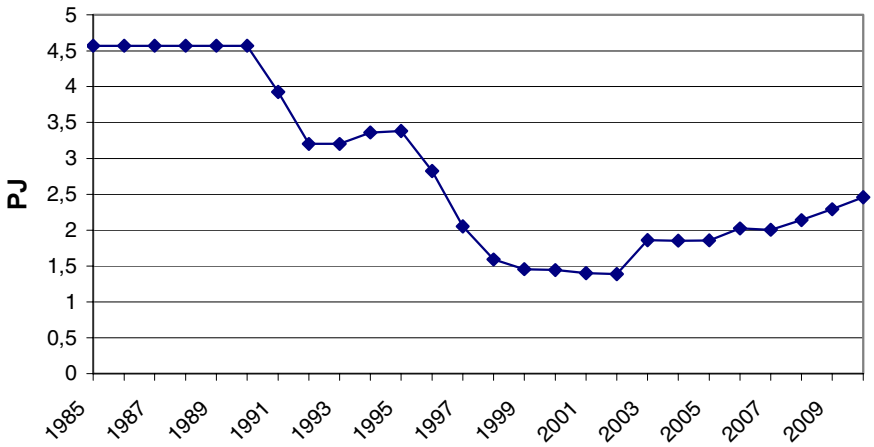


Figure 3.58 Residual oil fuel consumption in CRF sectors for other mobile sources 1985-2010.

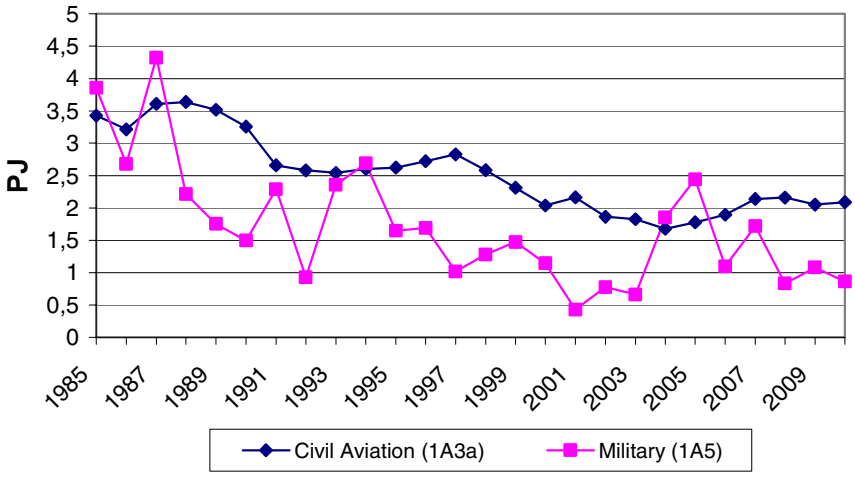


Figure 3.59 Jet fuel consumption in CRF sectors for other mobile sources 1985-2010.

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.

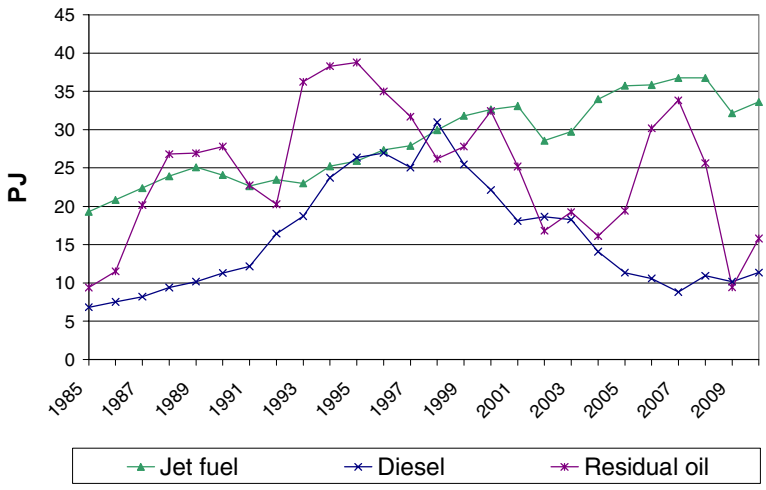


Figure 3.60 Bunker fuel consumption 1985-2010.

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

In Table 3.22 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 2010 in NFR sectors. For particulate matter (PM; TSP, PM_{10} and $PM_{2.5}$), only the exhaust emission contributions are included in Table 3.22. Non-exhaust TSP, PM_{10} and $PM_{2.5}$ emissions are treated in a separate section below. The emission figures in the time series 1985-2010 are given in Annex 2.B.16 (NFR format) and are shown for 2010 in Annex 2.B.15 (CollectER format).

From 1985 to 2010, the road transport emissions of SO_2, NO_X, NMVOC, CO and PM (all size fractions) have decreased by 99, 52, 84, 72 and 65 %, respectively (Figures 3.61-3.65), whereas the NH_3 emissions have increased by 2232 % during the same time period (Figure 3.66).

For other mobile sources, the emission changes for SO_2, NO_X, NMVOC, CO and PM (all size fractions) are -88, -17, -28, -8 and -65 %, respectively (Figures 3.68)-3.72). The NH_3 emissions have increased by 17 % during the same time period (Figure 3.73).

Table 3.22 Emissions of SO_2, NO_X, NMVOC, CO NH_3, TSP, PM_{10} and $PM_{2.5}$ in 2010 for road transport and other mobile sources.

NFR ID	SO_2 tonnes	NO_x tonnes	NMVOC tonnes	CO tonnes	NH_3 tonnes	TSP Tonnes	PM_{10} tonnes	$PM_{2.5}$ tonnes
Industry-Other (1A2f)	31	8 540	1 173	6 446	3	686	686	686
Civil Aviation (1A3a)	50	623	109	688	0	3	3	3
Railways (1A3c)	2	2 818	189	481	1	95	95	95
Navigation (1A3d)	1 440	9 582	937	5 841	0	307	305	304
Comm./Inst. (1A4a)	1	217	4 423	72 338	0	67	67	67
Residential (1A4b)	0	87	2 032	25 616	0	14	14	14
Ag./for./fish. (1A4c)	404	20 770	2 374	19 380	4	957	955	954
Military (1A5)	20	438	41	309	0	9	9	9
Total other mobile	1 947	43 075	11 279	131 100	8	2 138	2 135	2 133
Road (1A3b)	76	44 159	12 514	105 972	1433	1 513	1 513	1 513
Total mobile	2 023	87 235	23 793	237 072	1441	6 133	5 252	4 514

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 3.61). 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: 56, 26, 17 and 1 %, respectively (Figure3.67).

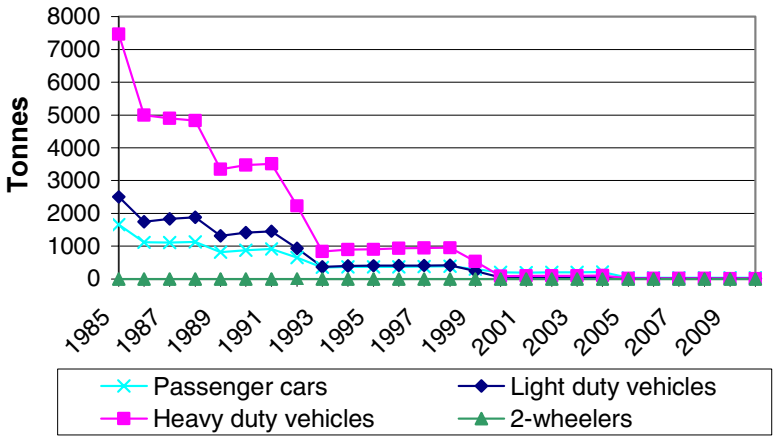


Figure 3.61 SO_2 emissions (tonnes) pr vehicle type for road transport 1985-2010.

Historically, the emission totals of NMVOC and CO have been very dominated by the contributions coming from private cars, as shown in Figures 3.63- 3.64. 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 3.62).

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. The environmental benefit of introducing diesel private cars with lower particulate emissions since 1990 is more than outbalanced by an increase in sales of new vehicles in recent years (Figure 3.65).

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 3.63).

The 2010 emission shares for heavy-duty vehicles, passenger cars, light-duty vehicles and 2-wheelers for NO_x (52, 35, 13 and 0 %), NMVOC (5, 58, 8 and 18 %), CO (6, 77, 7, 10 %), PM (25, 37, 35 and 3 %) and NH_3 (1, 96, 3 and 0 %), are also shown in Figure 3.67.

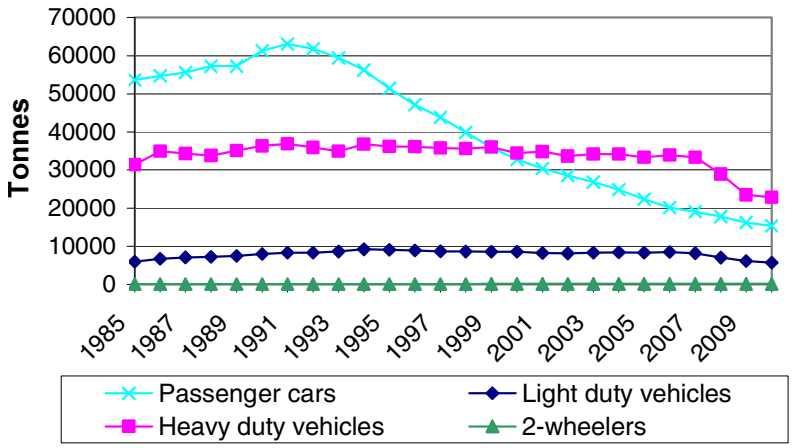


Figure 3.62 NO_x emissions (tonnes) pr vehicle type for road transport 1985-2010.

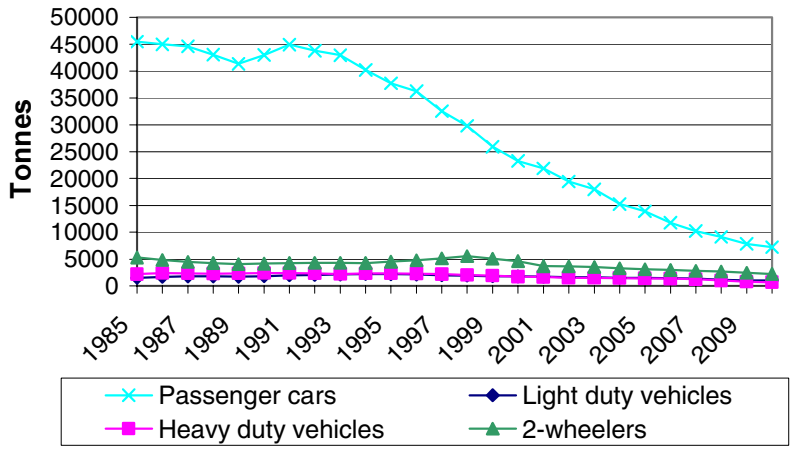


Figure 3.63 NMVOC emissions (tonnes) pr vehicle type for road transport 1985-2010.

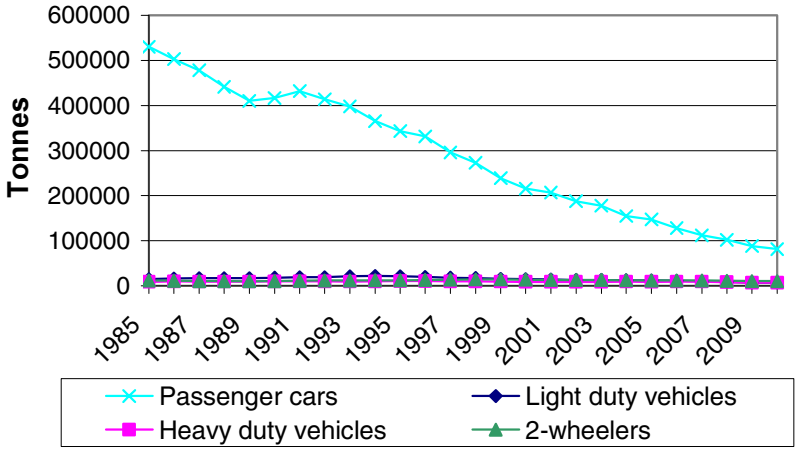


Figure 3.64 CO emissions (tonnes) pr vehicle type for road transport 1985-2010.

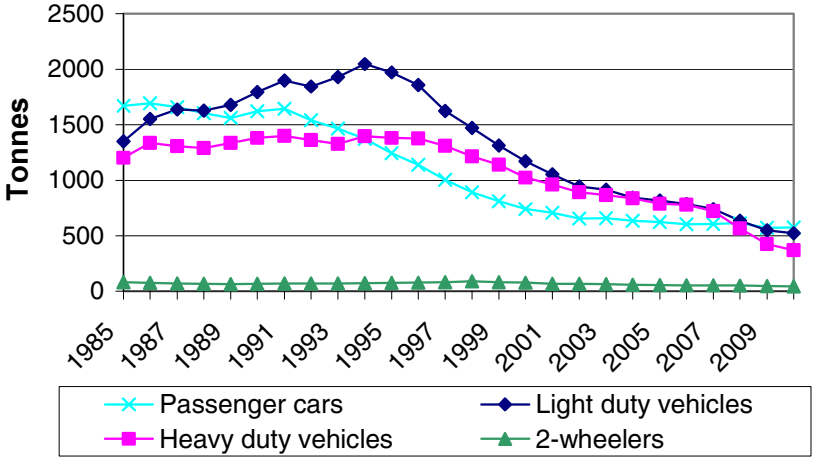


Figure 3.65 PM emissions (tonnes) pr vehicle type for road transport 1985-2010.

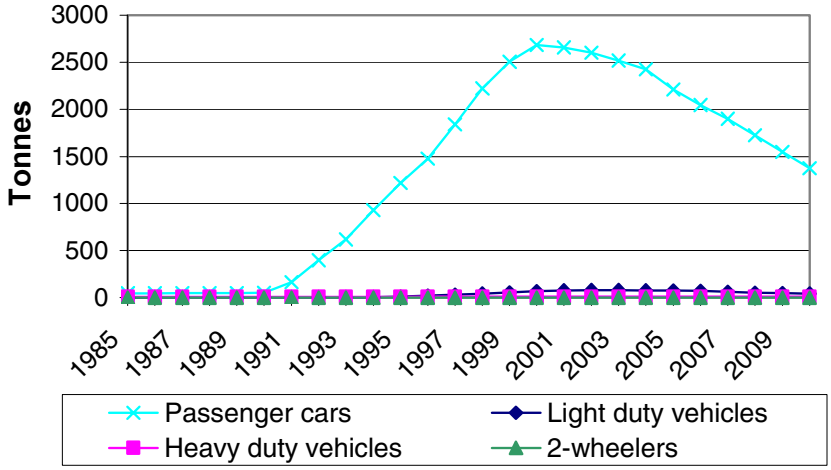


Figure 3.66 NH_3 emissions (tonnes) pr vehicle type for road transport 1985-2010.

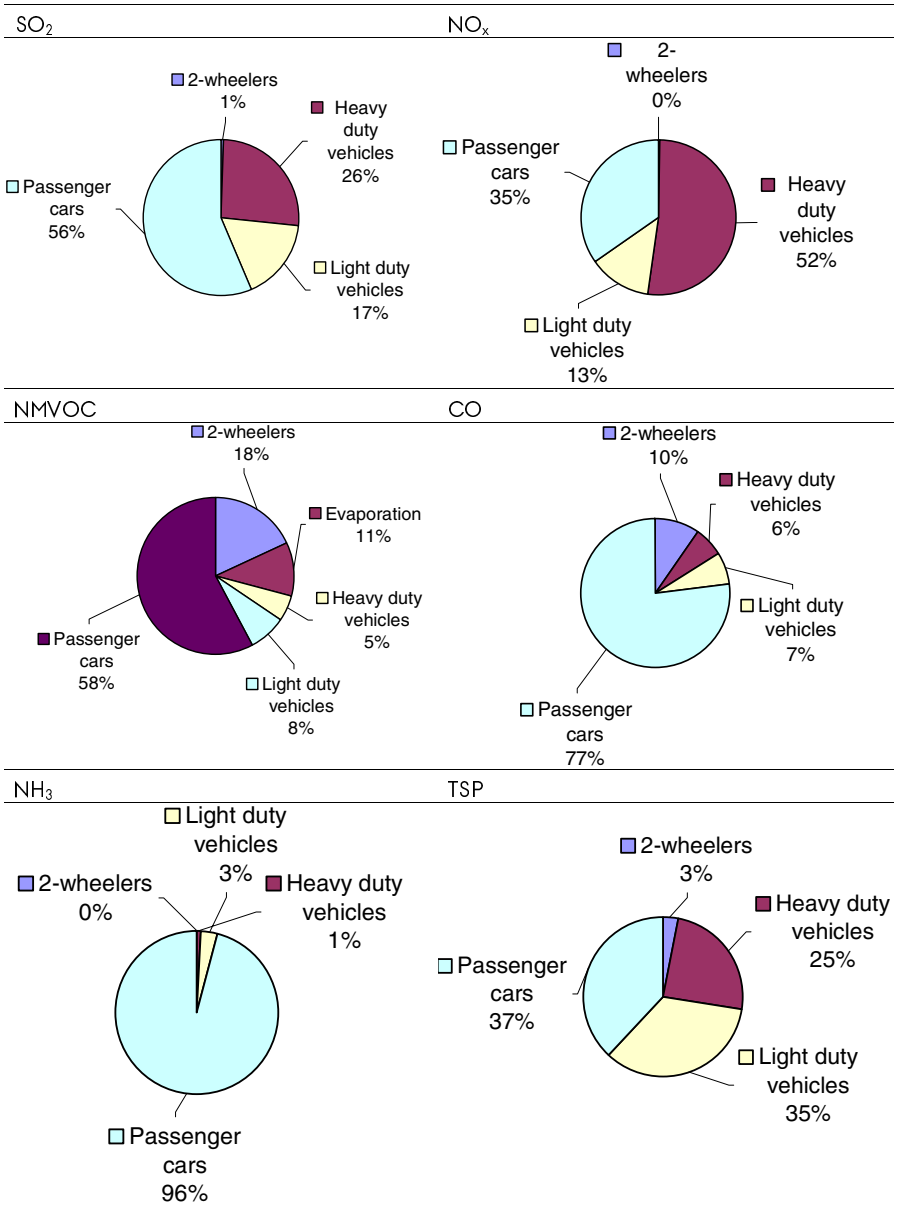


Figure 3.67 SO_2, NO_X, NMVOC, CO, NH_3 and PM emission shares pr vehicle type for road transport in 2010.

Other mobile sources

For SO_2 the trends in the Navigation (1A3d) emissions shown in Figure 3.68 mainly follow the development of the heavy fuel oil consumption (Figure 3.58). 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.

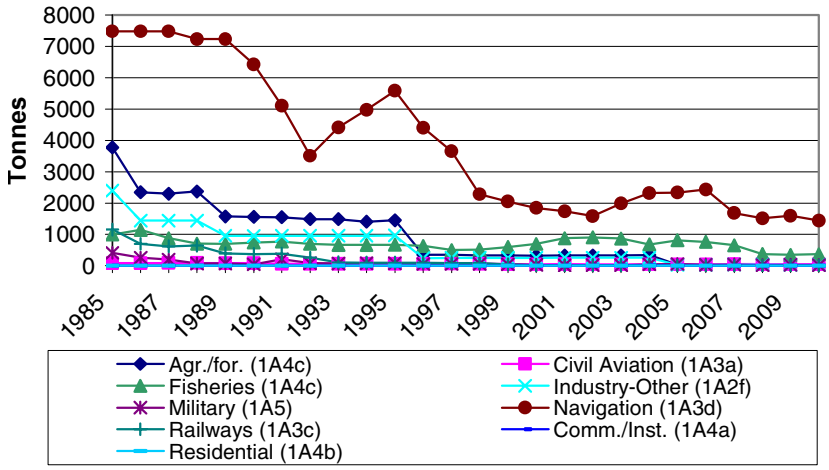


Figure 3.68 SO_2 emissions (k-tonnes) in NFR sectors for other mobile sources 1985-2010.

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 3.67. The 2010 emission shares are 48, 22, 20 and 7 %, respectively (Figure 3.70). 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.

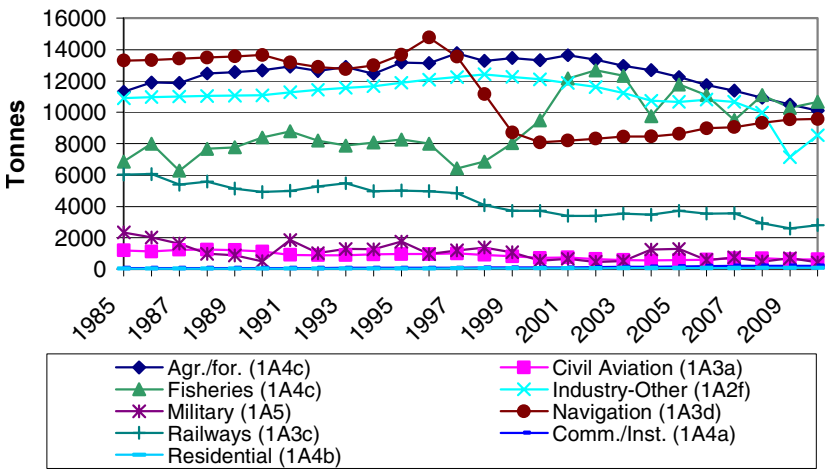


Figure 3.69 NO_X emissions (tonnes) in NFR sectors for other mobile sources 1985-2010.

The 1985-2010 time series of NMVOC and CO emissions are shown in Figures 3.68 and 3.69 for other mobile sources. The 2010 sector emission shares are shown in Figure 3.74. For NMVOC, the most important sectors are Commercial/Institutional (1A4a), Agriculture/forestry/-fisheries (1A4c), Residential (1A4b), Industry (1A2f) and Navigation (1A3d) with 2010 emission shares of 40, 21, 18, 10 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 3.74, for other mobile sources the largest TSP contributors in 2010 are Agriculture/forestry/fisheries (1A4c), Industry (1A2f) and Navigation (1A3d), with emission shares of 46, 32 and 14 %, respectively. The remaining sectors: Railways (1A3c), Civil aviation (1A3a), Military (1A5) and Residential (1A4b) represent only minor emission sources.

The 1985-2009 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 develop-

ment in emission factors, as explained for agricultural machinery. The TSP emission explanations for railways are the same as for NO_x (Figure 3.69).

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, 26, 8 and 8 %, respectively.

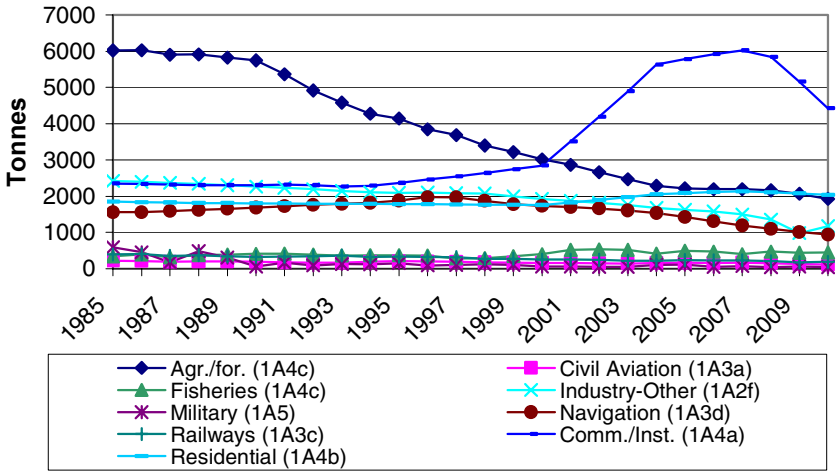


Figure 3.70 NMVOC emissions (tonnes) in NFR sectors for other mobile sources 1985-2010.

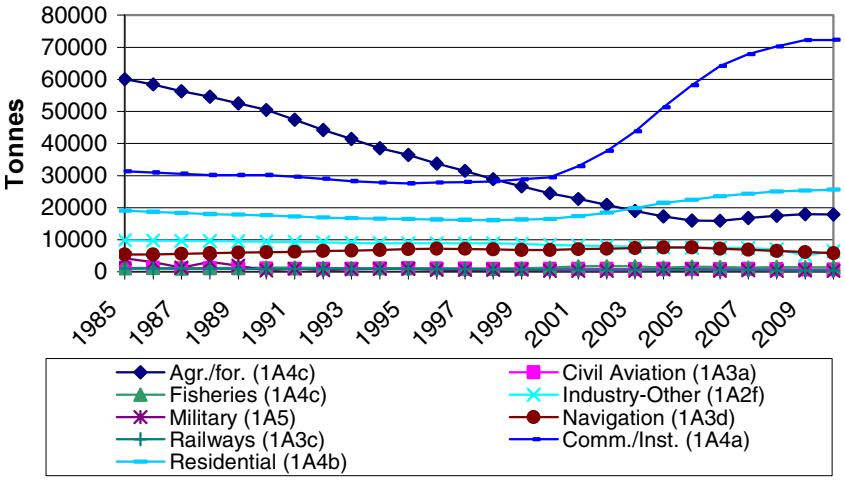


Figure 3.71 CO emissions (tonnes) in NFR sectors for other mobile sources 1985-2010.

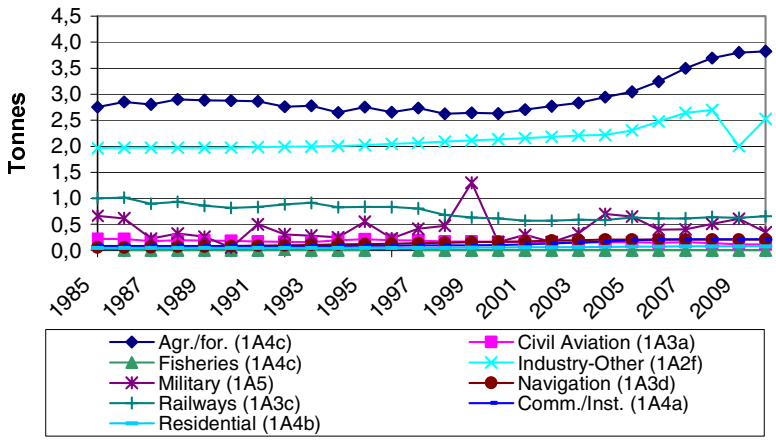


Figure 3.72 NH_3 emissions (tonnes) in NFR sectors for other mobile sources 1985-2010.

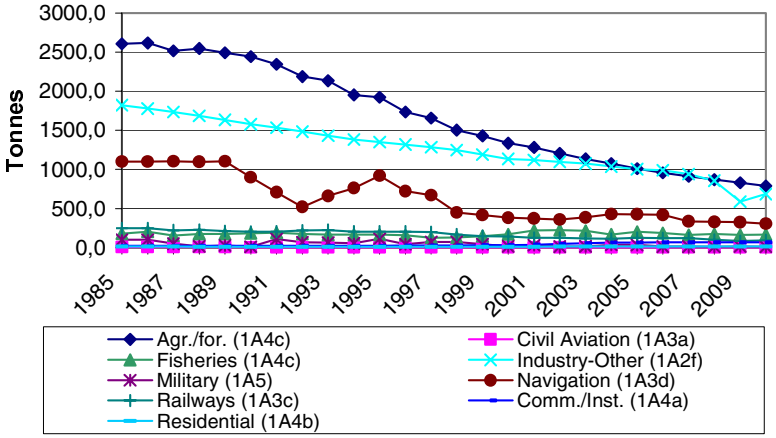


Figure 3.73 TSP emissions (tonnes) in NFR sectors for other mobile sources 1985-2010.

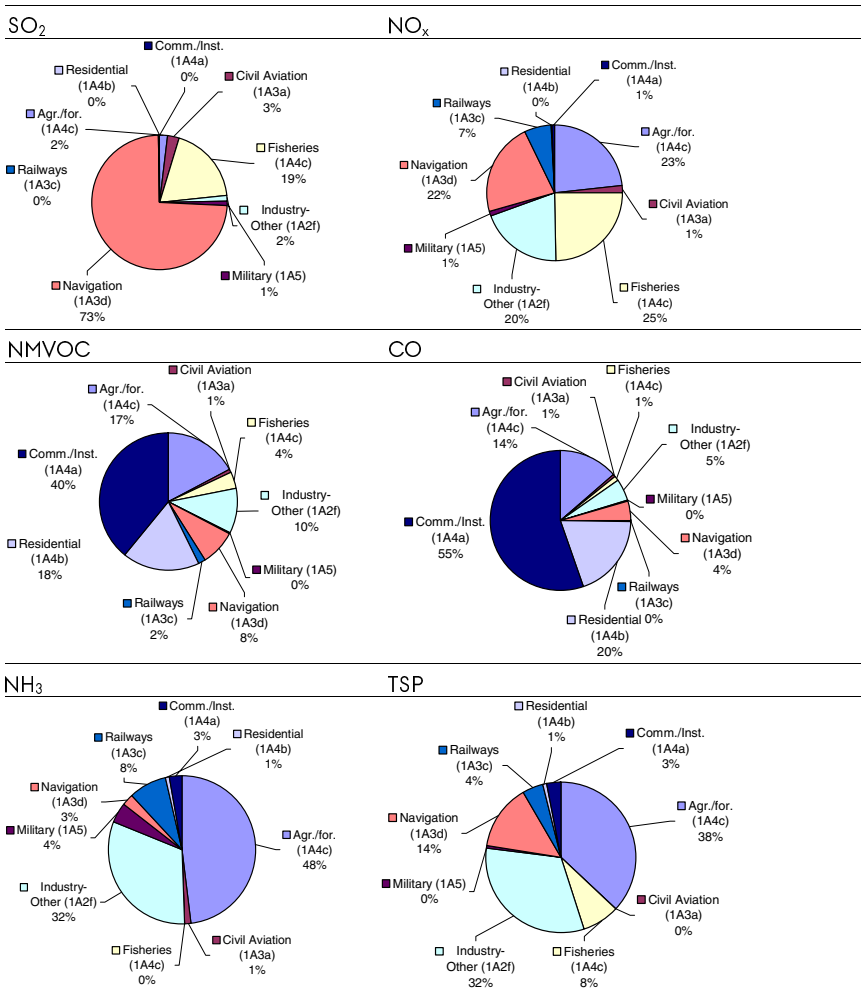


Figure 3.74 SO_2, NO_X, NMVOC, CO, NH_3 and PM emission shares pr vehicle type for other mobile sources in 2010.

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 3.23, the non-exhaust TSP, PM_{10} and $PM_{2.5}$ emissions for road transport are shown for 2010 in NFR sectors. The activity data and emission factors are also shown in Annex 2.B.15.

Table 3.23 Emissions of TSP, PM_{10} and $PM_{2.5}$ in 2009 from road transport and other mobile sources.

NFR Sector	TSP tonnes	PM_{10} tonnes	$PM_{2.5}$ tonnes
Road brake wear	577	566	225
Road tyre wear	861	516	361
Road abrasion	1 044	522	282
Total Road non-exhaust	2 482	1 604	868

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 3.75. For tyre wear and road abrasion passenger cars caused the highest emissions in 2010, 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.

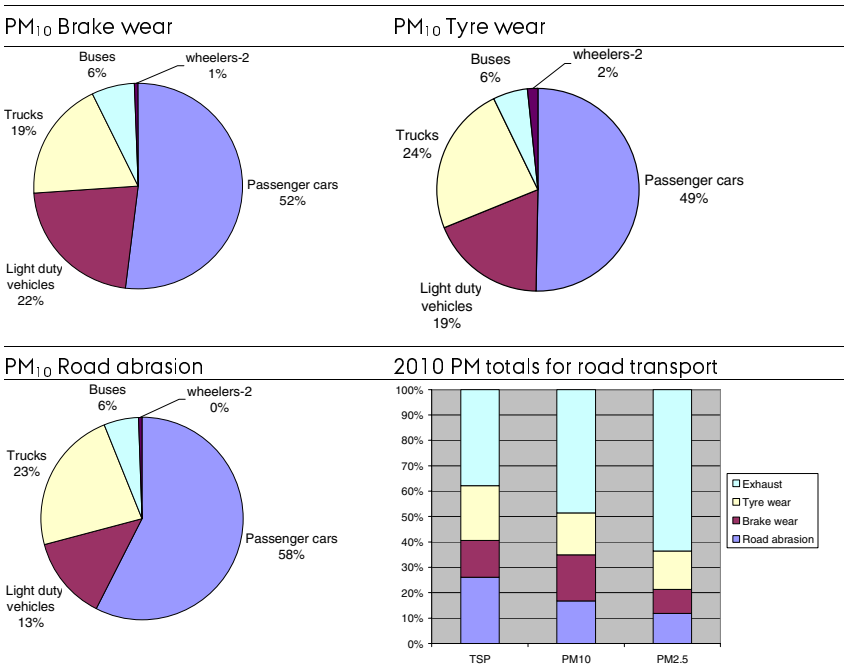


Figure 3.75 Brake and tyre wear and road abrasion PM_{10} emission shares and PM exhaust/non-exhaust distributions for road traffic in 2010.

Figure 3.75 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 38, 49 and 64 %, respectively, in 2010. For brake and tyre wear and road abrasion the TSP shares are 14, 22 and 26 %, respectively. The same three sources have PM_{10} shares of 18, 17 and 17 %, respectively, and $PM_{2.5}$ shares of 9, 15 and 12 %, 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 stepwise strengthening of exhaust emission standards for all vehicle types.

Heavy metals

In Table 3.24, the heavy metal emissions for road transport and other mobile sources are shown for 2010 in NFR sectors. The emission figures in the time series 1990-2010 are given in Annex 2.B.16 (NFR format) and are shown for 1990 and 2010 in Annex 2.B.15 (CollectER format).

Table 3.24 Heavy metal emissions in 2009 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	7	2	3	15	0	519
Civil Aviation (1A3a)	0	0	0	0	0	0	929	0	3
Railways (1A3c)	0	1	2	2	0	1	4	0	122
Navigation (1A3d)	35	3	17	36	6	1811	23	43	157
Comm./Inst. (1A4a)	0	1	1	2	0	1	2	0	119
Residential (1A4b)	0	0	0	1	0	0	1	0	43
Agric./forestry/fish. (1A4c)	9	5	19	17	11	16	37	36	749
Military (1A5)	0	0	0	0	0	0	80	0	24
Total other mobile	44	12	48	65	20	1 831	1 090	80	1 737
Road exhaust (1A3b)	1	36	92	111	25	39	168	1	7 171
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	51	55	230	46 803	45	1 972	7 417	109	28 252

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 3.76 and 3.77 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.

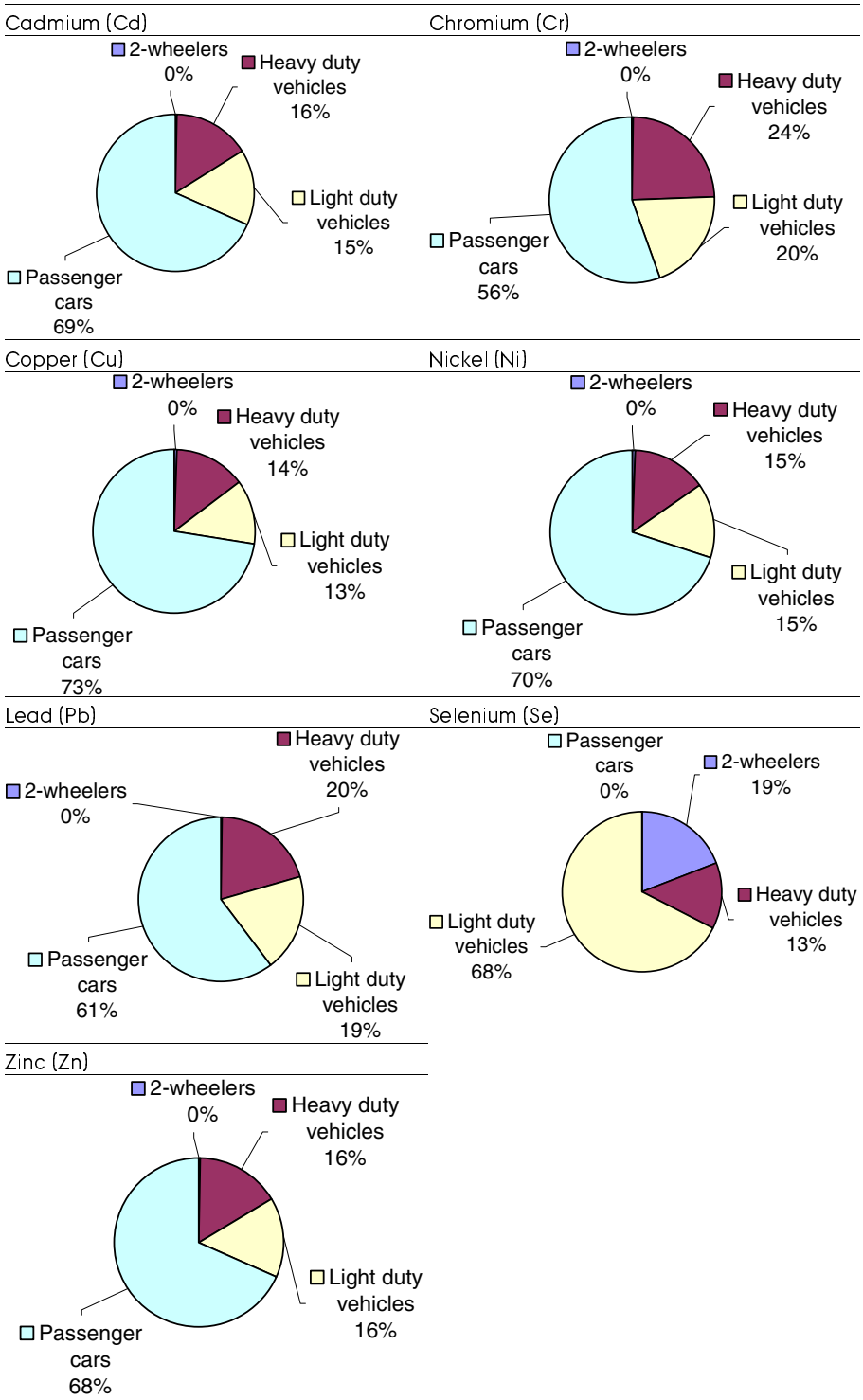


Figure 3.76 Heavy metal emission shares for road transport in 2010.

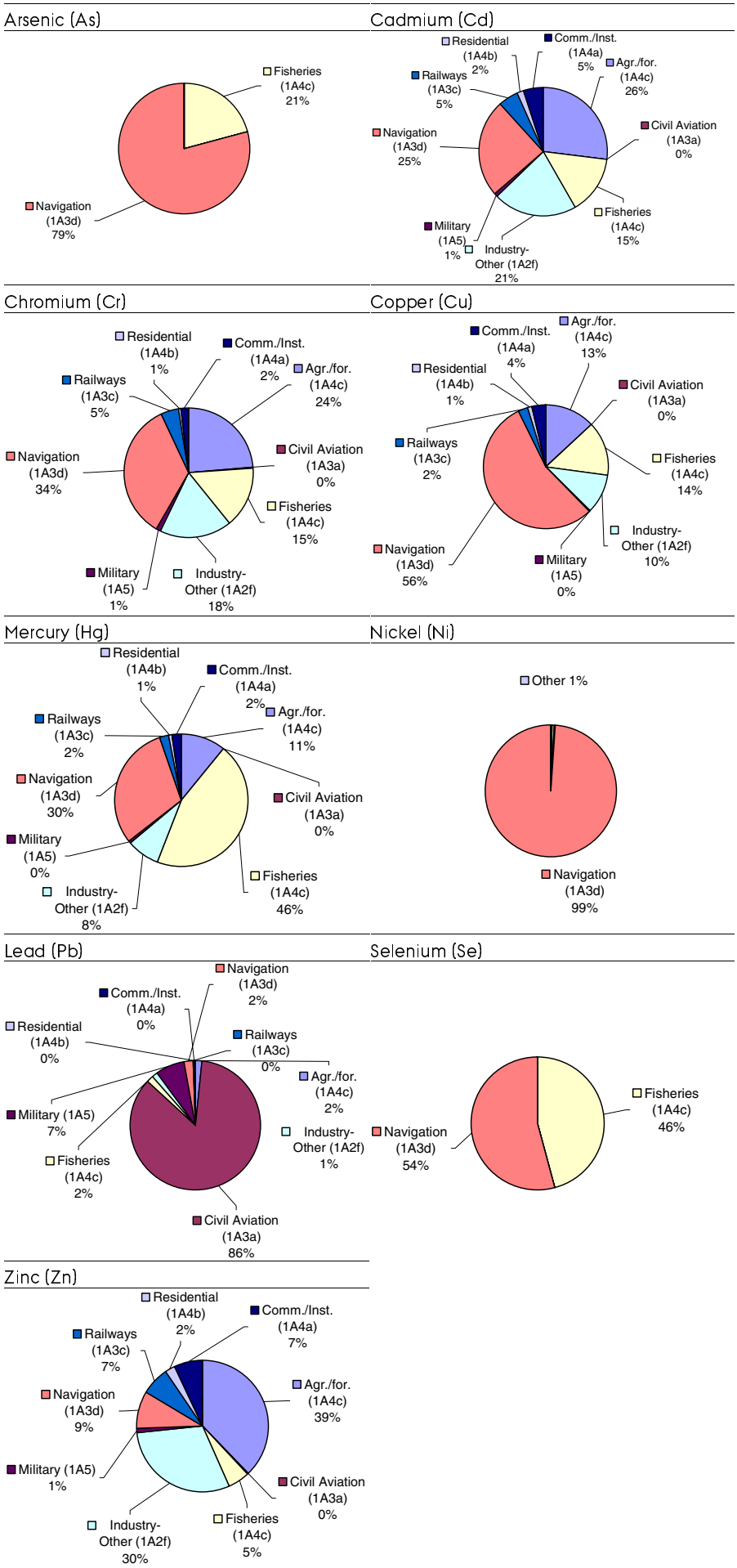


Figure 3.77 Heavy metal emission shares for other mobile sources in 2010.

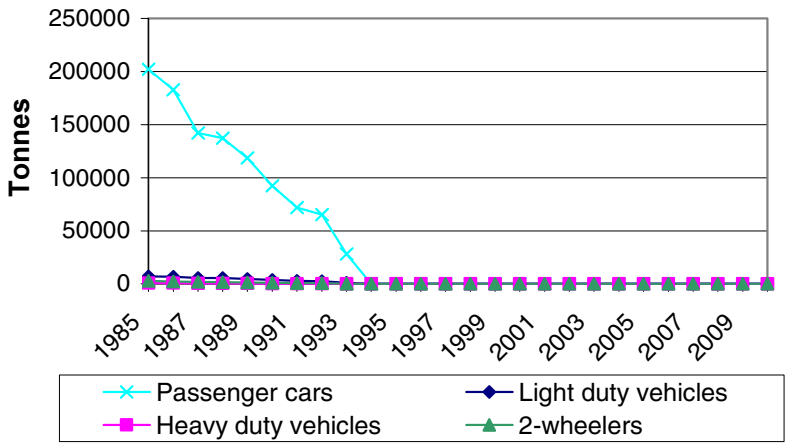


Figure 3.78 Pb emissions (kg) pr vehicle type for road transport 1985-2010.

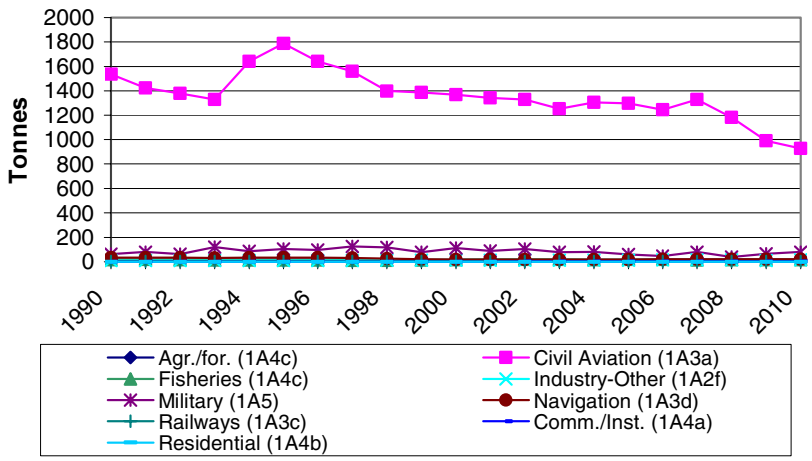


Figure 3.79 Pb emissions (kg) in NFR sectors for other mobile sources 1990-2010.

Dioxin and PAH

In Table 3.25, the dioxin and PAH emissions for road transport and other mobile sources are shown for 2010 in NFR sectors. The emission figures in the time series 1990-2010 are given in Annex 2.B.16 (NFR format) and are shown for 1990 and 2010 in Annex 2.B.15 (CollectER format).

Table 3.25 Dioxin and PAH emissions in 2010 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)	0.008	45	5	5	3	5	3
Civil Aviation (1A3a)	0.000	0	0	0	0	0	0
Railways (1A3c)	0.002	4	1	1	0	0	0
Navigation (1A3d)	0.085	50	4	2	1	7	6
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)	0.105	131	14	11	5	19	13
Military (1A5)	0.001	5	1	1	0	1	0
Total other mobile	0.218	250	25	20	10	34	23
Road (1A3b)	0.110	755	70	79	56	106	61
Total mobile	0.329	1 005	95	99	66	140	84

For mobile sources, road transport displays the largest emission of dioxins and PAH. The dioxin emission share for road transport is 33 % of all mobile

emissions in 2010, whereas Agriculture/forestry-/fisheries and Navigation have smaller shares of 33 and 26 %. 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 3.80 and 3.81 show the dioxin and PAH emission distributions into vehicle categories and other mobile sectors, respectively.

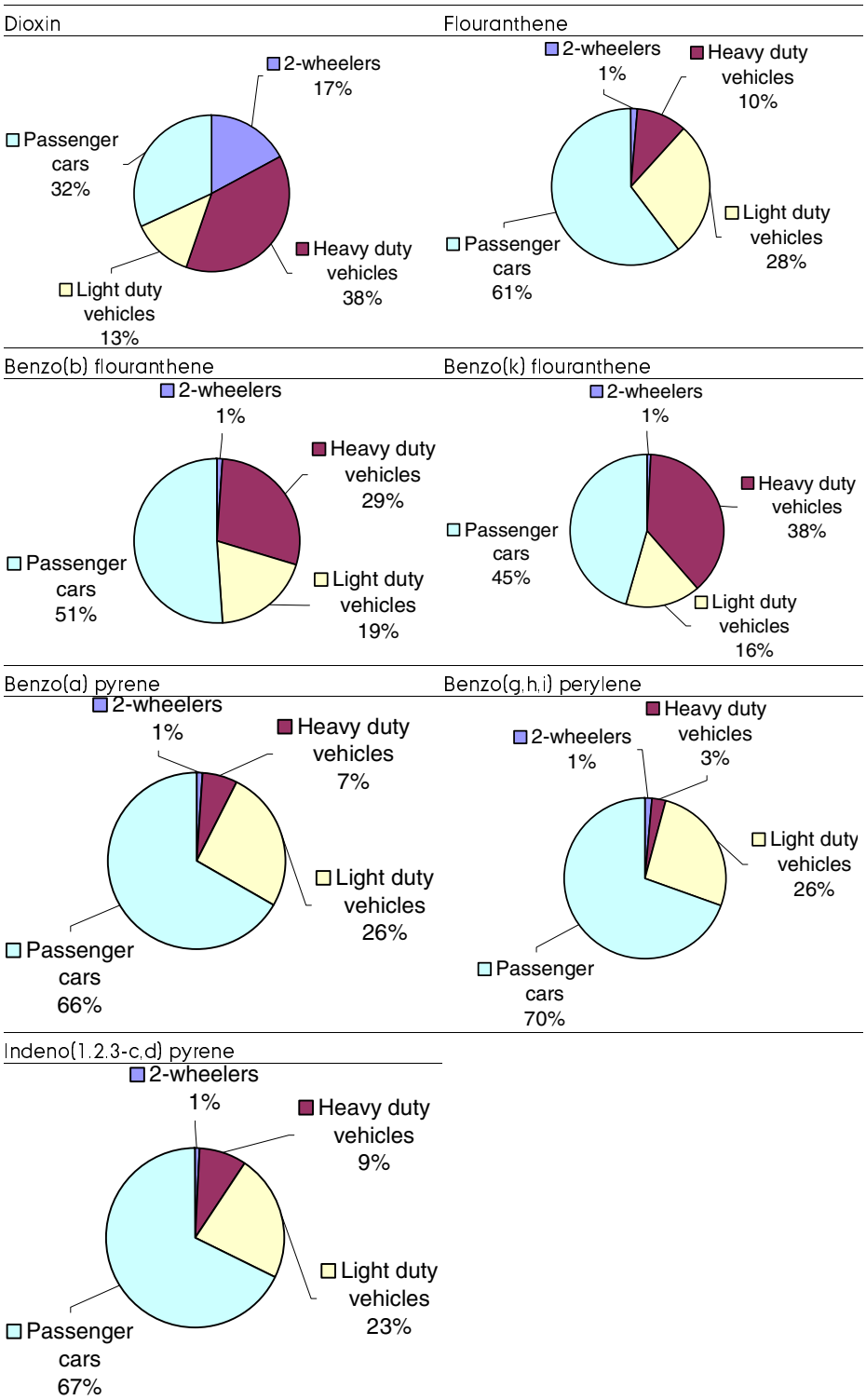


Figure 3.80 Dioxin and PAH emission shares for road transport in 2010.

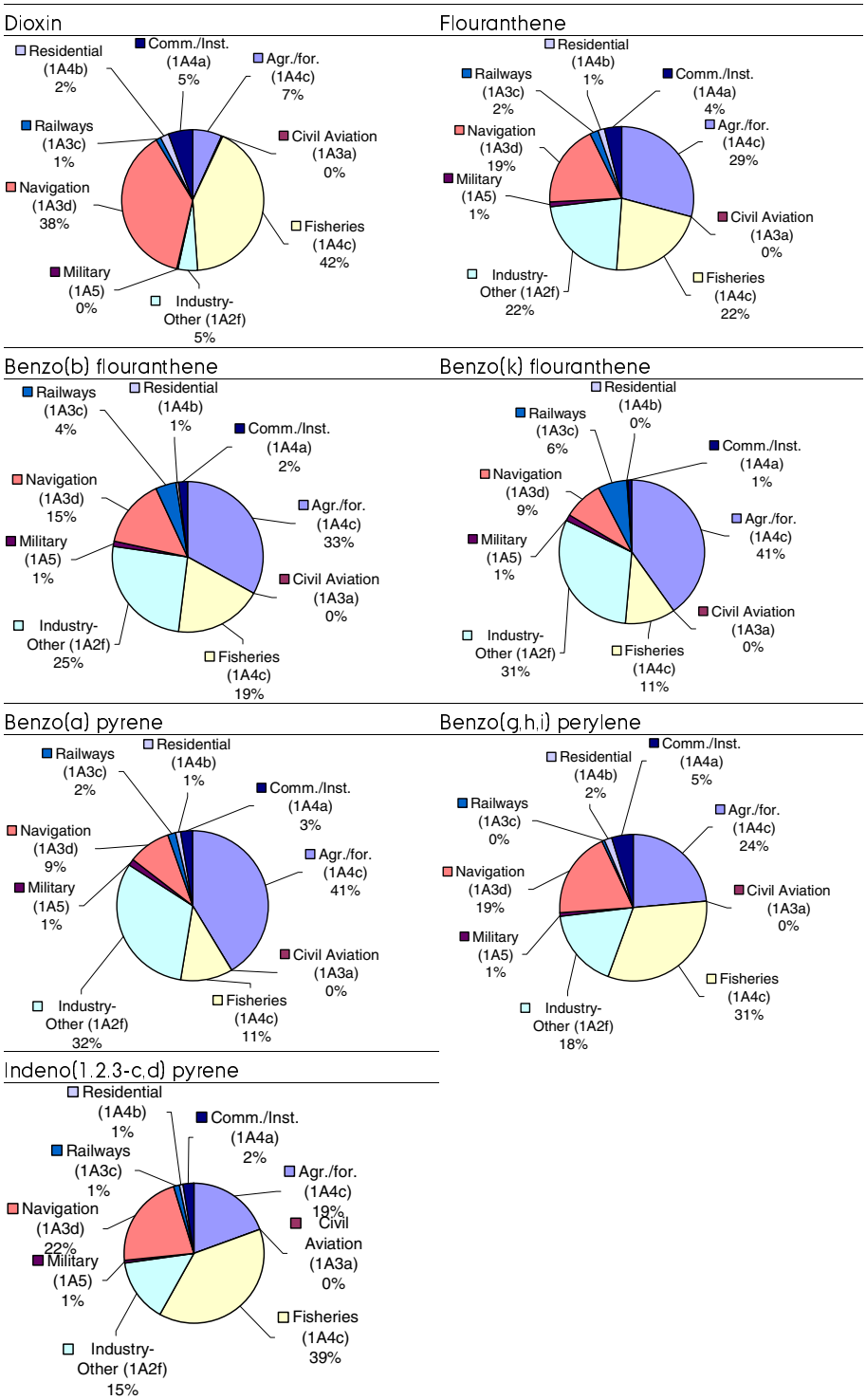


Figure 3.81 Dioxin and PAH emission shares for other mobile sources in 2010.

Bunkers

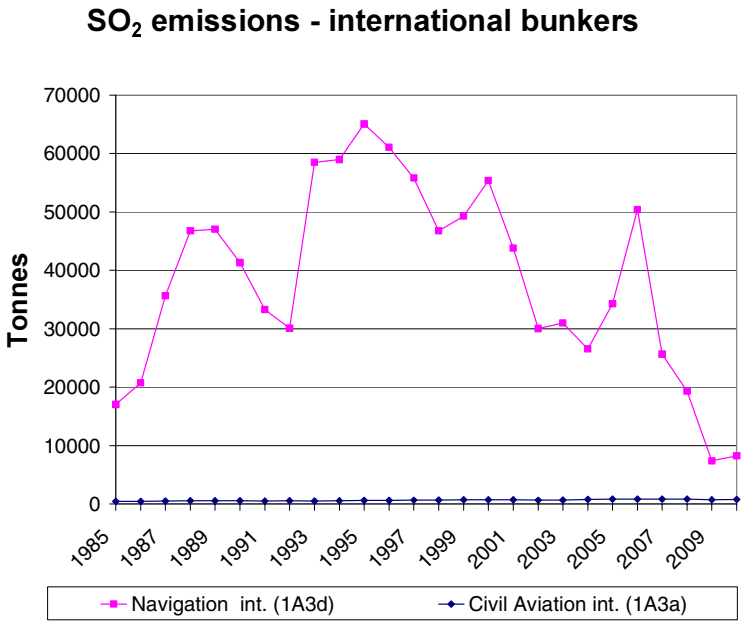
The most important emissions from bunker fuel consumption (fuel consumption for international transport) are SO_2 and NO_x. The bunker emission totals are shown in Table 3.26 for 2010, split into sea transport and civil aviation. All emission figures in the 1985-2010 time series are given in Annex 2.B.16 (NFR format). In Annex 2.B.15, the emissions are also given in CollectER format for 2010.

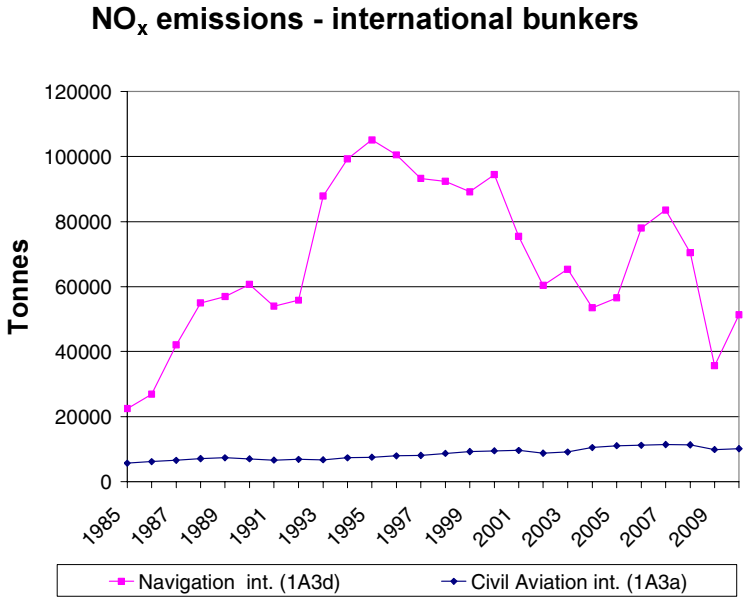
Table 3.26 Emissions in 2010 for international transport.

CRF sector	SO_2 tonnes	NO_X tonnes	NMVOC tonnes	CO tonnes	NH_3 tonnes	TSP tonnes
Navigation int. (1A3d)	7 383	35 658	1 160	3 826		820
Civil Aviation int. (1A3a)	739	9 854	503	1 791	0	37
International total	8 122	45 512	1 663	5 617	0	857

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 3.82 are similar to the fuel-use 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).





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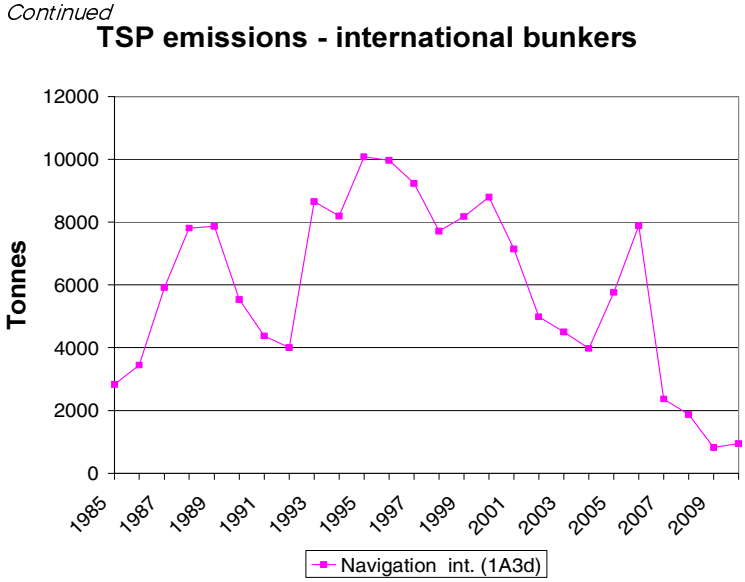


Figure 3.82 CO_2, SO_2, NO_X and TSP emissions for international transport 1985-2010.

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 3.27 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.

Table 3.27 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

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, 2011). 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, 2011).

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 2010.

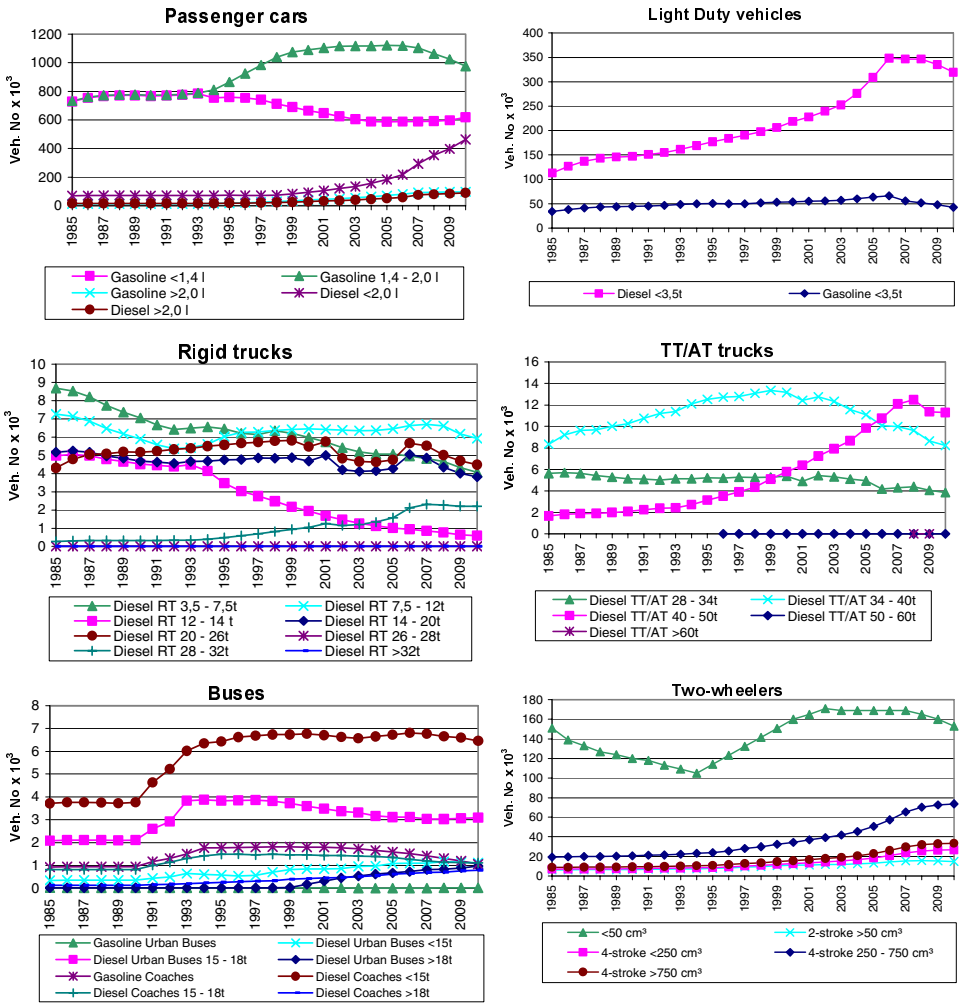


Figure 3.83 Number of vehicles in sub-classes in 1985-2010.

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 an increase in the number of gasoline cars (>2 litres) and diesel cars (< 2 litres). Until 2005, there has been a decrease in the number of cars with an engine size smaller than 1.4 litres.

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 2010. 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 1985-2010 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 3.84) by using the correspondence between layers and first year of registration:

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

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.

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

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 et al. (2011). 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 1985-2010. The trends in vehicle numbers pr layer are also shown in Figure 3.84. 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.

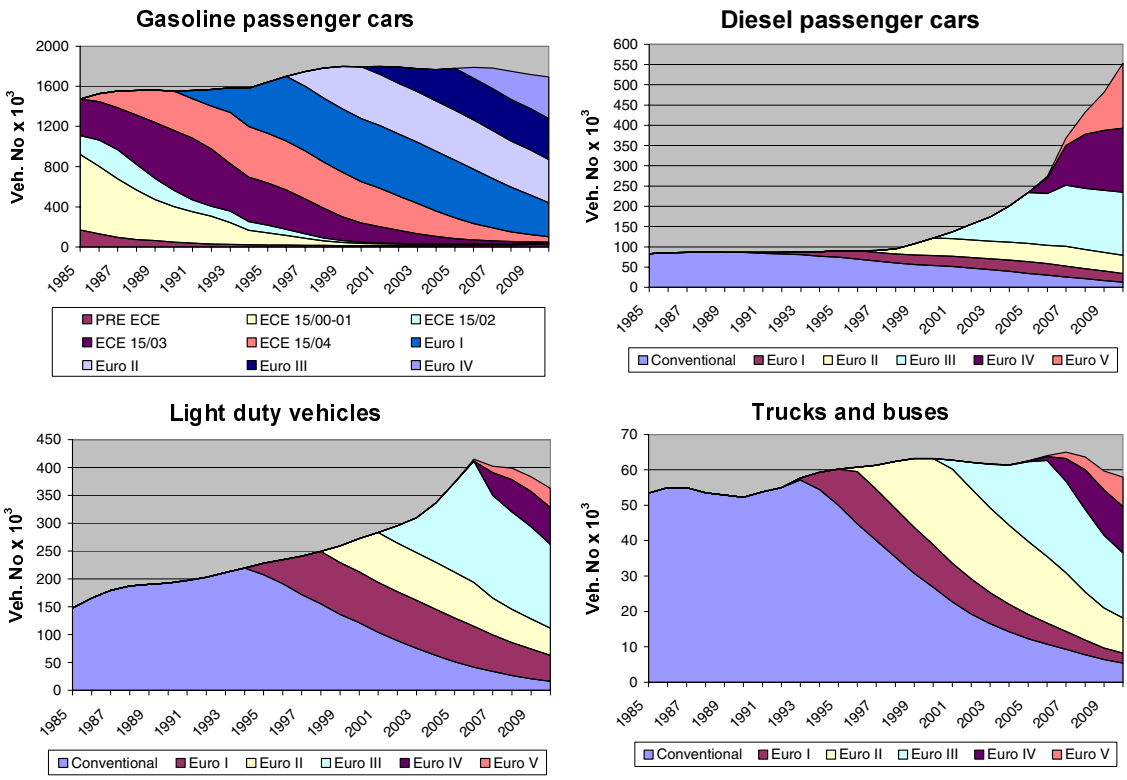


Figure 3.84 Layer distribution of vehicle numbers pr vehicle type in 1985-2010.

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 cycle3 (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 3.28. The emission directives distinguish between three vehicle classes according to vehicle reference mass[4]: 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.

[3] 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.
[4] Reference mass: net vehicle weight + mass of fuel and other liquids + 100 kg.

Therefore, in order to represent the Danish fleet and to support average national emission estimates, emission factors must be chosen which derive 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 after-treatment 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 3.28 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	1.10.2014
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 3.27. 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.

In order to account for the trend towards more fuel efficient vehicles being sold in Denmark in the later years, fuel consumption factors for Euro 5 and Euro 6 passenger cars are estimated in the following way.

An aggregated CO_2 emission factor (g/km) for new registered passenger cars in the years 2009 and 2010 have been calculated from 1) type approval fuel economy values incorporated in the DTU Transport fleet and mileage statistics and 2) fuel specific CO_2 emission factors. The aggregated CO_2 emission factor for 2010 is used in combination with the overall EU target of 130 g CO_2/km in 2015 and 95 g CO_2/km in 2020 in order to calculate an interpolated time series of type approval related CO_2 emission factors for the years 2011-2014 and 2016-2019 (year specific CO_2 emission factors).

By assuming that the fuel type/engine size specific COPERT IV fuel consumption factors for Euro 4 cars relate to cars from 2009, Euro 5 and 6 COPERT corresponding factors for each fuel type/engine size combination are calculated for each year in the forecast period by multiplying the Euro 4 factor with the ratio between the year specific aggregated CO_2 emission factor and the aggregated CO_2 emission factor for 2009.

The experimental basis for heavy-duty trucks and buses is computer simulated emission factors for Euro 0-V engines.

In COPERT IV updated emission factors have recently been made available for Euro V heavy duty vehicles using EGR and SCR exhaust emission aftertreatment 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.

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":

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

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

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:

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

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 120.000 km (pers. comm. Ntziachristos, 2007) 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 3.27. For non-catalyst vehicles this yields:

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

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

For catalyst vehicles the calculation becomes:

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

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 2010 are given in Cappelen et al. (2011). 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:

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

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:

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

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.

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

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:

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

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 tempera-

tures 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 use 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, 2011). 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.

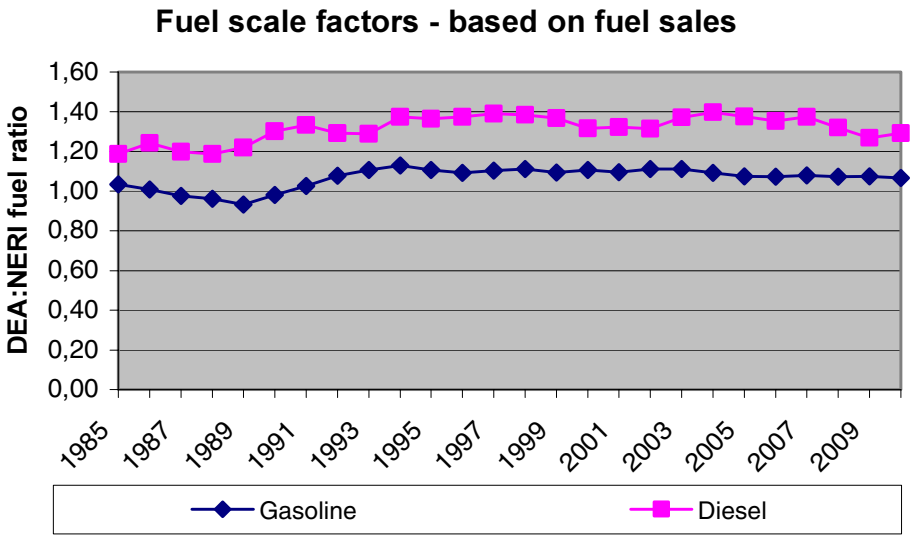


Figure 3.85 DEA:DCE Fuel ratios and diesel mileage adjustment factor based on DEA fuel sales data and DCE fuel consumption estimates.

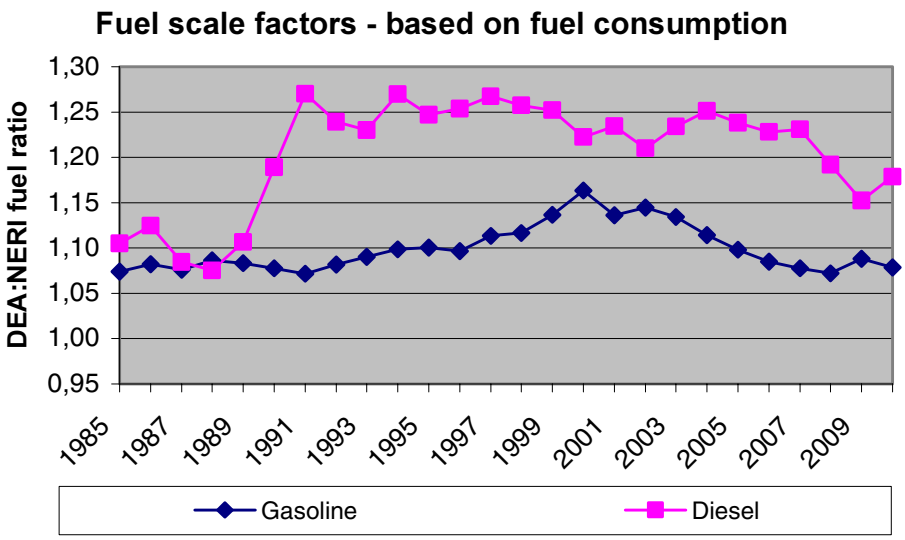


Figure 3.86 DEA:DCE Fuel ratios and diesel mileage adjustment factor based on DEA fuel consumption data and DCE fuel consumption estimates.

In the figures 3.85 and 3.86 the COPERT IV:DEA gasoline and diesel fuel use ratios are shown for fuel sales and fuel consumption from 1985-2010. The data behind the figures are also listed in Annex 3.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 subcategories, 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 1985-2010. The total fuel consumption and emissions are shown in Annex 2.B.8, pr vehicle category and as grand totals, for 1985-2010 (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 2010.

In Table 3.29, the aggregated emission factors for SO_2, NO_X, NMVOC and TSP are shown in CollectER format for Danish road transport.

Table 3.29 Fuel-based emission factors for SO_2, NO_X, NMVOC, CO, NH_3 and TSP for road transport in Denmark (2010).

SNAP ID	Category	Fuel type	Mode	Emission factors[1] [g pr GJ]					
				SO_2	NO_X	NMVOC	CO	NH_3	TSP
70101	Passenger cars	Highway	Diesel	0.47	303.26	5.80	13.23	0.48	15.44
70101	Passenger cars	Highway	Gasoline	0.45	142.30	32.30	685.83	30.88	0.90
70101	Passenger cars	Highway	LPG	0.00	247.65	39.76	1443.35	0.00	10.05
70101	Passenger cars	Rural	Diesel	0.47	259.62	8.38	25.61	0.51	12.65
70101	Passenger cars	Rural	Gasoline	0.45	114.22	36.32	538.53	34.47	0.85
70102	Passenger cars	Rural	LPG	0.00	270.21	59.92	562.88	0.00	14.45
70102	Passenger cars	Urban	Diesel	0.47	258.88	23.86	65.93	0.38	19.84
70102	Passenger cars	Urban	Gasoline	0.45	132.47	221.92	2378.17	11.46	0.92
70102	Passenger cars	Urban	LPG	0.00	162.36	123.43	816.28	0.00	13.44
70102	Light duty vehicles	Highway	Diesel	0.47	227.43	21.27	129.50	0.37	21.83
70103	Light duty vehicles	Highway	Gasoline	0.45	160.23	18.87	543.60	22.77	1.39
	Light duty vehicles	Highway	LPG	0.00	74.28	10.46	860.66	0.00	10.04
70103	Light duty vehicles	Rural	Diesel	0.47	237.74	24.06	111.29	0.40	17.90
	Light duty vehicles	Rural	Gasoline	0.45	140.14	27.94	411.60	21.84	1.24
	Light duty vehicles	Rural	LPG	0.00	81.85	14.66	386.57	0.00	14.45
70103	Light duty vehicles	Urban	Diesel	0.47	227.90	40.68	136.49	0.29	24.98
70103	Light duty vehicles	Urban	Gasoline	0.45	119.52	148.31	2931.76	5.74	0.85
	Light duty vehicles	Urban	LPG	0.00	54.81	36.84	428.25	0.00	13.82
70201	Heavy duty vehicles	Highway	Diesel	0.47	552.97	12.59	89.59	0.31	9.16
70201	Heavy duty vehicles	Highway	Gasoline	0.45	1037.78	474.61	7610.35	0.28	55.35
70201	Heavy duty vehicles	Rural	Diesel	0.47	567.88	15.12	92.25	0.29	9.35
70202	Heavy duty vehicles	Rural	Gasoline	0.45	1141.55	820.40	8371.39	0.30	60.88
70202	Heavy duty vehicles	Urban	Diesel	0.47	572.06	19.24	106.84	0.22	10.85
70202	Heavy duty vehicles	Urban	Gasoline	0.45	456.62	696.09	7102.99	0.20	40.59
70203	Mopeds	Urban	Gasoline	0.45	129.62	8889.08	9581.58	1.24	139.02
70203	Motorcycles	Highway	Gasoline	0.45	269.39	854.98	12090.75	1.28	22.72
70203	Motorcycles	Rural	Gasoline	0.45	192.38	832.68	11313.83	1.56	27.72
70301	Motorcycles	Urban	Gasoline	0.45	118.86	1019.07	10859.93	1.52	27.03

[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 2000-2010 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 2010 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 Civil Aviation Agency (CAA-DK) and Copenhagen Airport. Fuel statistics for jet fuel consumption and aviation gasoline are obtained from the Danish energy statistics (DEA, 2011).

For 2001 onwards, pr flight records are provided by CAA-DK 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 CAA-DK. 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).

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 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 CAA-DK. 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.

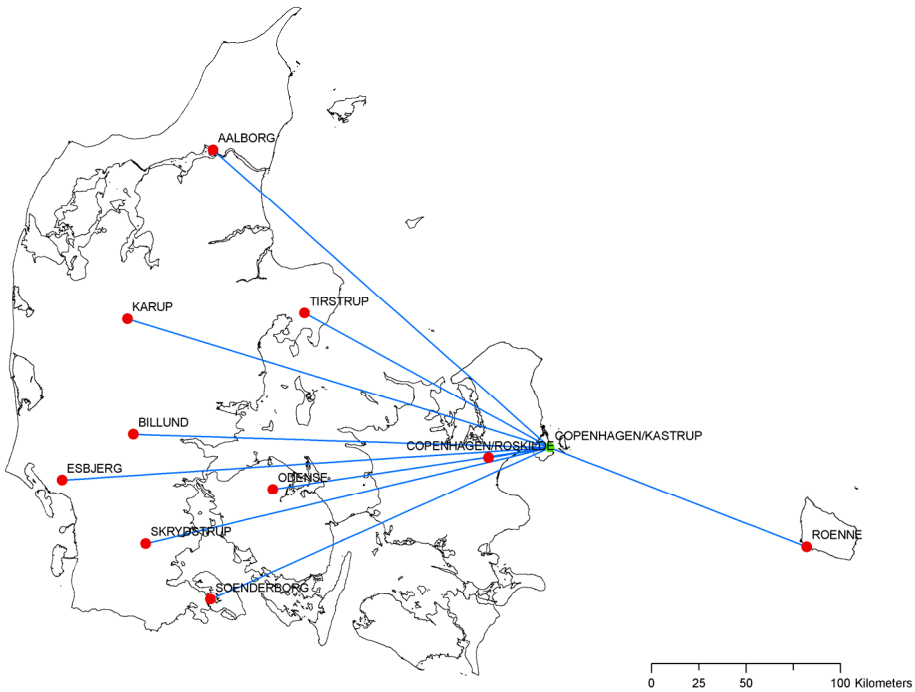


Figure 3.87 Most frequent domestic flying routes for large aircraft in Denmark.

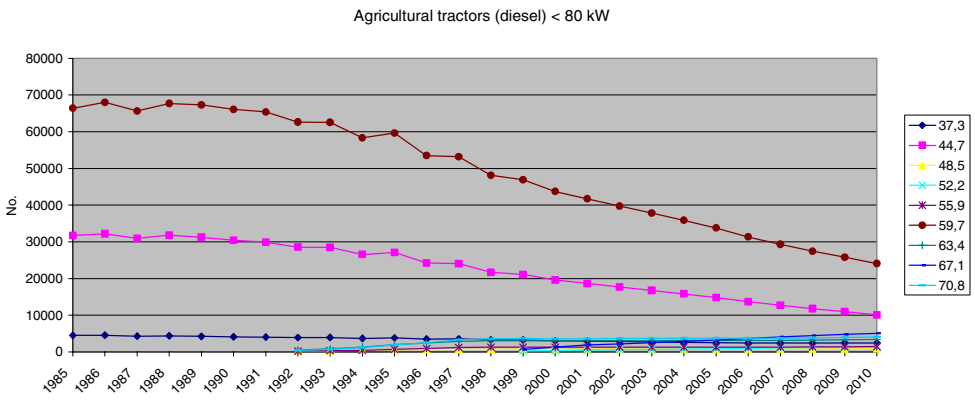
Copenhagen Airport is the starting or end point for most of the domestic aviation made by large aircraft in Denmark (Figure 3.87; routes to Greenland/Faroe Islands are not shown). Even though many domestic flights not touching Copenhagen Airport are also reported in the flight statistics kept by CAA-DK, 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.

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). The stock development from 1985-2010 for the most important types of machinery are shown in Figures 3.88-3.95 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 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 3.88-3.89, respectively. The figures clearly show a decrease in the number of small machines, these being replaced by machines in the large engine-size ranges.



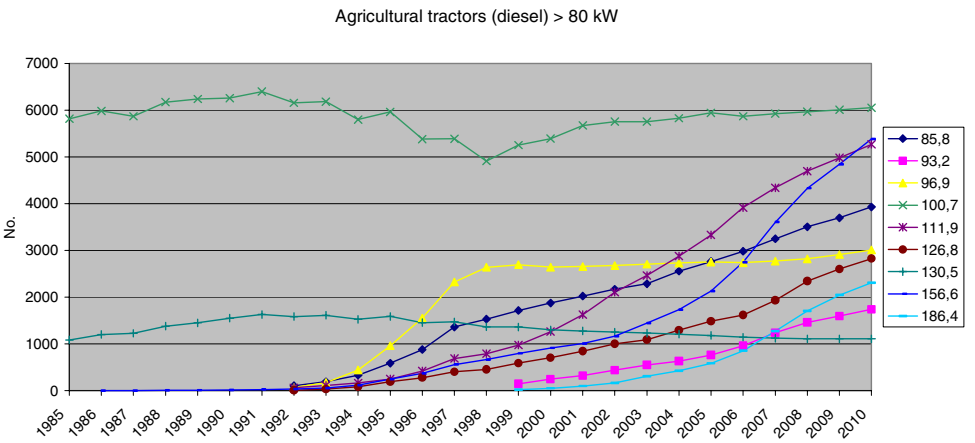
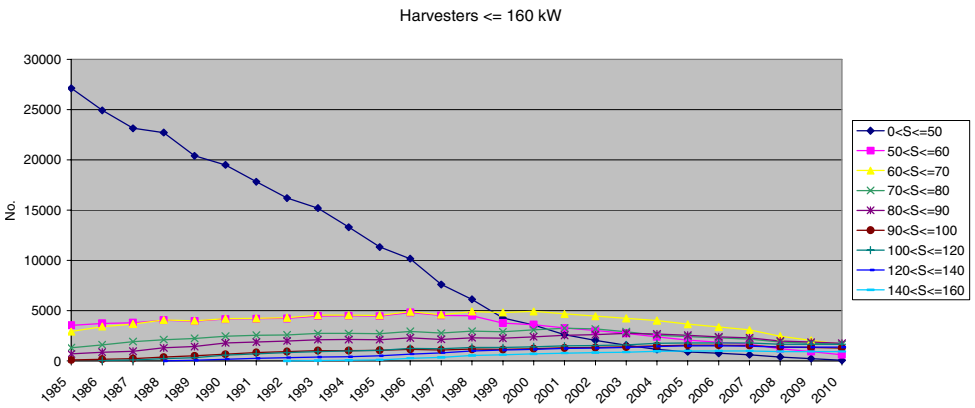


Figure 3.88 Total numbers in kW classes for tractors from 1985 to 2010.



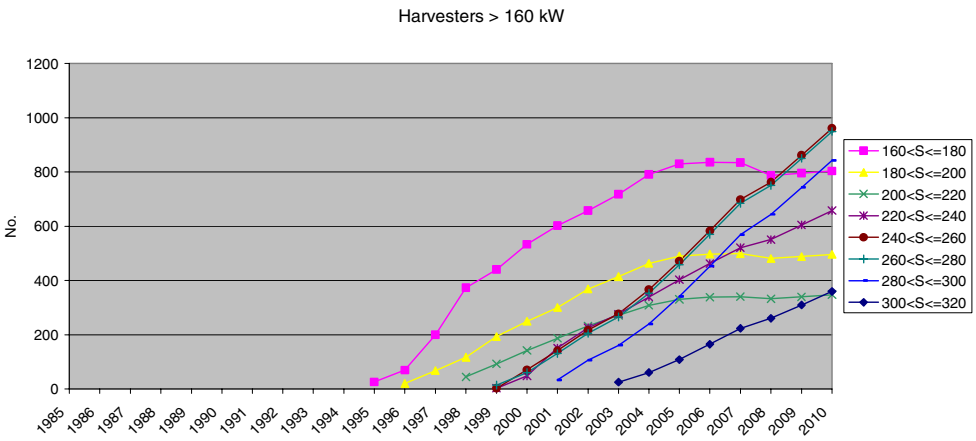


Figure 3.89 Total numbers in kW classes for harvesters from 1985 to 2010.

The tractor and harvester developments towards fewer vehicles and larger engines, shown in Figure 3.90, are very clear. From 1985 to 2010, tractor and harvester numbers decrease by around 20 % and 54 %, respectively, whereas the average increase in engine size for tractors is 32 %, and 175 % for harvesters, in the same time period.

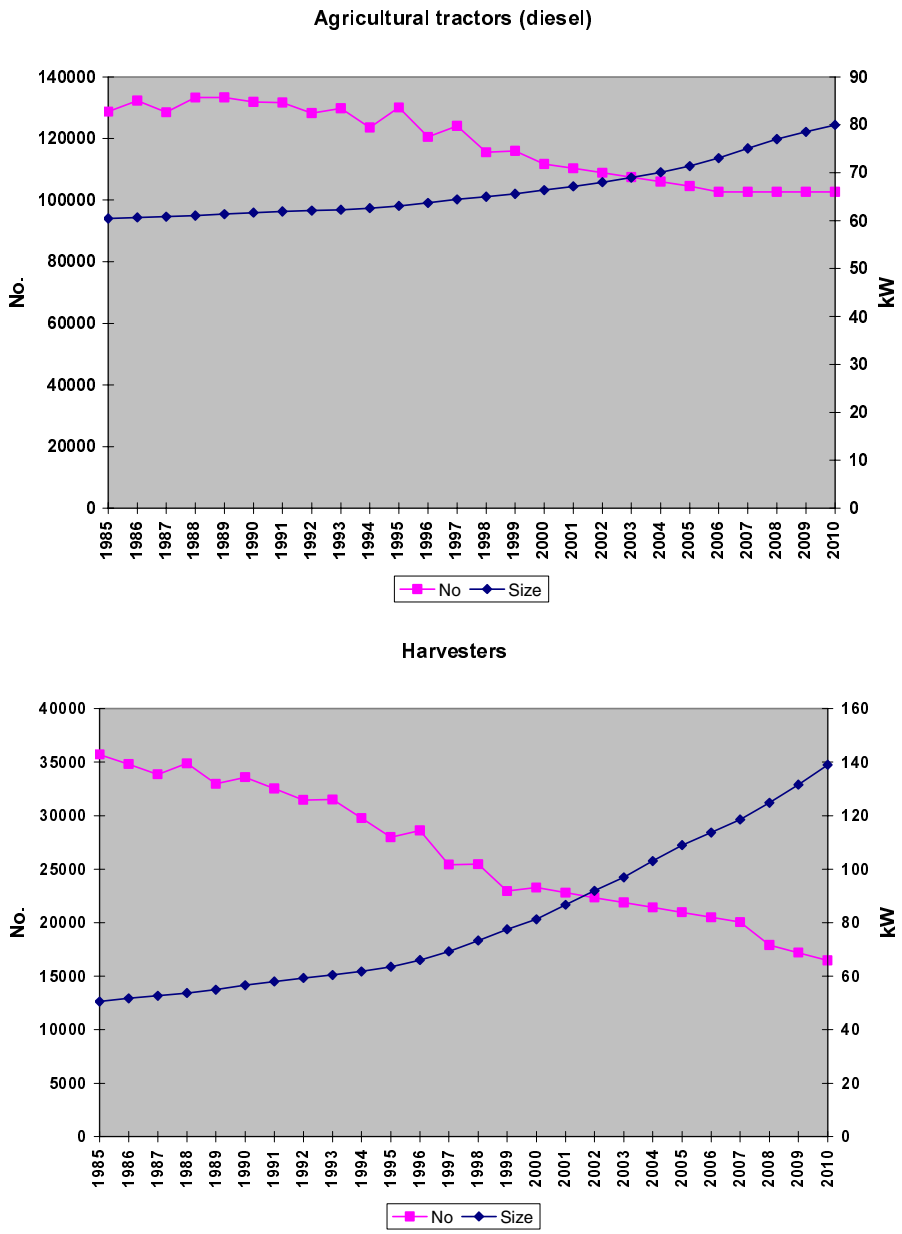


Figure 3.90 Total numbers and average engine size for tractors and harvesters from 1985 to 2010.

The most important machinery types for industrial use are different types of construction machinery and fork lifts. The Figures 3.91 and 3.92 show the 1985-2010 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.

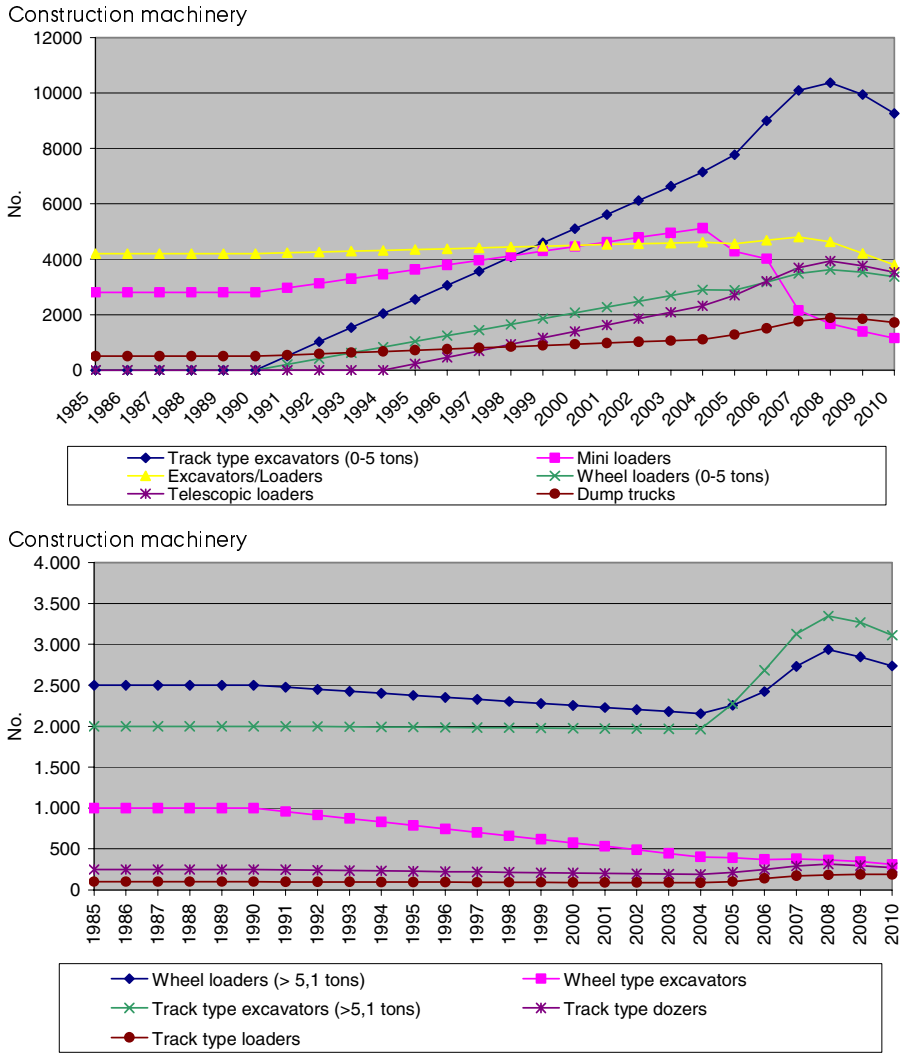


Figure 3.91 1985-2010 stock development for specific types of construction machinery.

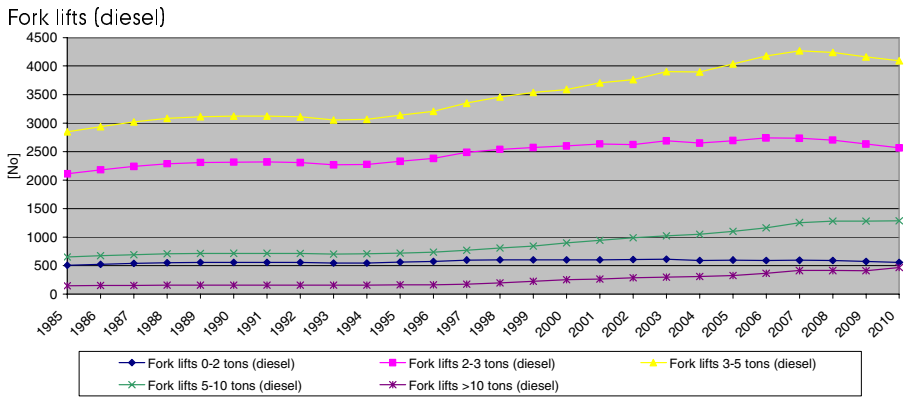


Figure 3.92 Total numbers of diesel fork lifts in kW classes from 1985 to 2010.

The emission level shares for tractors, harvesters, construction machinery and diesel fork lifts are shown in Figure 3.93, 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 3.93. 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 3.93.

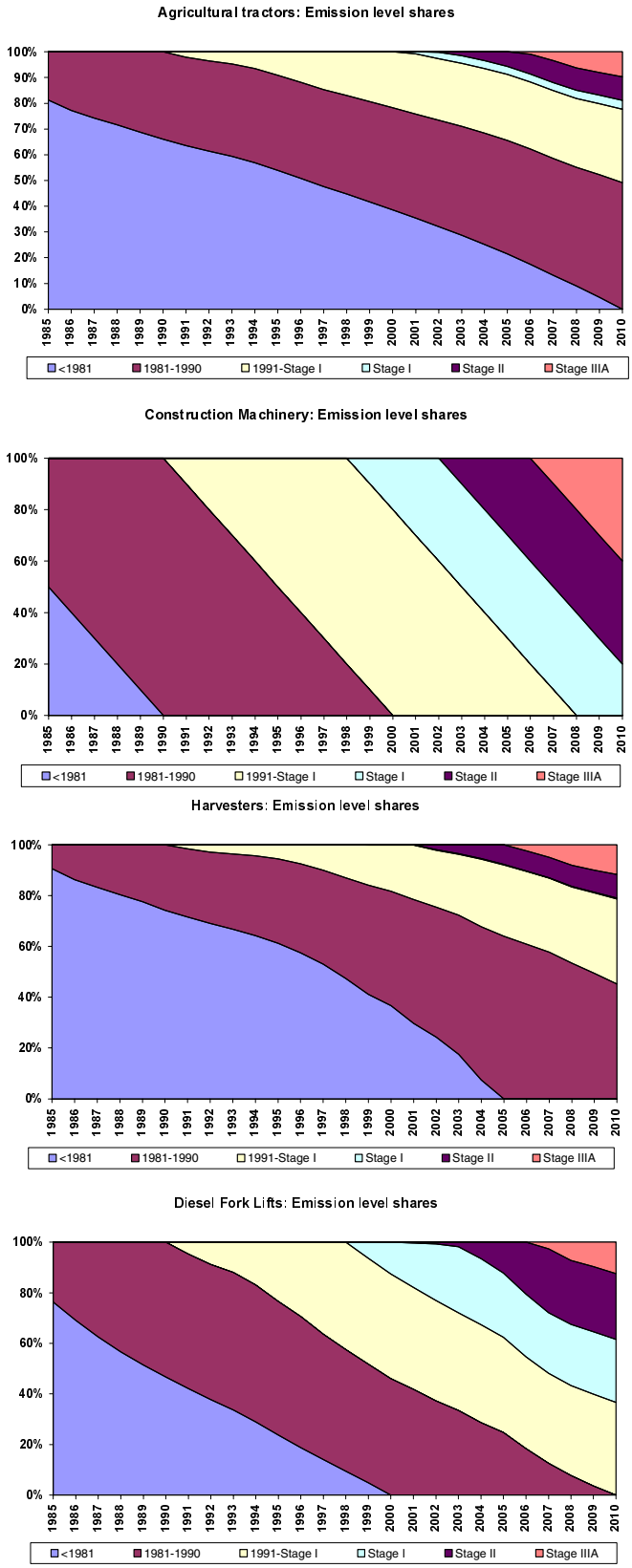
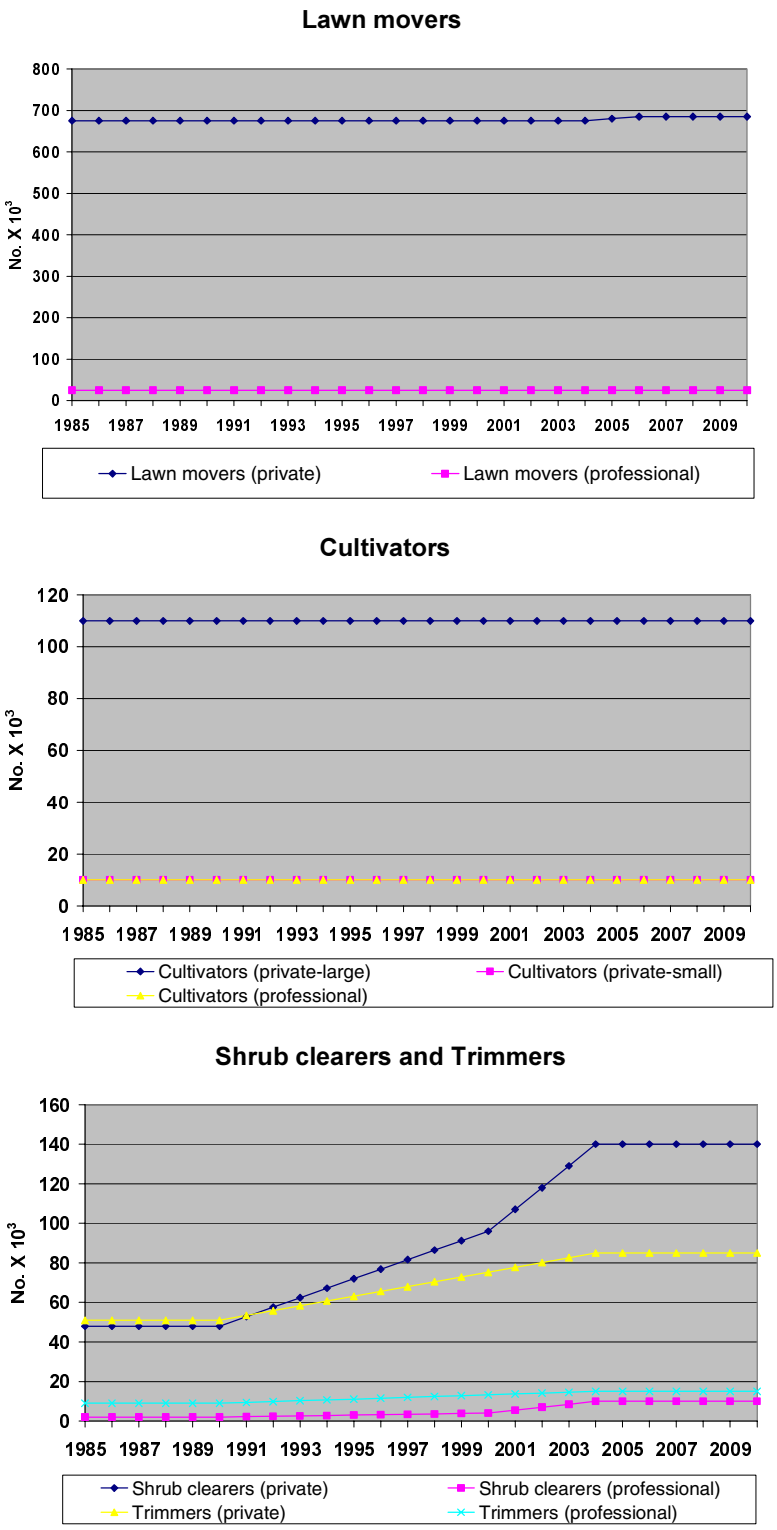


Figure 3.93 Emission level shares for tractors, harvesters, construction machinery and

diesel fork lifts (1985 to 2010).

The 1985-2010 stock development for the most important household and gardening machinery types is shown in Figure 3.94.

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.



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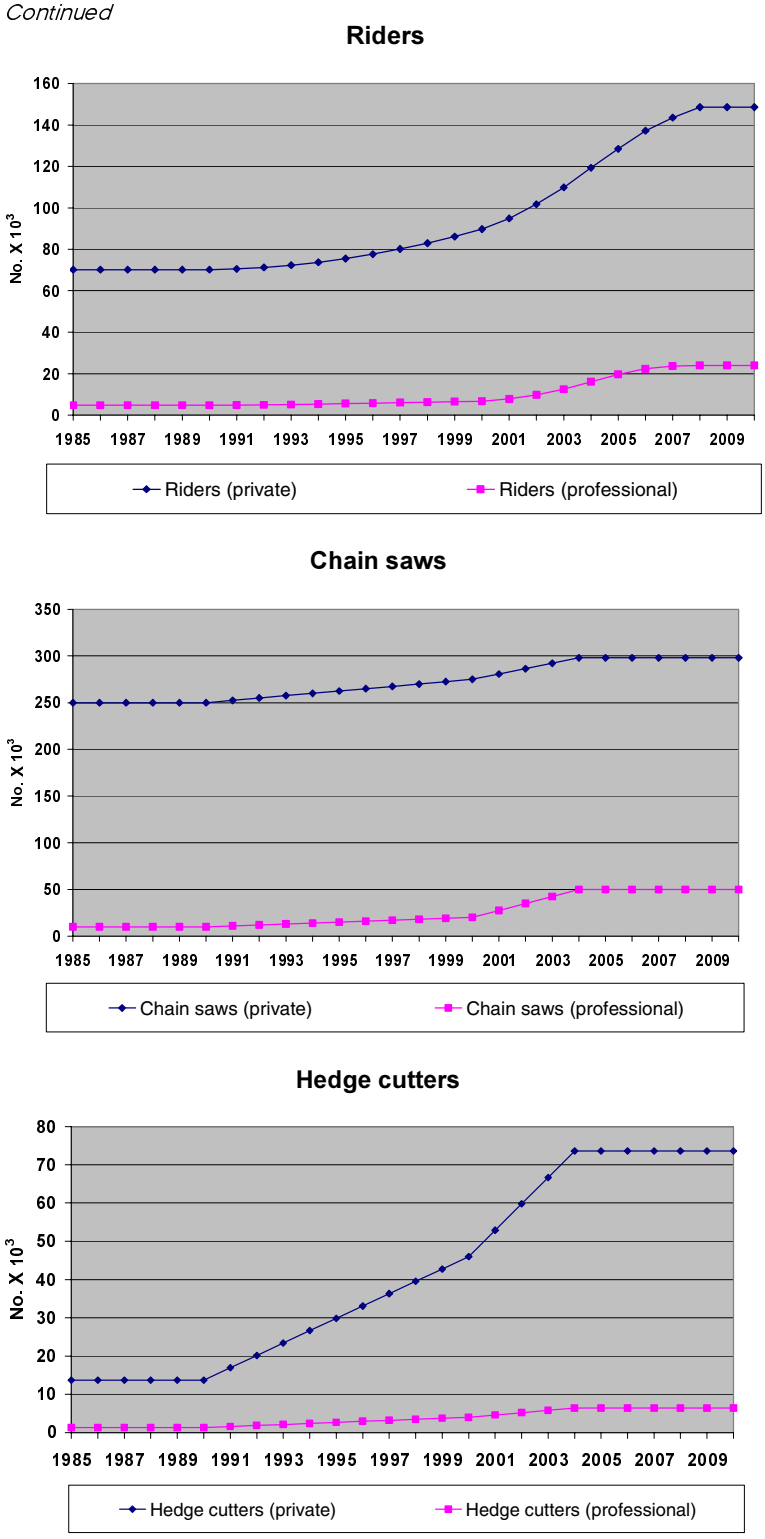


Figure 3.94 Stock development 1985-2010 for the most important household and gardening machinery types.

Figure 3.95 shows the development in numbers of different recreational craft from 1985-2010. 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).

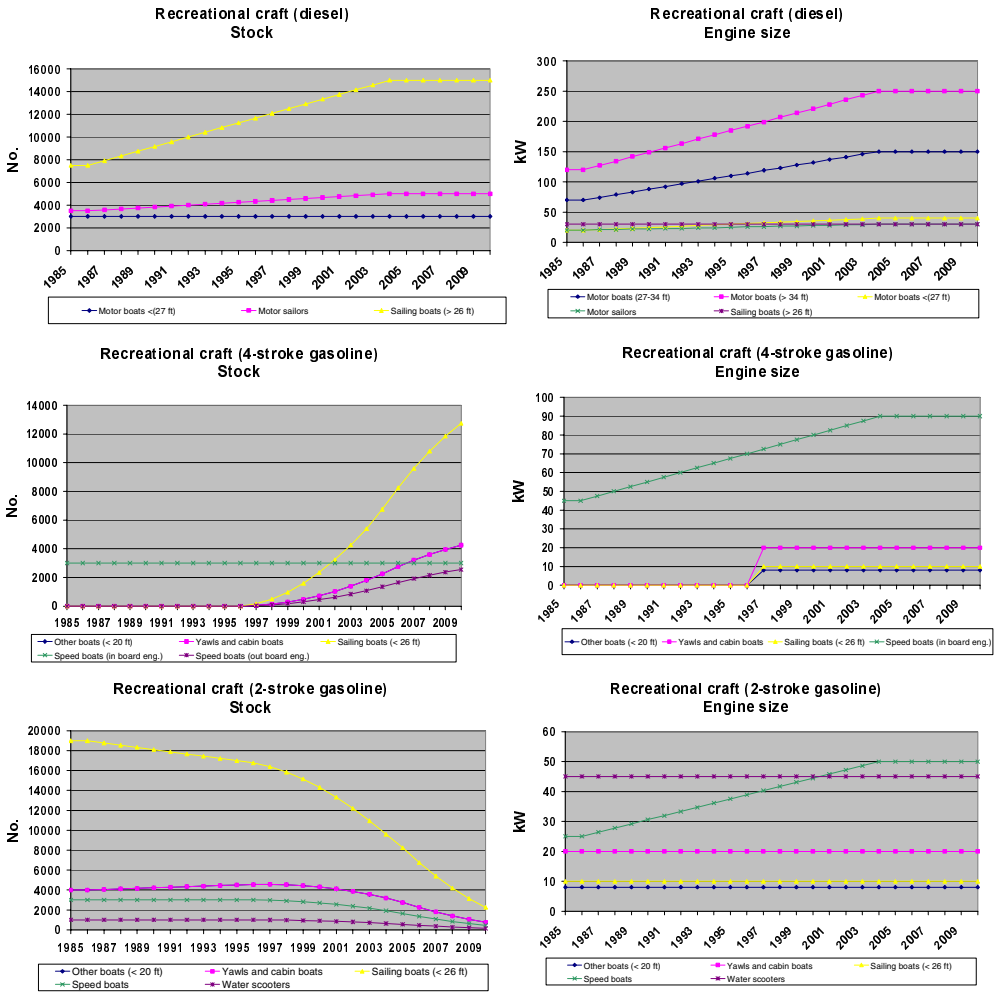


Figure 3.95 1985-2010 Stock and engine size development for recreational craft.

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, 2008a).

Table 3.30 lists the most important domestic ferry routes in Denmark in the period 1990-2010. For these ferry routes and the years 1990-2005, the following detailed traffic and technical data have been gathered by Winther (2008a): Ferry name, year of service, engine size (MCR), engine type, fuel type, average load factor, auxiliary engine size and sailing time (single trip).

For 2006-2010, the above mentioned traffic and technical data for specific ferries have been provided by Kristensen (2011) in the case of Mols-Linien (Sjællands Odde-Ebeltoft, Sjællands Odde-Århus, Kalundborg-Århus), by Hjortberg (2011) for Bornholmstrafikken (Køge-Rønne) and by Simonsen (2011) for Langelandstrafikken A/S (Tårs-Spodsbjerg). For Esbjerg/Hanstholm/Hirtshals-Torshavn traffic and technical data have been provided by Dávastovu (2011).

Table 3.30 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+

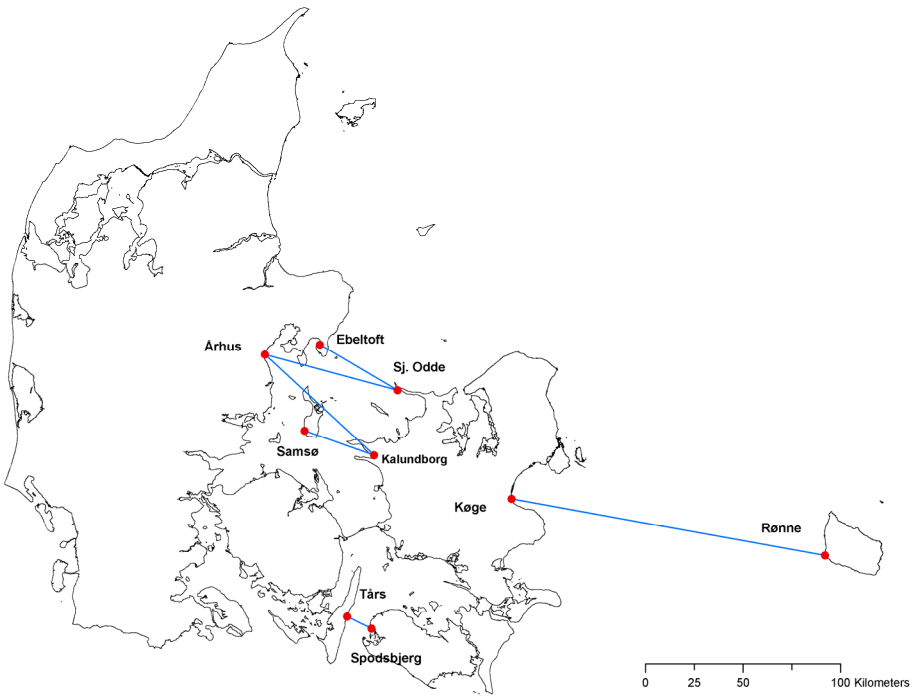
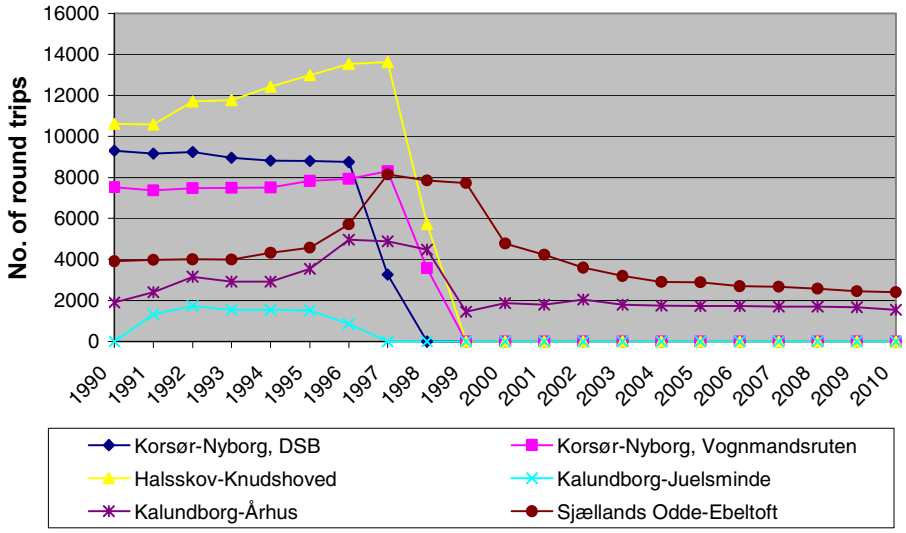


Figure 3.96 Domestic regional ferry routes in Denmark (2010).

The number of round trips pr ferry route from 1990 to 2010 is provided by Statistics Denmark (2011), see Figure 3.97 (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.



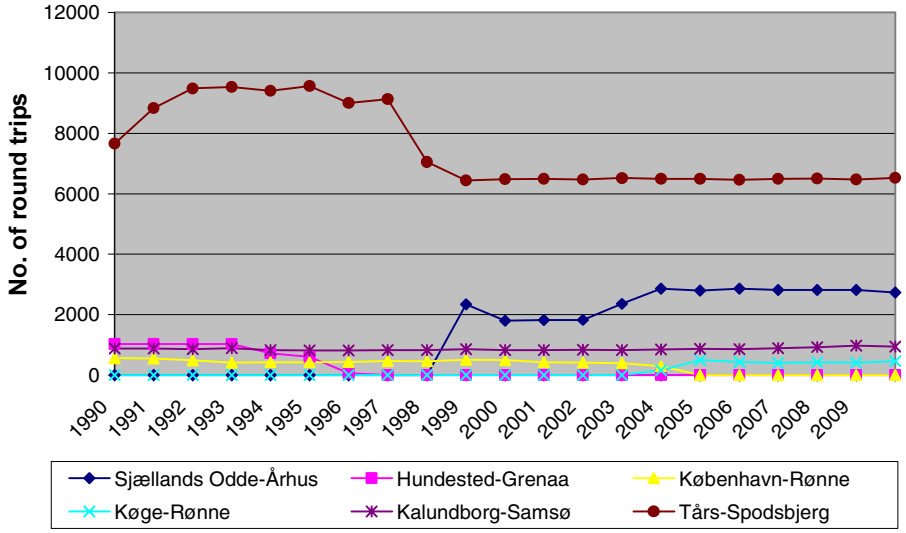


Figure 3.97 No. of round trips for the most important ferry routes in Denmark 1990-2010.

It is seen from Table 3.30 (and Figure 3.97) 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 1990-2010 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, 2011 and Thorarensen, 2011).

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 (2008a).

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 (2011). 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 (2008a) 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 2010 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 3.31 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	Implement. date		Tractors	
			[g pr kWh]			EU Directive	Transient	Constant	EU Directive	Implement. 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 3.32 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 3.33. 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 3.33 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

Tabel 3.34 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 3.35.

Table 3.35 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[5]: 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 3.36.

Table 3.36 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 · 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 · 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 · 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 3.37 shows the current legislation in force, and the amendment of MARPOL Annex VI agreed by IMO in October 2008.

[5] For ships operating in a designated Emission Control Area. Outside a designated Emission Control Area, Tier II limits apply.

Table 3.37 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 50 ppm sulphur in diesel (from 2005).

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.

For 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, 2011) 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 all sectors, emission factors are given in CollectER format in Annex 2.B.15 for 2010. Table 3.38 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 3.38 Fuel based emission factors for SO_2, NO_X, NMVOC, CO, NH_3 and TSP for other mobile sources in Denmark (2010).

			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	1242.60	6972.00	1.60	10.00
080100	Military	Diesel	0.47	362.43	18.55	99.64	0.36	13.88
080100	Military	Gasoline	0.44	114.24	166.31	1499.83	21.86	1.59
080100	Military	Jet fuel	22.99	250.57	24.94	229.89	0.00	1.16
080200	Railways	Diesel	0.47	861.00	57.78	147.00	0.20	29.00
080300	Inland waterways	Diesel	46.84	834.21	160.37	443.15	0.17	98.22
080300	Inland waterways	Gasoline	0.46	536.58	1176.04	13132.16	0.10	36.12
080402	National sea traffic	Diesel	46.84	950.95	51.95	84.45	0.00	21.55
080402	National sea traffic	Residual oil	489.00	1901.30	62.53	206.29	0.00	43.98
080403	Fishing	Diesel	46.84	1373.14	57.40	189.36	0.00	21.55
080403	Fishing	LPG						
080404	International sea traffic	Diesel	489.00	2114.39	62.58	206.46	0.00	43.98
080404	International sea traffic	Residual oil	22.83	859.00	1242.60	6972.00	1.60	10.00
080501	Air traffic, Dom. < 3000 ft.	AvGas	22.99	284.91	12.67	135.85	0.00	1.16
080501	Air traffic, Dom. < 3000 ft.	Jet fuel	22.83	859.00	1242.60	6972.00	1.60	10.00
080502	Air traffic, Int. < 3000 ft.	AvGas	22.99	300.20	21.33	172.31	0.00	1.16
080502	Air traffic, Int. < 3000 ft.	Jet fuel	22.99	259.66	8.48	107.16	0.00	1.16
080503	Air traffic, Dom. > 3000 ft.	Jet fuel	22.99	238.78	6.06	50.18	0.00	1.16
080504	Air traffic, Int. > 3000 ft.	Jet fuel	2.34	597.19	57.54	339.56	0.18	45.70
080600	Agriculture	Diesel	0.46	111.24	1198.22	21839.49	1.52	31.17
080600	Agriculture	Gasoline	2.34	410.67	30.56	245.71	0.18	27.30
080700	Forestry	Diesel	0.46	65.70	5061.02	17576.18	0.09	80.63
080700	Forestry	Gasoline	2.34	553.14	60.60	320.23	0.18	52.14
080800	Industry	Diesel	0.46	209.05	1535.64	13878.11	0.10	17.69
080800	Industry	Gasoline	0.00	1328.11	146.09	104.85	0.21	4.89
080800	Industry	LPG	0.46	100.65	2363.13	29784.64	0.09	16.72
080900	Household and gardening	Gasoline	0.46	91.81	1867.73	30544.46	0.09	28.18
081100	Commercial/Institutional	Gasoline	22.83	859.00	1242.60	6972.00	1.60	10.00
080501	Air traffic, Dom. < 3000 ft.	AvGas	22.99	277.85	14.59	181.79	0.00	1.16
080501	Air traffic, Dom. < 3000 ft.	Jet fuel	22.83	859.00	1242.60	6972.00	1.60	10.00
080502	Air traffic, Int. < 3000 ft.	AvGas	22.99	336.87	32.23	239.55	0.00	1.16
080502	Air traffic, Int. < 3000 ft.	Jet fuel	22.99	269.07	11.59	59.94	0.00	1.16
080503	Air traffic, Dom. > 3000 ft.	Jet fuel	22.99	305.04	9.40	32.03	0.00	1.16
080504	Air traffic, Int. > 3000 ft.	Jet fuel	22.99	859.00	1242.60	6972.00	1.60	10.00

[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).

The fuel consumption for one LTO cycle is calculated according to the following sum formula:

$$FC_{LTO}^{a} = \sum_{m=1}^{4} t_m \cdot ff_{a,m} \qquad (13)$$

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:

$$E_{LTO}^{a} = \sum_{m=1}^{4} FC_{a,m} \cdot EI_{a,m} \qquad (14)$$

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.

To estimate cruise results, fuel consumption and emissions for standard flying distances from EMEP/EEA (2009) are interpolated or extrapolated – 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:

$$E(y) = E_{x_i} + \frac{(y - x_i)}{x_{i+1} - x_i} \cdot (E_{x_{i+1}} - E_{x_i}) \quad y<x_{max},\ i = 0,1,2....max-1 \qquad (15)$$

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:

$$E(y) = E_{x_{max}} + \frac{(y - x_{max})}{x_{max} - x_{max-1}} \cdot (E_{x_{max}} - E_{x_{max-1}}) \quad y>x_{max} \qquad (16)$$

Total results are summed up and categorised according to each flight's airport and country codes.

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:

$$E_{Basis}(X)_{i,j,k} = N_{i,j,k} \cdot HRS_{i,j,k} \cdot P \cdot LF_i \cdot EF_{y,z} \quad (17)$$

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.10.

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:

$$DF_{i,j,k}(X) = \frac{K_{i,j,k}}{LT_i} \cdot DF_{y,z} \quad (18)$$

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:

$$DF_{i,j,k}(X) = \sqrt{\frac{K_{i,j,k}}{LT_i}} \cdot DF_{y,z} \quad (19)$$

The deterioration factors inserted in (18) and (19) are shown in Annex 2.B.10. 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:

$$TF_{i,j,k}(X) = TF_z \quad (20)$$

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.10. 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:

$$E(X)_{i,j,k} = E_{Basis}(X)_{i,j,k} \cdot TF(X)_{i,j,k} \cdot (1 + DF(X)_{i,j,k}) \quad (21)$$

The evaporative hydrocarbon emissions from fuelling are calculated as:

$$E_{Evap,fueling,i} = FC_i \cdot EF_{Evap,fueling} \quad (22)$$

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:

$$E_{Evap,\tan k,i} = N_i \cdot EF_{Evap,\tan k,i} \tag{23}$$

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:

$$E(X) = \sum_i N_i \cdot T_i \cdot S_{i,j} \cdot P_i \cdot LF_j \cdot EF_{k,l,y} \tag{24}$$

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:

$$E(X) = \sum_i EC_{i,k} EF_{k,l,y} \tag{25}$$

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:

$$EF_{k,l,y} = \frac{\sum_{year=X}^{year=X-LT} EF_{k,l}}{LT_{k,l}} \tag{26}$$

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:

$$E = FC \cdot EF \tag{27}$$

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 2010 and as time series 1985-2010 in Annex 2.B.16 (NFR format).

Energy balance: DEA statistics and DCE estimates

Following convention rules, the DEA statistical fuel sales figures are behind 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 1.1.3 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 new bottom-up estimates replace the previous fuel based figures 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 (2008a) 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

For aviation, the emissions associated with flights inside the Kingdom of Denmark are counted as domestic. The flights from Denmark to Greenland and the Faroe Islands are classified as domestic flights in the inventory background data. In Greenland and the Faroe Islands, the jet fuel sold is treated as domestic. This decision can be considered sensible since in the real world almost no fuel is bunkered in Greenland/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 avia-

tion. 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 3.39 Uncertainties for activity data, emission factors and total emissions in 2010 and as a trend.

	Emission factor uncertainties [%]		Emission uncertainties [%]	
Pollutant	Road	Other	Overall 2010	Trend
SO_2	50	50	49	3
NO_x	50	100	56	11
NMVOC	50	100	55	9
CO	50	100	60	16
NH_3	1 000	1 000	994	2 004
TSP	50	100	48	6
PM_{10}	50	100	51	4
$PM_{2.5}$	50	100	54	3
Arsenic	1 000	1 000	872	66
Cadmium	1 000	1 000	809	136
Chromium	1 000	1 000	819	178
Copper	1 000	1 000	999	5
Mercury	1 000	1 000	711	108
Nickel	1 000	1 000	931	34
Lead	1 000	1 000	865	13
Selenium	1 000	1 000	779	124
Zinc	1 000	1 000	941	33
Dioxins	1 000	1 000	748	182
Flouranthene	1 000	1 000	792	7
Benzo(b) flouranthene	1 000	1 000	779	35
Benzo(k) flouranthene	1 000	1 000	820	62
Benzo(a) pyrene	1 000	1 000	861	54
Benzo(g,h,i) perylene	1 000	1 000	797	46
indeno(1,2,3-c,d) pyrene	1 000	1 000	775	144

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 2006 inventory (Winther, 2008b).

The QA/QC descriptions of the Danish emission inventories for transport are given in Nielsen et al. (2011).

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 1985-2009 have been updated based on new data prepared by DTU Transport. Important changes are a different split of total mileage between gasoline and diesel passenger cars based on data for the year 2008 from the Danish vehicle inspection and maintenance programme. Also updated mileage for foreign vehicles driven on Danish roads has been included.

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 %, 2009), NO_x (-3.5 %; -1.1 %, 2000), NMVOC (-0.2 %; 0.5 %, 2009), CO (0.2 %; 2.6 %, 2009), NH_3 (-0.2 %; 1.0 %, 1990) and Particulates (-0.9 %; 4.6 %, 2009).

Agriculture/forestry/fisheries

The sales distribution into engine sizes for harvesters has been updated for the years 2002, 2003 and 2009. The following largest percentage differences (in brackets) for agriculture/forestry/fisheries are noted for: SO_2 (-0.1 %), NO_x (-0.1 %), NH_3 (-0.3 %) and Particulates (0.1 %).

Military

Emission factors derived from the new road transport simulations have caused some emission changes from 1985-2009. The following largest percentage differences (in brackets) are noted for: SO_2 (0 %), NO_x (-3.7 %), NMVOC (-2 %,), CO (5.8 %), NH_3 (2.9 %) and Particulates (4.3 %,).

Aviation

Emission changes occur for the years 2007-2009, due to a correction in the representative aircraft type for new aircraft used for flying in Denmark. Due to an error F28 was previously used as a representative aircraft type for the new aircraft types CRJ9, E70, E170 and E175. However, F28 is a very old aircraft which cannot represent these new aircraft types. Instead new fuel consumption and emission factors have been calculated for the CRJ9, E70, E170 and E175 jets.

The following largest percentage differences (in brackets) are noted for the year 2009: SO_2 (-1.7 %), NO_x (-2.4 %), NMVOC (-25.3 %,), CO (-5.4 %), NH_3 (0 %) and Particulates (-1.3 %,).

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.

3.3.9 References for transport and other mobile sources

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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 categorization in the reporting format 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: Emissions from solid fuels are only relevant for the Danish national emission inventories in the case of particulate emissions. Other components are not occurring, as these emissions should be included in the inventory for the nation housing the coalmines.
-
- 1B2a Fugitive emissions from oil include emissions from offshore activities and refineries.
- 1B2b Fugitive emissions from natural gas include emissions from transmission and distribution of natural gas. Emissions from gas storage are included in the transmission.
- 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 assumed to be negligible 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 3.40 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 3.40 List of NFR sectors relevant for fugitive emissions, and the corresponding SNAP codes and emission sources.

NFR sector	SNAP ID	SNAP name	Source
	04	Production processes	
1 B 2 a	040101	Petroleum products processing	Oil
1 B 2 a	040103	Sulfur Recovery Plants	Oil
1 B 2 a	040104	Storage and handling of petroleum products in refinery	Oil
	05	Extraction and distribution of fossil fuels and geothermal energy	
1 B 1 a	050103	Storage of solid fuel	Coal mining and handling
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
	09	Waste treatment and disposal	
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 united under "Extraction, 1st treatment and loading of liquid fossil fuels / Off-shore activities" (NFR 1B2a / SNAP 050202).

Table 3.41 summarizes the Danish fugitive emissions in 2010. The methodologies, activity data and emission factors used for calculation are described in the following chapters.

Table 3.41 Summary of the Danish fugitive emission in 2010. P refers to point source and A to area source.

IPCC code	SNAP code	Source	Pollutant	Emission	Unit
1B2a iv	040101	P	SO_2	0*	Mg
1B2a iv	040101	P	NMVOC	3867	Mg
1B2a iv	040103	P	SO_2	981	Mg
1B2a iv	040104	A	NMVOC	**	Mg
1B1a	050103	A	TSP	686	Mg
1B1a	050103	A	PM_{10}	274	Mg
1B1a	050103	A	$PM_{2.5}$	27	Mg
1B2a i	050201	A	NMVOC	2566	Mg
1B2a i	050202	A	NMVOC	2224	Mg
1B2a v	050503	A	NMVOC	1090	Mg
1B2b	050601	A	NMVOC	6	Mg
1B2b	050603	A	NMVOC	34	Mg
1B2c	050699	P	NMVOC	18	Mg
1B2c	090203	P	SO_2	288	Mg
1B2c	090203	P	NO_x	19	Mg
1B2c	090203	P	NMVOC	27	Mg
1B2c	090203	P	CO	62	Mg
1B2c	090203	P	TSP	0.3	Mg
1B2c	090203	P	PM_{10}	0.3	Mg
1B2c	090203	P	$PM_{2.5}$	0.3	Mg
1B2c	090203	P	As	0.0	kg
1B2c	090203	P	Cd	0.2	kg
1B2c	090203	P	Cr	0.2	kg
1B2c	090203	P	Cu	0.1	kg
1B2c	090203	P	Hg	< 0.1	kg
1B2c	090203	P	Ni	0.3	kg
1B2c	090203	P	Pb	0.1	kg
1B2c	090203	P	Se	< 0.1	kg
1B2c	090203	P	Zn	4.9	kg
1B2c	090203	P	Dioxin	< 0.01	g
1B2c	090203	P	Benzo(b)flouranthene	< 0.01	kg
1B2c	090203	P	Benzo(k)flouranthene	< 0.01	kg
1B2c	090203	P	Benzo(a)pyrene	< 0.01	kg
1B2c	090203	P	Indeno(1,2,3-c,d)pyrene	< 0.01	kg
1B2c	090206	A	SO_2	1.7	Mg
1B2c	090206	A	NO_x	146	Mg
1B2c	090206	A	NMVOC	12	Mg
1B2c	090206	A	CO	126	Mg
1B2c	090206	A	TSP	5	Mg
1B2c	090206	A	PM_{10}	5	Mg
1B2c	090206	A	$PM_{2.5}$	5	Mg
1B2c	090206	A	As	0.5	kg
1B2c	090206	A	Cd	2.7	kg
1B2c	090206	A	Cr	3.9	kg
1B2c	090206	A	Cu	2.3	kg
1B2c	090206	A	Hg	0.6	kg
1B2c	090206	A	Ni	5.6	kg
1B2c	090206	A	Pb	1.1	kg
1B2c	090206	A	Se	< 0.1	kg
1B2c	090206	A	Zn	77.7	kg
1B2c	090206	A	Dioxin	< 0.01	g
1B2c	090206	A	Benzo(b)flouranthene	< 0.01	kg

Continued					
1B2c	090206	A	Benzo(k)flouranthene	< 0.01	kg
1B2c	090206	A	Benzo(a)pyrene	< 0.01	kg
1B2c	090206	A	Indeno(1,2,3-c,d)pyrene	< 0.01	kg
1B2c	090206	P	SO_2	0.1	Mg
1B2c	090206	P	NO_x	9	Mg
1B2c	090206	P	NMVOC	0.5	Mg
1B2c	090206	P	CO	1	Mg
1B2c	090206	P	TSP	< 0.1	Mg
1B2c	090206	P	PM_{10}	< 0.1	Mg
1B2c	090206	P	$PM_{2.5}$	< 0.1	Mg
1B2c	090206	P	As	< 0.1	kg
1B2c	090206	P	Cd	< 0.1	kg
1B2c	090206	P	Cr	< 0.1	kg
1B2c	090206	P	Cu	< 0.1	kg
1B2c	090206	P	Hg	< 0.1	kg
1B2c	090206	P	Ni	< 0.1	kg
1B2c	090206	P	Pb	< 0.1	kg
1B2c	090206	P	Se	< 0.1	kg
1B2c	090206	P	Zn	0.6	kg
1B2c	090206	P	Dioxin	< 0.01	g
1B2c	090206	P	Benzo(b)flouranthene	< 0.01	kg
1B2c	090206	P	Benzo(k)flouranthene	< 0.01	kg
1B2c	090206	P	Benzo(a)pyrene	< 0.01	kg
1B2c	090206	P	Indeno(1,2,3-c,d)pyrene	< 0.01	kg

* SO_2 from SNAP 040101 is included in SNAP 010306.

** Not occurring in 2010.

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 components (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 in consequence 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.

$$E_{ships} = EMF_{ships,onshore} \cdot L_{oil,onshore} + EMF_{ships,offshore} \cdot L_{oil,offshore} \qquad \text{(Eq. 3.4.5)}$$

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 oil are given in the environmental reports from DONG Oil Pipe for 2010 (DONG Oil Pipe A/S, 2011). An implied emission factor is calculated on the basis of the amount of oil transported in pipelines according to equation 3.4.6.

$$IEF_{tanks} = E_{tanks} \div T_{oil} \qquad \text{(Eq. 3.4.6)}$$

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.

$$E_{service\ stations} = \left(EMF_{reloading} \cdot T_{fuel}\right) + \left(EMF_{refuelling} \cdot T_{fuel}\right) \qquad \text{(Eq. 3.4.7)}$$

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 components (VOC) is emitted to the atmosphere. The VOC emissions from the petroleum 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 included 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 due to the assumption that 10 % of VOC is CH_4 and the remaining 90 % is NMVOC.

Both the non-combustion processes including 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 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. From the fugitive losses from transmission and distribution pipelines the emissions of NMVOC are calculated due to the gas quality measured by Energinet.dk.

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 summarized flared amount are available.

3.4.3 Activity data

Coal storage

The activity data is the imported amounts and the calorific values of coal (Danish Energy Agency, 2011b). In 2010 the imported amount was 4 570 Gg (Figure 3.98) which is a decrease since 2009.

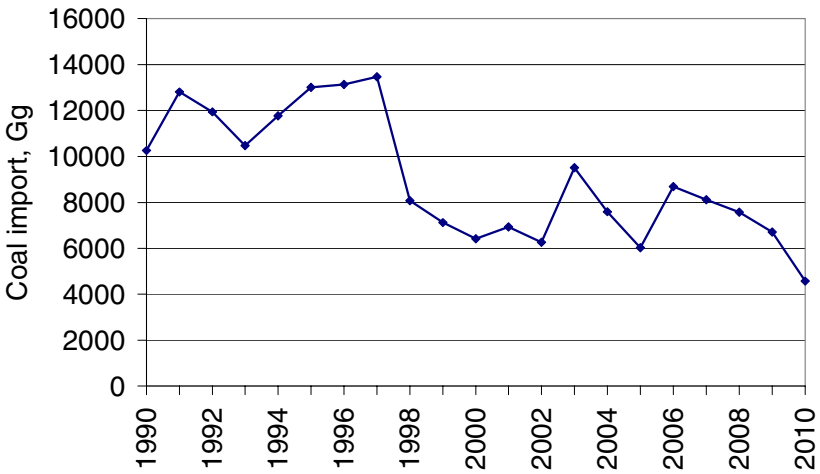

Figure 3.98 Amounts of imported coal.

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 3.42. Data are based on information from the Danish Energy Agency (2011a) and from the environmental reports from DONG Oil Pipe (2011).

Table 3.42 Activity data for 2010.

Activity	Symbols	Amounts	Data source
Number of platforms	N_p	54	Danish Energy Agency, 2011a
Produced gas, 10^6 Nm^3	P_{gas}	8 056	Danish Energy Agency, 2011a
Produced oil, 10^3 m^3	$P_{oil,vol}$	14 223	Danish Energy Agency, 2011a
Produced oil, 10^3 tonnes	P_{oil}	12 232	Danish Energy Agency, 2011a
Oil loaded, 10^3 m^3	$L_{oil\ off\text{-}shore}$	1 928	Danish Energy Agency, 2011a
Oil loaded, 10^3 tonnes	$L_{oil\ off\text{-}shore}$	1 658	Danish Energy Agency, 2011a
Oil loaded, 10^3 m^3	$L_{oil\ on\text{-}shore}$	9 200	DONG Oil Pipe A/S, 2011
Oil loaded, 10^3 tonnes	$L_{oil\ on\text{-}shore}$	7 912	DONG Oil Pipe A/S, 2011

Mass weight raw oil = 0.86 tonnes per m^3

As seen in Figure 3.99 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 yet still increasing (Figure 3.100). 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.

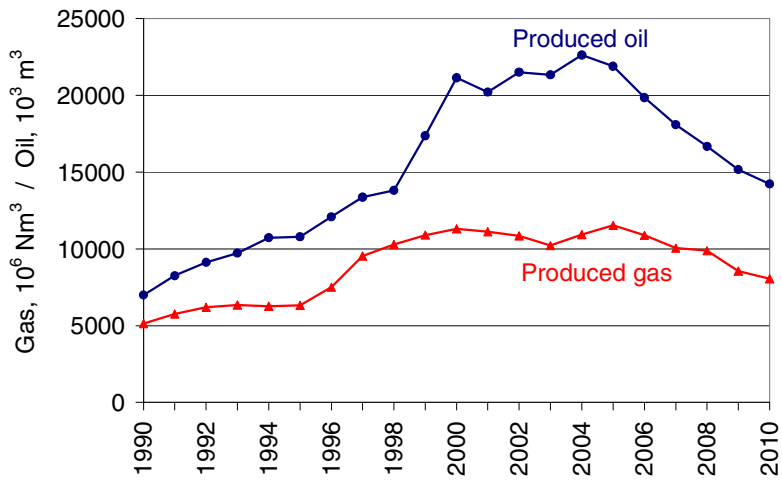

Figure 3.99 Production of oil and gas in the Danish part of the North Sea.

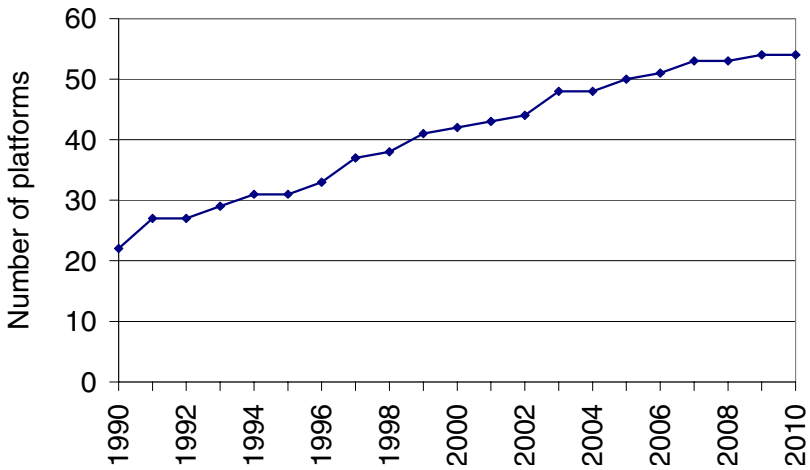

Figure 3.100 The number of platforms in the Danish part of the North Sea.

The amounts of oil loaded offshore on ships roughly follow the trend of the oil and gas production (Figure 3.101). In case of onshore loading of ships the trend is more smoothed.

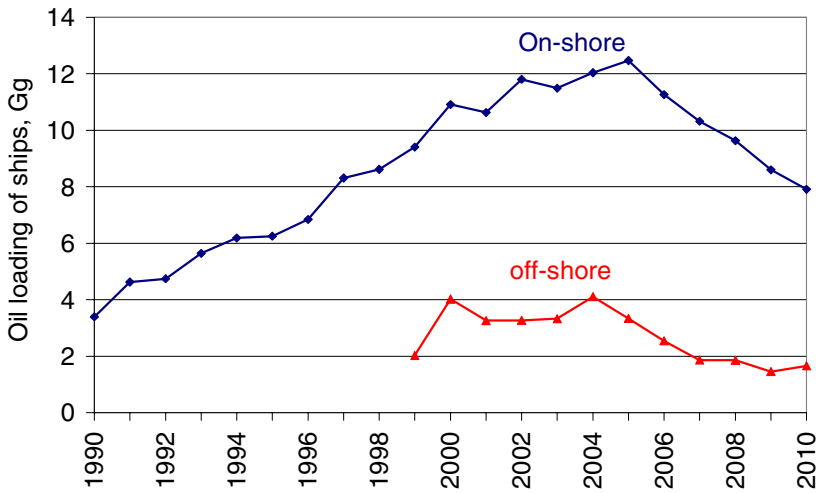

Figure 3.101 Onshore and offshore loading of ships.

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, 2011 and Statoil A/S, 2011). 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 3.102. The amount of crude oil being processed was 8 954 Gg in 2010.

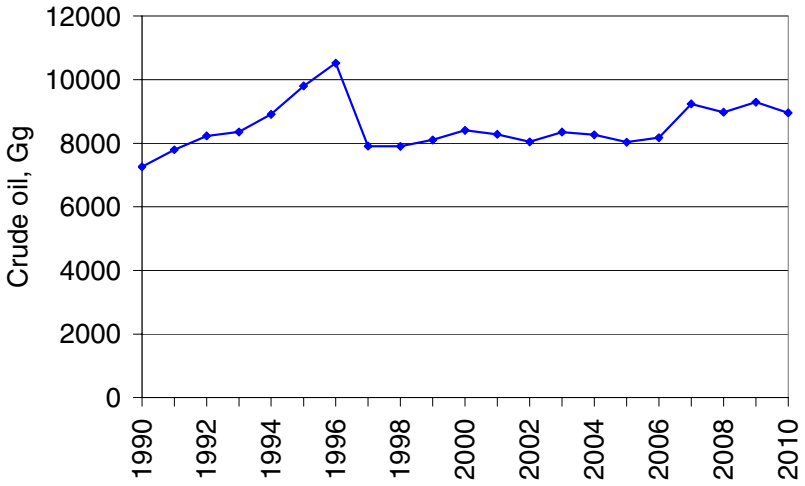

Figure 3.102 Oil refineries. Processed crude oil in Danish refineries.

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 1999-2010 as shown in Figure 3.103. In 2010 the gasoline sale was 1 550 Gg.

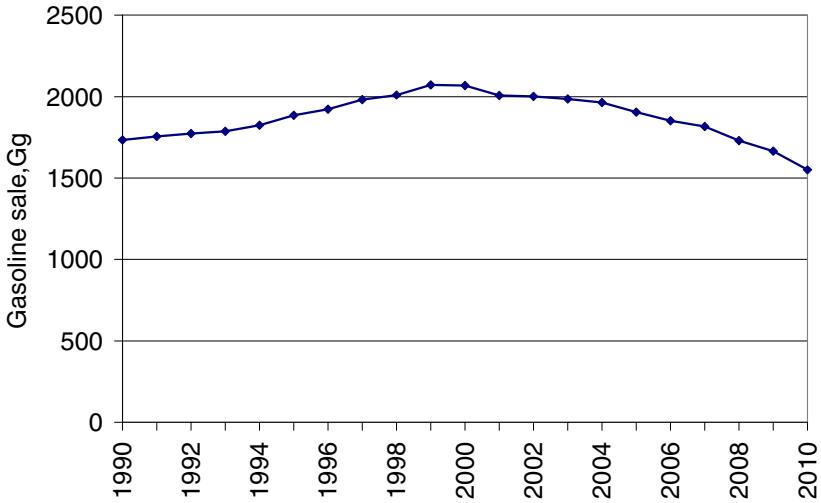

Figure 3.103 Gasoline sales in Denmark.

Transmission, storage and distribution of gas

The activity data used in the calculation of the emissions from natural gas is shown in Table 3.43. 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. In 2007-2010 the transmission rate stems from the annual environmental report by Energinet.dk (2011a). The distribution rates for 2007-2010 are given by the distribution companies, either in their annual reports or through personal communication.

Table 3.43 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	2006	2007	2008	2009	2010
Transmission, Mm^3 *	2 739	4 689	7 079	7 600	7 600	6 400	7 565	6 500	7 462
Distribution, Mm^3 **	1 905	3 089	3 511	3 297	3 460	3 160	3 135	2 890	2 493

* 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 7 642 Mm^3 and the distribution rate was 2 493 Mm_n^3, hereof 22 Mm_n^3 town gas (Figure 3.104). 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.

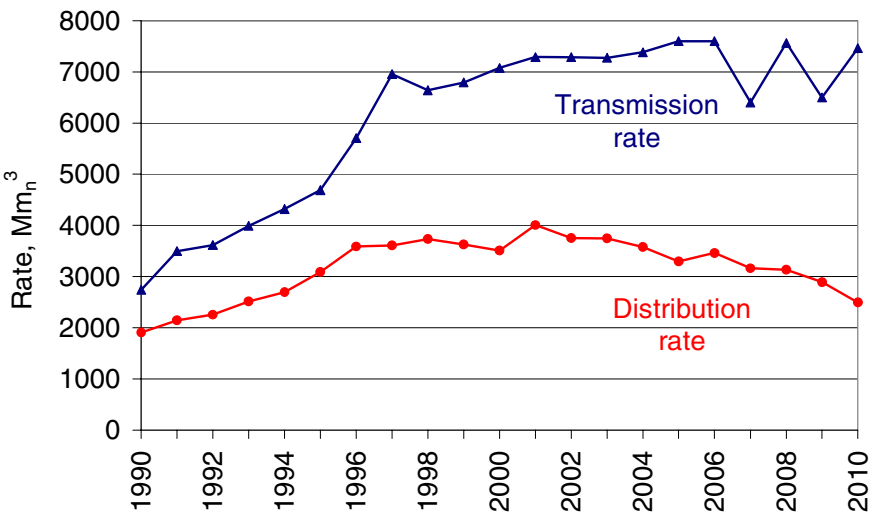

Figure 3.104 Rates for transmission and distribution of gas. Distribution covers both natural gas and town gas.

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 2010 the length of the transmission pipelines was around 860 km. Because the distribution system in Denmark is relatively new most of the distribution network is made of plastic. In 2010 the length of the distribution network was a round 23 400 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 circumstances as the plastic distribution system is basically tight with only minimal 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 more town gas distribution companies are now closed (one in 2004 and another in 2006), and therefore the data availability is scarce.

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 685 Mm^3 and 715 Mm^3 in 2010, respectively. Until 2000 emissions from storage of gas were included in transmission in the inventories.

Venting and Flaring

Venting at the two Danish gas storage plants are included in the inventory. Venting of gas is assumed to be negligible in extraction and in refineries as controlled venting enters the gas flare system. Venting rates are shown in Figure 3.105. 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.

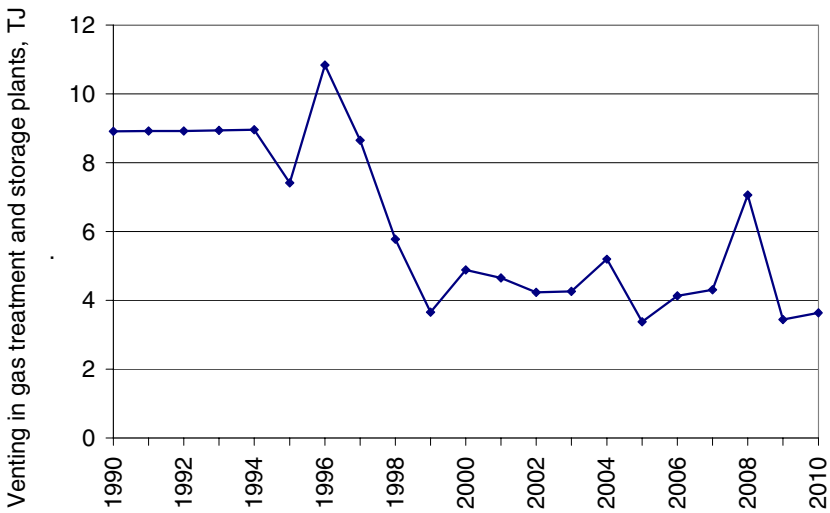

Figure 3.105 Amount vented in gas treatment and storage plants.

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, 2010; Dong Energy, 2011). Flaring rates for the two Danish refineries are given in their environmental reports and additional data. From 2006 flaring amounts are given in the EU ETS reporting.

The flaring rates are shown in Figure 3.106 and 3.107. 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.

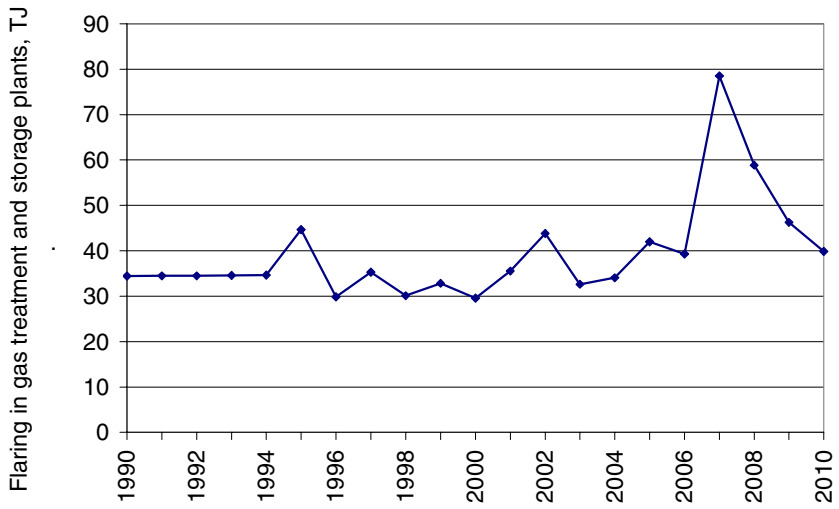

Figure 3.106 Amount flared in gas treatment and storage plants.

The offshore flaring amounts have been decreasing over the last 10 years period in accordance with the decrease in production as seen in Figure 3.99. Further, there is focus on reduction of the amount being flared for environmental reasons.

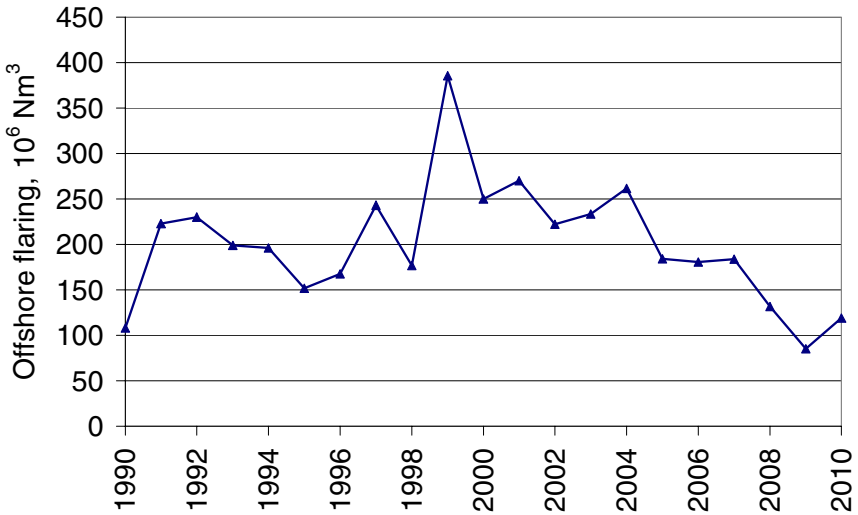

Figure 3.107 Amounts of gas flared in offshore exploration.

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 3.44.

Table 3.44 Emission factors used to estimate particulate emissions from coal storage.

Emission factor	TSP	PM_{10}	$PM_{2.5}$
Emission factor, g pr Mg	150	60	6

Loading of ships

In the EMEP/EEA Guidebook standard emission factors for different countries are given. In the Danish emission inventory the Norwegian emission factors are used for estimation of fugitive emissions from loading of ships onshore and offshore (EMEP/EEA, 2009). The emission factors are listed in Table 3.45.

Table 3.45 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	0.0002	EMEP/EEA, 2009

Oil refining

The refineries deliver 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 given in the basic data tables 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

NMVOC from service stations is calculated by use of different emission factors for the time series as shown in Table 3.46. 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 3.46 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.

Venting and flaring

Venting

Emissions of NMVOC from flaring are given in the environmental reports for the gas storage plants (DONG Energy, 2010; DONG Energy, 2011).

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 have been included in the inventory for all years (1990-2009) as the 2008 fuel gas composition is assumed to be more accurate for the emission calculation than the annual composition for natural gas being distributed in Denmark used in previous emission inventories. 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 3.47.

Table 3.47 Emission factors for flaring in refineries.

Pollutant	Emission factor	Unit
NO_x*	32.2	g pr GJ
NMVOC	76.5	g pr GJ
CO	177	g pr GJ
TSP	0.90	g pr GJ
PM_{10}	0.90	g pr GJ
$PM_{2.5}$	0.90	g pr GJ
As	0.09	mg pr GJ
Cd	0.50	mg pr GJ
Cr	0.70	mg pr GJ
Cu	0.40	mg pr GJ
Hg	0.10	mg pr GJ
Ni	1.00	mg pr GJ
Pb	0.20	mg pr GJ
Se	0.01	mg pr GJ
Zn	14.0	mg pr GJ
Dioxin	0.03	ng pr GJ
Benzo(b)fluoranthene	0.08	µg pr GJ
Benzo(k)fluoranthene	0.08	µg pr GJ
Benzo(a)pyrene	0.06	µg pr GJ
Indeno(1,2,3-c,d)pyrene	0.08	µg pr GJ

*The emission of NO_x is given for one refinery why the emission factor is used for one refinery only.

Flaring offshore

The emission factors for offshore flaring are shown in Table 3.48. 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 pr GJ or 0.0015 tonnes NO_x pr 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 pr tonnes gas and United Kingdom: approximately 0.0013 tonnes NO_x pr 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 3.48 Emission factors for offshore flaring.

Pollutant	Emission factor	Unit
SO_2	0.014	g pr Nm^3
NO_x	1.227	g pr Nm^3
NMVOC	0.106	g pr Nm^3
CO	1.055	g pr Nm^3
TSP	0.042	g pr Nm^3
PM_{10}	0.042	g pr Nm^3
$PM_{2.5}$	0.042	g pr Nm^3
As	0.004	mg pr Nm^3
Cd	0.023	mg pr Nm^3
Cr	0.033	mg pr Nm^3
Cu	0.019	mg pr Nm^3
Hg	0.005	mg pr Nm^3
Ni	0.047	mg pr Nm^3
Pb	0.009	mg pr Nm^3
Se	0.0005	mg pr Nm^3
Zn	0.652	mg pr Nm^3
Dioxin	0.001	ng pr Nm^3
Benzo(b)fluoranthene	0.037	µg pr Nm^3
Benzo(k)fluoranthene	0.037	µg pr Nm^3
Benzo(a)pyrene	0.028	µg pr Nm^3
Indeno(1,2,3-c,d)pyrene	0.037	µg pr Nm^3

3.4.5 Emissions

Coal storage

The emission from storage of coal is 686 Mg TSP in 2009 (274 Mg PM_{10} and 27 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 3.49). Note that PM was only included in the inventory from 2000.

Table 3.49 PM_{10} from storage of solid fuels for selected years of the time series.

	2000	2005	2006	2007	2008	2009	2010
PM_{10}, Mg	385	362	521	487	454	403	274

Extraction of oil and gas and loading of ships

From the activity data in Table 3.42, equation 3.4.3 the fugitive emissions of NMVOC from extraction are calculated. Corresponding emissions from loading of ships can be estimated by Table 3.42, Table 3.46 and equation 3.4.5. The emissions are listed in Table 3.50 along with the emissions from storage of oil given in the environmental reports from DONG Oil Pipe (2011). A degassing system has been established at the raw oil terminal leading to reduced VOC emissions from filling of tanks and from storage in tanks. The degassing system has been in operation since summer 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 209 to 2010.

Table 3.50 NMVOC emissions for 2010.

	NMVOC, Mg
Onshore loading of ships	1 582
Oil tanks	984
Fugitive emissions from extraction	566
Offshore loading of ships	1 658
Total	4 790

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 3.51 and Table 3.52.

Table 3.51 NMVOC from onshore activities related to extraction of oil and natural gas (onshore loading of ships and oil tanks).

	1990	1995	2000	2005	2006	2007	2008	2009	2010
NMVOC, Mg	2 404	3 913	6 183	6 994	6 403	5 981	5 551	3 818	2 566

Table 3.52 NMVOC from offshore activities related to extraction of oil and natural gas (offshore loading of ships and extraction).

	1990	1995	2000	2005	2006	2007	2008	2009	2010
NMVOC, Mg	236	330	4 476	3 873	3 087	2 422	2 417	2 018	2 224

The increase for NMVOC emission from offshore activities in 1999-2000 owe to offshore loading as there were no offshore loading in the years 1990-1998.

Oil refining

NMVOC emissions from oil refining at the Danish refineries are listed for selected years of the time series in Table 3.53. 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 summarized and reported as an area source in category 1B2a vi. Note also that SO_2 from oil refining from 2001 are included in stationary combustion.

Table 3.53 Oil Refineries. Emissions of NMVOC and SO_2 from oil refining and SO_2 from sulphur recovery.

	1990[1]	1995	2000	2005[2]	2006[2]	2007[2]	2008[2]	2009[2]	2010[2]
NMVOC, Mg	3 667	5 885	4 983	3 550	3 837	3 761	3 784	3994	3867
SO_2, oil refining, Mg		585	178						
SO_2, sulphur recovery, Mg	3 335	2 437	803	347	755	746	931	420	981

[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 3.46 and the sales of gasoline given by the Danish Energy statistics. The NMVOC emissions are listed in Table 3.54.

Table 3.54 Emissions of NMVOC from service stations for selected years of the time series.

	1990	1995	2000	2005	2006	2007	2008	2009	2010
NMVOC, Mg	4 856	3 016	2 616	1 742	1 563	1 405	1 216	1 171	1 090

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 (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.

The decrease in NMVOC emission from transmission in 2007 is caused by the completion of a greater construction work and rerouting of a major pipeline (Table 3.55). As the pipelines in Denmark are relatively new, most emissions are due to construction and maintenance. There have been no significant construction or renovation work since 2007 and therefore low emissions.

The NMVOC emission from distribution increased from 53 Mg in 2003 to 75 Mg in 2004. The increase owes to venting of the distribution network. The reason for the decrease in 2008 is not mentioned in the environmental report for the given company.

Table 3.55 NMVOC emission from transmission, storage and distribution for selected years of the time series. NMVOC emissions are estimated from the CH_4 emission according to the gas quality given by Energinet.dk.

NMVOC emission	1990	1995	2000	2005	2006	2007	2008	2009	2010
Transmission, Mg	36	121	52	36	37	2	4	2	6
Distribution, Mg	57	69	66	61	63	66	38	32	34

Venting and flaring

Venting

Emissions of NMVOC from flaring are given in the environmental reports for the gas storage plants (DONG Energy, 2010; DONG Energy, 2011). The time series are shown in figure 3.108.

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 3.108 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 South Arne.

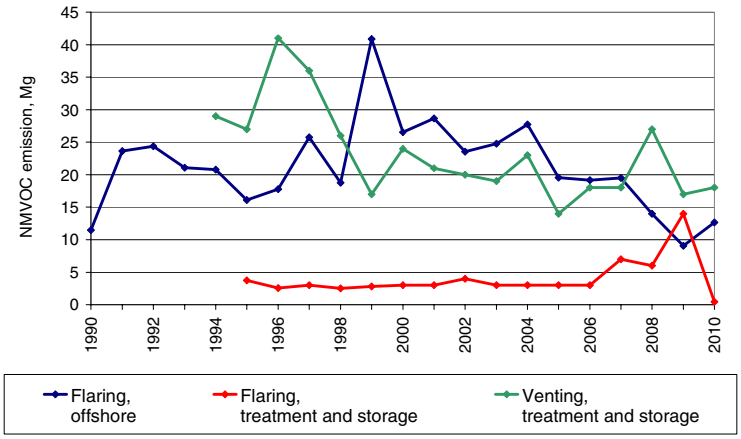

Figure 3.108 Fuel rate and CO_2 emission from offshore flaring of gas.

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 3.56. The decrease in the NMVOC emission from 2009 to 2010 owes to change from continuous to regulated operation of the power producing gas turbine at the gas storage plant.

Table 3.56 Emissions from flaring in oil and gas extraction.

Year	1990	1995	2000	2005	2006	2007	2008	2009	2010
	tonnes	tonnes	tonnes	tonnes	tonnes	tonnes	tonnes	Tonnes	tonnes
SO_2	2	2	4	3	3	3	2	1	2
NO_x	133	188	310	231	226	233	168	111	155
NMVOC	11	20	30	23	22	26	20	23	13
CO	114	161	265	195	192	196	141	91	127

Besides in the offshore sector flaring also takes place in refineries. Flaring in refineries is a significant fugitive emission source for SO_2. In 1990-1993 emissions from petroleum product processing were included in emissions from flaring in refineries (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 1B2a iv.

Emissions for selected years and components are shown in Table 3.57. 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 ammoniumthiosulfat (ATS) plant has lead to increased emissions. In 2007 the capacity of the ATS plant was increased followed by commissioning difficulties.

Table 3.57 Emissions from flaring in refineries.

Year	1990*	1995	2000	2005	2006	2007	2008	2009	2010
	tonnes	tonnes	tonnes	tonnes	tonnes	tonnes	tonnes	tonnes	tonnes
SO_2 *	943	203	51	296	257	526	380	453	288
NO_x	41	23	11	26	22	24	26	17	19
NMVOC	34	31	26	32	31	33	38	23	27
CO	5	73	60	73	73	77	88	53	62

*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 components.

The uncertainty rates are based on the EMEP/EEA emission inventory guidebook (2009), on uncertainty estimates from a minor number of companies and on estimates and assumptions by DCE. The applied uncertainty levels for activity data and emission factors are given in Table 3.58. The uncertainty rates vary between pollutants because the emission sources vary as well.

Table 3.58 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 uncertainty for both the emission and the trend. The emission uncertainty for SO_2, NO_x, NMVOC and CO is 25 %, 15 %, 40 % and 125 %, respectively.

For PM the uncertainty is 50 % and for most heavy metals and PAHs the uncertainty is around 200 %. A list of the individual uncertainty estimates for the fugitive emission inventory is shown in Table 3.59.

Table 3.59 Estimated emission uncertainty and trend uncertainty for fugitive emissions. The trend refers to the years 1990-2009 for all pollutants except PM where the trend refers to 2000-2010.

Pollutant	Emission uncertainty %	Trend uncertainty %
SO_2	25	4
NO_x	15	11
NMVOC	40	18
CO	125	17
TSP	50	2
PM_{10}	50	2
$PM_{2.5}$	50	2
As	225	13
Cd	225	13
Cr	225	12
Cu	125	12
Hg	75	12
Ni	125	12
Pb	225	13
Se	200	12
Zn	200	12
Benzo(b)	200	13
Benzo(k)	200	13
Benzo(a)	200	12
Indeno	200	13

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:

- 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.
- Total emission, when aggregated to reporting tables, is compared with totals based on SNAP source categories (control of data transfer).
- A manual log table in the emission databases is applied to collect information about recalculations.
- The emission from the large point sources (refineries, gas treatment and gas storage plants) 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 factor 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 now incorporated in the emission database, itself.
- Data sources are incorporated in the fugitive emission models
- Annual environmental reports are kept for subsequent control of plant-specific emission data.

The QC work will continue in future years.

Data deliveries

Table 3.60 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 3.60 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 offshore loading of ships	Activity data	The Danish Energy Agency	Jan H. Andersen	No formal data agreement.
Offshore flaring	Flaring offshore in oil and gas extraction	Activity data	The Danish Energy Agency	Peter Dal	Data agreement
Service stations	Data on gasoline sales from the Danish energy statistics.	Activity data	The Danish Energy Agency	Peter Dal	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

In the emission inventory for 2010 there have been some recalculations as listed below.

Refineries: Emissions of NMVOC have been changed for the years 1994-2000 and 2002-2009 according to VOC measurements in carried out in 2001, as no further information on fugitive emissions from the refineries are or will become available for other historical years. This is the result of an extended communication with one refinery leading to a recommendation to use measured emissions, and not an estimated emissions calculated by weighting the measured emissions by the annual processed crude oil amount as done in previous inventories.

The fugitive emissions are more related to other conditions than the processed amounts. The split of VOC emissions provided by the refineries have been revised in order to apply more similar approach for the two refineries.

For both refineries annual emissions of NMVOC are not available, and emissions are following based on the provided VOC emissions and assumptions for the part of VOC being NMVOC and CH_4, respectively.

Assumptions are based on information from the refineries and on literature study of international proportions/conditions. In the previous inventory CH_4 is estimated as 10 % of VOC based on information from one refinery.

The NMVOC recalculation has decreased the total fugitive emission by 1.0 % in 2009. The largest recalculation is in 2008 (1.5 %).

Updated SO_2 emissions for the years 2005-2009 provided by a refinery are included in the inventory. The recalculation has increased the total fugitive SO_2 emissions by 6 % in 2009.

Gas distribution: Emission factors for NMVOC for town gas distribution have been corrected for an error. Distribution of town gas is a minor source and the recalculation is insignificant for all years (< 0.001 % of the total fugitive NMVOC emission in 2009).

Offshore flaring: Activity data has been corrected for 2008 for two offshore installations. The calorific value has been corrected for the whole time series according to the average calorific value in the EU ETS reports for 2008-2010 which affects the emission factor for NO_x, NMVOC, CO, particulate matter, heavy metals, dioxin and PAHs. Further, the emission factors for CO and NMVOC have been corrected by including a conversion from m_s3 to m_n3. The activity data has been updated according to the latest figures from the Danish Energy Agency.

The recalculation has decreased the fugitive NO_x emission by 0.1 % in 2009 and 0.3 % in 1990.

3.4.9 Source specific planned improvements

The following future improvements are suggested.

Emissions from storage of fuels in tank facilities: The recent edition of the Danish emission inventory holds emissions from extraction of fuels, com-

bustion 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.

Emissions from offshore extraction of oil and gas: The fugitive emissions from extraction of oil and gas are based on a standard formula. If a better estimate becomes available it will be implemented.

3.5 References for fugitive emissions

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4 Industrial processes (NFR sector 2)

4.1 Overview of the sector

The present 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 presentation 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 or steelworks, as well as a number of smaller companies e.g. iron foundries.

Table 4.1 presents a survey of sources and groups of pollutants included in the present survey as well as pollutants and sources that will be included in the survey. Explanations to the abbreviations are given below the table. Table 4.1 indicates that some groups of substances are planned to be included in the inventory. In addition to the indicated groups of substances some groups do not include all relevant substances 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	Energy	$SO_X/NO_X/NH_3$	NMVOC/CO	$TSP/PM_{10/2.5}$	HM	POP
Grey iron foundries	030303	2C1	i.e.	+	+	x	x	-
Secondary lead production	030307	2C5b	i.e.	-	-	x	x	-
Secondary zinc production	030308	2C5d	i.e.	-	-	x	+	-
Secondary aluminium production	030310	2C3	i.e.	-	-	x	+	-
Cement	030311	2A1	y	x	x	x	x	-
Lime (incl. iron, steel and paper pulp industry)	030312	2A2	i.e.	+	-	x	+	-
Asphalt concrete plants	030313	2A7d	i.e	+	+	+	-	+/?
Container glass	030315	2A7d	y	x	x	x	x	-
Glass wool	030316	2A7d	i.e.	x/+	-	x	+	-
Mineral wool	030318	2A7d	y	x/+	x	x	+	-
Paper mill industry	030321	2D1	y	-	+	x	-	-
Electric arc furnace	040207	2C1	i.e.	-	-	x	x	+/?
Rolling mils	040208	2C1	i.e.	-	-	x	x	+/?
Allied metal manufacturing	040306	2C5	-	-	-	+	x	-
Sulphuric acid	040401	2B5a	-	x	-	-	-	-
Nitric acid	040402	2B2	y	x	-	x	-	-
NPK-fertiliser	040407	2B5a	-	x	i.e.	x	i.e.	-
Other (catalysts)	040416	2B5a	y	x	-	x	-/?	-
Chemical ingredients	040500	2B5a	i.e.	-	x	-	-	-
Pesticide production	040525	2B5a	-	+	x	+	-	+/?
Biscuits, cakes and other bakery products	040605	2D2	i.e.	-	x	-	-	-
Bread (rye and wheat)	040605	2D2	i.e.	-	x	-	-	-
Beer	040607	2D2	i.e.	-	x	-	-	-
Ethanol, technical	040608	2D2	i.e.	-	x	-	-	-
Spirits, other	040608	2D2	i.e.	-	x	-	-	-
Sugar production	040625	2D2	y	-	x	-	-	-
Meat curing, fish and shellfish	040627	2D2	i.e.	-	x	-	-	-
Meat curing, meat	040627	2D2	i.e.	-	x	-	-	-
Meat curing, poultry	040627	2D2	i.e.	-	x	-	-	-
Margarine and solid cooking fats	040698	2D2	i.e.	-	x	-	-	-
Coffee roasting	040699	2D2	i.e.	-	x	-	-	-
Roof covering with asphalt materials	040610	2A5	-	-	x	-	-	+/?
Road paving with asphalt	040611	2A6	-	+	x	-	-	+/?
Cement (decarbonising)	040612	2A1	-	i.e.	-	-	+	-
Glass (decarbonising)	040613	2A7	-	i.e.	-	-	+	-
Lime (decarbonising)	040614	2A2	-	i.e.	-	-	+	-
Other (slaughterhouse waste)	040617	2G	y	x/+	x	x	-	+/?
Limestone and dolomite use	040618	2A3	-	i.e.	+	i.e.	i.e.	-

x Included in the present inventory.
+ Will be included.
- Not included/not relevant.
i.e. 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:

- Production of cement (SNAP 030311/040612).
- Production of lime (quicklime) (SNAP 030312/040614).

- Production of container glass/glass wool (SNAP 030315/030316/040613).
- Production of mineral wool (SNAP 030318).
- Limestone and dolomite use (SNAP 040618).
- Roof covering with asphalt (SNAP 040610).
- Road paving with asphalt (SNAP 040611).

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 NO_X from production of container glass is increasing slightly until 2004 and thereafter decreasing significantly whereas the emission of CO is decreasing in the period 1990-2010. 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 in production of container glass. Emission of NH_3 from production of glass wool and mineral wool shows a decreasing trend from 1990-2010 as can be verified by the decreasing emission pr amount produced.

Table 4.2 Time series for pollutants from *Mineral products 2A* (process emissions; metals: kg and other pollutants: tonnes).

Pollutants	1990	1995	2000	2001	2002	2003	2004
NMVOC	567	568	567	559	555	556	573
NH_3	489	489	497	444	358	334	363
CO	10993	10996	11506	10788	9361	8339	9499
TSP			212	231	235	235	237
PM_{10}			179	194	196	199	202
$PM_{2.5}$			131	142	141	146	149
As	19,7	20,6	3,98	3,73	3,33	2,95	3,44
Cd	24,6	22,7	1,70	1,59	1,42	1,25	1,47
Cr	394	349	12,7	11,9	10,6	9,36	11,0
Cu	98,4	100,4	16,5	15,5	13,8	12,1	14,3
Hg	8,20	14,47	7,63	7,15	6,37	5,63	6,59
Ni	312	278	12,3	11,5	10,2	9,01	10,6
Pb	1164	881,6	456	290	277	365	545
Se	328	225,7	342	273	272	235	226
Zn	164	271,5	246	202	182	164	188
Continued	2005	2006	2007	2008	2009	2010	
NMVOC	573	572	589	581	551	591	
NH_3	335	337	353	374	309	311	
CO	8791	8456	9675	8697	6815	239	
TSP	226	235	203	192	134	123	
PM_{10}	194	201	172	163	117	103	
$PM_{2.5}$	143	148	125	119	87,0	74,6	
As	3,13	3,46	4,00	3,63	15,4	2,90	
Cd	1,33	1,49	1,74	1,57	1,18	1,25	
Cr	9,98	11,2	13,0	11,8	8,85	9,37	
Cu	12,9	14,5	16,9	15,3	11,5	12,1	
Hg	5,98	6,67	7,74	7,02	5,27	5,59	
Ni	9,60	10,8	12,5	11,4	8,52	9,02	
Pb	247	123	145	135	106	117	
Se	108	60,5	54,7	47,6	27,9	21,3	
Zn	173	191	218	200	147	149	

4.2.2 Methodological issues

The emissions of SO_2, NO_X, CO and TSP from the production of cement are measured yearly from 1997 to 2010 (TSP from 2000 to 2009) (Aalborg Portland, 2011). PM_{10} and $PM_{2.5}$ are estimated from the distribution between TSP, PM_{10} and $PM_{2.5}$ from CEPMEIP (2003). 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, 2011). The emissions of heavy metals are measured in 1997 (Illerup et al., 1999) and estimated for the other years from emission factors (based on the measurements) and TCE. The activity has increased from 1.6 million tonne TCE in 1990 to 2.9 million tonne TCE in 2007 and thereafter decreased to 1.5 million tonne TCE in 2010 due to the financial crisis.

[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.

The emission of NO_X, CO, TSP, lead, selenium, and zinc from production of container glass is measured yearly from 1997 to 2009 (TSP from 2000 to 2009) (Ardagh Glass Holmegaard, 2011). PM_{10} and $PM_{2.5}$ are estimated from the distribution between TSP, PM_{10} and $PM_{2.5}$ 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. For 1997 to 2010, the energy related emissions are estimated from emission factors and the actual energy consumption. This change in methodology results in inconsistency in the emission trend that cannot be explained by natural factors. 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).

The emission of NH_3 and TSP from the production of glass wool has been measured yearly from 1996 to 2010 (TSP from 2000 to 2010) (Saint-Gobain Isover, 2011). PM_{10} and $PM_{2.5}$ are estimated from the distribution between TSP, PM_{10} and $PM_{2.5}$ 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 2010 to 24 899 tonnes due to the financial crises. During the same period, the emission decreased from approximately 300 to 108 tonne NH_3.

The emissions from asphalt roofing and road paving have been estimated from production statistics compiled by Statistics Denmark and default emission factors presented by IPCC/Corinair. The default emission factors are presented in Table 4.3.

Table 4.3 Default emission factors for application of asphalt products.

		Road paving with asphalt	Use of cutback asphalt	Asphalt roofing
CH_4	g pr tonnes	5	0	0
CO	g pr tonnes	75	0	10
NMVOC	g pr tonnes	15	64 935	80
Carbon content fraction of NMVOC	%	0.667	0.667	0.8

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/-CORINAIR, 2007; CEPMEIP, 2003). Detailed discussion of QA/QC can be found in Nielsen et al. (2008).

4.2.5 Source specific recalculations

Production of chemical ingredients and treatment of slaughterhouse waste are transferred from *Mineral products* to *Other production, consumption, storage, transportation or handling of bulk products* (NFR 2G).

4.2.6 Source specific planned improvements

The inventory will be improved regarding coverage of pollutants included. Especially glass wool and mineral wool will be extended. The inconsistent methodology applied for emission of As, Cd, Cr, Cu, Hg, and Ni from glass production will be improved.

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 4.4.

Table 4.4 Time series for pollutants from *Chemical industry 2B* (tonnes).

Pollutant	1990	1995	2000	2001	2002	2003	2004
SO_2	636	406	421	449	436	321	340
NO_x	842	648	447	422	419	475	302
NH_3	25,0	75,0	27,0	101	93,0	113	101
NMVOC	490	157	69,0	47,0	44,7	40,4	47,4
TSP			381	365	329	334	204
PM_{10}			305	292	263	267	163
$PM_{2.5}$			228	219	197	201	122
Continued	2005	2006	2007	2008	2009	2010	
SO_2	402	258	36,0	13,0	20,0	10,8	
NO_x	30,2	37,0	18,0	19,0	18,0	21,0	
NH_3	79,0	88,0	107	111	165	123	
NMVOC	39,7	40,3	41,0	38,9	30,0	26,9	
TSP	23,0	12,0	25,0	26,0	16,0	26,0	
PM_{10}	18,0	10,0	20,0	21,0	13,0	21,0	
$PM_{2.5}$	14,0	7,00	15,0	16,0	10,0	16,0	

Sulphuric acid production ceased in 1997.

Nitric acid production ceased in 2004.

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; however, the emission of NO_X pr amount produced is decreasing from 1994 to 2004; see Figure 4.1. The emission of NH_3 does not follow the activity as it appears from the fluctuation in the emission pr amount produced. The production of nitric acid and fertiliser stopped in the middle of 2004.

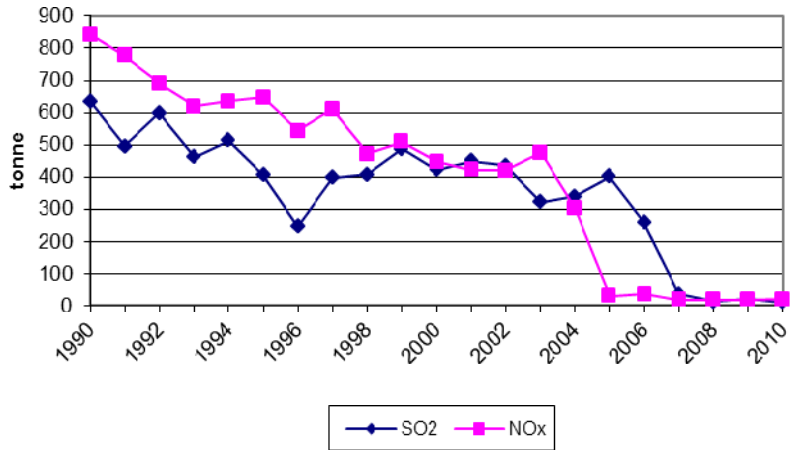

Figure 4.1 Emission of NO_x and SO_2 from Chemical industry (2B).

The emission of NO_X from production of catalysts/fertilisers decreases from 1996 to 2009, whereas the emission of NH_3 increases. Fluctuations 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 2010 (Cheminova, 2010). The decrease can probably 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 $PM_{2.5}$ 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 2010 (TSP from 2000 to 2010) (Haldor Topsøe, 2011). PM_{10} and $PM_{2.5}$ are estimated from the distribution between TSP, PM_{10} and $PM_{2.5}$ 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 123 tonne from 1990 to 2010. In the same period, the production of catalysts and fertilisers increased from approximately 33 000 to 45 000 tonnes.

The emission of NMVOC from production of pesticides is measured yearly from 1990 to 2000 (Cheminova, 2011) and estimated for 2001 to 2010. An

emission factor based on 2000 figures is used for estimation of 2001 to 2010 emissions. The emission of NMVOC shows a decreasing trend from 1990 to 2010.

The emission of NMVOC from production of chemical ingredients has been measured from 1996 to 2010 (Danisco Grindsted, 2011). 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.

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/CORINAIR, 2007). Detailed discussion of QA/QC can be found in Nielsen et al. (2008).

4.3.5 Source specific recalculations

Emission of NMVOC from production of chemical ingredients has been transferred from sector *Other production (2G)* to *Chemical industry*.

4.3.6 Source specific planned improvements

No source specific improvements are planned.

4.4 Metal production (NFR 2C)

4.4.1 Source category description

The sub-sector *Metal production* (NFR 2C) covers the following processes:

- Steelworks (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 4.5.

The emission inventory for metal production is based on specific 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 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 4.5 Time series for pollutants from *Metal production 2C* (process emissions; metals: kg and other pollutants: tonnes).

Pollutant	1990	1995	2000	2001	2002	2003	2004
TSP			268	299	207	203	207
PM_{10}			128	171	81,8	78,5	78,0
$PM_{2.5}$			48	78	21,3	20,4	19,8
As	30,9	27,1	28,9	25,7	26,2	26,2	27,2
Cd	57,1	62,2	38,1	52,6	16,8	19,6	20,2
Cr	120	107	106	94,3	96,0	96,0	99,7
Cu	40,1	44,6	46,4	46,4	46,4	46,4	46,4
Hg	136	158	90,0	184	0,00	10,9	11,7
Ni	406	435	185,3	234	113	154	162
Pb	1482	1509	1211	1565	705	746	773
Se	515	451	482	429	437	437	453
Zn	6406	7303	2506	3849	1071	1248	1278
Continued	2005	2006	2007	2008	2009	2010	
TSP	208	195	191	194	72,5	73,2	
PM_{10}	82,4	81,6	82,6	78,3	24,2	25,1	
$PM_{2.5}$	22,2	23,5	24,8	21,7	5,37	6,01	
As	26,2	23,6	22,2	24,1	10,3	10,2	
Cd	19,3	18,3	18,0	18,7	10,6	11,6	
Cr	96,0	86,4	81,5	88,4	37,6	37,4	
Cu	46,4	46,4	46,4	46,4	46,4	46,4	
Hg	74,0	10,8	12,1	11,2	4,90	8,84	
Ni	194	143	142	147	62,8	77,3	
Pb	1044	683	656	698	341	355	
Se	436	393	371	402	171	170	
Zn	2200	1204	1201	1219	885	948	

[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 $PM_{2.5}$ 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 $PM_{2.5}$ 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 $PM_{2.5}$ 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 recalculation has 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. (2008).

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.

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 4.6, 4.7 and presents the emission of NMVOC from production of food, beverage and sugar. The emissions are presented for relevant subsectors.

Table 4.6 Emission of NMVOC from production of beer and spirits (tonne NMVOC).

	1990	1995	2000	2001	2002	2003	2004
Beer	326	347	261	253	287	292	299
Spirits	32.1	31.3	23.6	23.4	25.0	25.5	23.8
Ethanol, technical	51.9	77.4	72.2	78.2	76.7	72.4	70.7
Sum	410	455	357	355	389	390	394
Continued	2005	2006	2007	2008	2009	2010	
Beer	304	286	268	227	211	222	
Spirits	22.1	20.1	16.6	11.9	10.9	12,7	
Ethanol, technical	83.1	81.3	62.7	76.8	63.6	55,3	
Sum	409	387	347	315	286	290	

Table 4.7 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).

	1990	1995	2000	2001	2002	2003	2004
Biscuits, cookies and other bakery products	98.6	148	138	146	151	156	165
Bread (rye and wheat)	853	1 038	1 098	1 218	1 135	1 110	1 151
Meat	443	528	559	587	601	599	615
Poultry	39.4	51.9	60.5	64.8	65.3	59.9	57.9
Fish and shellfish	493	708	578	569	552	450	453
Liquid fats and oils							
Solid fats and oils	2 307	1 983	1 957	1 782	2 250	2 090	2 103
Coffee, not roasted, not decaffeinated, supply	28.6	26.9	30.6	32.4	31.3	28.1	30.1
Total emission	4 263	4 484	4 422	4 399	4 785	4 493	4 576
Continued	2005	2006	2007	2008	2009	2010	
Biscuits, cookies and other bakery products	157	149	136	124	115	118	
Bread (rye and wheat)	1 158	1 217	1 153	1 145	1 201	1 101	
Meat	603	587	605	574	536	563	
Poultry	56.3	51.3	51.7	52.9	50.6	56,0	
Fish and shellfish	405	371	314	295	316	320	
Liquid fats and oils							
Solid fats and oils	2 002	1 817	1 914	1 911	1 752	1 802	
Coffee, not roasted, not decaffeinated, supply	20.1	19.3	18.2	18.5	18.8	19,5	
Total emission	4 401	4 211	4 192	4 120	3 990	3 980	

Table 4.8 Emission of NMVOC from production of sugar (tonne NMVOC).

	1990	1995	2000	2001	2002	2003	2004
Sugar	84,0	109	88,6	112	102	102	90,3
Continued	2005	2006	2007	2008	2009	2010	
Sugar	101	91,6	66,0	80,1	85,7	84,0	

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 UNECE Guidebook (EMEP/EEA, 2009); see Table 4.8. 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 4.9 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
Beer	0.35
Spirits	4
Ethanol, technical	4
Food	**kg NMVOC/tonne**
Meat, fish and poultry	0.3
Sugar	0.2
Margarine and solid cooking fats	10
Cakes, biscuits and breakfast cereals	1
Bread	4.5
Coffee roasting	0.55

The activity data used in the estimates are presented in Table 4.10, 4.11 and 4.12.

Table 4.10 Production of beer and spirits (1000 l) (Statistics Denmark, 2011).

	1990	1995	2000	2001	2002	2003	2004
Beer	930 405	990 321	745 492	723 311	820 242	835 184	854 988
Spirits	8 026	7 823	5 893	5 861	6 240	6 379	5 943
Ethanol, technical	12 977	19 338	18 059	19 556	19 183	18 097	17 686
Continued	2005	2006	2007	2008	2009	2010	
Beer	868 041	816 890	765 789	647 402	603 797	633 535	
Spirits	5 518	5 018	4 140	2 976	2 721	3 173	
Ethanol, technical	20 780	20 336	15 663	19 195	15 896	13 827	

Table 4.11 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, 2011).

	1990	1995	2000	2001	2002	2003	2004
Biscuits, cookies and other bakery products	98 574	148 247	138 488	145 566	150 596	156 018	165 139
Bread (rye and wheat)	189 562	230 762	244 060	270 707	252 163	246 639	255 813
Meat	1 477 700	1 758 800	1 864 000	1 957 600	2 002 500	1 997 600	2 051 500
Poultry	131 400	173 000	201 700	216 100	217 600	199 700	192 900
Fish and shellfish	1 643 648	2 360 076	1 926 516	1 895 372	1 838 940	1 500 075	1 508 929
Liquid fats and oils	348 919	494 388	386 832	313 581	338 622	411 321	497 364
Solid fats and oils	230 705	198 274	195 679	178 171	225 037	208 980	210 337
Coffee, not roasted, not decaffeinated, supply	52 086	48 870	55 617	58 947	56 857	51 009	54 638
Continued	2005	2006	2007	2008	2009	2010	
Biscuits, cookies and other bakery products	157 214	148 683	136 397	124 170	115 496	117 500	
Bread (rye and wheat)	257 444	270 493	256 265	254 373	266 886	244 753	
Meat	2 009 400	1 958 200	2 016 100	1 912 800	1 785 300	1 877 000	
Poultry	187 500	171 100	172 400	176 200	168 800	186 500	
Fish and shellfish	1 348 424	1 235 158	1 046 152	984 407	1 054 914	1 066 548	
Liquid fats and oils	539 074	622 761	595 785	534 976	499 979	572 182	
Solid fats and oils	200 170	181 654	191 405	191 082	175 192	180 214	
Coffee, not roasted, not decaffeinated, supply	36 555	35 134	33 121	33 720	34 176	35 381	

Table 4.12 Production of sugar (Statistics Denmark, 2011;Nordic Sugar, 2010).

	1990	1995	2000	2001	2002	2003	2004
Sugar	505 709	444 143	487 107	520 578	495 695	514 600	492 459
Continued	2005	2006	2007	2008	2009	2010	
Sugar	488 934	450 666	329 811	400 261	428 446	*420 000*	

Production in 2010 is assumed.

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 emission factors applied for NMVOC from refining of sugar within the sector *Other production* has been revised.

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 spirits/ethanol, bread, meat etc., fats and coffee. However, investigation of potential country specific emission factors is still on going.

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 4.13 presents the emission of NH_3 from treatment of slaughterhouse waste.

Table 4.13 Emission of NH_3 from treatment of slaughterhouse waste (tonne).

Year	1990	1995	2000	2001	2002	2003	2004
NH_3	24.2	31.5	34.0	31.9	47.9	157	167
Continued	2005	2006	2007	2008	2009	2010	
NH_3	132	96.4	112	112	92.5	89.0	

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, 2010). Activity data are obtained from production statistics (Statistics Denmark, 2010).

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*. The emission of NMVOC from production of chemical ingredients has been transferred to *Chemical industry*.

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

No source specific improvements are planned.

4.7 Uncertainty estimates

Uncertainty estimates for industrial processes (SNAP 04) are presented in Table 4.14. The uncertainty estimates are based on standard uncertainty factors (EMEP/EEA, 2009).

Table 4.14 Uncertainty estimates for industrial processes (%).

	Activity data uncertainty	Emission factor uncertainty	Overall 2010	Trend
SO_2	2	20	20.100	0,048
NO_x	2	50	50.040	0,071
NMVOC	50	50	70.711	60,289
CO	50	100	50.040	0,061
NH_3	2	1000	1000.002	2,75
Cadmium	2	1000	1000.002	0,444
Copper	2	1000	1000.002	1,196
Lead	2	1000	1000.002	0,504
Zinc	2	1000	1000.002	0,472

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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 pollutant emissions from use of solvents and other products in industrial processes and households that are related the to 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, SO_2, NO_x, CO, NH_3, 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 pollutants and 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 1990 – 2010 are summarised. The method is mainly based on the detailed approach described in EMEP/CORINAIR (2004) 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/CORINAIR, 2004).

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/CORINAIR, 2004).

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. ethylenglycol, 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 6.

5.2.2 Activity data

For each pollutant or product a mass balance is formulated:

$$\text{Consumption} = (\text{production} + \text{import}) - (\text{export} + \text{destruction/disposal} + \text{hold-up}) \qquad \text{(Eq. 1)}$$

Data concerning production, import and export amounts of solvents and solvent containing products are collected from StatBank DK (2011), 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.

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 StatBank DK (2011). When StatBank (2011) 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 industrial processes, 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 1990 to 2010, where the used amounts of single pollutants have been assigned to specific products and NFR sectors. 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 2010. 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 2010 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.

	1990	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Paint application (3A)	6.02	6.89	7.44	6.08	6.08	5.95	5.40	4.89	4.07	3.39	3.66	3.32	3.11
Degreasing and dry cleaning (3B)	7.05E-05	7.67E-05	2.93E-05	1.25E-05	2.98E-05	2.89E-05	2.4E-05	1.83E-05	1.46E-05	2.17E-05	1.5E-05	1.31E-05	1.24E-05
Chemical products, manufacturing and processing (3C)	7.96	9.11	6.74	6.10	6.39	4.76	5.90	6.12	5.94	6.07	5.84	4.90	4.96
Other (3D)	23.7	28.8	26.6	23.8	23.4	21.4	20.6	20.0	20.3	17.7	18.0	19.2	18.7
Total NMVOC	37.6	44.8	40.7	36.0	35.8	32.1	31.9	31.0	30.3	27.1	27.5	27.4	26.8

Table 5.2 Used amounts of NMVOC in Gg per year.

	1990	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Paint application (3A)	13.9	15.3	17.3	14.2	14.3	13.4	12.8	12.1	10.2	8.76	9.10	8.04	7.46
Degreasing and dry cleaning (3B)	0.705	0.767	0.293	0.125	0.298	0.289	0.240	0.183	0.146	0.217	0.150	0.131	0.124
Chemical products, manufacturing and processing (3C)	81.4	101	114	110	108	103	127	148	150	163	155	137	128
Other (3D)	37.9	47.8	44.4	39.8	42.3	35.5	35.2	39.7	35.1	31.8	32.9	35.0	33.0
Total NMVOC	134	165	175	165	165	152	175	200	196	204	197	180	169

Table 5.3 Used amounts of products (activity data) in Gg per year.

	1990	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Paint application (3A)	92.6	102	115	94.7	95.4	89.5	85.2	80.9	67.7	58.4	60.6	53.6	49.8
Degreasing and dry cleaning (3B)	1.41	1.53	0.586	0.251	0.597	0.578	0.481	0.366	0.292	0.433	0.299	0.263	0.247
Chemical products, manufacturing and processing (3C)	407	505	568	552	541	514	635	742	751	817	773	683	641
Other (3D)	210	260	250	224	242	214	211	227	210	185	189	203	187
Total products	710	869	934	870	879	818	931	1050	1030	1060	1022	940	878

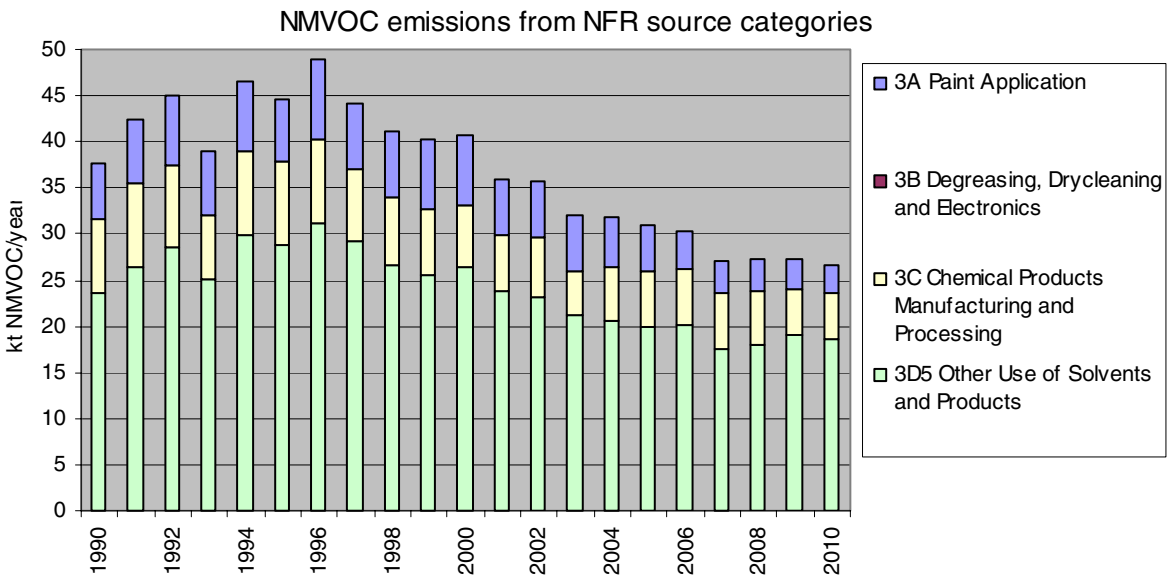

Figure 5.1 Emissions of NMVOC in Gg NMVOC per year. The methodological approach for finding emissions in the period 1990 – 2010 is described in the text. Figures can be seen in Table 5.1.

Table 5.4 NMVOCs with highest emissions 2010.

Pollutant	CAS no	Emissions 2010 (Gg)
ethanol	64-17-5	7,95
turpentine (white spirit: stoddard solvent and solvent naphtha)	64742-88-7 8052-41-3	5,79
propylalcohol	67-63-0	2,93
cyanates	79-10-7	2,12
pentane	109-66-0	1,56
methanol	67-56-1	1,06
propylenglycol	57-55-6	946
acetone	67-64-1	839
propane	74-98-6	654
butane	106-97-8	654
butanone	78-93-3	481
xylene	1330-20-7 95-47-6 108-38-3 106-42-3	472
phenol	108-95-2	201
cyclohexanones	108-94-1	164
toluene	108-88-3	158
glycolethers	110-80-5 107-98-2 108-65-6 34590-94-8 112-34-5 and others	158
ethylenglycol	107-21-1	124
formaldehyde	50-00-0	124
butanoles	78-92-2 2517-43-3 and others	105
acyclic aldehydes	78-84-2 111-30-8 and others	82.4
ethylacetate	141-78-6	50.1
styrene	100-42-5	43.4
1-butanol	71-36-3	26.2
naphthalene	91-20-3	14.7
butylacetate	123-86-4	14.0
tetrachloroethylene	127-18-4	2.03
acrylic acid	79-10-7	0.159
Total 2010		26,7

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 and charcoal for barbeques. These are included in 3D Other Use.

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 2006, 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-1.

Table 5.6 Emissions from use of fireworks.

	Unit	1990	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
SO_2	Mg	2.5	5.8	9.4	7.4	9.2	11.7	16.7	7.1	8.1	8.7	8.5	10.4	10.5
CO	Mg	8.8	20.7	33.5	26.4	32.7	41.8	59.6	25.4	29.0	30.9	30.1	37.1	37.4
TSP	Mg	50.7	118.9	192.5	151.9	187.9	240.0	342.7	146.1	166.9	177.4	173.2	213.3	214.9
PM_{10}	Mg	25.4	59.4	96.3	76.0	93.9	120.0	171.4	73.0	83.5	88.7	86.6	106.6	107.5
$PM_{2.5}$	Mg	17.8	41.6	67.4	53.2	65.8	84.0	119.9	51.1	58.4	62.1	60.6	74.6	75.2
As	kg	1.7	4.0	6.5	5.1	6.3	8.1	11.5	4.9	5.6	6.0	5.8	7.2	7.2
Cd	kg	0.9	2.0	3.2	2.6	3.2	4.0	5.8	2.5	2.8	3.0	2.9	3.6	3.6
Cr	kg	19.9	46.6	75.5	59.6	73.7	94.2	134.5	57.3	65.5	69.6	68.0	83.7	84.3
Cu	kg	568	1332	2157	1703	2106	2690	3840	1637	1871	1988	1941	2390	2409
Hg	kg	0.1	0.2	0.3	0.2	0.3	NO	NO	NO	NO	NO	NO	NO	NO
Ni	kg	38.4	89.9	145.6	114.9	142.1	181.6	259.3	110.5	126.3	134.2	131.1	161.3	162.6
Pb	kg	2814	6595	3237	2554	3159	4035	5762	2456	2807	NO	NO	NO	NO
Zn	kg	333	779	1262	996	1232	1574	2247	958	1095	1163	1136	1398	1409

Table 5.7 Emissions from combustion of cigarettes and other tobacco products.

	Unit	1990	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
SO_2	Mg	4.64	4.14	4.06	3.86	3.84	4.06	4.06	3.87	3.93	3.74	3.69	3.63	3.53
NO_X	Mg	20.74	18.52	18.13	17.27	17.18	18.15	18.14	17.30	17.55	16.72	16.50	16.21	15.76
CO	Mg	634.49	566.55	554.59	528.42	525.61	555.20	555.03	529.13	536.85	511.67	504.84	496.02	482.24
NH_3	Mg	47.76	42.65	41.75	39.78	39.57	41.80	41.78	39.83	40.41	38.52	38.00	37.34	36.30
TSP	Mg	157.5	140.6	137.6	131.1	130.4	137.8	137.7	131.3	133.2	127.0	125.3	123.1	119.7
PM_{10}	Mg	157.5	140.6	137.6	131.1	130.4	137.8	137.7	131.3	133.2	127.0	125.3	123.1	119.7
$PM_{2.5}$	Mg	157.5	140.6	137.6	131.1	130.4	137.8	137.7	131.3	133.2	127.0	125.3	123.1	119.7
As	kg	1.83	1.63	1.60	1.52	1.52	1.60	1.60	1.53	1.55	1.48	1.46	1.43	1.39
Cd	kg	0.18	0.16	0.16	0.15	0.15	0.16	0.16	0.15	0.16	0.15	0.15	0.14	0.14
Cr	kg	4.08	3.64	3.56	3.39	3.38	3.57	3.57	3.40	3.45	3.29	3.24	3.19	3.10
Cu	kg	1.75	1.56	1.53	1.46	1.45	1.53	1.53	1.46	1.48	1.41	1.39	1.37	1.33
Hg	kg	0.07	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.05	0.05	0.05
Ni	kg	0.37	0.33	0.32	0.31	0.31	0.32	0.32	0.31	0.31	0.30	0.29	0.29	0.28
Pb	kg	7.42	6.62	6.48	6.18	6.14	6.49	6.49	6.18	6.27	5.98	5.90	5.80	5.64
Se	kg	0.09	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.07	0.07	0.07	0.07
Zn	kg	18.54	16.55	16.20	15.44	15.36	16.22	16.22	15.46	15.69	14.95	14.75	14.49	14.09
PCDD/Fs	mg	1.15	1.03	1.01	0.96	0.95	1.01	1.01	0.96	0.97	0.93	0.92	0.90	0.88
Flouranthene	kg	10.94	9.77	9.56	9.11	9.06	9.57	9.57	9.12	9.26	8.82	8.70	8.55	8.31
Benzo[b]fluoranthene	kg	0.52	0.46	0.45	0.43	0.43	0.45	0.45	0.43	0.44	0.42	0.41	0.41	0.39
Benzo[k]fluoranthene	kg	0.52	0.46	0.45	0.43	0.43	0.45	0.45	0.43	0.44	0.42	0.41	0.41	0.39
Benzo[a]pyrene	kg	1.28	1.14	1.12	1.06	1.06	1.12	1.12	1.07	1.08	1.03	1.02	1.00	0.97
Benzo[ghi]perylene	kg	0.71	0.64	0.62	0.59	0.59	0.62	0.62	0.60	0.60	0.58	0.57	0.56	0.54
Indeno[1,2,3-cd]pyrene	kg	0.52	0.46	0.45	0.43	0.43	0.45	0.45	0.43	0.44	0.42	0.41	0.41	0.39

Table 5.8 Emissions from use of charcoal in barbeques.

	Unit	1990	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
SO_2	Mg	22.23	24.47	41.41	33.78	50.83	62.12	50.25	46.27	63.85	37.67	32.19	42.47	25.97
NO_X	Mg	21.52	23.69	40.07	32.69	49.19	60.11	48.63	44.77	61.79	36.45	31.15	41.10	25.13
CO	Mg	1506.2	1658.0	2805.1	2288.4	3443.4	4207.8	3404.3	3134.2	4325.4	2551.8	2180.5	2877.0	1759.3
TSP	Mg	17.21	18.95	32.06	26.15	39.35	48.09	38.91	35.82	49.43	29.16	24.92	32.88	20.11
PM_{10}	Mg	17.21	18.95	32.06	26.15	39.35	48.09	38.91	35.82	49.43	29.16	24.92	32.88	20.11
$PM_{2.5}$	Mg	17.21	18.95	32.06	26.15	39.35	48.09	38.91	35.82	49.43	29.16	24.92	32.88	20.11
As	kg	0.68	0.75	1.27	1.04	1.56	1.90	1.54	1.42	1.96	1.15	0.99	1.30	0.80
Cd	kg	0.25	0.28	0.47	0.39	0.58	0.71	0.58	0.53	0.73	0.43	0.37	0.49	0.30
Cr	kg	100.41	110.53	187.01	152.56	229.56	280.52	226.95	208.95	288.36	170.12	145.37	191.80	117.3
Hg	kg	0.47	0.51	0.87	0.71	1.07	1.30	1.05	0.97	1.34	0.79	0.67	0.89	0.54
Ni	kg	0.93	1.03	1.74	1.42	2.13	2.60	2.11	1.94	2.68	1.58	1.35	1.78	1.09
Pb	kg	31.92	35.13	59.44	48.49	72.97	89.17	72.14	66.42	91.66	54.07	46.21	60.97	37.28
Se	kg	4.66	5.13	8.68	7.08	10.66	13.02	10.54	9.70	13.39	7.90	6.75	8.91	5.45
Zn	kg	99.70	109.74	185.67	151.47	227.92	278.52	225.33	207.45	286.30	168.90	144.33	190.43	116.45
PCDD/Fs	g	0.08	0.08	0.14	0.11	0.17	0.21	0.17	0.16	0.22	0.13	0.11	0.14	0.09
PAHs	kg	8.03	8.84	14.96	12.20	18.36	22.44	18.16	16.72	23.07	13.61	11.63	15.34	9.38

Table 5.9 Activity data for the product use of fireworks, tobacco and charcoal for barbeques (BBQ).

Year		1990	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Fireworks	Gg	1.3	3.0	4.9	3.8	4.7	6.1	8.6	3.7	4.2	4.5	4.4	5.4	5.4
Tobacco	Gg	11.5	10.3	10.1	9.6	9.5	10.1	10.1	9.6	9.7	9.3	9.2	9.0	8.8
BBQ	Gg	7.2	7.9	13.4	10.9	16.4	20.0	16.2	14.9	20.6	12.2	10.4	13.7	8.4

Emission factors for use of fireworks, tobacco and charcoal for barbeques (BBQ) are found from literature studies and are shown in Table 5.10.

Table 5.10 Emission factors for other product use, per Mg.

Compound	Unit	Fireworks	Tobacco	BBQ
SO_2	kg	1.935 (a)	0.40(e)	3.1 (l)
NO_X	kg	NAV	1.80(f)	3.0 (m)
NMVOC	kg	NAV	4.84 (g)	3.0 (m)
CO	kg	6.9 (a)	55.10(f)	210 (m)
NH_3	kg	NAV	4.15(f)	NAV
TSP	kg	39.66 (b)	13.67(f)	2.4 (b)
PM_{10}	kg	19.83 (b)	13.67(f)	2.4 (b)
$PM_{2.5}$	kg	13.88 (b)	13.67(f)	2.4 (b)
As	g	1.333 (c)	0.159 (h)	0.10 (l)
Cd	g	0.667 (c)	0.016(e)	0.04 (l)
Cr	g	15.56 (c)	0.354 (h)	14.00 (l)
Cu	g	444.4 (c)	0.152 (h)	NAV
Hg	g	0.064 (d)*	0.006(e)	0.065 (l)
Ni	g	30 (d)	0.032(e)	0.13 (l)
Pb, 1980-1999	g	2200 (d)	0.644(e)	4.45 (l)
Pb, 2000-2006	g	666.7 (c)*		
Se	g	NAV	0.008(e)	0.65 (l)
Zn	g	260 (d)	1.61(e)	13.90 (l)
PCDD/Fs	ug	NAV	0.1(i)	10.50 (n)
Flouranthene	g	NAV	0.95 (j)	NAV
Benzo[b]fluoranthene	g	NAV	0.045 (k)	NAV
Benzo[k]fluoranthene	g	NAV	0.045 (k)	NAV
Benzo[a]pyrene	g	NAV	0.111 (k)	NAV
Benzo[ghi]perylene	g	NAV	0.062 (k)	NAV
Indeno[1,2,3-cd]pyrene	g	NAV	0.045 (k)	NAV
PAHs	g	NAV		1.12 (l)

*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) Wood, (f) Martin et al. 1997, (g) Sandmo, T. 2011, (h) Finstad & Rypdal 2003, (i) Toolkit 2005, (j) US-EPA 1998, (k) Daher 2010, (l) Environment Australia (1999), (m) IPCC Guidelines (1996), (n) Hansen (2000).

5.4 Uncertainties and time series consistency

5.4.1 NMVOC

For NMVOCs an overall Tier 1 uncertainty of 23% is found for 2010. This represents a 95%-confidence interval limit relative to the calculated mean 2010 emission. The Tier 1 trend uncertainty for 1990 to 2010 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, 2011) 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 (2011). 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 (2011) 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 1990-2010, %	Uncertainty trend %-age points
SO_2	70,5	36,2	31,5
NO_x	62,2	-3,2	16,9
CO	77,7	6,0	15,2
NH_3	20,2	-24,0	21,5
TSP	182,8	-0,3*	24,7
PM_{10}	133,1	-4,7*	25,8
$PM_{2.5}$	109,3	-6,8*	25,5
As	230,6	123,2	244,4
Cd	267,8	213,6	222,6
Cr	136,4	64,6	130,9
Cu	299,9	322,7	47,9
Hg	91,7	-3,3	54,9
Ni	396,7	313,3	61,7
Pb	87,4	-98,5	6,0
Se	99,2	16,0	16,2
Zn	366,2	241,6	248,4
PCDD/F	99,5	16,2	16,3
flouranthene	32,0	-24,0	21,5
benzo[b]flouranthene	40,0	-24,0	21,5
benzo[k]flouranthene	40,0	-24,0	21,5
benzo[a]pyrene	37,8	-24,0	21,5
benzo[g,h,i]perylene	35,8	-24,0	21,5
indeno[1,2,3-c,d]pyrene	50,1	-24,0	21,5

* Trend for particles is calculated for 2000-2010

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 tobacco, are not available in StatBank DK (2011). 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 come by for other product use categories. Some chosen emission factors apply to countries that are not directly comparable to Denmark, and hereby induce an over- or under estimation of emissions. 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 in industries and households. The main improvements in the 2011 reporting include the following:

- Inclusion of NMVOC use and calculations of NMVOC emissions for the time period 1990 to 1994
- Inclusion of Tobacco smoking and Combustion of Charcoal for Barbeques in Other Product Use

5.7 Planned improvements

- PAH, PCB, dioxin and mercury use and emissions may be implemented for a variety of uses
- Pollutants that are listed as products in Statistics Denmark, e.g. cosmetics, may be assessed

5.8 References

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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 manure management and agricultural soils, PM emission from animal production and emission from field burning of straw includes NH_3, PM, NO_x, CO, NMVOC, SO_2, heavy metals, dioxin and PAH.

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 traffic and industrial process. Figure 6.1 shows the distribution of sources of NH_3 emission from the agricultural sector 2010. The main part of the agricultural emission is related to manure management, corresponding to 84 % 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 %.

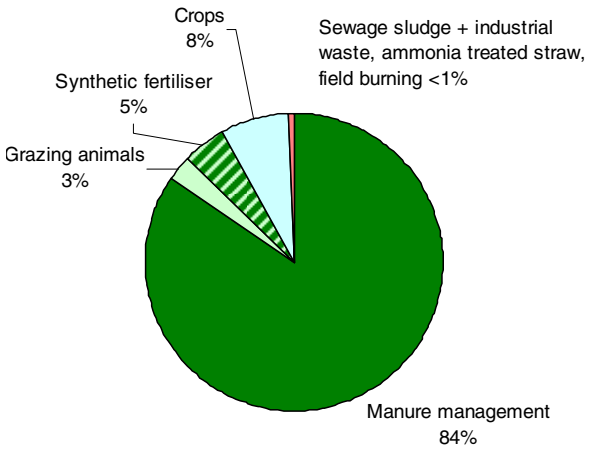

Figure 6.1 NH_3 emissions from the agricultural sector, 2010.

The NH_3 emission from the agricultural sector 1985 to 2010 has decreased from 116.78 Gg NH_3 to 71.76 Gg NH_3, corresponding to a 39 % reduction (Table 6.1). The significant decrease in NH_3 emissions is a consequence of an active national environmental policy. A string of measures have been introduced by action plans to prevent the loss of nitrogen from agriculture to the aquatic environment, 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) and the Ammonia Action Plan (2001). The latest action plan form 2009 the Agreement on Green Growth, which purpose is to ensure that a high level of environmental, nature and climate protection goes hand in hand with modern and competitive agriculture and food industries. These measures have brought about 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 reduce the overall NH_3 emission significantly.

Table 6.1 Total NH_3 emissions from the agricultural sector 1985 to 2010, Gg NH_3.

Year		1985	1990	1995	2000	2005	2006	2007	2008	2009	2010
NFR		Gg NH_3									
4B	Manure management	93.07	87.68	76.45	72.46	68.05	65.07	65.53	63.56	60.99	60.64
4D1	Synthetic N-fertiliser	6.46	6.59	5.55	3.85	3.12	3.28	3.42	3.65	3.67	3.47
4D2c	Grazing animals	3.13	2.92	3.03	2.92	2.21	2.09	1.99	1.99	1.91	1.85
4F	Field burning of agricultural Waste	1.53	0.08	0.09	0.11	0.13	0.13	0.11	0.10	0.12	0.09
4G	Crops	5.97	5.92	5.28	5.21	5.34	5.34	5.26	5.41	5.41	5.41
4G	NH_3 treated straw	6.54	10.19	6.63	2.47	0.26	0.00	0.00	0.00	0.00	0.24
4G	Sewage sludge used as fertiliser	0.0	0.07	0.11	0.08	0.05	0.05	0.05	0.05	0.07	0.06
4.	Agricultural sector - total	116.78	113.45	97.14	87.11	79.16	75.96	76.36	74.78	72.16	71.76

The main part of the emission from the agricultural sector is related to livestock production and, hence, the management of manure has to be considered as the most important emission source. Most of the emission from manure originates from the production of pigs and cattle, which contributed, respectively with 44 % and 34 %, respectively.

It is noteworthy that the overall emission from pigs has decreased by 40 % from 1985 to 2010 despite a considerable increase in pig production from 14.7 million produced fattening pigs in 1985 to 20.9 million in 2010. One of the most important reasons for this is the improvement in feed efficiency. In 1985, the nitrogen excretion for a fattening pig was an estimated 5.09 kg N (Poulsen & Kristensen, 1998). In 2010, that figures were considerably lower at 2.82 kg N per fattening pig produced (Poulsen, 2011). Due to the large contribution from the pig production, the lower level of N-excretion has a significant influence on total agricultural emissions.

Another important cause of the significant decrease in the NH_3 emission since 1985 is changes in practice of manure application to the fields where considerable changes have taken place. 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 to 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 NFR, the emission of particulate matter (PM) is registered for the years 2000 to 2010. The emission from the agricultural sector includes the emission of dust from animal housing systems, which include emission from cattle, pigs, poultry, horses, sheep and goats. Furthermore, the emission from field burning of agricultural wastes is calculated.

Present, the Danish inventory does not include emission from plant production, which means activities related to field operations as harvesting and cultivation of the soil.

TSP emission from the agricultural sector contributes with 29 % to the national TSP emission in 2010 and the emission shares for PM_{10} and $PM_{2.5}$ are

only 18 % and 5 % respectively. Most of this comes from animal production. The emission from the field burning of agricultural residues, contributes less than 1 % to the agricultural emission.

The same emission factor is used for all years. So changes in the total PM emissions for each livestock category is mainly reflecting the changes in number of animals, but also effected by the distribution of the subcategories and changes in the housing type.

The PM emission from agricultural activities, given in TSP, is almost unaltered in the period from 2000 to 2010 (Figure 6.2). The emission of TSP is increased in 2010 compared to 2009 and this is mainly due to an increase in number of swine.

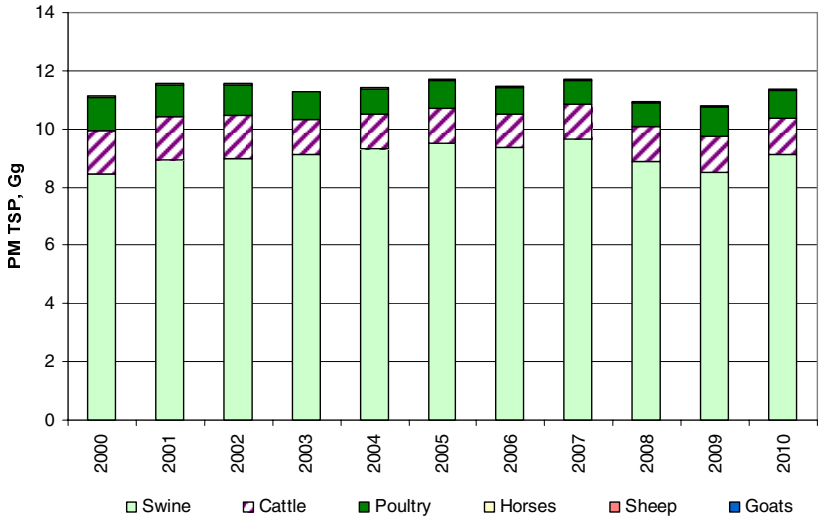

Figure 6.2 Emission of particulate matter (TSP) from the agricultural sector 2000 to 2010.

6.1.2 References – sources of information

Data on activity and emissions are collected, evaluated and discussed in co-operation with Statistics Denmark, DCA - Danish Centre for Food and Agriculture, Aarhus University, the Danish Agricultural Advisory Service, Danish Environmental Protection Agency and the Danish Plant Directorate. 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)	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
The Danish Plant Directorate (http://www.plantedirektoratet.dk)	PD	-synthetic fertiliser -number of animals from CHR -housing type (from 2005)

Methods

The calculated emission is based on the air EMEP/EEA air pollutant emission inventory guidebook (EMEP/EEA, 2009).

The emissions from agricultural activities include NFR Table 4B Manure Management, Table 4D Agricultural Soils, Table 4F Field Burning of Agricultural Wastes and Table 4G Agriculture Other. In general the field burning of agricultural wastes has been prohibited since 1989. However, burning of straw may only take place in connection with fields continuously cultivation of seed grass or in cases where weather conditions result in surplus of straw in form of wet or broken bales.

The emission is calculated as the sum of activities (a_i) multiplied by the implied emission factor (IEF) for each activity, *i*.

$$E_{total} = \sum a_i \bullet IEF_i$$

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 in great detail and it is used to cover 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 coherence between the NH_3 emission and the emission 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 is available for timely completion of the emission inventory. The main part of the emission is related to livestock production and much of the data is based on Danish standards. DCA, 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 spreadsheets. These standards have been described and published in English in Poulsen & Kristensen (1998).

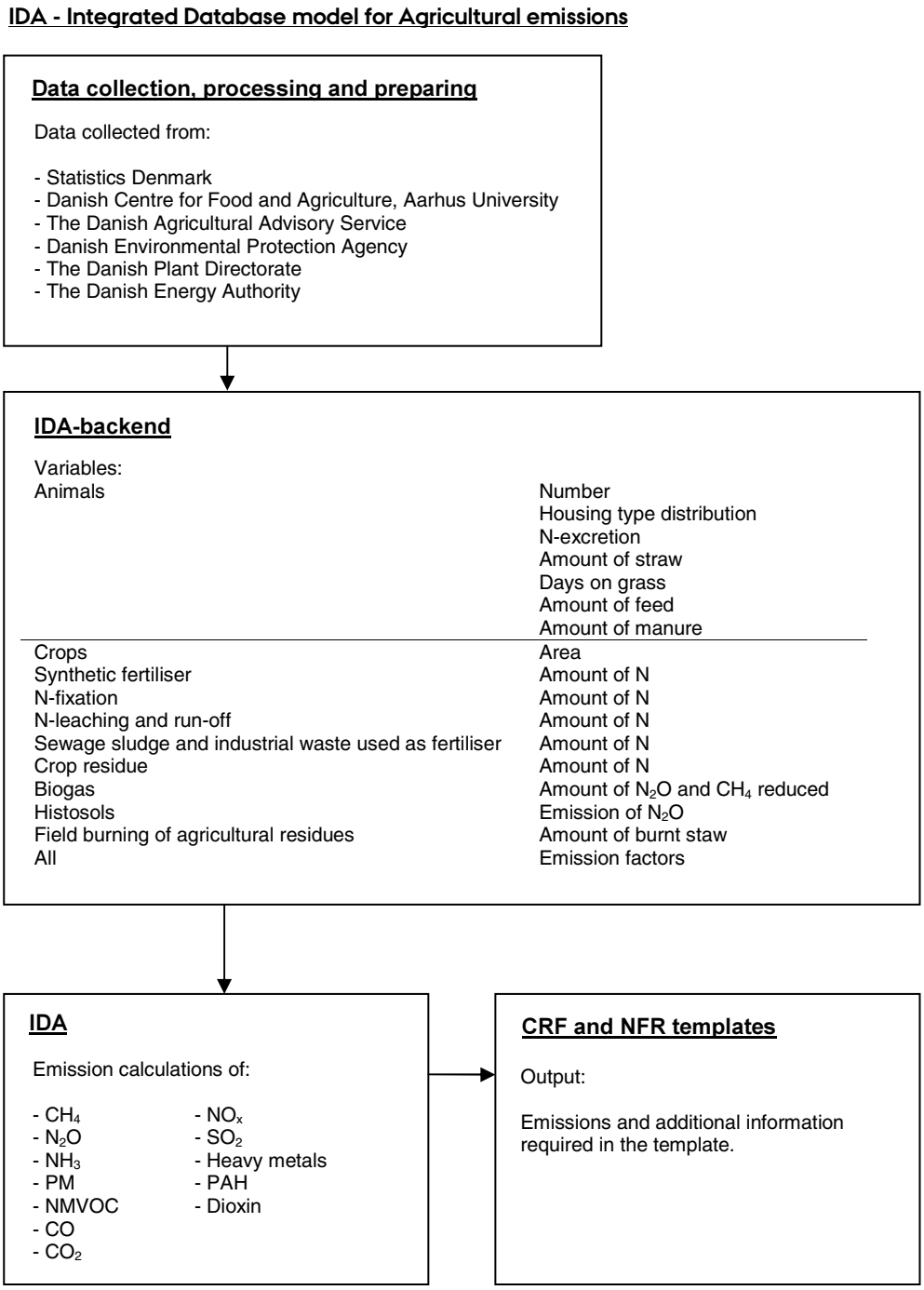

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Figure 6.3 Overview of the data process for calculation of agricultural emissions.

IDA includes 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 the region of 200 different combinations of subcategories and housing type (Table 6.3). The emission is 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
4B 1a	Dairy Cattle[1]	Dairy Cattle	28
4B 1b	Non-dairy Cattle[1]	Calves (<½ yr), heifers, bulls, suckling cattle	96
4B 3	Sheep	including lambs	1
4B 4	Goats	Including kids (meet, dairy and mohair)	3
4B 6	Horses	<300 kg, 300 - 500 kg, 500 - 700 kg, >700 kg	4
4B 8	Swine	Sows, weaners, fattening pigs	26
4B 9	Poultry	Hens, pullet, broilers, turkey, geese, ducks, ostrich, pheasant	28
4B 13	Other	Fur farming, deer	6

[1)] For all subcategories, 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 85% 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 2010. The main part of the emission is related to cattle and pig production, corresponding to 78 %.

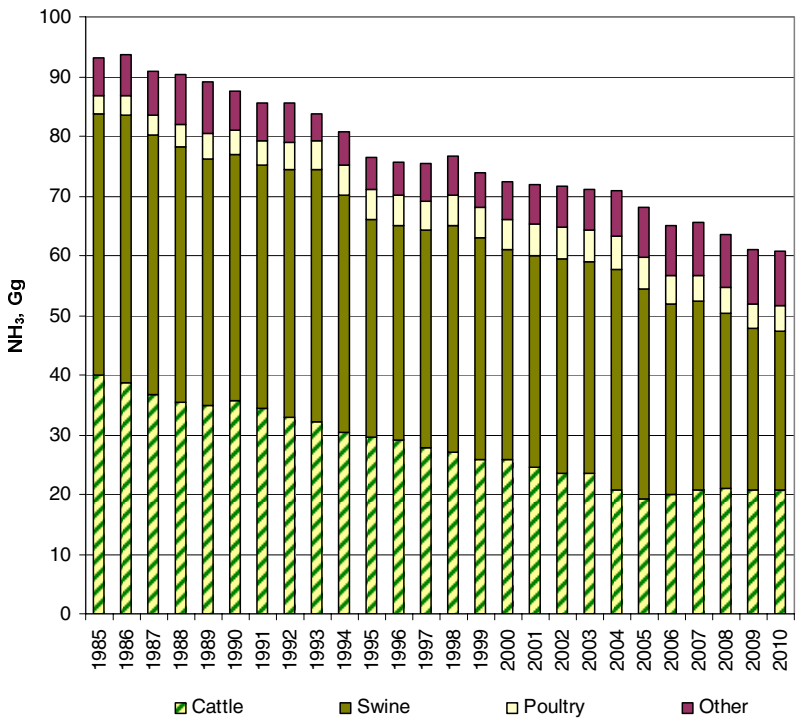

Figure 6.4 NH_3 emission from manure management 1985 to 2010.

6.2.2 Methodological issues

Activity data

Table 6.4 shows the development in livestock production 1990-2010 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 annual Agricultural Statistic can be used directly. However, for pigs, bulls and poultry the number is based on slaughter data also collected from the Agricultural Statistics.

It has to be mentioned that only farms larger than 5 hectares are included in the annual census. Especially horses, goats and sheep are placed on small farms which mean the number of animal given in the Agricultural Statistics is not representative. Therefore, the number of sheep and goats is based on the Central House-animal farm Register (CHR) which is the central register of farms and animal 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 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 pheasant breeding association.

Since 1985, the production of pigs has increased practically. This is contrary to the production of cattle, which has decreased as a result of rising milk yields. Buffalo, camels and llamas, mules and donkeys do not occur in Denmark.

Table 6.4 Livestock production 1985 to 2010 given in AAP, 1000 head - NFR category 4B.

NFR	Animal category	1985	1990	1995	2000	2005	2006	2007	2008	2009	2010
4B 1a	Dairy Cattle	896	753	702	636	564	550	545	558	563	568
4B 1b	Non-dairy cattle	1 721	1 486	1 388	1 232	1 006	984	1 021	1 006	977	1 003
4B 3	Sheep*	40	92	81	112	126	128	124	117	116	111
4B 4	Goats*	8	7	7	8	11	12	13	14	16	16
4B 6	Horses*	140	135	143	150	175	180	185	190	178	165
4B 8	Swine	9 089	9 497	11 084	11 922	13 534	13 361	13 723	12 738	12 369	13 173
4B 9a	Laying hens	5 577	5 696	6 088	4 935	5 168	3 902	4 209	4 973	4 437	5 248
4B 9b	Broilers	8 490	9 802	12 585	16 047	11 905	12 924	11 758	9 737	14 787	12 836
4B 9c	Turkeys	739	571	1 094	1 095	1 238	786	1 010	1 069	1 176	1 185
4B 9d	Other poultry	1 822	1 600	1 563	1 374	1 509	1 543	1 644	1 590	1 350	1 510
4B 13	Other:										
4B 13	Fur farming	1 906	2 264	1 850	2 199	2 552	2 708	2 837	2 810	2 721	2 658
4B 13	Deer	9	10	10	10	10	10	10	10	9	10

*Includes animals on small farms (less than 5 ha), which are not included in Statistics Denmark figures.

Implied emission factor

Table 6.5 shows the implied emission factor for each NFR livestock category from 1990 to 2010. The implied emission factor expresses the average emission of NH_3 per AAP (annual average production) per year. The implied emission factor is changing from year to year depending on a combination of several factors, such as:

- change in number of animal or change in the share of different subcategories,
- change in fodder condition 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).

In Annex 2C1, more detailed information about N-excretion and housing type for some livestock categories, 1985–2010, used in the Danish emission inventory are given. Furthermore, tables show the Danish standards for emission factors used to calculate the NH_3 emission in housings and in relation to storage and application of manure.

For most of the animal categories, the implied emission factor has decreased from 1985 to 2010, which is the result of measures in relation to implementation of the action plans for the aquatic environment and the Ammonia Action Plan. Increasingly strict requirements to improve the utilisation of nitrogen in manure have resulted in reduction of N-excretion, especially for fattening pigs. Changes in manure management in relation to spreading are another important factor which has reduced the emission. Measures include a 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 spreading of manure in winter and, from 1 August 2003, broad spreading is no longer allowed. From 2003 slurry tanks have to be covered with supernatant or safety access cover. From 2006 it is prohibited to treat straw with NH_3 but in 2010 an exemption has been given due to wet weather.

Table 6.5 Implied emission factor, manure management 1985 to 2010, kg NH_3 pr AAP pr yr (NFR category 4B).

NFR	Animal category	1985	1990	1995	2000	2005	2006	2007	2008	2009	2010
4b 1a	Dairy cattle	30.94	33.36	29.87	28.46	24.98	26.00	26.14	26.03	25.17	25.95
4b 1b	Non-dairy cattle	7.13	7.05	6.16	6.25	5.19	5.68	6.40	6.44	6.61	6.08
4B 3	Sheep	1.93	1.85	1.88	1.45	1.44	1.44	1.32	1.32	1.32	1.32
4B 4	Goats	1.93	1.85	1.88	1.45	1.35	1.34	1.22	1.28	1.28	1.28
4B 6	Horses	7.62	7.10	6.32	6.27	6.23	6.20	5.71	5.71	5.71	5.71
4B 8	Swine	4.83	4.34	3.29	2.96	2.60	2.40	2.31	2.30	2.20	2.01
4B 9a	Laying hens	0.21	0.26	0.30	0.32	0.39	0.45	0.39	0.35	0.36	0.31
4B 9b	Broilers	0.18	0.24	0.21	0.19	0.24	0.20	0.19	0.23	0.15	0.17
4B 9c	Turkeys	0.57	0.59	0.74	0.72	0.71	0.72	0.61	0.61	0.61	0.61
4B 9d	Other poultry	0.12	0.11	0.16	0.12	0.09	0.10	0.04	0.04	0.04	0.03
4B 13	Other	2.62	2.44	2.32	2.34	2.69	2.61	2.66	2.72	2.89	3.00

Time series

The NH_3 emission from manure management is estimated to 60.64 Gg NH_3 in 2010 (table 6.6). From 1985 to 2010, the emission is reduced by 35 %. As mentioned in section 6.1.1 this development is mainly due to an active environmental policy to reduce nitrogen losses from the agricultural production.

The number of cattle has decreased as a result of a growth in milk yield. In 2010, cattle production contributes with 34 % of the total emission from manure management. The pig production contributes in 2010 with 44 % of the total emission from manure management. 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 measures focused on the biological development and improvement in fodder efficiency.

Table 6.6 Emission of NH_3 from manure 1985 to 2010, Gg NH_3.

NFR	Animal category	1985	1990	1995	2000	2005	2006	2007	2008	2009	2010
4b 1a	Dairy cattle	27.73	25.13	20.98	18.09	14.10	14.31	14.26	14.52	14.18	14.74
4b 1b	Non-dairy cattle	12.27	10.47	8.55	7.70	5.22	5.59	6.53	6.48	6.46	6.10
4B 3	Sheep	0.08	0.17	0.15	0.16	0.18	0.18	0.16	0.16	0.15	0.15
4B 4	Goats	0.02	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.02
4B 6	Horses	1.07	0.96	0.90	0.94	1.09	1.12	1.06	1.08	1.01	0.94
4B 8	Swine	43.88	41.25	36.45	35.28	35.15	32.03	31.72	29.33	27.19	26.47
4B 9a	Laying hens	1.15	1.49	1.82	1.56	2.02	1.76	1.63	1.75	1.59	1.65
4B 9b	Broilers	1.49	2.32	2.67	3.07	2.87	2.58	2.26	2.22	2.15	2.21
4B 9c	Turkeys	0.18	0.14	0.34	0.33	0.37	0.24	0.26	0.27	0.30	0.30
4B 9d	Other poultry	0.22	0.18	0.25	0.16	0.14	0.15	0.06	0.06	0.05	0.05
4B 13	Other	5.02	5.56	4.32	5.17	6.90	7.10	7.58	7.66	7.89	8.01
Manure Management											
- total emission		93.09	87.68	76.45	72.46	68.05	65.07	65.53	63.56	60.99	60.64

Figure 6.5 shows the percentage distribution of the NH_3 emission in housings, storage and spreading of manure in fields. The main part of the reduction in NH_3 emission has taken place in connection with the spreading of manure in fields, due to changes in manure application practice. There has been a reduction in emissions in relation to storage as a result of improved covering of slurry tanks. From 1985 to 2010, the emission relating to manure management in housings increased from 38 % to 56 %. In future, the possibilities for NH_3 reduction will be likely to be focused on measurements in housings.

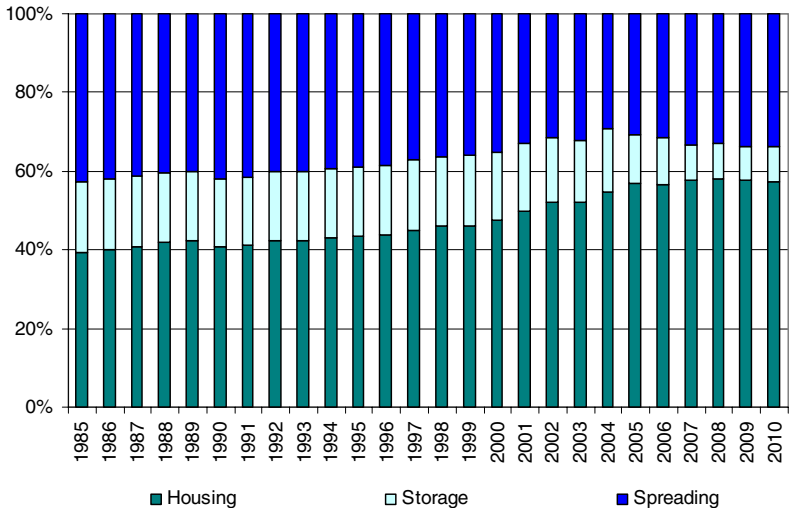

Figure 6.5 The percentage distribution of the NH_3 emission in the agricultural production 1985 to 2010.

6.3 NH_3 emission from agricultural soils – NFR 4.D

6.3.1 Description

NH_3 emission from agricultural soils contributes with 8 % of the total emission from the agricultural sector and includes emission from use of synthetic fertiliser and emission from nitrogen deposited by grazing animals. In 2010 approximately 65 % of the emission from agricultural soils originates from synthetic fertiliser.

6.3.2 Methodological issues

More detailed description covering the calculation of the emission sources and information about activity data and emission factors used is given in annex 2C2.

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 forest, semi-natural, road and built-up areas and this development is expected to continue. Table 6.7 shows the activity data used in calculation of the NH_3 emission from agricultural soils. The amount of nitrogen used in synthetic fertiliser is based on information from the Danish Plant Directorate. The use of fertiliser has decreased considerably – consumption in 2010 is almost half that in 1985. The increase of fertiliser from 2007 to 2008 can mainly be explained by expectations of rising prices and cultivation of fallow fields, which also can explain the decrease in 2009.

Table 6.7 Activity data used to estimate the NH_3 emission from agricultural soils 1985 to 2010.

NFR 4.D											
Activity data	Unit	1985	1990	1995	2000	2005	2006	2007	2008	2009	2010
N in fertiliser	M kg N	398	400	316	251	206	192	195	220	200	190
N deposit on grass	M kg N	37	34	36	34	26	25	23	23	22	22

Implied emission factor

The implied emission factors, 1990-2010, in relation to agricultural soils are given in table 6.8.

The implied emission factors relating to use of synthetic fertiliser depend on consumption and type of fertiliser and remain almost the same for all years. The implied emission factors for grazing animals remain unaltered.

Table 6.8 Implied emission factors used to estimate the NH_3 emission from agricultural soils.

NFR 4.D											
Source	Unit	1985	1990	1995	2000	2005	2006	2007	2008	2009	2010
Fertiliser	% of total N	1.3	1.4	1.4	1.3	1.2	1.4	1.4	1.4	1.5	1.5
N grass	% of total N	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0

6.3.3 Time series

From 1985 to 2010 the NH_3 emission from agricultural soils decreased from 9.59 Gg NH_3 to 5.32 Gg NH_3, which corresponds to a 45 % reduction (Table 6.9). A considerable decrease in the use of fertiliser has, in particular, been important for this development.

As mentioned, there has been an active effort in recent decades to reduce nitrogen leaching by means of action plans. This focus on environmental impact in agricultural production has led to an improvement in the utilisation of nitrogen in manure. A consequence of this development is that the use of fertiliser and, in turn, the NH_3 emission has been reduced.

Table 6.9 Emission of NH_3 from Agricultural Soils from 1985 to 2010, Gg NH_3.

NFR 4.D											
Agricultural Soils	1985	1990	1995	2000	2005	2006	2007	2008	2009	2010
Use of fertiliser	6.46	6.59	5.55	3.85	3.12	3.28	3.42	3.65	3.67	3.47
N excretion on pasture	3.13	2.92	3.03	2.92	2.21	2.09	1.99	1.99	1.91	1.85
Emission - total	9.59	9.51	8.58	6.77	5.33	5.37	5.41	5.64	5.57	5.32

6.4 NH_3 emission from agriculture other – NFR 4.G

6.4.1 Description

Emissions reported in NFR table 4G include three emissions sources; emission from growing crops, sewage sludge used as fertilizer and NH_3 treated straw. NH_3 emission from these sources contributes in 2010 with 8 % of the total emission from the agricultural sector and the most important ones are emission from growing crops.

6.4.2 Methodological issues

More detailed description covering activity data and emission factors used for crops and NH_3 treated straw is given in Annex 2C3.

Activity data – sewage sludge

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 Protection Agency. The activity data is given in Table 6.10. The amount of sewage sludge has increased from 1985 until 1995. In the following years to 2010 the trend is a fall in amount of sludge used as fertiliser as a result of increasing request from the industrial sector. The sludge is used in industrial process, e.g. in the cement production and production of sandblasting material.

Table 6.10 Activity data used to estimate the NH_3 emission from agriculture other 1985 to 2010.

NFR 4.G											
Activity data	Unit	1985	1990	1995	2000	2005	2006	2007	2008	2009	2010
Crops											
Cultivated area	1000 ha	2 834	2 788	2 726	2 647	2 707	2 711	2 663	2 668	2 626	2 646
Sewage sludge											
Amount of sludge applied on soil	Tonnes of dry matter	50 000	77 883	112 235	83 727	45 738	45 427	45 623	50 401	62 709	60 000
N-content	Percent	4.00	4.00	4.13	4.33	4.75	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	2 158	2 167	2 394	2 979	2 850
NH_3 treated straw	Tonnes NH_3-N	8 285	12 912	8 406	3 125	329	0	0	0	0	300

Implied emission factor

The implied emission factors relating to crops are expressed as total emission divided by total area under cultivation, and are decreasing due to the growth in set-a-side area. The implied emission factors for sewage sludge and NH_3 used for straw treatment remain unaltered.

Table 6.11 Implied emission factors used to estimate the NH_3 emission from agriculture other.

NFR 4.G											
Source	Unit	1985	1990	1995	2000	2005	2006	2007	2008	2009	2010
Crops	kg NH_3-N pr hectare	1.7	1.7	1.6	1.6	1.6	1.6	1.6	1.7	1.7	1.7
Sewage sludge	kg NH_3-N pr kg N	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
NH_3 treated straw	% of total NH_3-N	65	65	65	65	65	65	65	65	65	65

6.4.3 Time series

From 1985 to 2010 the NH_3 emission from agriculture other decreased from 12.56 Gg NH_3 to 5.71 Gg NH_3, which corresponds to a 55 % reduction (table 6.12). The decrease is mainly due to a decrease of NH_3 used for treatment of straw. NH_3 treatment was prohibited by law in 2006 but in 2010 an exemption were given due to wet weather.

Table 6.12 Emission of NH_3 from agriculture other 1985 to 2010, Gg NH_3.

NFR 4.G	1985	1990	1995	2000	2005	2006	2007	2008	2009	2010
Crops	5.97	5.92	5.28	5.21	5.34	5.34	5.26	5.41	5.41	5.41
Sewage sludge	0.05	0.07	0.11	0.08	0.05	0.05	0.05	0.05	0.07	0.06
NH_3 treated straw	6.54	10.19	6.63	2.47	0.26	0.00	0.00	0.00	0.00	0.24
Emission - total	12.56	16.18	12.02	7.76	5.65	5.39	5.31	5.47	5.48	5.71

6.5 PM emission from housings – NFR 4.B

This chapter only describes the PM emission related to the animal production. The calculation of PM emission in connection to filed 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 since the particles are able to carry bacteria, viruses and other organic compounds. Presently, only the emission from 2000 to 2010 is given in NFR.

In 2010 the PM emission from housings, given in TSP, is estimated to 11.35 Gg. Of this, 80 % relates to swine production. The emission from cattle and poultry contributes with 11 % and 9 %, respectively and the remainder less than 1 %.

6.5.2 Methodological issues

The estimation of PM emission is based on the EMEP/EEA guidebook Chapter B1010, where the scientific data mainly is 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 operates with PM emission from cattle, swine, poultry, horses, sheep and goats (Table 6.13). Some animal categories are divided into subcategories and for each category it is distinguished between solid and slurry based housing systems.

The PM emission is related to the number of annual average population (AAP) and to the time the animal is housed. The PM emission from grazing animals is considered as negligible.

Table 6.13 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 piglets 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 is based on Statistics Denmark, Agricultural Statistics (www.dst.dk) – Table 6.14.

Table 6.14 Livestock production 2000 – 2010, 1000 head AAP (Annual average production).

NFR	Animal category	2000	2005	2006	2007	2008	2008	2010
4B 1a	Dairy Cattle	636	564	550	545	558	563	568
4B 1b	Non-dairy cattle	1 232	1 006	984	1 021	1 006	977	1 003
4B 3	Sheep	112	126	128	124	117	116	111
4B 4	Goats	8	11	12	13	14	16	16
4B 6	Horses	150	175	180	185	190	178	165
4B 8	Swine	11 922	13 534	13 361	13 723	12 738	12 369	13 173
4B 9a	Laying hens	4 935	5 168	3 902	4 209	4 973	4 437	5 248
4B 9b	Broilers	16 047	11 905	12 924	11 758	9 737	14 787	12 836
4B 9c	Turkeys	1 095	1 238	786	1 010	1 069	1 176	1 185
4B 9d	Other poultry	1 374	1 509	1 543	1 644	1 590	1 350	1 510

Emission factor

Emission factor for TSP, PM_{10} and $PM_{2.5}$ is based on the EMEP/EEA guidebook (EMEP/EEA, 2009). However, calves and weaners are not included and therefore guidebook 2005 is used. Emission factors for sheep and goats are based on Fontelle et al., 2009. The same emissions factors are used for all years.

In Takai et al. (1998), dust emission from housings is 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. T., 2002). Estimation of TSP is based on the transformation factors for the conversion of inhalable dust into PM_{10} given in inventory guidebook 2005 table B3 in appendix B.

Table 6.15 Emission factor for particle emission from animal housing system.

Livestock category	Housing system	Emission factor PM_{10} kg pr AAP pr yr	$PM_{2.5}$ kg pr AAP pr yr	TSP kg pr AAP pr yr	Transformation factor PM_{10} to TSP kg pr AAP pr yr
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, pechery	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 Time series

Table 6.16 shows the PM emission, given in TSP, PM_{10} and $PM_{2.5}$ for each animal category in the period 2000 to 2010. It is seen that the main part of the emission originates from swine housings. In the period 2000 to 2010, 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 6.16 PM emission from housings 2000 - 2010, Gg PM_{10}, $PM_{2.5}$ and TSP.

	Gg TSP	2000	2005	2006	2007	2008	2009	2010
NFR	Animal Category							
4B 1a	Dairy	0.72	0.72	0.72	0.74	0.72	0.73	0.73
4B 1b	Non-dairy	0.76	0.77	0.73	0.45	0.44	0.42	0.43
4B 3	Sheep	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4B 4	Goats	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4B 6	Horses	0.03	0.03	0.03	0.03	0.03	0.03	0.04
4B 8	Swine	8.47	8.93	9.00	9.13	9.34	9.53	9.37
4B 9a	Laying hens	0.29	0.26	0.25	0.28	0.26	0.32	0.20
4B 9b	Broilers	0.83	0.81	0.79	0.63	0.59	0.62	0.67
4B 9c	Turkeys	0.01	0.01	0.01	0.01	0.01	0.02	0.01
4B 9d	Other poultry	0.01	0.01	0.01	0.01	0.01	0.01	0.01
4B 13	Other	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	TSP total	11.13	11.56	11.55	11.29	11.41	11.69	11.46
	Gg PM_{10}	2000	2005	2006	2007	2008	2009	2010
NFR	Animal Category							
4B 1a	Dairy	0.33	0.33	0.33	0.34	0.33	0.34	0.34
4B 1b	Non-dairy	0.35	0.36	0.33	0.21	0.20	0.19	0.20
4B 3	Sheep	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4B 4	Goats	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4B 6	Horses	0.01	0.01	0.01	0.01	0.02	0.02	0.02
4B 8	Swine	3.81	4.02	4.05	4.11	4.20	4.29	4.22
4B 9a	Laying hens	0.29	0.26	0.25	0.28	0.26	0.32	0.20
4B 9b	Broilers	0.83	0.81	0.79	0.63	0.59	0.62	0.67
4B 9c	Turkeys	0.01	0.01	0.01	0.01	0.01	0.02	0.01
4B 9d	Other poultry	0.01	0.01	0.01	0.01	0.01	0.01	0.01
4B 13	Other	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	PM_{10} total	5.65	5.82	5.80	5.61	5.62	5.80	5.66
	Gg $PM_{2.5}$	2000	2005	2006	2007	2008	2009	2010
NFR	Animal Category							
4B 1a	Dairy	0.21	0.21	0.21	0.22	0.21	0.22	0.22
4B 1b	Non-dairy	0.22	0.23	0.21	0.13	0.13	0.12	0.13
4B 3	Sheep	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4B 4	Goats	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4B 6	Horses	0.01	0.01	0.01	0.01	0.01	0.01	0.01
4B 8	Swine	0.62	0.66	0.66	0.67	0.69	0.70	0.69
4B 9a	Laying hens	0.05	0.05	0.05	0.05	0.05	0.06	0.04
4B 9b	Broilers	0.11	0.11	0.10	0.08	0.08	0.08	0.09
4B 9c	Turkeys	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4B 9d	Other poultry	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4B 13	Other	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	$PM_{2.5}$ total	1.24	1.27	1.25	1.17	1.17	1.20	1.17

6.6 Field burning of agricultural wastes – NFR 4F

Field burning of agricultural wastes has in Denmark been prohibited since 1990 and may only take place in connection to 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 20 - 15 % of the total amount produced. The amount of burnt bales of or wet straw is estimated as 0.1 % of total amount of straw. Both estimates are based on an expert judgement by the Danish Agricultural Advisory Service. The total amounts are based on data from Statistics Denmark. An EMEP

EEA guidebook (EMEP/EEA, 2009) default value for the emission factors for field burning of agricultural wastes is used.

Emissions of NH_3, NO_x, CO, NMVOC, SO_2, PM, heavy metals, dioxin and PAH is included under the NFR category 4F. The emission of NH_3 from field burning contributes in 2010 with less than 1 % of the agricultural emission. Emissions of PM and NMVOC from field burning contributes with 2 % TSP, 4 % PM_{10}, 14 % $PM_{2.5}$ 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 PAH contribute with around 2 % of the national emission. From 1989 to 1990 decreases all emissions significantly due to the prohibition, see annex 2C.4.

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, see chapter 6.6. Activity data is obtained from Statistics Denmark. The emission factor for crops and grassland is for land with arable crops is 393 g NMVOC pr ha and for grassland, 2 120 g NMVOC pr ha (Fenhann & Kilde 1994; Priemé & Christensen 1991).

Table 6.17 Areas and NMVOC emission from agricultural soils 1985 – 2010.

	1985	1990	1995	2000	2005	2006	2007	2008	2009	2010
Arable crops, 1000 ha	2 336	2 322	2 064	2 043	2 086	2 083	2 050	2 107	2 103	2 096
Grassland, 1000 ha	498	466	446	413	446	460	459	490	497	521
NMVOC emission, Gg	1.97	1.90	1.76	1.68	1.77	1.79	1.78	1.87	1.88	1.93

6.8 Uncertainties

Table 6.18 shows the estimated uncertainties for the pollutants.

6.8.1 NH_3

4B Manure management

Uncertainties regarding animal production, such as number of animals, feeding consumption, normative figures etc. are low. Number of the most important animal 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 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, 2011) 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, therefore, relates to the emission factors.

4D1a Synthetic N-fertilizers

The activity data for the emission from synthetic fertiliser is the amount of sold fertiliser given by the Danish Plant Directorate. Uncertainty for this is considered to be low. The uncertainty for the emission factors is based on expert judgement.

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 %.

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. For the uncertainty of the emission factor for the three sources a high uncertainty is seen for crops and NH_3 treated straw, while it for sewage sludge is lower. For both activity and emission factor an overall uncertainty is estimated.

6.8.2 PM

Previously the uncertainties for the PM emission factors have been considered to be very high and especially for manure management. The uncertainty estimates regarding the PM emission factors for is based on 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. The uncertainty for the emission factors is based on expert judgment and is consider being very high. 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 PAH 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 6.18 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	2.17	25	100	103	103
NMVOC, Gg	4.F Field burning	0.23	25	100	103	446
NMVOC, Gg	4 G Agriculture other	1.93	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	60.64	10	20	22	19
NH_3, Gg	4 D 1 a Synthetic N-fertilizers	3.47	3	25	25	
NH_3, Gg	4 D 2 c N-excretion on pasture range and paddock	1.85	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	2	300	300	295
TSP, Gg	4.F Field burning	0.21	25	50	56	
PM_{10}, Gg	4.B Animal husbandry and manure management	57	2	300	300	299
PM_{10}, Gg	4.F Field burning	0.21	25	50	0	
$PM_{2.5}$, Gg	4.B Animal husbandry and manure management	12	2	300	300	295
$PM_{2.5}$, 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 still under development, but some measures have been formulated as general lines for the further work. 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 in the inventory, certain time series have been prepared for both the activity data, the emission factors and implied emission

factors, 1985 - 2009. Considerable variation between years can reveal miscalculations or changes in methods. These variations are checked and errors have been rectified. There have been some problems related to the implementation of the new database system IDA – especially in connection to the data of nitrogen. Now a quality check procedure are provided which include annually check for all activity data, emission factor and implied emission factors.

Activity data and emission factors are collected and discussed in cooperation with specialists and researchers at different institutes and research sections. 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 2010 - submitted under the United Nations Framework Convention on Climate Change. (http://www.dmu.dk/Pub/FR784.pdf).

6.10 Recalculations

Compared with the previous NH_3 and PM emissions inventory (submission 2011), some changes and updates have been made. These changes cause a decrease in the NH_3 emission (1985 – 2009) and a decrease in the PM emission (2000 – 2009), see Table 6.19.

Emission of NH_3 has decreased 1-3% in the period 1985-2009 compared to the submission 2011. The main reason for the decrease is an adjustment of emission factors for synthetic fertilisers. The emission factors have been updated in cooperation with the Danish Plant Directorate.

The PM emission decreases because a technical error in the calculation of PM from animal husbandry has been corrected.

Table 6.19 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	2006	2007	2008	2009
Previous	119.31	115.98	99.22	88.92	80.15	77.10	76.38	74.94	73.83
Updated	116.78	113.45	97.14	87.11	79.16	75.96	76.36	74.78	72.16
Difference, %	-2.1	-2.2	-2.1	-2.0	-1.2	-1.5	0.0	-0.2	-2.3

PM emission, Gg TSP	2000	2005	2006	2007	2008	2009
Previous	12.50	12.83	12.58	12.38	11.46	11.26
Updated	11.13	11.69	11.46	11.72	10.93	10.79
Difference, %	-10.9	-8.9	-8.9	-5.3	-4.6	-4.1

There have been no changes in the methodology.

In the following some further changes are mentioned, which has minor influence on the total emissions:

The calculation of number of produced bulls has been changed to being based on slaughtering data from DSt instead of annually census. An error in the calculation of number of weaners and fattening pigs has been corrected. Further more have the time series of the distribution of animals on deferent housings types been reviewed by experts. These changes in activity data have influence on both NH_3 and PM emissions.

The emission of NMVOC from crops has been recalculated for 2009 because of new data for agricultural land from DSt.

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. However, very little housings have implemented NH_3 reduction technologies, although these probably will be an important issue in future. When data is available, it is planned to implement the reduction effect 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 DK has noticed that ERT strongly encourage making further efforts to include it.

The QA/QC plan for the agricultural sector is still under development. The first step will focus on improvement of the procedure of internal quality check of both data input and output. It is planned to provide a check list of all activity data, emission factor, implied emission factor and other important key parameters. The annual change for each emission source on activity will be checked for significant differences and if necessary explained. Next step includes 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. The third step is to consider how to provide a quality assurance procedure for the entire inventory.

6.12 References

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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 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 waste disposal are emissions of greenhouse gases. It is assumed that waste disposal 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 no emission factors are available.

For the 2012 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 Waste-water handling

According to the EMEP/EEA Guidebook waste-water 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 waste-water handling. The EMEP/EEA Guidebook contains a default NMVOC emission factor for latrines and waste-water handling, however due to limited resources it has not been possible to estimate the emissions.

7.3 Waste incineration

Incineration of municipal, industrial and clinical waste take 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 combustions, 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

There are 31 crematoria in Denmark, some with multiple furnaces, 21 facilities are run by the church and 10 by the local authorities (DKL, 2011, Kirkeministeriet, 2006).

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 cremation facilities are therefore performing controlled incinerations with a good burn-out of the gases, and a low production of pollutants. But only a few crematoria are equipped with flue gas cleaning (bag filters with activated carbon).

Following the development of new technology, the emission limits for crematoria were lowered again in 1/2011. These new standard terms were originally expected from 1/2009 but have been postponed two years for existing crematoria. Table 7.2 shows a comparison of the emission limits from 2/1993 and the new standard limits.

Table 7.2 Emission limit values mg pr 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

The use of air pollution control devices, and activated carbon, for the removal of Hg is expected to 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 nationally deceased persons (Statistics Denmark, 2011), number of cremations and the development in the fraction of cremated corpses from the total number of deceased (DKL, 2011). Annex 2D Table 2D-1 presents data for the entire time series.

Table 7.3 Data human cremations (DKL 2011, Statistics Denmark 2011).

	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

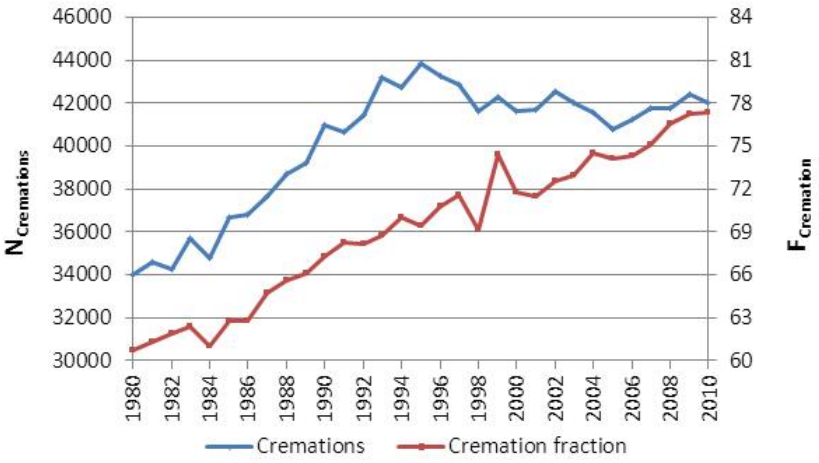

Figure 7.1 Illustration of the development in cremations (DKL 2011), where the number of cremations, $N_{cremations}$, is shown at the left Y-axis. The cremation percentage, $F_{cremations}$, shows the percentage of cremated deceased of the total number of deceased for the years 1984 to 2010. Data for 1980-1983 are estimated values, for details on the estimation, see Annex 2D-1.

Even though the total number of yearly cremations is fluctuating, the cremation percentage has been steadily increasing since 1984, and is likely to continue to increase.

The average body weight of cremated corpses is assumed to be 65 kg.

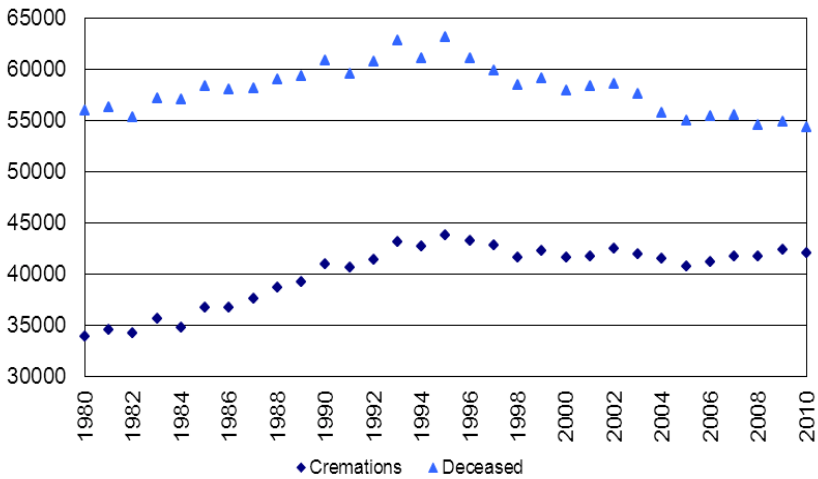

Figure 7.2 Trends of the activity data for cremation of human bodies and the national number of deceased persons.

Figure 7.2 presents the trend of the national 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 77 % in 2010; 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 measurements available of the yearly emission from Danish crematoria, the estimation of emis-

sions 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	g/body	54.4	US-EPA
NO_X	g/body	308.5	US-EPA
NMVOC	g/body	13.0	CANA, 1993
CO	g/body	10.8	Schleicher et al., 2001
NH_3		NA	
TSP	g/body	43.5	WEBFIRE
PM_{10}	g/body	39.2	WEBFIRE
$PM_{2.5}$	g/body	39.2	WEBFIRE
As	µg/body	10.98	US-EPA
Cd	µg/body	3.11	US-EPA
Cr	µg/body	8.44	US-EPA
Cu	µg/body	7.71	US-EPA
Hg	g/body	1.12	Kriegbaum et al.
Ni	µg/body	10.8	US-EPA
Pb	µg/body	18.6	US-EPA
Se	g/body	0.0223	WEBFIRE
Zn	g/body	0.181	WEBFIRE
HCB	µg/body	151.6	Eisaku TODA
PCDD/F	µg I-TEQ/body**	0.950	Henriksen et al.
Flouranthene	µg/body	0.059	US-EPA
Benzo(b)flouranthene	µg/body	8.14	WEBFIRE
Benzo(k)flouranthene	µg/body	7.27	WEBFIRE
Benzo(a)pyrene	µg/body	0.010	US-EPA
Benzo(g,h,i)perylene	µg/body	14.9	WEBFIRE
Indeno(1,2,3-c-d)pyrene	µg/body	7.88	WEBFIRE
PCB	µg/body	413.5	Eisaku TODA

*NA = not available.

** I-TEQ: International Toxicity Equivalents.

Danish measurements of dioxin emissions from three furnaces in two different crematoria in 2001 showed concentration ranges of 0.2 – 0.7 ng I-TEQ per m^3 (n.t.10 % O_2) and emission factor in the range of 180 - 930 ng I-TEQ per cremation. The calculated average emission factor is 350 ng I-TEQ per cremation, and the average concentration is 0.3 ng I-TEQ per m^3 (n.t.10 %O_2). The measurements are assumed representative for all Danish crematory furnaces (Schleicher & Gram, 2008).

A Danish substance flow analysis from 2003 estimated the dioxin emission factor from crematoria to be in the range of 6-70 mg I-TEQ per year (90 % confidence level), with an average value of 950 ng I-TEQ per cremation (Henriksen et al., 2006). The estimate from Henriksen et al. (2006) is the based on the latest dated measurements and is the one chosen for this inventory.

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.

For the compounds Se, PCB, HCB, benzo(b)- and (k)-flouranthene, benzo(g,h,i)perylene and indeno(1,2,3-c-d)pyrene, it has not been possible to find any additional data to validate the emission factors. Only in the case of PCB, Thomsen et al. (2009) provides an emission factor for PCB of 0.4 mg per tonnes and assuming a body mass of 70 kg this gives an emission factor of 28 µg per body. The Japanese reference Eisaku TODA (2006) may be overestimated due to differences in sources to the total exposure in Japan and in Denmark and due to a higher technological development and use of air pollution devices. Still, the Japanese emission factor was selected in the inventory of this year as this data source represents refers to real measurements.

For the compounds As, Cd, Cr, Cu, Ni, benzo(a)pyrene and flouranthene, the emission factors from US EPA 1996 were compared with data found in the database provided by US EPA (WEBFIRE, 1992). The two data sources present emission factors that differ significantly for these compounds. Since no other data is available, the most resent estimated emission factor is chosen.

In addition to the two US data sources (WEBFIRE and US-EPA, 1996), emission factors for Pb and Zn were found in a scientific paper by Santarsiero et al. (2005) and, for Pb, also in a Swiss report Heldstab et al. (2008). These data corresponds well with the emission factors of the WEBFIRE database, which are therefore applied for Pb and Zn.

Since emission factors are country specific, Danish estimated data is selected whenever available. Ten data sources were found providing emission factors for CO, Hg and PCDD/F and amongst these were data from the Danish EPA and the National Environmental Research Institute (NERI). The selected Danish emission factors were verified by comparability to values provided by the US database WEBFIRE and the Swiss report by Heldstab et al. (2008).

Five data sources to information and estimates of emission factors for SO_2, NO_x and NMVOC showed very similar values. Since none of these data sources are based on Danish estimates, the most common (US-EPA, 1996) and (CANA, 1993) referenced by the EMEP/Corinair Guidebook 2007 are selected.

There are also several data sources to the emission factor of TSP. The WEBFIRE database provides the one referred to in most of the scientific literature, and was therefore selected for this inventory. The particulate matter fractions of PM_{10} and $PM_{2.5}$ are both calculated from TSP, as it is assumed that PM_{10} and $PM_{2.5}$ are 90 % of the total TSP (Fontelle et al., 2008).

Emissions

Tables 7.5 show the total national emissions from selected years. To view the entire time series 1980-2010, 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	1.85	2.00	2.23	2.39	2.27	2.27	2.32	2.29	2.26	2.22
NO_X	Mg	10.48	11.32	12.65	13.53	12.85	12.87	13.12	12.96	12.82	12.57
NMVOC	Mg	0.442	0.477	0.533	0.570	0.541	0.542	0.553	0.546	0.540	0.530
CO	Mg	0.366	0.395	0.441	0.472	0.449	0.449	0.458	0.452	0.448	0.439
TSP	Mg	1.48	1.60	1.78	1.91	1.81	1.81	1.85	1.83	1.81	1.77
PM_{10}	Mg	1.33	1.44	1.61	1.72	1.63	1.63	1.67	1.64	1.63	1.60
$PM_{2.5}$	Mg	1.33	1.44	1.61	1.72	1.63	1.63	1.67	1.64	1.63	1.60
As	g	0.373	0.403	0.450	0.481	0.457	0.458	0.467	0.461	0.456	0.447
Cd	g	0.106	0.114	0.127	0.136	0.129	0.130	0.132	0.130	0.129	0.127
Cr	g	0.287	0.310	0.346	0.370	0.351	0.352	0.359	0.354	0.351	0.344
Cu	g	0.262	0.283	0.316	0.338	0.321	0.322	0.328	0.324	0.320	0.314
Hg	kg	38.0	41.1	45.9	49.1	46.6	46.7	47.6	47.0	46.5	45.6
Ni	g	0.365	0.395	0.441	0.471	0.448	0.448	0.457	0.451	0.447	0.438
Pb	g	0.632	0.683	0.762	0.816	0.775	0.776	0.791	0.781	0.773	0.758
Se	g	758	819	915	979	930	931	949	937	927	910
Zn	kg	6.14	6.67	7.45	7.97	7.57	7.58	7.73	7.63	7.55	7.41
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	32.3	34.9	38.9	41.7	39.6	39.6	40.4	39.9	39.5	38.7
flouranthene	mg	2.0	2.2	2.4	2.6	2.5	2.5	2.5	2.5	2.5	2.4
benzo(b)flouranthene	mg	277	299	334	357	339	339	346	342	338	332
benzo(k)flouranthene	mg	247	267	298	319	303	303	309	305	302	296
benzo(a)pyrene	mg	0.351	0.380	0.424	0.453	0.431	0.431	0.440	0.434	0.430	0.421
benzo(g,h,i)perylene	mg	506	547	611	653	620	621	634	626	619	607
indeno(1,2,3-c-d)pyrene	mg	268	289	323	346	328	329	335	331	328	321
PCB	g	14.1	15.2	17.0	18.1	17.2	17.2	17.6	17.4	17.2	16.9

Continued	Unit	2006	2007	2008	2009	2010
SO_2	Mg	2.24	2.27	2.27	2.31	2.29
NO_X	Mg	12.72	12.88	12.89	13.08	12.97
NMVOC	Mg	0.536	0.543	0.543	0.551	0.547
CO	Mg	0.444	0.450	0.450	0.457	0.453
TSP	Mg	1.79	1.82	1.82	1.85	1.83
PM_{10}	Mg	1.61	1.64	1.64	1.66	1.65
$PM_{2.5}$	Mg	1.61	1.64	1.64	1.66	1.65
As	g	0.453	0.458	0.459	0.466	0.462
Cd	g	0.128	0.130	0.130	0.132	0.131
Cr	g	0.348	0.352	0.353	0.358	0.355
Cu	g	0.318	0.322	0.322	0.327	0.324
Hg	kg	46.1	46.7	46.8	47.5	47.1
Ni	g	0.443	0.449	0.449	0.456	0.452
Pb	g	0.767	0.777	0.777	0.789	0.782
Se	g	920	932	933	946	938
Zn	kg	7.49	7.59	7.59	7.71	7.64
HCB	g	6.25	6.33	6.33	6.43	6.37
PCDD/F	mg	39.2	39.7	39.7	40.3	39.9
flouranthene	mg	2.4	2.5	2.5	2.5	2.5
benzo(b)flouranthene	mg	336	340	340	345	342
benzo(k)flouranthene	mg	300	304	304	308	306
benzo(a)pyrene	mg	0.426	0.432	0.432	0.438	0.435
benzo(g,h,i)perylene	mg	614	622	622	632	626
indeno(1,2,3-c-d)pyrene	mg	325	329	329	334	331
PCB	g	17.1	17.3	17.3	17.5	17.4

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.

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 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 waste, and emission from 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 compounds 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 activ-

[1] Bekendtgørelse no. 162 of March 11 2003 on waste incineration plants.

ity 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 25 years, assumed 1980
C	Kæledyrskrematoriet	2006
D	Kæledyrskrematoriet v. Modtagestation Vendsyssel I/S	-

Crematoria D is situated at the AVV waste incineration site and the emission from this site is, as previously mentioned, included in the yearly inventory from AVV and consequently included under waste incineration in this report. From here on only crematoria A-C are considered.

Table 7.7 lists the activity data for crematoria A, B, C and the total national cremated. 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
Crematorium A, Mg	-	-	-	-	-
Crematorium B, Mg	50	100	150	200	443
Crematorium C, Mg	-	-	-	-	-
Total, Mg	50	100	150	200	443
	2001	2002	2003	2004	2005
Crematorium A, Mg	-	-	-	-	-
Crematorium B, Mg	452	451	462	571	762
Crematorium C, Mg	-	-	-	-	-
Total, Mg	452	451	462	571	762
	2006	2007	2008	2009	2010
Crematorium A, Mg	300	450	450	450	475
Crematorium B, Mg	798	802	848	853	934
Crematorium C, Mg	18	32	40	36	40
Total, Mg	1116	1284	1338	1339	1449

Crematorium B delivered exact yearly activity data for the years 1998-2010. 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 trendline, in this case would become negative from 1993 and back in time.

Statistic data describing the national consumption for pets including food and equipment for pets was evaluated as surrogate data. These statistic 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 en expert judgement. The estimated data are shown in Table 7.7, Figure 7.3 and Annex 2D Table 2D-2.

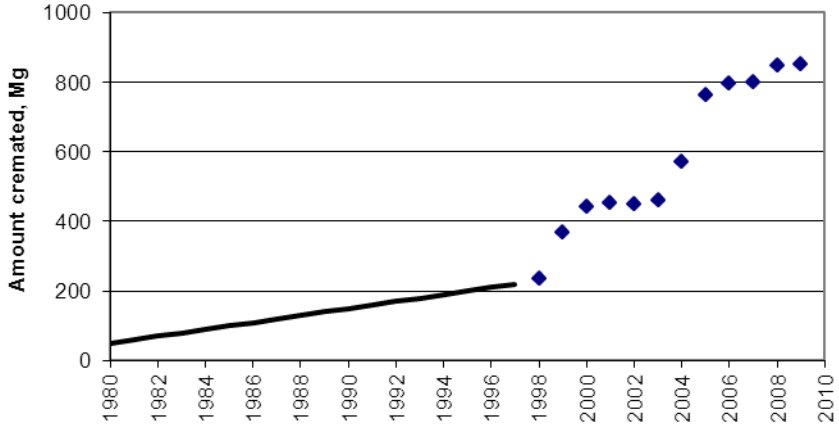

Figure 7.3 The amount of cremated carcasses in Mg at crematorium B, which is the oldest and largest crematorium in Denmark. Data from 1998-2009 are delivered by the crematorium and is considered to be exact; these data are marked as points. Data from 1980-1997 are estimated and are shown as the thick line in the figure.

Emission factors

The Guidebook, 2009 (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 compounds.

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 compounds 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 compliance between the emission factors for animal and human incineration for PCDD/F and a relatively good compliance for NMVOC, TSP, PM_{10} and $PM_{2.5}$. The emission factors given by Chen et al. (2004) for heavy metals are at least a factor 100 larger than those accepted for human cremations with the exception of that of Zn, which is much higher for the incineration of corpses.

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	g	837*	US-EPA
NO_X	g	4 746*	US-EPA
NMVOC	g	2 000	EEA, 2009
CO	g	166*	Schleicher et al., 2001
NH_3	g	1 900	EEA, 2009
TSP	g	2 180	EEA, 2009
PM_{10}	g	1 530	EEA, 2009
$PM_{2.5}$	g	1 310	EEA, 2009
As	mg	0.17*	US-EPA
Cd	mg	10	Chen et al., 2004
Cr	mg	70	Chen et al., 2004
Cu	mg	20	Chen et al., 2004
Hg	-	NAV	-
Ni	mg	60	Chen et al., 2004
Pb	mg	180	Chen et al., 2004
Se	mg	343*	WEBFIRE
Zn	mg	190	Chen et al., 2004
HCB	mg	2.33*	Eisaku TODA
PCDD/F	ng I-TEQ	10 000	EEA, 2009
Flouranthene	mg	0.00091*	US-EPA
Benzo(b)flouranthene	mg	0.125*	WEBFIRE
Benzo(k)flouranthene	mg	0.112*	WEBFIRE
Benzo(a)pyrene	mg	0.00016*	US-EPA
Benzo(g,h,i)perylene	mg	0.229*	WEBFIRE
Indeno(1,2,3-c-d)pyrene	mg	0.121*	WEBFIRE
PCB	mg	6.37*	Eisaku TODA

* Emission factors from human cremations.

Emissions

For the burning of animal carcasses, emissions are calculated by multiplying the amount of incinerated animals by the emission factors.

National emissions are shown in the following Tables 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	0.04	0.08	0.13	0.17	0.37	0.38	0.38	0.39	0.48	0.64
NO_X	Mg	0.24	0.47	0.71	0.95	2.10	2.15	2.14	2.19	2.71	3.62
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	0.08	0.07	0.08	0.09	0.13
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	g	0.01	0.02	0.03	0.03	0.08	0.08	0.08	0.08	0.10	0.13
Cd	g	0.50	1.00	1.50	2.00	4.43	4.52	4.51	4.62	5.71	7.62
Cr	g	3.50	7.00	10.50	14.00	31.04	31.66	31.59	32.31	39.98	53.36
Cu	g	1.00	2.00	3.00	4.00	8.87	9.05	9.02	9.23	11.42	15.25
Ni	g	3.00	6.00	9.00	12.00	26.61	27.14	27.07	27.70	34.27	45.74
Pb	g	9.00	18.00	27.00	36.00	79.82	81.41	81.22	83.09	102.80	137.22
Se	g	17.15	34.30	51.45	68.60	152.09	155.14	154.77	158.33	195.89	261.49
Zn	g	9.50	19.00	28.50	38.00	84.25	85.94	85.73	87.71	108.51	144.85
HCB	g	0.12	0.23	0.35	0.47	1.04	1.06	1.06	1.08	1.34	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
fluoranthene	g	0.05	0.09	0.14	0.18	0.40	0.41	0.41	0.42	0.52	0.69
benzo(b)fluoranthene	g	6.26	12.52	18.78	25.05	55.53	56.64	56.51	57.81	71.52	95.47
benzo(k)fluoranthene	g	5.59	11.18	16.77	22.37	49.59	50.58	50.46	51.62	63.87	85.25
benzo(a)pyrene	g	0.01	0.02	0.02	0.03	0.07	0.07	0.07	0.07	0.09	0.12
benzo(ghi)perylene	g	11.46	22.92	34.38	45.85	101.64	103.68	103.43	105.82	130.92	174.75
indeno(1.2.3.-c.d)pyrene	g	6.06	12.13	18.19	24.26	53.78	54.86	54.72	55.98	69.27	92.46
PCB	g	0.32	0.64	0.96	1.27	2.82	2.88	2.87	2.94	3.64	4.86

Continued	unit	2006	2007	2008	2009	2010
SO_2	Mg	0.93	1.07	1.12	1.12	1.21
NO_X	Mg	5.30	6.09	6.35	6.35	6.88
NMVOC	Mg	2.23	2.57	2.68	2.68	2.90
CO	Mg	0.19	0.21	0.22	0.22	0.24
NH_3	Mg	2.12	2.44	2.54	2.54	2.75
TSP	Mg	2.43	2.80	2.92	2.92	3.16
PM_{10}	Mg	1.71	1.96	2.05	2.05	2.22
$PM_{2.5}$	Mg	1.46	1.68	1.75	1.75	1.90
As	g	0.19	0.22	0.23	0.23	0.25
Cd	g	11.16	12.84	13.38	13.39	14.49
Cr	g	78.14	89.89	93.68	93.72	101.41
Cu	g	22.33	25.68	26.77	26.78	28.97
Ni	g	66.98	77.05	80.30	80.33	86.92
Pb	g	200.94	231.16	240.89	241.00	260.77
Se	g	382.91	440.48	459.04	459.23	496.91
Zn	g	212.11	244.00	254.28	254.39	275.26
HCB	g	2.61	3.01	3.13	3.13	3.39
PCDD/F	mg	11.16	12.84	13.38	13.39	14.49
fluoranthene	g	1.01	1.17	1.22	1.22	1.32
benzo(b)fluoranthene	g	139.80	160.82	167.59	167.67	181.42
benzo(k)fluoranthene	g	124.84	143.61	149.66	149.73	162.01
benzo(a)pyrene	g	0.18	0.20	0.21	0.21	0.23
benzo(ghi)perylene	g	255.90	294.38	306.78	306.91	332.09
indeno(1.2.3.-c.d)pyrene	g	135.39	155.75	162.31	162.38	175.70
PCB	g	7.11	8.18	8.52	8.53	9.23

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 waste water 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 wastes called composting. Pollutants that escape from this treatment 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 low 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 low technology in Denmark this means that temperature, moisture and aeration is 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 Guidelines, 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 (Affaldsstatistik, 2006).

Figure 7.4 illustrates the nationally composted amount of waste divided in the four categories mentioned earlier.

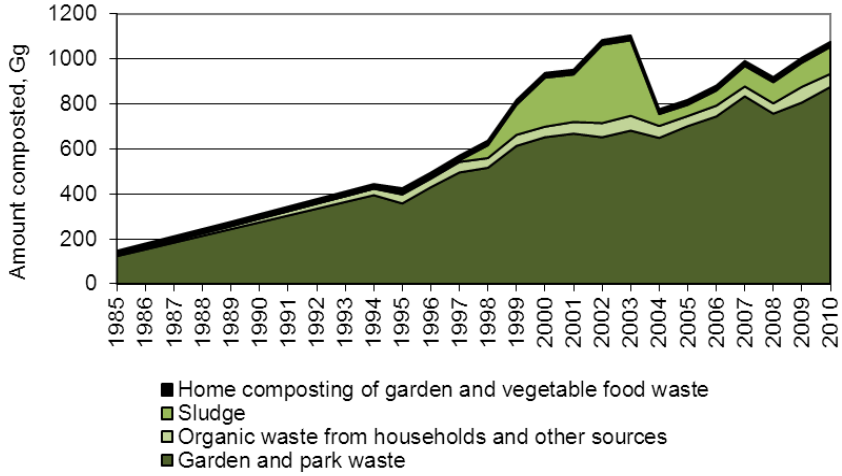

Figure 7.4 National amount of composted waste, these data are also shown in Table 7.11.

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 attended 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.

Activity data for the years 1995-2009 stems from ISAG data for the categories: sludge and organic waste from households and other sources. Activities for 2010 are calculated by using the development trend from earlier years.

The development in composting of sludge does not demonstrate a convincing trend that can be used for estimation of activity data for previous years. Since there is no surrogate data available for the years 1980-1994, activity data for these years are "not available".

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 in "Methodology".

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.

Petersen (2001) and Petersen & Hansen (2003) provides 1997-2001 activity data for the composting of garden and park waste (GPW). Activity data for GPW for the years 1985-1996 and 2002-2010 are estimated from the surrogate data gathered from the waste statistic reports, Affaldsstatistik 2007 & 2008 (and earlier years).

The waste statistics provides the development in composting and wood chipping of GPW for 1995-2009, and by looking at the trend of this development the remaining years 1985-1994 and 2010 are estimated. This data series is used.

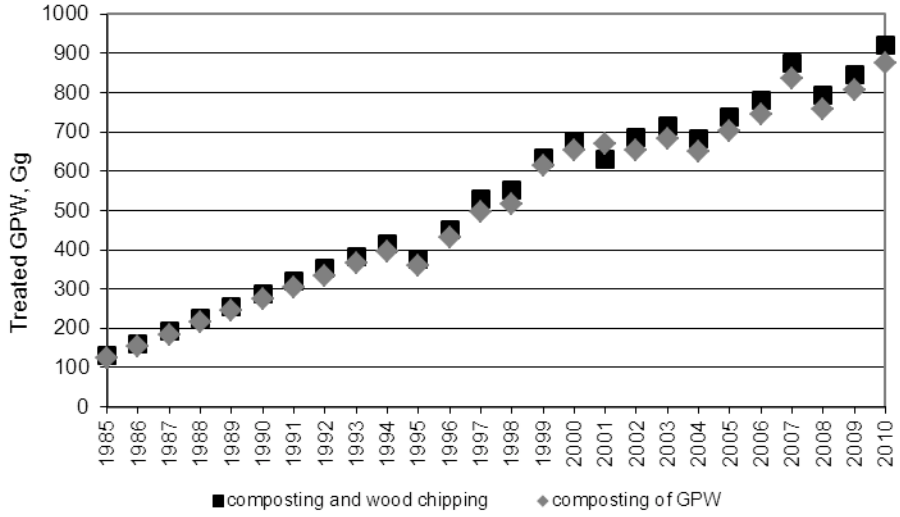

Figure 7.5 Composted amount of GPW.

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 1985-2010.

- 28 % of all residential buildings with private gardens (including weekend cabins) 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, weekend cabins 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	124	274	358	653	669	653	682	650	702
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
Continued	2006	2007	2008	2009	2010				
Composting of garden and park waste	745	835	757	807	877				
Composting of organic waste from households and other sources	48	44	46	70	58				
Composting of sludge	67	91	94	107	120				
Home composting of garden and vegetable food waste	22	22	22	23	23				

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
CO	0.563	NAV	NAV	0.075
NH_3	0.66	0.190	0.022	0.630
Source	Boldrin et al., 2009	Amlinger et al., 2008	Amlinger et al., 2008	Boldrin et al., 2009

Emission factors for composting of GPW waste 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.

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	71.0	155.8	203.0	368.7	377.7	368.7	385.3	367.1	396.6
NH_3	95.1	198.7	262.2	463.7	475.7	471.7	491.9	460.4	492.5

Continued	2006	2007	2008	2009	2010
CO	420.7	471.1	427.7	455.6	494.8
NH_3	522.2	580.7	530.5	571.1	613.6

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 is 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. Emissions that escape 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 separated 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 1989-2010. For the years 2007-2010 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 1989-2010) and the occurrence of building fires (2007-2010) 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

The total number of building fires is quite higher this year than last year. This is due to the addition of additional building fires and container fires in this year's inventory.

The building fires that occurred in the years 2007-2010 are subcategorised into six building types; detached houses, undetached houses, apartment buildings, industrial buildings, additional buildings and container fires.

Table 7.15 states the 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	814	781	897	788	775	751	846	731	759
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					
Container fires	778	979	1004	841	623					
Detached house fires	774	757	886	876	833					
Undetached house fires	230	343	278	208	194					
Apartment building fires	366	405	433	413	348					
Industry building fire	319	435	346	344	281					
Additional building fires	435	483	523	466	429					

The numbers of FSE of the different building categories are lower in this year's submission compared to last year's. This is due to two different changes that were implemented this year. Firstly, the introduction of the additional buildings category means that buildings like e.g. garages and sheds have been moved from detached houses to additional buildings. Secondly, the damage rates have been changed from large, medium and small of respectively 100 %, 50 % and 5 % to full, large, medium and small of respectively 100 %, 75 %, 30 % and 5 %

The amount of detailed activity data is still limited due to the few years of reported data in the ODIN system, during the next years more data will become available providing a better basis for extrapolating back in time.

Emission factors

For building fires, emissions are calculated by multiplying the number of full scale equivalent fires with the emission factors. The estimation of emissions is based on emission factors from literature. The estimation is based on the measurements and estimations performed in countries 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 reliable 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 2010 as the best reliable and their respective references.

Table 7.17 Emission factors building fires, 2010.

Compound	Unit /fire	Detached house	Undetached house	Apartment building	Industrial building	Additional building	Container	Source
SO_2	kg	261.5	214.6	123.5	802.9	32.1	2.4	Blomqvist et.al. 2002
NO_x	kg	19.5	16.0	9.2	24.0	1.0	3.0	NAEI, 2009
NMVOC	kg	97.7	80.2	46.1	120.0	4.8	0.7*	NAEI, 2009
CO	kg	273.6	224.5	129.2	336.0	13.4	42.0	NAEI, 2009
TSP	kg	0.14	0.06	0.04	0.30	0.01	0.02	EEA, 2009
PM_{10}	kg	0.14	0.06	0.04	0.30	0.01	0.02	EEA, 2009
$PM_{2.5}$	kg	0.14	0.06	0.04	0.30	0.01	0.02	EEA, 2009
As	mg	1.40	0.58	0.41	0.25	0.01	0.23	EEA, 2009
Cd	mg	0.85	0.36	0.26	0.16	0.01	0.14	EEA, 2009
Cr	mg	1.30	0.55	0.39	0.24	0.01	0.21	EEA, 2009
Cu	mg	3.00	1.30	0.91	0.57	0.02	0.48	EEA, 2009
Hg	mg	0.85	0.36	0.26	0.16	0.01	0.14	EEA, 2009
Pb	mg	0.42	0.18	0.13	0.08	0.003	0.07	EEA, 2009
PCDD/F	mg	3.4	2.8	1.6	4.2	0.2	1.1*	Hansen, 2000
Flouranthene	g	18.2	15.0	8.6	22.4	0.9	2.8	NAEI, 2009
Benzo[b]fluoranthene	g	12.4	10.2	5.8	15.2	0.6	1.9	NAEI, 2009
Benzo[k]fluoranthene	g	4.4	3.6	2.1	5.4	0.2	0.7	NAEI, 2009
Benzo[a]pyrene	g	7.8	6.4	3.7	9.6	0.4	1.2	NAEI, 2009
Benzo[ghi]perylene	g	8.5	6.9	4.0	10.4	0.4	1.3	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.

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 1980-2009 are shown in Annex 2D Table 2D-9, 2D-10 and 2D-11.

Emission factors from the EMEP/EEA Guidebook (EEA, 2009) are already specified for four of the six building types; detached houses, undetached houses, apartment buildings and industrial buildings. The EMEP/EEA Guidebook and all other considered sources were altered to match the six building types.

This alternation was performed simply by adjusting the average floor space for each of the building types respectively, whereas factors like loss rate and pounds of combustible contents per square foot 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

Statistics Denmark, BOL51 and BOL 511.

Emission factors for container fires cannot de 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.

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 use to a further extent in Sweden and Norway contra Denmark.

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 2010.

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	163	134	77	500	20	-
Building mass per floor area	kg/m^2	40	40	35	30	30	-
Total building mass	Mg/fire	6.5	5.3	2.7	15.0	0.6	1

* 2010 numbers

Emission factors for particulate matter are available from the EMEP/EEA Guidebook (EEA, 2009) (hereafter the Guidebook), EIIP (2001), Claire (1999) and NAEI (2009), giving four emission factors that vary from 0.14-51.4 kg PM per full scale fire of a detached house. The best reliable source in this case is believed to be the Guidebook 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 the Guidebook. Comparing with the 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.

The Guidebook 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 the Guidebook 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 3.05 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. The total PAH emission factor sums the emissions of: benzo(b)flouranthene, benzo(k)flouranthene, benzo(a)pyrene, indeno(1,2,3-c,d)pyrene and benzo(ghi)perylene.

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 compounds there is a good compliance 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 national emissions from building fires. The entire time series 1980-2010 is shown in Annex 2D Table 2D-13.

Table 7.20 National emissions from building fires.

	unit	1980	1985	1990	1995	2000	2001	2002	2003	2004	2005
SO_2	Mg	580.42	581.39	559.3	640.3	565.2	560.3	544.4	615.2	532.2	552.4
NO_x	Mg	32.91	33.07	31.8	36.4	32.2	32.0	31.1	35.2	30.5	31.6
NMVOC	Mg	153.34	153.70	148.1	169.3	149.7	148.9	144.9	163.9	141.9	147.2
CO	Mg	460.67	462.98	445.8	509.9	450.8	447.9	435.7	492.7	426.5	442.5
TSP	Mg	0.27	0.27	0.3	0.3	0.3	0.3	0.2	0.3	0.2	0.2
PM_{10}	Mg	0.27	0.27	0.3	0.3	0.3	0.3	0.2	0.3	0.2	0.2
$PM_{2.5}$	Mg	0.27	0.27	0.3	0.3	0.3	0.3	0.2	0.3	0.2	0.2
As	kg	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
Cd	kg	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Cr	kg	0.002	0.002	0.002	0.002	0.002	0.002	0.001	0.002	0.001	0.001
Cu	kg	0.004	0.004	0.004	0.004	0.004	0.004	0.003	0.004	0.003	0.003
Hg	kg	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Pb	kg	0.001	0.001	0.000	0.001	0.000	0.000	0.000	0.001	0.000	0.000
PCDD/F	g I-TEQ	6.21	6.26	6.0	6.9	6.1	6.0	5.9	6.6	5.8	6.0
Flouranthene	kg	30.71	30.87	29.7	34.0	30.1	29.9	29.0	32.8	28.4	29.5
Benzo(b)fluoranthene	kg	20.84	20.94	20.2	23.1	20.4	20.3	19.7	22.3	19.3	20.0
Benzo(k)fluoranthene	kg	7.35	7.39	7.1	8.1	7.2	7.1	7.0	7.9	6.8	7.1
Benzo(a)pyrene	kg	13.16	13.23	12.7	14.6	12.9	12.8	12.4	14.1	12.2	12.6
Benzo(g,h,i)perylene	kg	14.26	14.33	13.8	15.8	14.0	13.9	13.5	15.3	13.2	13.7
Indeno(1,2,3-cd)pyrene	kg	14.26	14.33	13.8	15.8	14.0	13.9	13.5	15.3	13.2	13.7
Continued	unit	2006	2007	2008	2009	2010					
SO_2	Mg	567.8	683.6	638.4	616.0	543.1					
NO_x	Mg	32.5	37.5	37.3	35.3	31.6					
NMVOC	Mg	151.4	173.5	172.3	164.7	149.1					
CO	Mg	455.2	525.0	522.5	494.7	442.5					
TSP	Mg	0.3	0.3	0.3	0.3	0.2					
PM_{10}	Mg	0.3	0.3	0.3	0.3	0.2					
$PM_{2.5}$	Mg	0.3	0.3	0.3	0.3	0.2					
As	kg	0.002	0.002	0.002	0.002	0.002					
Cd	kg	0.001	0.001	0.001	0.001	0.001					
Cr	kg	0.002	0.002	0.002	0.002	0.002					
Cu	kg	0.004	0.004	0.004	0.004	0.004					
Hg	kg	0.001	0.001	0.001	0.001	0.001					
Pb	kg	0.000	0.001	0.001	0.001	0.000					
PCDD/F	g I-TEQ	6.1	7.1	7.1	6.7	5.9					
Flouranthene	kg	30.3	35.0	34.8	33.0	29.5					
Benzo(b)fluoranthene	kg	20.6	23.8	23.6	22.4	20.0					
Benzo(k)fluoranthene	kg	7.3	8.4	8.3	7.9	7.1					
Benzo(a)pyrene	kg	13.0	15.0	14.9	14.1	12.6					
Benzo(g,h,i)perylene	kg	14.1	16.3	16.2	15.3	13.7					
Indeno(1,2,3-cd)pyrene	kg	14.1	16.3	16.2	15.3	13.7					

7.4.5 Accidental vehicle fires

Emissions that escape 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 number 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 2007-2010; 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

The total number of vehicle fires is higher this year than last year. This is due to the addition of the new vehicle categories of other transport, train, ship, airplane, bicycle, tractor, combined harvester and machine fires in this year's inventory.

There are fourteen different vehicle categories. The activity data is 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 2007-2010 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 2007-2010.

The total number of registered vehicles is known from Statistics Denmark. By assuming that the share of vehicle fires in relation to the total number of registered vehicles, of the 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 1980-2010 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	430	8070	12	99168	10	47428	60
1985	1564449	456	8010	12	147877	14	46962	60
1990	1645587	479	8109	12	192321	19	45664	58
1995	1733405	505	14371	21	228076	22	48077	61
2000	1916686	558	15051	22	272387	26	50227	64
2001	1932741	563	15005	22	283031	27	49885	63
2002	1946353	567	14971	22	295581	29	49208	62
2003	1948967	568	14989	22	309614	30	48653	62
2004	1967643	573	14997	22	336038	32	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	2182235	666	14830	24	398552	44	50528	71
2009	2199453	729	14752	23	383148	48	46510	67
2010	2247021	646	14577	23	362389	38	44812	60

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	192395	68			7284	9	2222	25
1990	164111	58	86257	24	7156	9	2324	26
1995	165313	58	95831	26	6854	8	1911	21
2000	233695	83	106935	29	4907	6	1759	19
2001	243390	86	108924	30	4561	5	1797	20
2002	253731	90	110995	30	4169	5	1878	21
2003	256779	91	113338	31	4048	5	1838	20
2004	263815	93	116930	32	3273	4	1783	20
2005	274264	97	121350	33	3195	4	1792	20
2006	287672	102	126011	35	3002	4	1789	20
2007	302914	99	131708	36	2617	2	1755	20
2008	308546	122	136905	45	2588	3	1728	20
2009	307373	128	140366	34	2489	5	1742	22
2010	301766	83	142354	37	2740	2	1773	16

Table 7.22c Number of nationally registered vehicles and full scale equivalent vehicle fires.

	Airplane		Tractor		Combined Harvester		Bicycle	Other Transport	Machine
	Registered	FSE fires	Registered	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

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 2011). The corresponding weights from 1980 to 1992 and the average weight of the units from the remaining categories are estimated by an 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

It is assumed that the average weight of a bus equals that of a ship. That vans and tractors weigh the same and that trucks have the same average weight as trains, airplanes and combined harvesters.

Bicycles, machines and other transport can only be calculated for the years 2007-2010 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 1990-2010, 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	570	581	590	603	626
Buses	116	115	117	223	242	244	245	247	249	251
Light duty vehicles	19	29	37	55	82	89	95	103	116	137
Heavy duty vehicles	903	894	870	903	970	943	905	866	834	830
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	2956	2889	2867	2940	3016	2991	2952	2899	2856	2884

Continued

	2006	2007	2008	2009	2010
Passenger cars	653	572	748	827	739
Buses	255	182	283	264	266
Light duty vehicles	165	86	207	223	171
Heavy duty vehicles	848	608	936	863	715
Motorcycle, moped	11	11	14	15	10
Other transport	-	47	54	53	33
Caravan	34	36	45	34	38
Train	47	33	39	63	24
Ship	231	234	230	253	189
Airplane	10	8	13	13	7
Bicycle	-	0.02	0.05	0.03	0.05
Tractor	263	235	290	301	347
Combine harvester	448	255	450	552	378
Machine	-	33	61	50	43
Total	2965	2339	3371	3512	2960

The total burnt mass of vehicle has changed compared to last year's inventory due to the changes in methodology. Last year the damage rate was set to 70 % for all fires, but this year the damage rate was divided in four categories according to the measure of fire extinguishing.

Also the activity data now includes other transport, trains, ships, airplanes, bicycles, tractors, combined harvesters and machines. The activity of the eight new categories has a descending trend, whereas activities that were also included in last year's inventory are increasing. The resulting new total activity has a relatively constant trend.

The joint effect of these two changes in methodology is an increase in activity for 1980-1991 and a decrease 1992-2009. The largest increase is 9 % in 1980 and the largest decrease is -33 % in 2007, the changes to 1990 and 2009 are +4 % and -16 % respectively.

Emission factors

In the process of selecting the best reliable 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	0.26	Lönnermark et al., 2004
Cd	g	1.7	Lönnermark et al., 2004
Cr	g	3.8	Lönnermark et al., 2004
Cu	g	27	Lönnermark et al., 2004
Ni	g	2.8	Lönnermark et al., 2004
Pb	g	820	Lönnermark et al., 2004
Zn	g	3200	Lönnermark et al., 2004
PCDD/F	mg	0.0428	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
Benzo(g,h,i)perylene	g	6.3	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. The Guidebook gives an emission factor that is a factor 1000 lower than the other sources and Lönnermark et al. (2004) and Lemieux et al. (2004) give factors that are a factor 1000 and 100,000 higher than the major of the sources respectively. There is a very good compliance between the remaining 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 to 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; the EMEP/EEA Guidebook, 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 PCB. 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	14.45	14.34	14.70	15.08	14.96	14.76	14.50	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	25.13	24.56	24.37	24.99	25.64	25.42	25.09	24.64	24.27	24.51
CO	Mg	186.25	182.04	180.63	185.25	190.02	188.43	185.95	182.66	179.91	181.67
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	4.33
Ni	kg	0.44	0.43	0.43	0.44	0.45	0.45	0.44	0.43	0.43	0.43
Pb	kg	130.08	127.14	126.15	129.38	132.71	131.60	129.87	127.57	125.65	126.88
Zn	kg	511.44	499.88	496.02	508.70	521.79	517.45	510.63	501.58	494.05	498.88
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	47.74	46.67	46.30	47.49	48.71	48.30	47.67	46.82	46.12	46.57
Benzo(k)fluoranthene	kg	47.74	46.67	46.30	47.49	48.71	48.30	47.67	46.82	46.12	46.57
Benzo(a)pyrene	kg	43.46	42.48	42.15	43.22	44.34	43.97	43.39	42.62	41.98	42.39
Benzo(ghi)perylene	kg	18.62	18.20	18.06	18.52	19.00	18.84	18.60	18.27	17.99	18.17
Indeno(1,2,3-cd)pyrene	kg	68.88	67.33	66.80	68.51	70.28	69.69	68.77	67.55	66.54	67.19

Continued	unit	2006	2007	2008	2009	2010
SO_2	Mg	14.82	11.70	16.85	17.56	14.80
NO_X	Mg	5.93	4.68	6.74	7.02	5.92
NMVOC	Mg	25.20	19.88	28.65	29.85	25.16
CO	Mg	186.79	147.38	212.37	221.24	186.51
TSP	Mg	6.08	4.80	6.91	7.20	6.07
PM_{10}	Mg	6.08	4.80	6.91	7.20	6.07
$PM_{2.5}$	Mg	6.08	4.80	6.91	7.20	6.07
As	kg	0.04	0.03	0.05	0.05	0.04
Cd	kg	0.27	0.22	0.31	0.32	0.27
Cr	kg	0.59	0.47	0.67	0.70	0.59
Cu	kg	4.45	3.51	5.06	5.27	4.44
Ni	kg	0.44	0.35	0.51	0.53	0.44
Pb	kg	130.46	102.93	148.32	154.52	130.26
Zn	kg	512.94	404.70	583.18	607.54	512.16
PCDD/F	g I-TEQ	0.12	0.09	0.13	0.14	0.12
Benzo(b)fluoranthene	kg	47.88	37.78	54.44	56.72	47.81
Benzo(k)fluoranthene	kg	47.88	37.78	54.44	56.72	47.81
Benzo(a)pyrene	kg	43.59	34.39	49.55	51.62	43.52
Benzo(ghi)perylene	kg	18.68	14.74	21.24	22.12	18.65
Indeno(1,2,3-cd)pyrene	kg	69.08	54.51	78.54	81.83	68.98

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 banning. 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 gener-

ally appealed 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 likewise not registered, therefore it has not been possible to obtain activity data.

Due to the cold and wet climate conditions in Denmark wild fires very seldom occurs. Controlled burnings and the occasional wild fires should be included under Agriculture.

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 (1998-2010) 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		500	500
NO_x	150	150		700	500
NMVOC	100	300		700	500
CO	150	150	100	700	500
NH_3		300	100		
TSP	500	300		700	700
PM_{10}	500	300		700	700
$PM_{2.5}$	500	300		700	700
As	1000	1 000		700	500
Cd	1000	500		700	500
Cr	1000	500		700	500
Cu	1000	500		700	500
Hg	150			700	
Ni	1000	500			500
Pb	600	500		700	500
Se	1000	1 000			
Zn	1000	500			500
HCB	500	500			
PCDD/F	300	300		100	100
Flouranthene	1000				
Benzo(b)flouranthene	1000			700	500
Benzo(k)flouranthene	1000			700	500
Benzo(a)pyrene	1000			700	500
Benzo(g,h,i)perylene	1000			700	500
Indeno(1,2,3-c,d)pyrene	1000			700	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 1990-2010 (2000-2010), %	Trend Uncertainty, %-age points
SO_2	±290.7	-2.5	±13.4
NO_x	±282.9	12.6	±47.2
NMVOC	±425.6	2.6	±15.4
CO	±218.8	43.7	±143.3
NH_3	±107.2	209.8	±174.5
TSP	±393.9	22.6	±134.2
PM_{10}	±430.5	16.3	±104.2
$PM_{2.5}$	±443.0	13.9	±91.6
As	±473.9	3.6	±15.0
Cd	±473.7	8.1	±37.0
Cr	±432.1	18.7	±108.0
Cu	±496.4	3.9	±15.2
Hg	±150.0	2.6	±1.5
Ni	±425.9	20.9	±123.0
Pb	±499.1	3.4	±14.7
Se	±739.9	48.5	±613.1
Zn	±492.7	3.3	±14.4
HCB	±370.0	48.7	±308.8
PCDD/F	±97.7	-1.9	±13.5
Flouranthene	±500.1	-0.7	±14.0
Benzo(b)flouranthene	±382.2	2.0	±12.5
Benzo(k)flouranthene	±440.5	2.7	±13.2
Benzo(a)pyrene	±403.5	2.3	±12.7
Benzo(g,h,i)perylene	±357.7	1.5	±12.4
Indeno(1,2,3-c,d)pyrene	±425.4	2.6	±13.0
PCB	±739.7	48.6	±614.3

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 hr@dkl.dk	Public access	http://www.dkl.dk/statis-tik_1990_1999.aspx http://www.dkl.dk/statis-tik_2000_2009.aspx http://dkl.dk/statistik_2010_2019.aspx
Human cremation	Population statistics	Activity data	Statistics Denmark	Katja Hjelgaard kahj@dmu.dk	Public access	http://www.statistikbanken.dk/BEF5
Animal cremation	Annual number of cremated carcasses	Activity data	Dansk Dyre-kremering ApS	Knud Ribergaard info@danskdyrekremering.dk	Personal contact	
Animal cremation	Annual number of cremated carcasses	Activity data	Ada's Kæle-dyrskrematorium ApS	Frederik Møller frederik@adakrem.dk	Personal contact	
Animal cremation	Annual number of cremated carcasses	Activity data	Kæledyrs-krematoriet	Annette Laursen dyrepension@skylinemail.dk	Personal contact	
Accidental building fires	Average floor space in buildings	Activity data	Statistics Denmark	Katja Hjelgaard kahj@dmu.dk	Public access	http://www.statistikbanken.dk/BOL511
Accidental fires	Categorised fires	Activity data	The Danish Emergency Management Agency	Steen Hjere Nonnemann shn@beredskabsstyrelsen.dk	Public access	https://statistikbank.brs.dk/sb/main/p/a0109
Accidental building fires	Building type statistics	Activity data	Statistics Denmark	Katja Hjelgaard kahj@dmu.dk	Public access	http://www.statistikbanken.dk/BOL11 http://www.statistikbanken.dk/BOL3 http://www.statistikbanken.dk/BOL33 http://www.statistikbanken.dk/BYGB11
Accidental vehicle fires	Weight categorisa-tion of vehicles (passenger cars, busses, vans and trucks)	Activity data	Statistics Denmark	Katja Hjelgaard kahj@dmu.dk	Public access	http://www.statistikbanken.dk/BIL10 http://www.statistikbanken.dk/BIL12 http://www.statistikbanken.dk/BIL15 http://www.statistikbanken.dk/BIL18
Compost-ing	Waste categories for composting	Activity data	Waste Statistics (Affaldsstatistik)	Katja Hjelgaard kahj@dmu.dk	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

Changes have been made to the methodology of accidental building and vehicle fires. For accidental building fires, the different building categories now also include additional buildings (sheds, greenhouses etc.) and container fires. Also there are now four damage categories; full, large, medium and small scale fires, corresponding to 100, 75, 30 and 5 % damage rate respectfully. The effect of these changes is a decrease in emissions between 4-9 % for particles and 44-47 % for NMVOC. Even though the number of included building fires is higher in this year's inventory, the total emissions are lowered. In earlier years buildings like carports, sheds and greenhouses were categorised as detached houses and emissions from these fires were calculated based on average floor space and content masses that were much too high. The addition of the category additional buildings is the main reason for the lowered total emissions from accidental building fires.

For accidental vehicle fires, similar changes were made. Last year the damage rate was set to 70 % for all fires, but this year the damage rate was divided in four damage categories according to the measure of fire extinguishing; full, large, medium and small scale fires, corresponding to 100, 75, 30 and 5 % damage rate respectfully. These new damage categories give an average burnout for all vehicle categories in 2007-2010 of 34 % and thereby a reduction in emission of about 50 % compared with the 70 % burnout used in last year's inventory. Also the activity data now includes other transport, trains, ships, airplanes, bicycles, tractors, combined harvesters and machines. The activity of these eight new categories has a descending trend, whereas activities that were also included in last year's inventory have an increasing trend. The resulting new total emission from accidental vehicle fires has a relatively constant trend. The joint effect of these two changes in methodology is an increase in emissions for 1980-1991 and a decrease for 1992-2009. The largest increase is 9 % for all pollutants in 1980 and the largest decrease is -33 % for all pollutants in 2007, the changes in 1990 and 2009 data are +4 % and -16 % respectively.

The total change in emissions caused by the recalculation of accidental fires is a decrease in 2009 data between 16 % (particles) and 44 % (NMVOC).

7.8 Source-specific planned improvements

There are currently no planned improvements for this section.

7.9 Source-specific performed improvements

The methodology of accidental fires has been improved in this year's inventory. The impacts of the changes are described under 7.7 Source-specific recalculations.

7.10 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 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.

9.1 Background for reporting

According to the UNECE LRTAP convention parties are obligated to report gridded emissions every fifth year. In this 2012 reporting Denmark include gridded emissions for the emission 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, PAHs, HCB, and dioxins and furans. The reporting includes GNFR sectoral total 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	NFR	SNAP	Note
A_PublicPower	1A1a	0101, 0102	
B_IndustrialCombustion	1A1c, 1A2a, 1A2b, 1A2f	0103, 0105, 03	
C_SmallCombustion	1A4a, 1A4b i, 1A4c i	0201, 0202, 0203	
D_IndustrialProcesses	2	0402, 0404, 0405, 0406	
E_Fugitive	1B1, 1B2	0401, 0501, 0502, 0505, 0506, 0902	
F_Solvents	3	06	
G_RoadRail	1A3b, 1A3c	07, 0802	
H_Shipping	1A3d ii, 1A4c iii	0803, 080402, 080403	
I_OffRoadMobile	1A2f, 1A4b ii, 1A4c ii, 1A5b	0801, 0806, 0807, 0808, 0809, 0811	
J_AviationLTO	1A3 a i (i), 1A3 a ii (i)	080501, 080502	
L_OtherWasteDisposal	6D	0910	
M_WasteWater			NO
N_WasteIncineration	6C,	0909	
O_AgricultureLivestock	4B	*	
P_AgricultureOther	4D, 4G	*	
Q_AgricultureWaste	4F	*	
R_Other			NO
S_Natural			NO
K_CivilAviationCruise	1A3a ii (ii)	080503	
T_InternationalAviationCruise	1A3a i (ii)	080504	
Z_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. 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 will be included in the IIR report. For a more detailed description, please refer to Plejdrup & Gyldenkærne (2011).

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 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 to 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 (SNAP 10) 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 due to 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 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 2.1). 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.

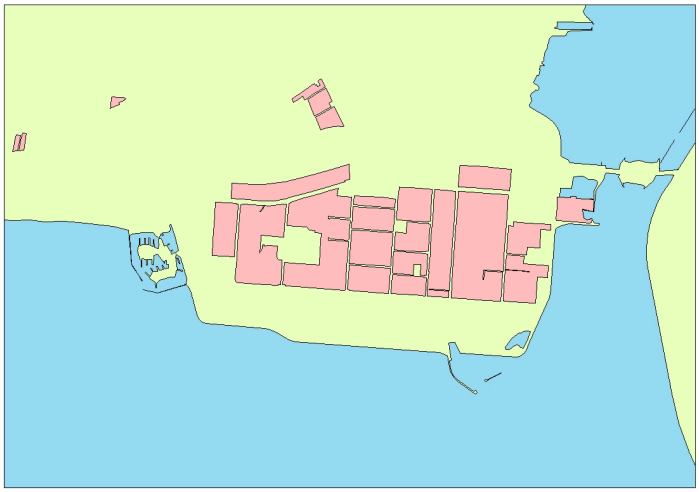

Figure 9.1 Segment around Avedøre in Copenhagen of the map of industrial areas (KORT10).

As SPREAD gives emissions on 1x1 km, the map of industrial areas must be combined with the Danish 1x1 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 9.2).

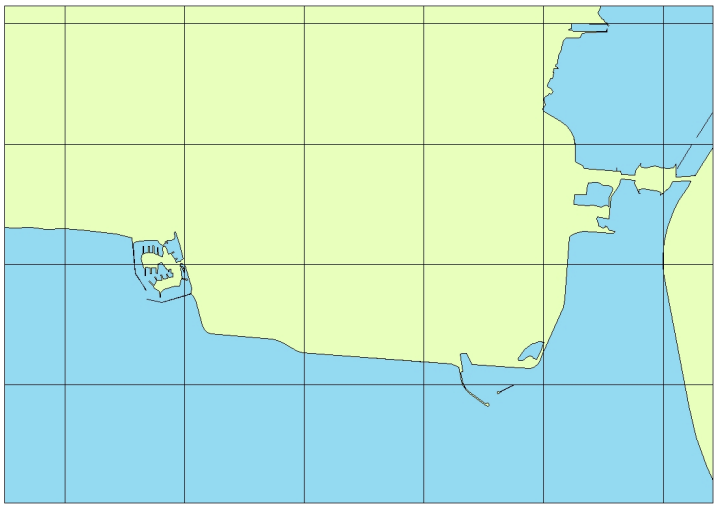

Figure 9.2 Segment around Avedøre in Copenhagen of the map of the Danish 1x1 km grid net (KORT10).

To be able to distribute the emissions on 1x1 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. 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.

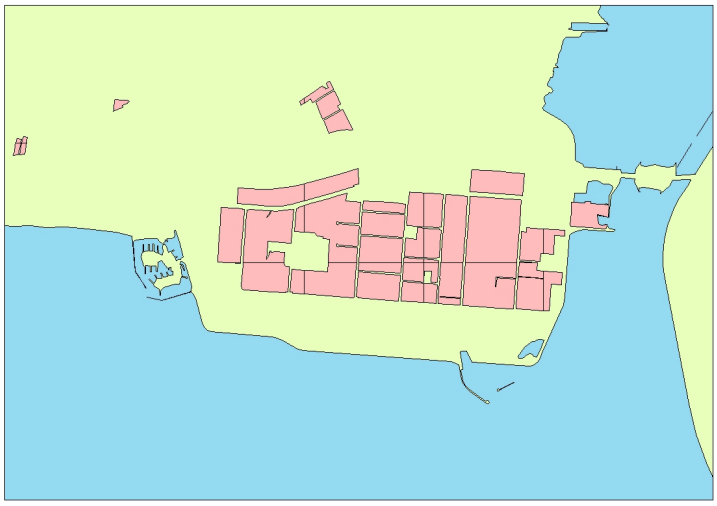

Figure 9.3 Segment around Avedøre in Copenhagen of the map of industrial areas and the Danish 1x1 km grid net (KORT10).

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 1x1 km grid net. The emission in each grid cell is calcu-

lated 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 emission is presented, all referring to the emission year 2010. The selected maps in Figure 9.1 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.

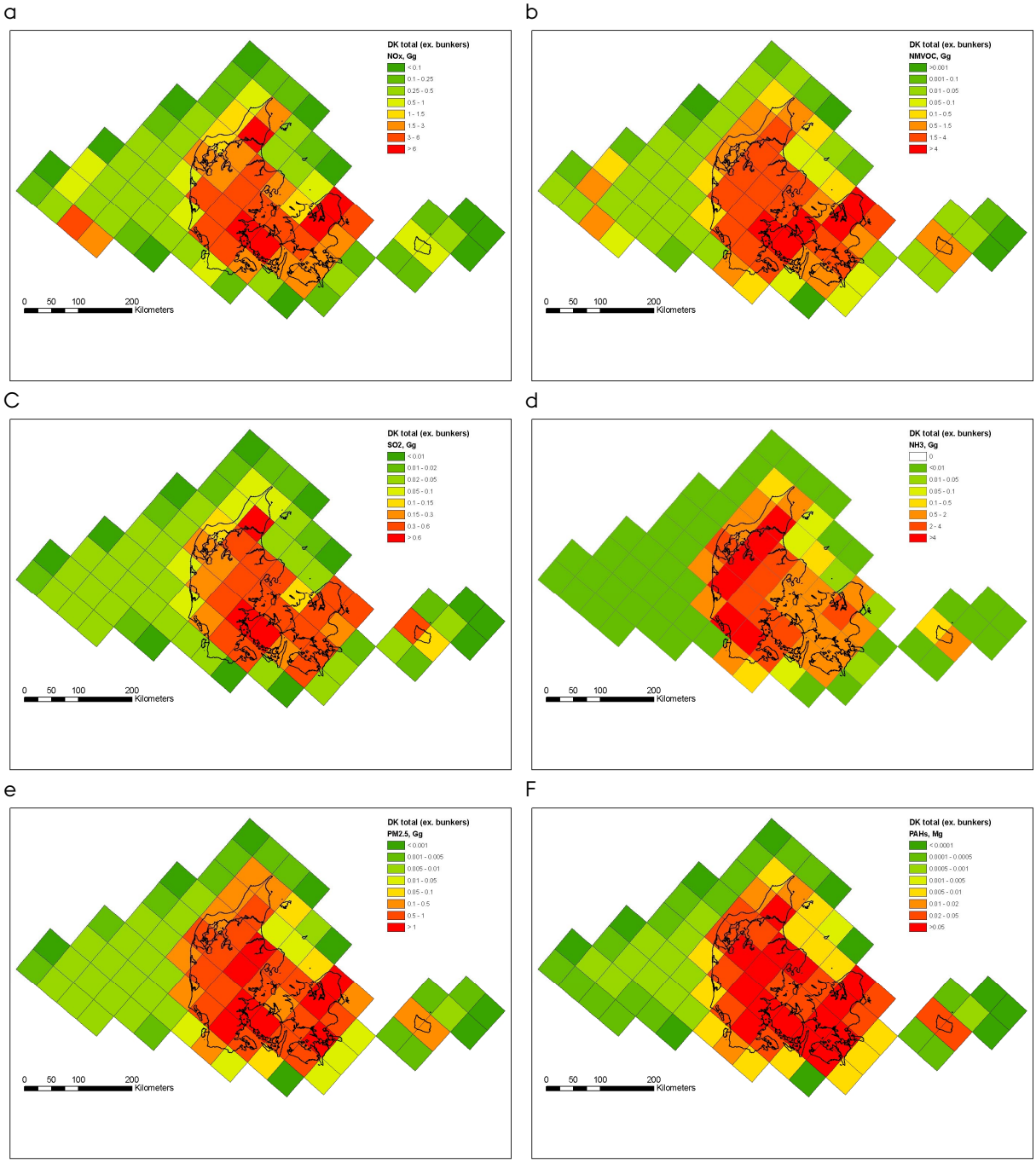

Figure 9.4 National total gridded emissions excluding civil aviation and international navigation of a) NO_x, b) NMVOC, c) SO_2, d) NH_3, e) $PM_{2.5}$ and f) PAHs (the sum of benzo(b)flouranthene, benzo(k)flouranthene, benzo(a)pyrene and indeno(1,2,3-c,d)pyrene) for the emission year 2010.

Even on the 50 km x 50 km aggregated level spatial patterns from the major sectors are recognisable for different pollutants.

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 8.2). Further, large emissions from PublicPower and IndustrialComb are allocated to areas around the major cities.

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.

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 and SmallComb reflect the location of a large number of CHP plants not reported as LPS due to no plant specific emission factors, and 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 EEZ.

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.

$PM_{2.5}$

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.

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 ma-

jor source to PAH emissions in Denmark is SmallCombustion 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.

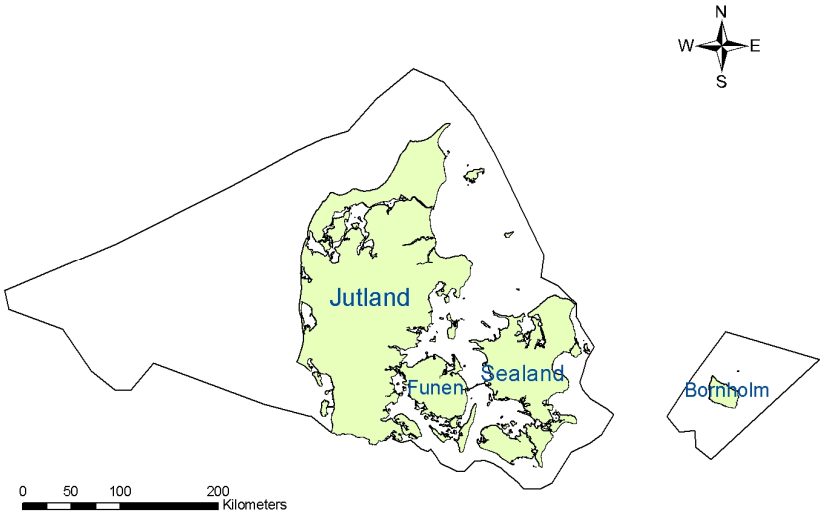

Figure 9.5 Map of Denmark including names of regions and the Exclusive Economic Zone.

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 further important references in this regard are the IPCC guidelines and IPCC good practice guidance.

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. This, however, does not include energy statistics for fuel consumption data for specific industries.

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 1990-2009 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.

The disaggregation of emissions in *1A2 Manufacturing industries and construction* has been recalculated based on a new improved methodology. Thus, the

estimated emissions in the subsectors are considerable, but the total emissions in sector 1A2 are relatively low.

The emissions from residential wood combustion have been recalculated based on improved technology disaggregation data. In addition the NMVOC emission factor has been improved for new stoves resulting in a decreased emission from this sector.

The NO_x emission factor for natural gas consumption in large power plants has been updated according to Danish legislation[1].

The NMVOC emission factor for refineries have been included or revised for several years. This results in improved time series but also in large relative changes for some years.

The PM_{10} and $PM_{2.5}$ emission factors for wood and straw have been recalculated to improve consistency with the TSP emission factor.

10.1.2 Mobile sources

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 1985-2009 have been updated based on new data prepared by DTU Transport. Important changes are a different split of total mileage between gasoline and diesel passenger cars based on data for the year 2008 from the Danish vehicle inspection and maintenance programme. Also updated mileage for foreign vehicles driven on Danish roads has been included.

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 %, 2009), NO_x (-3.5 %; -1.1 %, 2000), NMVOC (-0.2 %; 0.5 %, 2009), CO (0.2 %; 2.6 %, 2009), NH_3 (-0.2 %; 1.0 %, 1990) and Particulates (-0.9 %; 4.6 %, 2009).

Agriculture/forestry/fisheries

The sales distribution into engine sizes for harvesters has been updated for the years 2002, 2003 and 2009. The following largest percentage differences (in brackets) for agriculture/forestry/fisheries are noted for: SO_2 (-0.1 %), NO_x (-0.1 %), NH_3 (-0.3 %) and Particulates (0.1 %).

Military

Emission factors derived from the new road transport simulations have caused some emission changes from 1985-2009. The following largest percentage differences (in brackets) are noted for: SO_2 (0 %), NO_x (-3.7 %), NMVOC (-2 %,), CO (5.8 %), NH_3 (2.9 %) and Particulates (4.3 %,).

Aviation

Emission changes occur for the years 2007-2009, due to a correction in the representative aircraft type for new aircraft used for flying in Denmark. Due to an error F28 was previously used as a representative aircraft type for the new aircraft types CRJ9, E70, E170 and E175. However, F28 is a very old air-

[1] However, in general plant specific emission data are available.

craft which cannot represent these new aircraft types. Instead new fuel consumption and emission factors have been calculated for the CRJ9, E70, E170 and E175 jets. The following largest percentage differences (in brackets) are noted for the year 2009: SO_2 (-1.7 %), NO_x (-2.4 %), NMVOC (-25.3 %,), CO (-5.4 %), NH_3 (0 %) and Particulates (-1.3 %).

10.1.3 Fugitive emissions

Refineries: Emissions of NMVOC has been changed for the years 1994-2000 and 2002-2009 according to VOC measurements in carried out in 2001, as no further information on fugitive emissions from the refineries are or will become available for other historical years. This is the result of an extended communication with one refinery leading to a recommendation to use measured emissions, and not an estimated emissions calculated by weighting the measured emissions by the annual processed crude oil amount as done in previous inventories. The fugitive emissions are more related to other conditions than the processed amounts. The split of VOC emissions provided by the refineries have been revised in order to apply more similar approach for the two refineries. For Both refineries annual emissions of NMVOC are not available, and emissions are following based on the provided VOC emissions and assumptions for the part of VOC being NMVOC and CH_4, respectively. Assumptions are based on information from the refineries and on literature study of international proportions/conditions. In the previous inventory CH_4 is estimated as 10 % of VOC based on information from one refinery.

The NMVOC recalculation has decreased the total fugitive emission by 1.0 % in 2009. The largest recalculation is in 2008 (1.5 %).

Updated SO_2 emissions for the years 2005-2009 provided by a refinery are included in the inventory. The recalculation has increased the total fugitive SO_2 emissions by 6 % in 2009.

Gas distribution: Emission factors for NMVOC for town gas distribution have been corrected for an error. Distribution of town gas is a minor source and the recalculation is insignificant for all years (< 0.001 % of the total fugitive NMVOC emission in 2009).

Offshore flaring: Activity data has been corrected for 2008 for two offshore installations. The calorific value has been corrected for the whole time series according to the average calorific value in the EU ETS reports for 2008-2010 which affects the emission factor for NO_x, NMVOC, CO, particulate matter, heavy metals, dioxin and PAHs. Further, the emission factors for CO and NMVOC have been corrected by including a conversion from m_s3 to m_n3. The activity data has been updated according to the latest figures from the Danish Energy Agency.

The recalculation has decreased the fugitive NO_x emission by 0.1 % in 2009 and 0.3 % in 1990.

10.2 Industrial processes

Production of chemical ingredients and treatment of slaughterhouse waste are transferred from *Mineral products* to *Other production, consumption, storage, transportation or handling of bulk products* (NFR 2G).

Emission of NMVOC from production of chemical ingredients has been transferred from sector *Other production (2G)* to *Chemical industry*.

The emission factors applied for NMVOC from refining of sugar within the sector *Other production* has been revised.

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 in industries and households. The main improvements in the 2011 reporting include the following:

- Inclusion of NMVOC use and calculations of NMVOC emissions for the time period 1990 to 1994
- Inclusion of Tobacco smoking and Combustion of Charcoal for Barbeques in Other Product Use

10.4 Agriculture

Compared with the previous NH_3 and PM emissions inventory (submission 2011), some changes and updates have been made. These changes cause a decrease in the NH_3 emission (1985 – 2009) and a decrease in the PM emission (2000 – 2009).

Emission of NH_3 has decreased 1-3% in the period 1985-2009 compared to the submission 2011. The main reason for the decrease is an adjustment of emission factors for synthetic fertilisers. The emission factors have been updated in cooperation with the Danish Plant Directorate.

The PM emission decreases because a technical error in the calculation of PM from animal husbandry has been corrected.

The calculation of number of produced bulls has been changed to being based on slaughtering data from Statistics Denmark instead of annually census. An error in the calculation of number of weaners and fattening pigs has been corrected. Furthermore have the time series of the distribution of animals on deferent housings types been reviewed by experts. These changes in activity data have influence on both NH_3 and PM emissions.

The emission of NMVOC from crops has been recalculated for 2009 because of new data for agricultural land from Statistics Denmark.

10.5 Waste

Changes have been made to the methodology of accidental building and vehicle fires. For accidental building fires, the different building categories now also include additional buildings (sheds, greenhouses etc.) and container fires. Also there are now four damage categories; full, large, medium and small scale fires, corresponding to 100, 75, 30 and 5 % damage rate respectfully. The effect of these changes is a decrease in emissions between 4-9 % for particles and 44-47 % for NMVOC. Even though the number of included building fires is higher in this year's inventory, the total emissions are lowered. In earlier years buildings like carports, sheds and greenhouses were categorised as detached houses and emissions from these fires were calculated based on average floor space and content masses that were much

too high. The addition of the category additional buildings is the main reason for the lowered total emissions from accidental building fires.

For accidental vehicle fires, similar changes were made. Last year the damage rate was set to 70 % for all fires, but this year the damage rate was divided in four damage categories according to the measure of fire extinguishing; full, large, medium and small scale fires, corresponding to 100, 75, 30 and 5 % damage rate respectfully. These new damage categories give an average burnout for all vehicle categories in 2007-2010 of 34 % and thereby a reduction in emission of about 50 % compared with the 70 % burnout used in last year's inventory. Also the activity data now includes other transport, trains, ships, airplanes, bicycles, tractors, combined harvesters and machines. The activity of these eight new categories has a descending trend, whereas activities that were also included in last year's inventory have an increasing trend. The resulting new total emission from accidental vehicle fires has a relatively constant trend. The joint effect of these two changes in methodology is an increase in emissions for 1980-1991 and a decrease for 1992-2009. The largest increase is 9 % for all pollutants in 1980 and the largest decrease is -33 % for all pollutants in 2007, the changes in 1990 and 2009 data are +4 % and -16 % respectively.

The total change in emissions caused by the recalculation of accidental fires is a decrease in 2009 data between 16 % (particles) and 44 % (NMVOC).

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
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
Annex 2A-2:	Fuel rate
Annex 2A-3:	Default Lower Calorific Value (LCV) of fuels and fuel correspondance list
Annex 2A-4:	Emission factors
Annex 2A-5:	Implied emission factors for power plants and municipal waste incineration plants
Annex 2A-6:	Large point sources
Annex 2A-7:	Uncertainty estimates
Annex 2A-8:	Emission inventory 2010 based on SNAP sectors
Annex 2A-9:	Description of the Danish energy statistics
Annex 2A-10:	Time-series 1980/1985 - 2010
Annex 2A-11:	QA/QC for 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 compres-sors	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
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

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 2010, 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	298.9	302.2	296.2	276.7	225.8
	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	1.9	2.9	2.7	2.0	0.7
	RESIDUAL OIL	177.0	137.5	116.7	95.9	87.8	83.7	72.1	52.5	41.2	34.9
	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	5.0	4.9	4.4	3.6	2.9
	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
	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
	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	2.6	2.7	2.5	2.6	2.6	2.7	3.0	2.5	2.5	2.2
	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
	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
	GAS OIL	41.3	43.6	38.6	38.9	35.8	31.7	26.6	21.6	20.9	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	2.0	1.7	1.5	1.7	1.8	1.8	2.0	1.7	1.5	1.4
	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	164.8
WASTE	WASTE	30.4	32.7	35.1	36.6	37.3	37.8	36.9	38.1	39.6	37.5
	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	66.1
	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	3.5	3.7	3.8	3.9	3.9	3.9	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
SOLID	ANODE CARBON	0.0
	COAL	162.5

	BROWN COAL BRI.	0.0
	COKE OVEN COKE	0.7
LIQUID	PETROLEUM COKE	5.1
	RESIDUAL OIL	11.2
	GAS OIL	21.3
	KEROSENE	0.1
	NAPHTA	
	ORIMULSION	
	LPG	1.4
	REFINERY GAS	14.3
GAS	NATURAL GAS	186.7
WASTE	WASTE	36.7
	INDUSTR. WASTES	1.4
BIOMASS	WOOD	80.1
	STRAW	23.6
	BIO OIL	1.9
	BIOGAS	4.3
	BIO PROD GAS	0.2

Table 2A-2.2 Detailed fuel consumption data for stationary combustion plants, PJ. 1980 – 2010.

fuel_type	fuel_gr_abbr	nfr_id	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
			030102										
			030103										
			030106	0.4	0.4	0.5	0.4						
			030700										
			030800										
			031200										
			031300										
			031400										
			031600										
			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										
	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										
		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
	RESIDUAL OIL	1A1a	010100	47.7	25.0	18.0	8.5	6.9	13.3	14.3	10.5	13.0	10.8
			010101										
			010102										
			010103										
			010104										
			010105										

fuel_type	fuel_gr_abbr	nfr_id	snap_id	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
			010200	49.0	43.7	40.8	34.7	29.2	25.1	15.7	11.5	5.4	3.0
			010202										
			010203										
		1A1b	010306	3.3	3.6	2.5	2.5	2.5	2.8	2.7	2.2	1.6	1.7
		1A2a	030400										
		1A2b	030500										
		1A2c	030600										
		1A2d	031100										
			031102										
		1A2e	030900										
			030902										
			030903										
		1A2f i	030100	49.9	40.0	34.9	33.0	31.8	29.2	28.7	20.6	16.4	15.9
			030102										
			030103										
			030104										
			030105										
			030700										
			030800										
			031000										
			031200										
			031300										
			031400										
			031500										
			031600										
			032000										
		1A4a i	020100	12.5	10.5	10.3	8.3	9.1	7.7	5.6	4.2	2.6	1.5
			020103										
		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	9.8	10.1	5.2	5.4	4.1	2.5	2.6	2.2	1.7	1.7
			020302										
			020304										
	GAS OIL	1A1a	010100	0.2	0.3	0.3	0.4	0.3	0.1	0.2	0.4	0.4	0.3
			010101										
			010102										
			010103										
			010104										
			010105										
			010200	0.3	0.3	0.4	0.3	1.3	0.9	0.7	0.7	0.7	3.0
			010202										
			010203										
		1A1b	010306							0.0	0.0		
		1A2a	030400										
		1A2b	030500										
		1A2c	030600										
			030602										
			030604										
		1A2d	031100										
			031102										
		1A2e	030900										
			030902										
			030904										
		1A2f i	030100	6.1	2.9	1.1	0.8	3.1	3.6	2.9	2.2	0.9	0.9
			030102										
			030103										
			030104										
			030105										
			030700										
			030800										
			031000										
			031200										
			031300										
			031400										
			031600										
			032000										
		1A4a i	020100	24.7	21.7	18.3	17.9	18.1	18.6	18.0	18.1	13.8	12.2
			020102										
			020103										
			020105										
		1A4b i	020200	113.2	94.4	87.1	79.7	69.4	84.8	79.4	78.5	67.1	54.3
			020204										
		1A4c i	020300	2.6	1.5	0.7	0.5	1.7	1.9	1.5	1.3	0.5	0.6
			020302										
			020304										
	KEROSENE	1A2f i	030100	0.2	0.2	0.2	0.2	0.1	0.4	0.3	0.2	0.1	0.1

fuel_type	fuel_gr_abbr	nfr_id	snap_id	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
			031500										
			032000										
		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	0.0	0.0	0.2	0.1	0.1	0.1	0.0	0.0	0.0	0.0
			010202										
			010203										
		1A1b	010306										
		1A2a	030400										
		1A2b	030500										
		1A2c	030600										
			030602										
		1A2d	031100										
		1A2e	030900										
		1A2f i	030100	3.7	3.0	2.7	2.8	2.4	2.0	2.0	2.1	1.9	1.7
			030700										
			030800										
			031000										
			031200										
			031300										
			031400										
			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	1.8	1.8	1.8	1.2	0.8
		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	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										
			030604										
		1A2d	031100										
			031102										
		1A2e	030900										
			030902										
			030904										
		1A2f i	030100	0.4	0.4	0.4	0.4	0.8	5.0	9.0	14.8	17.2	21.9
			030102										
			030103										
			030104										
			030105										
			030106					0.2	0.2	0.0	0.3	0.3	0.2
			030700										
			030800										
			031000										
			031200										
			031300										
			031400										
			031500										
			032000										
		1A4a i	020100	0.4	0.3	0.3	0.3	0.4	3.3	3.7	5.0	5.3	5.3

fuel_type	fuel_gr_abbr	nfr_id	snap_id	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
			020103 020104 020105										
		1A4b i	020200 020202 020204	4.2	3.9	3.7	3.7	4.8	8.3	11.8	14.8	14.5	15.5
		1A4c i	020300 020304					0.0	0.2	1.0	1.3	1.5	1.9
WASTE	WASTE	1A1a	010100 010101 010102 010103 010104 010200 010202 010203	10.0	10.6	11.1	11.8	12.3	13.0	13.5	13.5	13.4	14.0
		1A2a	030400										
		1A2c	030600										
		1A2d	031100										
		1A2e	030900 030902										
		1A2f i	030100 030102 030700 030800 031000 031200 031300 031400 031600 032000	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.2	0.3
		1A4a i	020100 020103	0.6	0.6	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.9
	INDUSTR. WASTES	1A2f i	031600										
BIOMASS	WOOD	1A1a	010100 010101 010102 010103 010104 010200 010203							1.3	1.7	2.0	2.8
		1A2a	030400										
		1A2b	030500										
		1A2c	030600										
		1A2d	031100 031102										
		1A2e	030900 030902										
		1A2f i	030100 030102 030103 030700 030800 031000 031200 031300 031400 032000	3.7	4.3	4.4	4.8	5.0	5.3	5.6	5.5	5.6	5.7
		1A4a i	020100 020105							0.2	0.2	0.2	0.2
		1A4b i	020200 020202 020204	7.6	9.7	10.6	10.2	9.9	9.6	9.9	10.6	9.8	8.9
		1A4c i	020300 020303					0.2	0.1	0.1	0.1	0.1	0.1
	STRAW	1A1a	010100 010101 010102 010103 010104 010200 010203	0.3	0.3	0.3	0.6	1.0	0.1 1.4	0.1 1.7	0.1 2.3	2.7	0.1 3.1
		1A2f i	030103 030105										
		1A4b i	020200	2.7	3.8	4.3	4.7	5.1	5.0	5.1	5.1	5.1	5.1

fuel_type	fuel_gr_abbr	nfr_id	snap_id	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
		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										
		1A2f i	030103										
			030105										
		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										
		1A2f i	030100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3
			030102										
			030103										
			030105										
		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	030105										
		1A4c i	020304										

fuel_type	fuel_gr_abbr	nfr_id	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	3.8	2.9	3.4	2.5	2.0	1.1	1.2	1.1	0.9
			030902						1.0	1.4	1.5	1.4	1.4
			030903										
		1A2f i	030100	1.6	1.5	0.9	0.8						
			030102					0.5	0.4	0.4	0.3	0.7	0.1
			030103					0.3	0.4	0.4	0.5	0.3	0.2
			030106										
			030700	0.2			0.2	0.3	0.3	0.8	0.6	0.7	1.1
			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										
	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

fuel_type	fuel_gr_abbr	nfr_id	snap_id	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
		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					3.5	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		0.1	0.3	0.3	0.2	0.1
	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	2.5	4.5	2.7	2.9	1.6
			010103					0.2	0.3	0.0	0.2	0.0	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					1.1	1.1	1.6	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
		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	5.2	5.0	4.3	4.7	4.7
			030902						0.2	0.4	0.4	0.4	0.4
			030903										
		1A2f i	030100	1.3	1.3	1.3	1.4						
			030102					0.8	0.8	0.8	0.7	0.6	0.6
			030103					0.2	0.2	0.1	0.1	0.1	0.2
			030104								0.1		
			030105										
			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
			031400	0.4	0.4	0.3	0.4	0.4	0.4	0.5	0.6	0.5	0.4
			031500	1.0	1.5	1.6	0.5	0.2	0.2	0.4	0.2	0.2	0.1
			031600	1.8	2.2	2.4	2.4	2.6	2.8	1.8	1.9	2.5	0.9
			032000	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1
		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
	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

fuel_type	fuel_gr_abbr	nfr_id	snap_id	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
			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		
		1A2a	030400	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		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										
		1A2e	030900	0.1	0.4	0.4	0.3	0.2	0.4	0.5	0.4	0.3	0.6
			030902										
			030904										
		1A2f i	030100										
			030102					0.0	0.0	0.0	0.0	0.0	0.0
			030103					0.0	0.0	0.0	0.0	0.0	0.0
			030104								0.0	0.0	0.0
			030105					0.0				0.0	0.0
			030700	0.1	0.2	0.2	0.1	0.1	0.2	0.4	0.5	0.5	0.2
			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
			031300	0.1	0.3	0.3	0.2	0.2	0.4	0.5	0.4	0.4	0.6
			031400	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.1
			031600										
			032000	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.3
		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
		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	0.7	0.7	0.6	0.9	0.8	0.7	0.8	0.6	0.7	0.7
		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

fuel_type	fuel_gr_abbr	nfr_id	snap_id	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
			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	12.0	17.5	17.3
			010102					2.0	2.9	4.1	8.1	9.3	6.5
			010103					0.0	0.1	0.1	0.1	0.1	0.1
			010104	2.5	3.9	5.7	7.5	7.6	8.2	15.2	17.7	21.5	23.7
			010105	0.7	1.3	2.2	4.2	8.6	16.8	21.9	23.5	26.4	26.6
			010200	10.0	11.8	11.1	10.9						
			010202					0.3	0.4	0.4	0.5	0.5	0.2
			010203					9.4	7.9	5.1		0.0	2.7
		1A1c	010504	9.5	9.7	11.1	11.2	12.3	12.9	15.2	19.9	22.0	24.0
		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	1.3	1.0	0.8	1.1	1.6	2.0
			030602	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3
			030604	0.5	0.6	0.7	0.7	0.8	0.9	1.3	1.3	1.2	1.3
		1A2d	031100	2.3	1.8	1.6	1.2	1.3	0.9	1.3	1.1	1.2	1.1
			031102						1.1	0.9	1.1	1.1	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
			030904										
		1A2f i	030100	0.7	0.7	1.1	1.0						
			030102					0.7	0.4	0.3	0.2	0.3	0.5
			030103					0.8	0.8	1.1	1.0	1.1	0.9
			030104					0.1	0.6	2.1	3.0	4.8	6.1
			030105	0.0	0.0	0.0	0.0	0.0	0.2	0.9	1.0	1.2	1.2
			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
			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
			031200	0.2	0.2	0.3	0.4	0.5	0.7	0.7	0.7	0.7	0.6
			031300	1.4	2.0	2.2	2.5	2.8	2.9	3.5	3.2	3.2	3.8
			031400	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.2
			031500	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2
			032000	1.1	1.2	1.2	1.5	1.6	1.7	1.9	2.0	2.1	2.3
		1A4a i	020100	6.3	6.8	7.1	8.6	7.3	8.4	11.2	7.6	3.0	5.3
			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				
		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										
			030102										
			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	

fuel_type	fuel_gr_abbr	nfr_id	snap_id	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
			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										
		1A2f i	030100	1.1	1.1	1.1	1.1						
			030102									0.0	0.0
			030103					0.4	0.4	0.5	0.4	0.4	0.4
			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
			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
			020105									0.0	0.0
		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	0.4	0.7	1.0	1.3
			010102					0.6	1.1	1.5	1.3	1.3	1.3
			010103					0.7	1.0	1.4	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
		1A2f i	030103						0.0				
			030105									0.0	0.0
		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						
			010202										
			010203					0.2	0.3	0.1	0.0	0.0	0.0
		1A2f i	030103										
			030105										
		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	0.6	0.8	1.0	1.1
			010200	0.0	0.0	0.1	0.1						
			010203					0.2	0.3	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										
		1A2f i	030100	0.3	0.3	0.4	0.4						
			030102										
			030103					0.0	0.0	0.0	0.0	0.0	0.0
			030105										
		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
	BIO PROD GAS	1A1a	010105					0.1	0.0	0.0	0.0	0.0	0.0
		1A2f i	030105										
		1A4c i	020304								0.0	0.0	0.0

fuel_type	fuel_gr_abbr	nfr_id	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	0.0	
		1A2c	030600	0.5	0.5	0.4	0.6	0.6	0.5	0.2			
		1A2d	031100										
			031102										
		1A2e	030900	1.5	1.7	1.1	0.4	0.7	0.4	0.5	0.5	0.0	
			030902	1.1	1.0	1.0	1.6	1.5	1.5	1.2	1.2	1.2	1.2
			030903							0.2	0.2	0.3	0.3
		1A2f i	030100										
			030102	0.1	0.1	0.1	0.1	0.0	0.0		0.1	0.0	0.0
			030103	0.4	0.4	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1
			030106										
			030700	0.3	0.3		1.6	1.8	1.6	1.8	1.9	1.2	0.5
			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	2.0	2.1	1.8	0.4
			020304					0.0	0.0				0.0
	BROWN COAL BRI.	1A2f i	030100										
			030800										
		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		0.0	0.0	
			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				
		1A4b i	020200	0.0	0.0	0.0	0.0		0.1	0.0	0.0	0.1	
		1A4c i	020300	0.0	0.0	0.0	0.0						
	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

fuel_type	fuel_gr_abbr	nfr_id	snap_id	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
			010105	0.0	0.0	0.0	0.0						
			010200										
			010202					0.1	0.1	0.1			
			010203	1.1	1.0	1.0	0.6	0.2	0.4	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	0.0
		1A2b	030500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		1A2c	030600	0.8	0.9	1.0	0.7	0.7	0.4	0.6	0.5		
		1A2d	031100	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	
			031102										
		1A2e	030900	4.7	4.3	4.9	3.2	2.9	1.7	3.0	1.6		
			030902	0.3	0.3	0.3	0.9	0.9	1.1	0.8	0.6	1.9	2.0
			030903				0.7	0.8	0.8	0.8	0.8	1.0	1.1
		1A2f i	030100										
			030102	0.6	0.6	0.5	0.6	0.4	0.5	0.7	0.4	0.2	
			030103	0.2	0.3	0.3	0.2	0.3	0.1	0.0			
			030104										
			030105		0.0	0.0	0.0	0.0	0.0	0.0		0.0	
			030700	0.5	0.5	0.6	0.2			0.2	0.1	0.4	
			030800	0.4	0.3	0.4	0.3	0.3	0.2	0.3	0.2	0.2	0.1
			031000	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
			031300	0.1	0.1	0.1	0.1	0.1	0.4	0.6	0.2	0.0	
			031400	0.3	0.2	0.3	0.2	0.2	0.3	0.4	0.1	0.1	0.1
			031500	0.0	0.0	0.0							
			031600	0.9	0.5	0.6	0.6	0.8	0.7	1.0	1.1	0.5	0.2
			032000	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.2		
		1A4a i	020100	0.3	0.2	0.5	0.2	0.1	0.1	0.3	0.1	0.1	0.0
			020103										
		1A4b i	020200	0.0	0.0	0.1	0.0	0.0	0.0	0.2	0.0	0.0	0.0
		1A4c i	020300	1.8	1.6	1.4	0.9	0.7	0.8	0.9	0.6	0.3	0.1
			020302				0.0	0.0	0.0	0.0	0.0	0.0	0.0
			020304	0.0	0.0	0.0	0.0						
	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	0.1	0.1	0.1	0.1	0.1	0.1	0.1
			010105	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
			010200										
			010202	0.5	0.9	0.2	0.4	0.5	0.2	0.2	0.2	0.3	0.4
			010203	0.6	0.5	0.4	1.0	0.6	0.5	0.4	0.4	0.7	1.0
		1A1b	010306				0.0	0.0	0.0	0.0	0.0	0.0	0.0
		1A2a	030400	0.0	0.0	0.0	0.0	0.0	0.0	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
		1A2d	031100	0.1	0.1	0.1	0.1	0.1	0.0	0.0			
			031102							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
			030904			0.0							
		1A2f i	030100						0.0	0.0	0.0	0.0	0.0
			030102							0.0	0.0	0.0	0.0
			030103	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
			030104	0.0		0.0			0.0	0.0	0.0	0.0	0.0
			030105	0.0	0.0							0.0	0.0
			030700	0.2	0.3	0.2	0.3	0.2	0.2	0.1			
			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			
			031300	0.6	0.7	0.5	0.6	0.6	0.3	0.1			
			031400	0.1	0.1	0.1	0.1	0.1	0.0	0.0			
			031600							0.0	0.0	0.0	0.0
			032000	0.2	0.3	0.2	0.3	0.3	0.1	0.0	0.0	0.0	0.0
		1A4a i	020100	5.0	4.7	4.0	4.3	4.4	3.8	3.0	2.6	2.9	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
			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

fuel_type	fuel_gr_abbr	nfr_id	snap_id	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
	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
		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	0.8	0.7	0.6	0.7	0.7	0.8	0.9	0.9	0.8	0.7
		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	22.9	24.9	30.0	29.8	32.0	27.3	33.5	26.2	27.9	24.6
			010105	25.5	27.9	27.6	26.7	26.9	24.0	21.5	17.1	18.3	15.4
			010200										
			010202	0.1	0.1	0.2	0.2	0.3	0.2	0.1	0.2	0.4	0.9
			010203	2.3	2.9	2.4	3.2	2.7	4.4	4.6	6.1	6.1	8.1
		1A1c	010504	25.4	24.8	26.6	26.6	27.4	28.1	28.7	28.5	28.1	26.6
		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	1.8	2.4	1.8	2.2	2.0	2.4	2.1	2.0	1.6	0.3
			030602	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.6	0.5
			030604	1.2	0.8	0.9	0.9	0.4	0.0				1.1
		1A2d	031100	1.0	1.4	0.9	1.6	1.3	1.6	1.5	1.6	1.7	1.5
			031102	1.1	1.1	1.2	1.0	1.0	1.0	1.0	0.2	0.1	0.1
		1A2e	030900	9.0	9.5	7.9	6.8	8.1	8.6	9.6	10.1	11.0	9.9
			030902		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			030904	2.2	2.2	2.3	2.2	1.9	2.3	1.2	1.3	0.0	0.2
		1A2f i	030100						0.0	0.0	0.0	0.0	0.1
			030102	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.1	0.1	0.0
			030103	0.7	0.2	0.5	0.6	0.6	0.6	0.6	0.6	0.5	0.6
			030104	6.4	6.2	6.7	6.5	6.8	5.9	4.6	4.5	3.4	3.0
			030105	1.6	1.7	1.6	1.6	1.6	1.3	1.0	0.5	0.6	0.6
			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	5.2	4.8
			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
			031200	0.5	0.5	0.4	0.5	0.5	0.4	0.5	0.6	0.6	0.5
			031300	3.6	4.1	3.7	4.1	3.8	3.4	3.3	3.3	3.3	3.0
			031400	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3
			031500	0.2	0.2	0.2	0.2	0.2	0.3	0.4	0.4	0.3	0.4
			032000	2.1	2.3	2.2	2.3	2.1	1.8	1.7	1.6	1.6	1.5

fuel_type	fuel_gr_abbr	nfr_id	snap_id	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
		1A4a i	020100	7.2	7.3	7.6	9.1	7.7	7.9	9.3	10.1	10.0	9.5
			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	0.9	0.8
		1A4b i	020200	27.6	29.3	28.1	30.0	29.9	29.5	28.6	26.6	26.5	26.8
			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	1.2
		1A4c i	020300	2.4	2.7	2.5	2.3	2.3	2.2	2.2	1.9	1.7	1.8
			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	19.6	19.9	20.3	21.0	20.8
			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	7.4	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	0.0	0.0
		1A2d	031100	0.0			0.0		0.0	0.0	0.0	0.1	0.1
		1A2e	030900				0.0		0.0	0.0	0.0	0.0	0.1
			030902									0.0	
		1A2f i	030100										
			030102				0.0	0.0	0.0	0.0	0.0	0.0	
			030700										
			030800						0.1	0.1	0.1	0.2	0.2
			031000	0.0							0.0	0.0	0.0
			031200										
			031300	0.0			0.0	0.1	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	0.5	1.4	1.9	1.5	2.0	2.0				
			032000	0.0			0.0		0.1	0.1		0.1	0.2
		1A4a i	020100	0.0			1.1	0.0					
			020103	0.0	0.0	0.0	0.1	0.1	0.2	0.2	0.0	0.1	0.1
	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	5.3	5.4	6.6	6.5	6.3	5.8	7.1
			010103	0.4	0.5	0.6	0.7	0.7	0.6	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	6.5	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	0.4	0.1	0.1	0.0	0.0
			030902										0.0
		1A2f i	030100						0.1	0.1	0.1	0.1	0.0
			030102	0.0	0.0					0.0	0.4	0.5	0.5
			030103	0.4	0.4	0.4	0.3	0.4	0.3	0.4	0.4	0.4	0.5
			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
			032000	1.2	1.3	0.7	1.6	1.6	1.1	1.4	0.7	1.2	1.2
		1A4a i	020100	0.8	0.7	0.7	0.7	0.7	0.8	1.0	1.0	1.1	1.0
			020105		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
		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	0.1
			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
		1A2f i	030103										
			030105	0.0	0.0								

fuel_type	fuel_gr_abbr	nfr_id	snap_id	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
		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
		1A2f i	030103			0.1							
			030105			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		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	1.7	1.8
			010200										
			010203	0.3	0.3	0.3	0.3	0.1	0.1	0.1	0.1	0.2	0.1
		1A2a	030400										
		1A2e	030900	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.0
			030902	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.1
			030903				0.1	0.1				0.0	0.1
		1A2f i	030100										
			030102				0.0	0.0	0.0	0.0	0.0	0.0	0.0
			030103	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			030105		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		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	0.4
			020304	0.1	0.1	0.2	0.4	0.5	0.6	0.5	0.5	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	030105								0.0	0.0	0.0
		1A4c i	020304	0.0	0.0								

fuel_type	fuel_gr_abbr	nfr_id	snap_id	2010
SOLID	ANODE CARBON	1A2f i	032000	0.0
	COAL	1A1a	010100	
			010101	155.9
			010102	1.7
			010103	
			010104	0.0
			010105	
			010200	
			010202	
			010203	
		1A2c	030600	
		1A2d	031100	
			031102	
		1A2e	030900	
			030902	1.0
			030903	0.2
		1A2f i	030100	
			030102	0.0
			030103	0.1
			030106	
			030700	0.5
			030800	0.0
			031200	
			031300	
			031400	
			031600	2.0
			032000	0.1
		1A4a i	020100	
		1A4b i	020200	0.0
		1A4c i	020300	0.9
			020304	
	BROWN COAL BRI.	1A2f i	030100	
			030800	
		1A4a i	020100	

fuel_type	fuel_gr_abbr	nfr_id	snap_id	2010
		1A4b i	020200	0.0
		1A4c i	020300	
	COKE OVEN COKE	1A2a	030400	
		1A2e	030900	
			030902	0.0
			030903	0.1
		1A2f i	030100	
			030700	0.0
			030800	
			031200	
			031300	0.0
			031400	
			032000	0.6
		1A4b i	020200	0.0
LIQUID	PETROLEUM COKE	1A1a	010100	
			010102	0.0
			010200	
		1A2a	030400	
		1A2c	030600	
		1A2d	031100	
		1A2e	030900	
		1A2f i	030100	
			030700	
			030800	0.0
			031000	
			031300	
			031400	
			031600	5.1
			032000	
		1A4a i	020100	
		1A4b i	020200	0.0
		1A4c i	020300	
	RESIDUAL OIL	1A1a	010100	
			010101	4.9
			010102	0.2
			010103	0.1
			010104	0.2
			010105	
			010200	
			010202	0.0
			010203	0.2
		1A1b	010306	0.5
		1A2a	030400	0.0
		1A2b	030500	0.0
		1A2c	030600	0.4
		1A2d	031100	0.1
			031102	
		1A2e	030900	
			030902	1.9
			030903	1.0
		1A2f i	030100	
			030102	
			030103	
			030104	
			030105	
			030700	0.3
			030800	0.1
			031000	0.0
			031200	0.0
			031300	0.2
			031400	0.1
			031500	
			031600	0.3
			032000	
		1A4a i	020100	0.0
			020103	
		1A4b i	020200	0.0
		1A4c i	020300	0.6
			020302	0.0
			020304	0.0
	GAS OIL	1A1a	010100	
			010101	1.3
			010102	0.2
			010103	0.0

fuel_type	fuel_gr_abbr	nfr_id	snap_id	2010
			010104	0.1
			010105	0.1
			010200	
			010202	1.0
			010203	1.3
		1A1b	010306	0.0
		1A2a	030400	
		1A2b	030500	
		1A2c	030600	
			030602	0.0
			030604	0.0
		1A2d	031100	
			031102	
		1A2e	030900	
			030902	0.0
			030904	
		1A2f i	030100	
			030102	0.0
			030103	0.0
			030104	0.0
			030105	0.0
			030700	
			030800	
			031000	
			031200	
			031300	
			031400	
			031600	0.0
			032000	0.0
		1A4a i	020100	2.5
			020102	
			020103	0.1
			020105	0.0
		1A4b i	020200	14.7
			020204	0.0
		1A4c i	020300	
			020302	0.0
			020304	
	KEROSENE	1A2f i	030100	
			031500	0.0
			032000	0.0
		1A4a i	020100	0.0
		1A4b i	020200	0.0
		1A4c i	020300	0.0
	NAPHTA	1A1a	010100	
	ORIMULSION	1A1a	010101	
	LPG	1A1a	010100	
			010101	0.0
			010102	0.1
			010103	0.0
			010200	
			010202	
			010203	0.0
		1A1b	010306	
		1A2a	030400	0.0
		1A2b	030500	0.0
		1A2c	030600	0.0
			030602	0.0
		1A2d	031100	0.0
		1A2e	030900	0.1
		1A2f i	030100	
			030700	0.1
			030800	0.0
			031000	0.0
			031200	0.0
			031300	0.1
			031400	0.0
			031500	0.1
		1A4a i	020100	0.2
			020105	0.0
		1A4b i	020200	0.8
		1A4c i	020300	0.0
	REFINERY GAS	1A1a	010203	
		1A1b	010300	

fuel_type	fuel_gr_abbr	nfr_id	snap_id	2010
			010304	1.5
			010306	12.7
		1A2f i	030100	
			032000	
GAS	NATURAL GAS	1A1a	010100	
			010101	14.4
			010102	4.6
			010103	0.0
			010104	28.6
			010105	19.5
			010200	
			010202	1.2
			010203	8.8
		1A1c	010504	26.0
		1A2a	030400	0.3
			030402	1.2
		1A2b	030500	0.1
		1A2c	030600	0.6
			030602	0.6
			030604	1.0
		1A2d	031100	1.7
			031102	0.1
		1A2e	030900	9.5
			030902	0.1
			030904	1.5
		1A2f i	030100	0.1
			030102	0.0
			030103	0.5
			030104	3.9
			030105	0.7
			030106	0.1
			030700	5.2
			030800	1.6
			031000	0.3
			031200	0.6
			031300	3.3
			031400	0.3
			031500	0.4
			032000	1.6
		1A4a i	020100	11.8
			020103	0.1
			020104	
			020105	0.8
		1A4b i	020200	31.4
			020202	0.1
			020204	1.1
		1A4c i	020300	1.9
			020304	1.0
WASTE	WASTE	1A1a	010100	
			010101	
			010102	20.4
			010103	8.5
			010104	3.3
			010200	
			010202	
			010203	4.2
		1A2a	030400	
		1A2c	030600	0.0
		1A2d	031100	0.1
		1A2e	030900	0.1
			030902	
		1A2f i	030100	
			030102	
			030700	
			030800	0.1
			031000	0.0
			031200	
			031300	0.0
			031400	0.0
			031600	
			032000	
		1A4a i	020100	
			020103	0.1
	INDUSTR. WASTES	1A2f i	031600	1.4
BIOMASS	WOOD	1A1a	010100	

fuel_type	fuel_gr_abbr	nfr_id	snap_id	2010
			010101	3.3
			010102	9.3
			010103	1.1
			010104	11.3
			010200	
			010203	9.6
		1A2a	030400	
		1A2b	030500	
		1A2c	030600	
		1A2d	031100	
			031102	1.2
		1A2e	030900	0.0
			030902	0.0
		1A2f i	030100	0.0
			030102	0.6
			030103	0.4
			030700	0.0
			030800	0.1
			031000	0.0
			031200	0.0
			031300	0.2
			031400	3.7
			032000	1.2
		1A4a i	020100	1.0
			020105	0.0
		1A4b i	020200	36.9
			020202	0.0
			020204	0.0
		1A4c i	020300	0.1
			020303	0.0
	STRAW	1A1a	010100	
			010101	5.5
			010102	3.9
			010103	2.4
			010104	2.0
			010200	
			010203	5.0
		1A2f i	030103	
			030105	
		1A4b i	020200	2.9
		1A4c i	020300	1.9
			020302	
	BIO OIL	1A1a	010101	
			010102	0.1
			010105	0.0
			010200	
			010202	0.1
			010203	1.7
		1A2f i	030103	
			030105	0.0
		1A4a i	020105	
		1A4b i	020200	0.0
		1A4c i	020304	
	BIOGAS	1A1a	010100	
			010101	0.0
			010102	0.0
			010104	
			010105	1.9
			010200	
			010203	0.1
		1A2a	030400	
		1A2e	030900	0.0
			030902	0.0
			030903	0.1
		1A2f i	030100	
			030102	0.0
			030103	0.0
			030105	0.0
		1A4a i	020100	0.4
			020103	0.1
			020105	0.5
		1A4c i	020300	0.4
			020304	0.6
	BIO PROD GAS	1A1a	010105	0.2
		1A2f i	030105	0.0

fuel_type	fuel_gr_abbr	nfr_id	snap_id	2010		
		1A4c i	020304			

Annex 2A-3 Default Lower Calorific Value (LCV) of fuels and fuel correspondance list

(see table next page)

Table 56 Time-series for calorific values of fuels (DEA 2011b).

		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
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									
Crude Oil, Average	GJ pr tonne	43.00									
Crude Oil, Golf	GJ pr tonne	41.80									
Crude Oil, North Sea	GJ pr tonne	43.00									
Refinery Feedstocks	GJ pr tonne	42.70									
Refinery Gas	GJ pr tonne	52.00									
LPG	GJ pr tonne	46.00									
Naphtha (LVN)	GJ pr tonne	44.50									
Motor Gasoline	GJ pr tonne	43.80									
Aviation Gasoline	GJ pr tonne	43.80									
JP4	GJ pr tonne	43.80									
Other Kerosene	GJ pr tonne	43.50									
JP1	GJ pr tonne	43.50									
Gas/Diesel Oil	GJ pr tonne	42.70									
Fuel Oil	GJ pr tonne	40.65									
Orimulsion	GJ pr tonne	27.65									
Petroleum Coke	GJ pr tonne	31.40									
Waste Oil	GJ pr tonne	41.90									
White Spirit	GJ pr tonne	43.50									
Bitumen	GJ pr tonne	39.80									
Lubricants	GJ pr tonne	41.90									
Natural Gas	GJ pr 1000 Nm3	39.46									
Town Gas	GJ pr 1000 m3	21.35									
Electricity Plant Coal	GJ pr tonne	24.44									
Other Hard Coal	GJ pr tonne	24.44									
Coke	GJ pr tonne	29.30									
Brown Coal Briquettes	GJ pr tonne	18.30									
Straw	GJ pr tonne	14.50									
Wood Chips	GJ pr Cubic metre	2.80									
Wood Chips	GJ pr m3	9.30									
Firewood, Hardwood	GJ pr m3	10.40									
Firewood, Conifer	GJ pr tonne	7.60									
Wood Pellets	GJ pr tonne	17.50									
Wood Waste	GJ pr Cubic metre	14.70									
Wood Waste	GJ pr 1000 m3	3.20									
Biogas	GJ pr tonne	23.00									
Wastes	GJ pr tonne	10.50									
Bioethanol	GJ pr tonne	26.70									
Liquid Biofuels	GJ pr tonne	37.50									
Bio Oil	GJ pr tonne	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
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 2010.

					SO_2		NO_x		NM-VOC		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*
				020105	25	*22, 21*	90	*22, 21, 4*	146	*13*	240	*4*
		1A4b i	Residential	020200	25	*22, 21*	120	*22*	358.5	*39*	3188	*39*
				020202	25	*22, 21*	120	*22*	358.5	*39*	3188	*39*
				020204	25	*22, 21*	120	*22*	358.5	*39*	3188	*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*
		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*
	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*
		1A2f	Industry-Other	030105	1	*37*	700	*15*	37	*13*	100	*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*	59	*4*	2	*16*	36	*4*
		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*

					SO_2		NO_x		NM-VOC		CO	
Fuel type	**Fuel**	**NFR**	**NFR_name**	**SNAP**	**g/GJ**	***Ref.***	**g/GJ**	***Ref.***	**g/GJ**	***Ref.***	**g/GJ**	***Ref.***
		1A2f	Industry-Other	030105	1.9	*12*	173	*12*	2	*12*	586	*12*
WA-STE	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*
		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*
				030904	0.3	*17*	48	*12*	1.6	*12*	4.8	*12*
		1A2f	Industry - Other	030104	0.3	*17*	48	*12*	1.6	*12*	4.8	*12*
				030105	0.3	*17*	135	*12*	92	*12*	58	*12*
				(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	PETRO-LEUM COKE	1A1a	Electricity and heat production	010102	605	*20*	95	*38*	10	*38*	61	*38*
		1A2f	Industry - Other	(all)	605	*20*	95	*38*	10	*38*	61	*38*
		1A4b	Residential	020200	605	*20*	50	*1*	484	*13*	1000	*1*
	RESIDUAL	1A1a	Electricity and heat production	010101	218	*18*	138	*18*	2.3	*13*	15	*3*

Fuel type	Fuel	NFR	NFR_name	SNAP	SO_2 g/GJ	SO_2 *Ref.*	NO_x g/GJ	NO_x *Ref.*	NM-VOC g/GJ	NM-VOC *Ref.*	CO g/GJ	CO *Ref.*
	OIL											
				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*
				010202	344	*25,10, 24*	142	*4*	2.3	*13*	30	*1*
				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*
		1A2a	Iron and steel	030400	344	*25,10, 24*	130	*28*	0.8	*12*	2.8	*12*
		1A2b	Non-ferrous metals	030500	344	*25,10, 24*	130	*28*	0.8	*12*	2.8	*12*
		1A2c	Chemicals	030600	344	*25,10, 24*	130	*28*	0.8	*12*	2.8	*12*
		1A2d	Pulp, paper and print	031100	344	*25,10, 24*	130	*28*	0.8	*12*	2.8	*12*
		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*
		1A4a	Commercial/ Institutional	020100	344	*25,10, 24*	142	*4*	5	*13*	30	*1*
		1A4b i	Residential	020200	344	*25,10, 24*	142	*4*	15	*13*	30	*1*
		1A4c i	Agriculture/ Forestry	020300	344	*25,10, 24*	142	*4*	5	*13*	30	*1*
				020302	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*
		1A2e	Food processing, beverages and tobacco	030902	23	*27*	65	*28*	5	*13*	30	*1*
		1A2f	Industry - other	030105	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*
				020204	23	*27*	942	*12*	37	*13*	130	*12*
		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*

Fuel type	Fuel	NFR	NFR_name	SNAP	SO_2 g/GJ	SO_2 Ref.	NO_x g/GJ	NO_x Ref.	NM-VOC g/GJ	NM-VOC Ref.	CO g/GJ	CO Ref.
		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 and tobacco	030900	0.13	*23*	96	*32*	5	*13*	25	*1*
		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	10	*18*	30	*18*	1.2	*13*	10	*3*
				010102	10	*18*	30	*18*	1.2	*13*	10	*3*
				010104	10	*18*	30	*18*	1.2	*13*	10	*3*
		1A2e	Food processing, beverages and tobacco	030902 030903	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.	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	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.

pollut-ant	fuel_gr	fuel	nfr_id	nfr_name	snap	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
CO	BIOMASS	BIOGAS	1A1a	Electricity and heat production	010105	230	234	239	243	248	252	256	260	265	269
			1A2f i	Industry-Other	030105										
			1A4a i	Commercial/Institutional plants	020105	230	234	239	243	248	252	256	260	265	269
			1A4c i	Agriculture/Forestry/Fishing, Stationary	020304					248	252	256	260	265	269
		STRAW	1A1a	Electricity and heat production	010200	600	554	508	463						
					010203					417	371	325	325	325	325
			1A4b i	Residential plants	020200	8500	8500	8500	8500	8500	7500	6500	5500	4500	4000
			1A4c i	Agriculture/Forestry/Fishing, Stationary	020300	8500	8500	8500	8500	8500	7500	6500	5500	4500	4000
					020302					325	325	325	325	325	325
		WOOD	1A1a	Electricity and heat production	010200	400	373	347	320						
					010203					293	267	240	240	240	240
			1A2a	Iron and steel	030400	400	373	347	320	293					
			1A2d	Pulp, Paper and Print	031100	400	373	347	320	293	267	240	240	240	240
			1A2e	Food processing, beverages and tobacco	030900	400	373	347	320	293	267	240	240	240	240
			1A2f i	Industry-Other	030100	400	373	347	320						
					030103					293	267	240	240	240	240
					030700	400	373	347	320	293	267	240	240	240	240
					031000					293	267				240
					031200	400	373	347		293	267	240	240	240	240
					031300	400	373	347	320	293	267	240	240	240	240
					031400	400	373	347	320	293	267	240	240	240	240
					032000	400	373	347	320	293	267	240	240	240	240
			1A4a i	Commercial/Institutional plants	020100	400	373	347	320	293	267	240	240	240	240
			1A4b i	Residential plants	020200	4428.7	4428.7	4428.7	4428.7	4428.7	4428.7	4428.7	4428.7	4428.7	4428.7
					020202										
					020204										
			1A4c i	Agriculture/Forestry/Fishing, Stationary	020300	400	373	347	320	293	267	240	240	240	240
	GAS	NATURAL GAS	1A1a	Electricity and heat production	010104	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2
					010105	189	211	212	227	226	222	221	182	182	182
			1A1c	Manufacture of solid fuels and other energy industries	010504	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2
			1A2c	Chemicals	030604	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2
			1A2e	Food processing, beverages and tobacco	030904										
			1A2f i	Industry-Other	030104					6.2	6.2	6.2	6.2	6.2	6.2
					030105	189	211	212	227	226	222	221	182	182	182
			1A4a i	Commercial/Institutional plants	020104						6.2		6.2		
					020105	189	211	212	227	226	222	221	182	182	182
			1A4b i	Residential plants	020204		211	212	227	226	222	221	182	182	182
			1A4c i	Agriculture/Forestry/Fishing, Stationary	020304	189	211	212	227	226	222	221	182	182	182
	WASTE	WASTE	1A1a	Electricity and heat production	010102					7.4	7.4	7.4	7.4	7.4	7.4
					010103					7.4	7.4	7.4	7.4	7.4	7.4
					010104					7.4	7.4	7.4	7.4	7.4	7.4
					010200	100	85	70	55						
					010203					40	25	10	10	10	10

pollut-ant	fuel_gr	fuel	nfr_id	nfr_name	snap	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
			1A2a	Iron and steel	030400					40	25				
			1A2c	Chemicals	030600	100	85	70	55	40	25	10	10	10	
			1A2d	Pulp, Paper and Print	031100	100	85	70	55	40	25	10	10	10	10
			1A2e	Food processing, beverages and tobacco	030900	100	85	70	55	40	25	10		10	10
			1A2f i	Industry-Other	030700	100	85	70	55	40	25			10	
					031000	100	85	70	55	40	25	10	10	10	10
					031200	100	85			40	25				
					031300	100	85	70	55	40	25	10	10	10	
					031400			70	55	40	25	10	10	10	10
					032000	100	85	70	55	40	25	10	10	10	10
			1A4a i	Commercial/Institutional plants	020100	100	85	70	55	40	25	10	10	10	10
					020103					40	25	10	10	10	10
NMVOC	BIOMASS	BIOGAS	1A1a	Electricity and heat production	010105	14	14	14	14	14	14	14	14	14	14
			1A2f i	Industry-Other	030105										
			1A4a i	Commercial/Institutional plants	020105	14	14	14	14	14	14	14	14	14	14
			1A4c i	Agriculture/Forestry/Fishing, Stationary	020304					14	14	14	14	14	14
		STRAW	1A4b i	Residential plants	020200	925	872.5	820	767	715	663	610	558	505	453
			1A4c i	Agriculture/Forestry/Fishing, Stationary	020302					10	10	10	10	10	10
		WOOD	1A2a	Iron and steel	030400	146	132	119	105	92					
			1A2d	Pulp, Paper and Print	031100	146	132	119	105	92	78	64	51	37	24
			1A2e	Food processing, beverages and tobacco	030900	146	132	119	105	92	78	64	51	37	24
			1A2f i	Industry-Other	030100	146	132	119	105						
					030103					92	78	64	51	37	24
					030700	146	132	119	105	92	78	64	51	37	24
					031000					92	78				24
					031200	146	132	119		92	78	64	51	37	24
					031300	146	132	119	105	92	78	64	51	37	24
					031400	146	132	119	105	92	78	64	51	37	24
					032000	146	132	119	105	92	78	64	51	37	24
			1A4b i	Residential plants	020200	572.5	572.5	572.5	572.5	572.5	572.5	572.5	572.5	572.5	572.5
					020202										
					020204										
	GAS	NATURAL GAS	1A1a	Electricity and heat production	010104	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
					010105	60	69	81	127	140	142	138	124	122	122
			1A1c	Manufacture of solid fuels and other energy industries	010504	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
			1A2c	Chemicals	030604	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
			1A2e	Food processing, beverages and tobacco	030904										
			1A2f i	Industry-Other	030104					1.4	1.4	1.4	1.4	1.4	1.4
					030105	60	69	81	127	140	142	138	124	122	122
			1A4a i	Commercial/Institutional plants	020104						1.4		1.4		
					020105	60	69	81	127	140	142	138	124	122	122
			1A4b i	Residential plants	020204		69	81	127	140	142	138	124	122	122
			1A4c i	Agriculture/Forestry/Fishing, Stationary	020304	60	69	81	127	140	142	138	124	122	122
	LIQUID	RESIDUAL	1A4c i	Agriculture/Forestry/Fishing, Stationary	020304									5	5

pollut-ant	fuel_gr	fuel	nfr_id	nfr_name	snap	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
		OIL													
	WASTE	WASTE	1A1a	Electricity and heat production	010102					0.98	0.98	0.98	0.98	0.98	0.98
					010103					0.98	0.98	0.98	0.98	0.98	0.98
					010104					0.98	0.98	0.98	0.98	0.98	0.98
NOX	BIOMASS	BIO OIL	1A1a	Electricity and heat production	010200	100	95	90	85						
					010203					80	75	70	65	65	65
		BIOGAS	1A1a	Electricity and heat production	010105	711	696	681	665	650	635	616	597	578	559
			1A2f i	Industry-Other	030105										
			1A4a i	Commercial/Institutional plants	020105	711	696	681	665	650	635	616	597	578	559
			1A4c i	Agriculture/Forestry/Fishing, Stationary	020304					650	635	616	597	578	559
		WOOD	1A1a	Electricity and heat production	010203					130	130	130	130	130	90
			1A2a	Iron and steel	030400	130	130	130	130	130					
			1A2d	Pulp, Paper and Print	031100	130	130	130	130	130	130	130	130	130	90
			1A2e	Food processing, beverages and tobacco	030900	130	130	130	130	130	130	130	130	130	90
			1A2f i	Industry-Other	030100	130	130	130	130						
					030102									130	90
					030103					130	130	130	130	130	90
					030700	130	130	130	130	130	130	130	130	130	90
					031000					130	130				90
					031200	130	130	130		130	130	130	130	130	90
					031300	130	130	130	130	130	130	130	130	130	90
					031400	130	130	130	130	130	130	130	130	130	90
					032000	130	130	130	130	130	130	130	130	130	90
			1A4a i	Commercial/Institutional plants	020100	130	130	130	130	130	130	130	130	130	90
					020105									130	90
			1A4c i	Agriculture/Forestry/Fishing, Stationary	020300	130	130	130	130	130	130	130	130	130	90
	GAS	NATURAL GAS	1A1a	Electricity and heat production	010101					115	115		115		
					010102					115	115			115	115
					010104	161	157	153	149	145	141	138	134	131	127
					010105	276	241	235	214	199	194	193	170	167	167
			1A2c	Chemicals	030604	161	157	153	149	145	141	138	134	131	127
			1A2f i	Industry-Other	030104					145	141	138	134	131	127
					030105	276	241	235	214	199	194	193	170	167	167
			1A4a i	Commercial/Institutional plants	020104						141		134		
					020105	276	241	235	214	199	194	193	170	167	167
			1A4b i	Residential plants	020204		241	235	214	199	194	193	170	167	167
			1A4c i	Agriculture/Forestry/Fishing, Stationary	020304	276	241	235	214	199	194	193	170	167	167
	LIQUID	GAS OIL	1A1a	Electricity and heat production	010103						75	65	65	65	65
					010105					1247	1196	1145	1094	1044	993
					010200	100	95	90	85						
					010202					80	75	70	65	65	65
					010203					80	75	70	65	65	65
			1A1b	Petroleum refining	010306		95	90	85	80	75	70	65		
			1A2a	Iron and steel	030400	100	95	90	85	80	75	70	65	65	65
			1A2b	Non-ferrous metals	030500	100	95	90	85	80	75	70	65	65	65

pollut-ant	fuel_gr	fuel	nfr_id	nfr_name	snap	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
			1A2c	Chemicals	030600	100	95	90	85	80	75	70	65	65	65
			1A2d	Pulp, Paper and Print	031100	100	95	90	85	80	75	70	65	65	65
			1A2e	Food processing, beverages and tobacco	030900	100	95	90	85	80	75	70	65	65	65
			1A2f i	Industry-Other	030102					75	75	70	65	65	65
					030103					80	75	70	65	65	65
					030105					1247				1247	1247
					030700	100	95	90	85	80	75	70	65	65	65
					030800	100	95	90	85	80	75	70	65	65	65
					031000	100	95	90	85	80	75	70	65	65	65
					031200	100	95	90	85	80	75	70	65	65	65
					031300	100	95	90	85	80	75	70	65	65	65
					031400	100	95	90	85	80	75	70	65	65	65
					032000	100	95	90	85	80	75	70	65	65	65
			1A4a i	Commercial/Institutional plants	020105					1247	1196	1145	1094	1044	993
			1A4c i	Agriculture/Forestry/Fishing, Stationary	020304							1145	1094		
		ORIMUL-SION	1A1a	Electricity and heat production	010101						138	139	138	138	
		PETROLEUM COKE	1A1a	Electricity and heat production	010102					200	200				
			1A2f i	Industry-Other	030700	200						200	200	200	200
					030800	200	200	200	200	200	200				200
					031600	200	200	200	200	200	200	200	200	200	200
		REFINERY GAS	1A1b	Petroleum refining	010306	100	100	100	100	80	80	80	80	80	80
		RESIDUAL OIL	1A1a	Electricity and heat production	010100	342	384	294	289						
					010101						239	250	200	177	152
					010102	342	384	294	289	267	239	250	200	177	152
					010103					267	239	250	200	177	152
					010104					267	239	250	200	177	152
					010105					267	239	250	200	177	152
			1A4c i	Agriculture/Forestry/Fishing, Stationary	020304									142	142
	SOLID	BROWN COAL BRI.	1A4b i	Residential plants	020200	200	200	200	200	200	200	200	200	200	200
		COAL	1A1a	Electricity and heat production	010100	342	384	294	289						
					010101	342	384	294	289	267	239	250	200	177	152
					010102	342	384	294	289	267	239	250	200	177	152
					010103					267	239	250			
					010104					267	239	250	200		
					010203					200	200	200	200	200	200
			1A2c	Chemicals	030600	200	200	200	200	200	200	200	200	200	200
			1A2e	Food processing, beverages and tobacco	030900	200	200	200	200	200	200	200	200	200	200
					030902						200	200	200	200	200
			1A2f i	Industry-Other	030102					200	200	200	200	200	200
					030103					200	200	200	200	200	200
					030700	200			200	200	200	200	200	200	200
					030800	200	200	200	200	200	200	200	200	200	200

pollut-ant	fuel_gr	fuel	nfr_id	nfr_name	snap	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
					031300	200	200	200	200	200	200	200	200	200	
					031600	200	200	200	200	200	200	200	200	200	200
					032000				200						
			1A4a i	Commercial/Institutional plants	020100	200	200	200	200	200	200	200	200	200	
			1A4b i	Residential plants	020200	200	200	200	200	200	200	200	200	200	200
			1A4c i	Agriculture/Forestry/Fishing, Stationary	020300	200	200	200	200	200	200	200	200	200	200
		COKE OVEN COKE	1A2a	Iron and steel	030400	200	200								200
			1A2e	Food processing, beverages and tobacco	030900	200	200	200	200	200	200	200	200	200	200
			1A2f i	Industry-Other	030700	200	200	200	200	200	200	200	200	200	200
					030800	200								200	200
					031300	200	200	200	200	200	200	200	200	200	
					032000	200	200	200	200		200	200	200	200	200
			1A4b i	Residential plants	020200	200	200	200	200	200	200	200	200	200	200
	WASTE	WASTE	1A1a	Electricity and heat production	010102					134	134	134	134	134	129
					010103					134	134	134	134	134	129
					010104					134	134	134	134	134	129
SO2	LIQUID	GAS OIL	1A1a	Electricity and heat production	010101					94	23	23	23	23	23
					010102					94	23	23	23	23	23
					010104		94	94	94	94	23	23	23	23	23
					010105					94	23	23	23	23	23
					010202					94	23	23	23	23	23
					010203					94	23	23	23	23	23
			1A1b	Petroleum refining	010306		94	94	94	94	23	23	23		
			1A2a	Iron and steel	030400	94	94	94	94	94	23	23	23	23	23
			1A2b	Non-ferrous metals	030500	94	94	94	94	94	23	23	23	23	23
			1A2c	Chemicals	030600	94	94	94	94	94	23	23	23	23	23
			1A2d	Pulp, Paper and Print	031100	94	94	94	94	94	23	23	23	23	23
			1A2e	Food processing, beverages and tobacco	030900	94	94	94	94	94	23	23	23	23	23
			1A2f i	Industry-Other	030102					94	23	23	23	23	23
					030103					94	23	23	23	23	23
					030105					94				23	23
					030700	94	94	94	94	94	23	23	23	23	23
					030800	94	94	94	94	94	23	23	23	23	23
					031000	94	94	94	94	94	23	23	23	23	23
					031200	94	94	94	94	94	23	23	23	23	23
					031300	94	94	94	94	94	23	23	23	23	23
					031400	94	94	94	94	94	23	23	23	23	23
					032000	94	94	94	94	94	23	23	23	23	23
			1A4a i	Commercial/Institutional plants	020100	94	94	94	94	94	23	23	23	23	23
					020102					94		23		23	
					020103					94		23	23	23	23
					020105					94	23	23	23	23	23
			1A4b i	Residential plants	020200	94	94	94	94	94	23	23	23	23	23
			1A4c i	Agriculture/Forestry/Fishing, Stationary	020300	94	94	94	94	94	23	23	23	23	23

pollut-ant	fuel_gr	fuel	nfr_id	nfr_name	snap	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
		ORIMUL-SION	1A1a	Electricity and heat production	010101						149	147	149	149	
		PETROLEUM COKE	1A1a	Electricity and heat production	010102					787	787				
			1A2f i	Industry-Other	030700	787						787	787	787	787
					030800	787	787	787	787	787	787				787
					031600	787	787	787	787	787	787	787	787	787	787
			1A4a i	Commercial/Institutional plants	020100	787	787	787	787	787	787	787	787	787	787
			1A4b i	Residential plants	020200	787	787	787	787	787	787	787	787	787	787
			1A4c i	Agriculture/Forestry/Fishing, Stationary	020300	787	787	787	787		787	787	787	787	787
		REFINERY GAS	1A1b	Petroleum refining	010306	1	1	1	1	61	1	1	1	1	1
		RESIDUAL OIL	1A1a	Electricity and heat production	010100	446	470	490	475						
					010101						351	408	344	369	369
					010102	446	470	490	475	543	351	408	344	369	369
					010103					543	351	408	344	369	369
					010104					543	351	408	344	369	369
					010105					543	351	408	344	369	369
					010202					495	495	495	344	344	344
					010203					495	495	495	344	344	344
			1A1b	Petroleum refining	010306	798	798	798	798	537	537	537	537	537	537
			1A2a	Iron and steel	030400	495	495	495	495	495	495	495	344	344	344
			1A2b	Non-ferrous metals	030500	495	495	495	495	495	495	495	344	344	344
			1A2c	Chemicals	030600	495	495	495	495	495	495	495	344	344	344
			1A2d	Pulp, Paper and Print	031100	495	495	495	495	495	495	495	344	344	344
			1A2e	Food processing, beverages and tobacco	030900	495	495	495	495	495	495	495	344	344	344
					030902						495	495	344	344	344
			1A2f i	Industry-Other	030102					495	495	495	344	344	344
					030103					495	495	495	344	344	344
					030700	495	495	495	495	495	495	495	344		344
					030800	495	495	495	495	495	495	495	344	344	344
					031000	495	495	495	495	495	495	495	344	344	344
					031200	495	495	495	495	495	495	495		344	344
					031300	495	495	495	495	495	495	495	344	344	344
					031400	495	495	495	495	495	495	495	344	344	344
					031500	495	495	495	495	495	495	495	344	344	344
					031600	495	495	495	495	495	495	495	344	344	344
					032000	495	495	495	495	495	495	495	344	344	344
			1A4a i	Commercial/Institutional plants	020100	495	495	495	495	495	495	495	344	344	344
			1A4b i	Residential plants	020200	495	495	495	495	495	495	495	344	344	344
			1A4c i	Agriculture/Forestry/Fishing, Stationary	020300	495	495	495	495	495	495	495	344	344	344
	SOLID	COAL	1A1a	Electricity and heat production	010100	506	571	454	386						
					010101	506	571	454	386	343	312	420	215	263	193
					010102	506	571	454	386	343	312	420	215	263	193
					010103					343	312	420			
					010104					343	312	420	215		

pollut-ant	fuel_gr	fuel	nfr_id	nfr_name	snap	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
	WASTE	INDUSTR. WASTES	1A2f i	Industry-Other	031600										
		WASTE	1A1a	Electricity and heat production	010100	138	116	95	73						
					010102					52	30	29	28	26	25
					010103					52	30	29	28	26	25
					010104					52	30	29	28	26	25
					010200	138	131	124	117						
					010203					110	103	95	88	81	74
			1A2a	Iron and steel	030400					110	103				
			1A2c	Chemicals	030600	138	131	124	117	110	103	95	88	81	
			1A2d	Pulp, Paper and Print	031100	138	131	124	117	110	103	95	88	81	74
			1A2e	Food processing, beverages and tobacco	030900	138	131	124	117	110	103	95		81	74
			1A2f i	Industry-Other	030102										
					030700	138	131	124	117	110	103			81	
					030800										
					031000	138	131	124	117	110	103	95	88	81	74
					031200	138	131			110	103				
					031300	138	131	124	117	110	103	95	88	81	
					031400			124	117	110	103	95	88	81	74
					031600										
					032000	138	131	124	117	110	103	95	88	81	74
			1A4a i	Commercial/Institutional plants	020100	138	131	124	117	110	103	95	88	81	74
					020103					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 2010.

pollut-ant	fuel_gr	fuel	nfr_id	nfr_name	snap	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
CO	BIOMASS	BIOGAS	1A1a	Electricity and heat production	010105	273	279	285	292	298	304	310	310	310	310	310
			1A2f i	Industry-Other	030105		279	285	292	298	304	310	310	310	310	310
			1A4a i	Commercial/Institutional plants	020105	273	279	285	292	298	304	310	310	310	310	310
			1A4c i	Agriculture/Forestry/Fishing, Stationary	020304	273	279	285	292	298	304	310	310	310	310	310
		STRAW	1A1a	Electricity and heat production	010200											
					010203	325	325	325	325	325	325	325	325	325	325	325
			1A4b i	Residential plants	020200	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
			1A4c i	Agriculture/Forestry/Fishing, Stationary	020300	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
					020302	325	325	325	325	325	325	4000	325	4000	4000	
		WOOD	1A1a	Electricity and heat production	010200											
					010203	240	240	240	240	240	240	240	240	240	240	240
			1A2a	Iron and steel	030400				240	240						
			1A2d	Pulp, Paper and Print	031100	240	240	240	240	240	240					
			1A2e	Food processing, beverages and tobacco	030900	240	240	240	240	240	240	240	240	240	240	240
			1A2f i	Industry-Other	030100						240	240	240	240	240	240
					030103	240	240	240	240	240	240	240	240	240	240	240
					030700	240	240	240	240	240	240	240	240	240	240	240

pollut-ant	fuel_gr	fuel	nfr_id	nfr_name	snap	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
					031000	240	240	240	240	240	240	240	240	240	240	240
					031200	240	240	240	240	240	240	240	240	240	240	240
					031300	240	240	240	240	240	240	240	240	240	240	240
					031400	240	240	240	240	240	240	240	240	240	240	240
					032000	240	240	240	240	240	240	240	240	240	240	240
			1A4a i	Commercial/Institutional plants	020100	240	240	240	240	240	240	240	240	240	240	240
			1A4b i	Residential plants	020200	4428.7	4027.3	3887.1	3880.5	3866.9	3734.9	3554.2	3643.8	3498.1	3292.7	3188.2
					020202						3734.9	3554.2	3643.8	3498.1	3292.7	3188.2
					020204									3498.1	3292.7	3188.2
			1A4c i	Agriculture/Forestry/Fishing, Stationary	020300	240	240	240	240	240	240	240	240	240	240	240
	GAS	NATURAL GAS	1A1a	Electricity and heat production	010104	6.2	6.2	6.2	6.2	6.2	6.2	5.5	4.8	4.8	4.8	4.8
					010105	183	163	142	122	101	81	70	58	58	58	58
			1A1c	Manufacture of solid fuels and other energy industries	010504	6.2	6.2	6.2	6.2	6.2	6.2	5.5	4.8	4.8	4.8	4.8
			1A2c	Chemicals	030604	6.2	6.2	6.2	6.2	6.2	6.2				4.8	4.8
			1A2e	Food processing, beverages and tobacco	030904	28	6.2	6.2	6.2	6.2	6.2	5.5	4.8	4.8	4.8	4.8
			1A2f i	Industry-Other	030104	6.2	6.2	6.2	6.2	6.2	6.2	5.5	4.8	4.8	4.8	4.8
					030105	183	163	142	122	101	81	70	58	58	58	58
			1A4a i	Commercial/Institutional plants	020104	6.2	6.2	6.2	6.2	6.2	6.2	5.5	4.8			
					020105	183	163	142	122	101	81	70	58	58	58	58
			1A4b i	Residential plants	020204	183	163	142	122	101	81	70	58	58	58	58
			1A4c i	Agriculture/Forestry/Fishing, Stationary	020304	183	163	142	122	101	81	70	58	58	58	58
	WASTE	WASTE	1A1a	Electricity and heat production	010102	8	8	8	8	6.6	5.3	3.9	3.9	3.9	3.9	3.9
					010103	8	8	8	8	6.6	5.3	3.9	3.9	3.9	3.9	3.9
					010104	8			8			3.9				3.9
					010200											
					010203	10	10	10	10	10	10	10	10	10	10	10
			1A2a	Iron and steel	030400											
			1A2c	Chemicals	030600	10			10	10	10	10	10	10	10	10
			1A2d	Pulp, Paper and Print	031100	10			10		10	10	10	10	10	10
			1A2e	Food processing, beverages and tobacco	030900				10		10	10	10	10	10	10
			1A2f i	Industry-Other	030700											
					031000	10							10	10	10	10
					031200											
					031300	10			10	10	10	10	10	10	10	10
					031400	10			10	10	10	10	10	10	10	10
					032000	10			10		10	10		10	10	
			1A4a i	Commercial/Institutional plants	020100	10			10	10						
					020103	10	10	10	10	10	10	10	10	10	10	10
NMVOC	BIOMASS	BIOGAS	1A1a	Electricity and heat production	010105	14	13	13	12	11	10	10	10	10	10	10
			1A2f i	Industry-Other	030105		13	13	12	11	10	10	10	10	10	10
			1A4a i	Commercial/Institutional plants	020105	14	13	13	12	11	10	10	10	10	10	10
			1A4c i	Agriculture/Forestry/Fishing, Stationary	020304	14	13	13	12	11	10	10	10	10	10	10
		STRAW	1A4b i	Residential plants	020200	400	400	400	400	400	400	400	400	400	400	400
			1A4c i	Agriculture/Forestry/Fishing, Stationary	020302	10	10	10	10	10	10	146	10	146	146	

pollut-ant	fuel_gr	fuel	nfr_id	nfr_name	snap	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
		WOOD	1A2a	Iron and steel	030400				10	10						
			1A2d	Pulp, Paper and Print	031100	10	10	10	10	10	10					
			1A2e	Food processing, beverages and tobacco	030900	10	10	10	10	10	10	10	10	10	10	10
			1A2f i	Industry-Other	030100						10	10	10	10	10	10
					030103	10	10	10	10	10	10	10	10	10	10	10
					030700	10	10	10	10	10	10	10	10	10	10	10
					031000	10	10	10	10	10	10	10	10	10	10	10
					031200	10	10	10	10	10	10	10	10	10	10	10
					031300	10	10	10	10	10	10	10	10	10	10	10
					031400	10	10	10	10	10	10	10	10	10	10	10
					032000	10	10	10	10	10	10	10	10	10	10	10
			1A4b i	Residential plants	020200	572.5	510.0	484.7	477.9	470.1	446.6	415.9	421.9	401.3	373.4	358.5
					020202						446.6	415.9	421.9	401.3	373.4	358.5
					020204									401.3	373.4	358.5
	GAS	NATURAL GAS	1A1a	Electricity and heat production	010104	1.4	1.4	1.5	1.5	1.6	1.6	1.6	1.6	1.6	1.6	1.6
					010105	121	114	108	101	95	88	90	92	92	92	92
			1A1c	Manufacture of solid fuels and other energy industries	010504	1.4	1.4	1.5	1.5	1.6	1.6	1.6	1.6	1.6	1.6	1.6
			1A2c	Chemicals	030604	1.4	1.4	1.5	1.5	1.6	1.6				1.6	1.6
			1A2e	Food processing, beverages and tobacco	030904	2	1.4	1.5	1.5	1.6	1.6	1.6	1.6	1.6	1.6	1.6
			1A2f i	Industry-Other	030104	1.4	1.4	1.5	1.5	1.6	1.6	1.6	1.6	1.6	1.6	1.6
					030105	121	114	108	101	95	88	90	92	92	92	92
			1A4a i	Commercial/Institutional plants	020104	1.4	1.4	1.5	1.5	1.6	1.6	1.6	1.6			
					020105	121	114	108	101	95	88	90	92	92	92	92
			1A4b i	Residential plants	020204	121	114	108	101	95	88	90	92	92	92	92
			1A4c i	Agriculture/Forestry/Fishing, Stationary	020304	121	114	108	101	95	88	90	92	92	92	92
	LIQUID	RESIDUAL OIL	1A4c i	Agriculture/Forestry/Fishing, Stationary	020304	5	5	5	5							10
	WASTE	WASTE	1A1a	Electricity and heat production	010102	0.98	0.98	0.98	0.98	0.84	0.7	0.56	0.56	0.56	0.56	0.56
					010103	0.98	0.98	0.98	0.98	0.84	0.7	0.56	0.56	0.56	0.56	0.56
					010104	0.98			0.98			0.56				0.56
NO_X	BIOMASS	BIO OIL	1A1a	Electricity and heat production	010200											
					010203	65	65	65	65	65	65	65	65	65	65	65
		BIOGAS	1A1a	Electricity and heat production	010105	540	484	427	371	315	259	202	202	202	202	202
			1A2f i	Industry-Other	030105		484	427	371	315	259	202	202	202	202	202
			1A4a i	Commercial/Institutional plants	020105	540	484	427	371	315	259	202	202	202	202	202
			1A4c i	Agriculture/Forestry/Fishing, Stationary	020304	540	484	427	371	315	259	202	202	202	202	202
		WOOD	1A1a	Electricity and heat production	010203	90	90	90	90	90	90	90	90	90	90	90
			1A2a	Iron and steel	030400				90	90						
			1A2d	Pulp, Paper and Print	031100	90	90	90	90	90	90					
			1A2e	Food processing, beverages and tobacco	030900	90	90	90	90	90	90	90	90	90	90	90
			1A2f i	Industry-Other	030100						90	90	90	90	90	90
					030102	90	90					90	90	90	90	90
					030103	90	90	90	90	90	90	90	90	90	90	90
					030700	90	90	90	90	90	90	90	90	90	90	90

pollut-ant	fuel_gr	fuel	nfr_id	nfr_name	snap	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
					031000	90	90	90	90	90	90	90	90	90	90	90
					031200	90	90	90	90	90	90	90	90	90	90	90
					031300	90	90	90	90	90	90	90	90	90	90	90
					031400	90	90	90	90	90	90	90	90	90	90	90
					032000	90	90	90	90	90	90	90	90	90	90	90
			1A4a i	Commercial/Institutional plants	020100	90	90	90	90	90	90	90	90	90	90	90
					020105		90	90		90	90	90	90	90	90	90
			1A4c i	Agriculture/Forestry/Fishing, Stationary	020300	90	90	90	90	90	90	90	90	90	90	90
	GAS	NATURAL GAS	1A1a	Electricity and heat production	010101	115	115	115	115	97	97	97	97	55	55	55
					010102	115	115	115	115	97	97	97	97	55	55	55
					010104	124	119	113	108	103	98	73	48	48	48	48
					010105	168	163	158	153	148	143	139	135	135	135	135
			1A2c	Chemicals	030604	124	119	113	108	103	98				48	48
			1A2f i	Industry-Other	030104	124	119	113	108	103	98	73	48	48	48	48
					030105	168	163	158	153	148	143	139	135	135	135	135
			1A4a i	Commercial/Institutional plants	020104	124	119	113	108	103	98	73	48			
					020105	168	163	158	153	148	143	139	135	135	135	135
			1A4b i	Residential plants	020204	168	163	158	153	148	143	139	135	135	135	135
			1A4c i	Agriculture/Forestry/Fishing, Stationary	020304	168	163	158	153	148	143	139	135	135	135	135
	LIQUID	GAS OIL	1A1a	Electricity and heat production	010103		65	65	65	65	65	65	65	65	65	65
					010105	942	942	942	942	942	942	942	942	942	942	942
					010200											
					010202	65	65	65	65	65	65	65	65	65	65	65
					010203	65	65	65	65	65	65	65	65	65	65	65
			1A1b	Petroleum refining	010306				65	65	65	65	65	65	65	65
			1A2a	Iron and steel	030400	65	65	65	65	65	65	65				
			1A2b	Non-ferrous metals	030500	65	65	65	65	65	65	65				
			1A2c	Chemicals	030600	65	65	65	65	65	65	65				
			1A2d	Pulp, Paper and Print	031100	65	65	65	65	65	65	65				
			1A2e	Food processing, beverages and tobacco	030900	65	65	65	65	65	65	65				
			1A2f i	Industry-Other	030102							65	65	65	65	65
					030103	65	65	65	65	65	65	65	65	65		65
					030105	942	942							942	942	942
					030700	65	65	65	65	65	65	65				
					030800	65	65	65	65	65	65	65				
					031000	65	65	65	65	65	65	65				
					031200	65	65	65	65	65	65	65				
					031300	65	65	65	65	65	65	65				
					031400	65	65	65	65	65	65	65				
					032000	65	65	65	65	65	65	65	65	65	65	65
			1A4a i	Commercial/Institutional plants	020105	942	942	942	942	942	942	942	942	942	942	942
			1A4c i	Agriculture/Forestry/Fishing, Stationary	020304	942	942	942	942		942	942			942	
		ORIMUL-SION	1A1a	Electricity and heat production	010101		88	86	86	86						
		PETROLEUM	1A1a	Electricity and heat production	010102											95

pollut-ant	fuel_gr	fuel	nfr_id	nfr_name	snap	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
		COKE														
			1A2f i	Industry-Other	030700	95	95	95	95	95						
					030800	95	95	95	95	95	95		95	95		95
					031600	95	95	95	95	95	95	95	95	95	95	95
		REFINERY GAS	1A1b	Petroleum refining	010306	80	80	80	80	80	80	80	80	80	80	80
		RESIDUAL OIL	1A1a	Electricity and heat production	010100											
					010101	129	122	130	144	131	127	109	98	138	138	138
					010102	129	122	130	144	131	127	109	98	138	138	138
					010103	129	122	130	144	131				138	138	138
					010104		122	130	144	131	127	109	98	138	138	138
					010105	129	122	130	144							
			1A4c i	Agriculture/Forestry/Fishing, Stationary	020304	142	142	142	142							130
	SOLID	BROWN COAL BRI.	1A4b i	Residential plants	020200	95	95	95	95					95	95	95
		COAL	1A1a	Electricity and heat production	010100											
					010101	129	122	130	144	131	127	109	98	59	39	30
					010102	129	122	130	144	131	127	109	98	59	39	30
					010103											
					010104											30
					010203	95	95	95	95	95	95		95	95		
			1A2c	Chemicals	030600	95	95	95	95	95	95	95				
			1A2e	Food processing, beverages and tobacco	030900	95	95	95	95	95	95	95	95	95		
					030902	95	95	95	95	95	95	95	95	95	95	95
			1A2f i	Industry-Other	030102	95	95	95	95	95	95		95	95	95	95
					030103	95	95	95	95	95	95	95	95	95	95	95
					030700	95	95		95	95	95	95	95	95	95	95
					030800	95	95	95	95	95	95	95	95	95	95	95
					031300	95	95	95	95	95						
					031600	95	95	95	95	95	95	95	95	95	95	95
					032000										95	95
			1A4a i	Commercial/Institutional plants	020100					95						
			1A4b i	Residential plants	020200	95	95	95	95	95	95	95	95	95	95	95
			1A4c i	Agriculture/Forestry/Fishing, Stationary	020300	95	95	95	95	95	95	95	95	95	95	95
		COKE OVEN COKE	1A2a	Iron and steel	030400	95	95	95								
			1A2e	Food processing, beverages and tobacco	030900	95	95	95	95	95	95	95	95			
			1A2f i	Industry-Other	030700	95	95	95	95	95	95	95	95	95	95	95
					030800	95										
					031300				95	95			95	95	95	95
					032000	95	95	95	95	95	95	95	95	95	95	95
			1A4b i	Residential plants	020200	95	95	95	95	95	95	95	95	95	95	95
	WASTE	WASTE	1A1a	Electricity and heat production	010102	124	124	124	124	117	110	102	102	102	102	102
					010103	124	124	124	124	117	110	102	102	102	102	102
					010104	124			124			102				102
SO_2	LIQUID	GAS OIL	1A1a	Electricity and heat production	010101	23	23	23	23	23	23	23	23	23	23	23

pollut-ant	fuel_gr	fuel	nfr_id	nfr_name	snap	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
					010102	23	23	23	23	23	23	23	23	23	23	23
					010104	23	23	23	23	23	23	23	23	23	23	23
					010105	23	23	23	23	23	23	23	23	23	23	23
					010202	23	23	23	23	23	23	23	23	23	23	23
					010203	23	23	23	23	23	23	23	23	23	23	23
			1A1b	Petroleum refining	010306				23	23	23	23	23	23	23	23
			1A2a	Iron and steel	030400	23	23	23	23	23	23	23				
			1A2b	Non-ferrous metals	030500	23	23	23	23	23	23	23				
			1A2c	Chemicals	030600	23	23	23	23	23	23	23				
			1A2d	Pulp, Paper and Print	031100	23	23	23	23	23	23	23				
			1A2e	Food processing, beverages and tobacco	030900	23	23	23	23	23	23	23				
			1A2f i	Industry-Other	030102							23	23	23	23	23
					030103	23	23	23	23	23	23	23	23	23		23
					030105	23	23							23	23	23
					030700	23	23	23	23	23	23	23				
					030800	23	23	23	23	23	23	23				
					031000	23	23	23	23	23	23	23				
					031200	23	23	23	23	23	23	23				
					031300	23	23	23	23	23	23	23				
					031400	23	23	23	23	23	23	23				
					032000	23	23	23	23	23	23	23	23	23	23	23
			1A4a i	Commercial/Institutional plants	020100	23	23	23	23	23	23	23	23	23	23	23
					020102											
					020103	23	23	23	23	23	23	23	23	23	23	23
					020105	23	23	23	23	23	23	23	23	23	23	23
			1A4b i	Residential plants	020200	23	23	23	23	23	23	23	23	23	23	23
			1A4c i	Agriculture/Forestry/Fishing, Stationary	020300	23	23	23	23	23	23	23				
		ORIMUL-SION	1A1a	Electricity and heat production	010101		12	12	12	12						
		PETROLEUM COKE	1A1a	Electricity and heat production	010102											605
			1A2f i	Industry-Other	030700	787	605	605	605	605						
					030800	787	605	605	605	605	605		605	605		605
					031600	787	605	605	605	605	605	605	605	605	605	605
			1A4a i	Commercial/Institutional plants	020100	787	605	605	605		605					
			1A4b i	Residential plants	020200	787	605	605	605		605	605	605	605		605
			1A4c i	Agriculture/Forestry/Fishing, Stationary	020300	787	605	605	605							
		REFINERY GAS	1A1b	Petroleum refining	010306	1	1	1	1	1	1	1	1	1	1	1
		RESIDUAL OIL	1A1a	Electricity and heat production	010100											
					010101	403	315	290	334	349	283	308	206	218	218	218
					010102	403	315	290	334	349	283	308	206	218	218	218
					010103	403	315	290	334	349				218	218	218
					010104		315	290	334	349	283	308	206	218	218	218
					010105	403	315	290	334							
					010202					344	344	344				344

pollut-ant	fuel_gr	fuel	nfr_id	nfr_name	snap	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
					010203	344	344	344	344	344	344	344		344	344	344
			1A1b	Petroleum refining	010306	537	537	537	537	537	537	537	537	537	537	537
			1A2a	Iron and steel	030400	344	344	344					344	344	344	344
			1A2b	Non-ferrous metals	030500	344	344	344	344	344	344	344	344	344	344	344
			1A2c	Chemicals	030600	344	344	344	344	344	344	344	344			344
			1A2d	Pulp, Paper and Print	031100	344	344	344	344	344	344	344	344	344		344
			1A2e	Food processing, beverages and tobacco	030900	344	344	344	344	344	344	344	344			
					030902	344	344	344	344	344	344	344	344	344	344	344
			1A2f i	Industry-Other	030102	344	344	344	344	344	344	344	344	344		
					030103	344	344	344	344	344	344	344				
					030700	344	344	344	344			344	344	344		344
					030800	344	344	344	344	344	344	344	344	344	344	344
					031000	344	344	344					344	344	344	344
					031200	344	344	344			344	344	344	344	344	344
					031300	344	344	344	344	344	344	344	344	344		344
					031400	344	344	344	344	344	344	344	344	344	344	344
					031500	344	344	344								
					031600	344	344	344	344	344	344	344	344	344	344	344
					032000	344	344	344	344	344	344	344	344			
			1A4a i	Commercial/Institutional plants	020100	344	344	344	344	344	344	344	344	344	344	344
			1A4b i	Residential plants	020200	344	344	344	344	344	344	344	344	344	344	344
			1A4c i	Agriculture/Forestry/Fishing, Stationary	020300	344	344	344	344	344	344	344	344	344	344	344
	SOLID	COAL	1A1a	Electricity and heat production	010100											
					010101	64	47	45	61	42	41	37	40	26	14	10
					010102	64	47	45	61	42	41	37	40	26	14	10
					010103											
					010104											10
	WASTE	INDUSTR. WASTES	1A2f i	Industry-Other	031600							22	15	15	15	15
		WASTE	1A1a	Electricity and heat production	010100											
					010102	24	24	24	24	19	14	8.3	8.3	8.3	8.3	8.3
					010103	24	24	24	24	19	14	8.3	8.3	8.3	8.3	8.3
					010104	24			24			8.3				8.3
					010200											
					010203	67	60	52	45	37	30	22	15	15	15	15
			1A2a	Iron and steel	030400											
			1A2c	Chemicals	030600	67			45	37	30	22	15	15	15	15
			1A2d	Pulp, Paper and Print	031100	67			45		30	22	15	15	15	15
			1A2e	Food processing, beverages and tobacco	030900				45		30	22	15	15	15	15
			1A2f i	Industry-Other	030102				45	37	30	22	15	15		
					030700											
					030800						30	22	15	15	15	15
					031000	67							15	15	15	15
					031200											
					031300	67			45	37	30	22	15	15	15	15
					031400	67			45	37	30	22	15	15	15	15

pollut-ant	fuel_gr	fuel	nfr_id	nfr_name	snap	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
					031600	67	60	52	45	37	30					
					032000	67			45		30	22		15	15	
			1A4a i	Commercial/Institutional plants	020100	67			45	37						
					020103	67	60	52	45	37	30	22	15	15	15	15

Table 2A-4.3 PM emission factors (in g per GJ) and references, 2010

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
			1A2f i	030100	19	1	13	2	10	1
				030102	19	1	13	2	10	1
				030103	19	1	13	2	10	1
			1A4a i	020100	143	1	143	9	135	9
				020105	143	1	143	9	135	9
			1A4b i	020200	503	17	479	17	473	17
				020202	503	17	479	17	473	17
				020204	503	17	479	17	473	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
			1A4b i	020200	234	4	222	5	211	5
			1A4c i	020300	234	4	222	5	211	5
	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
			1A2f i	030105	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
			1A2f i	030102	1.5	6	1.5	7	1.5	7
				030103	1.5	6	1.5	7	1.5	7
				030105	2.63	3	0.451	3	0.206	3
			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
			1A4a i	020103	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
			1A2f i	030100	0.1	9	0.1	9	0.1	9
				030102	0.1	9	0.1	9	0.1	9
				030103	0.1	9	0.1	9	0.1	9
				030104	0.1	3	0.061	3	0.051	3
				030105	0.76	3	0.189	3	0.161	3
				030106	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
			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
				010202	3	9	3	9	2.5	9
				010203	3	9	3	9	2.5	9
			1A1b	010306	50	9	40	9	35	9
			1A4a i	020100	14	6	10.5	13	7	13
			1A4b i	020200	14	6	10.5	13	7	13
			1A4c i	020300	14	6	10.5	13	7	13
				020302	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
			1A2f i	030102	5	9	5	9	5	9
				030103	5	9	5	9	5	9
				030104	5	9	5	9	5	9
				030105	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
				020204	5	9	5	9	5	9
			1A4c i	020302	5	9	5	9	5	9
	206A	KEROSENE	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	010101	0.2	9	0.2	9	0.2	9
				010102	0.2	9	0.2	9	0.2	9
				010103	0.2	9	0.2	9	0.2	9
				010203	0.2	9	0.2	9	0.2	9
			1A4a i	020100	0.2	9	0.2	9	0.2	9
				020105	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	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
			1A2f i	030102	17	6	12	14	7	14
				030103	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.	1A4b i	020200	17	16	12	16	7	16
	107A	COKE OVEN COKE	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-4.4a PM emission factors, time-series for the years 1990 to 1999.

pollutant	fuel_type	fuel_gr	nfr_id	nfr_name	snap	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
PM_{10}	BIOMASS	STRAW	1A4c i	Agriculture/Forestry/Fishing, Stationary	020302					15	15	15	15		
		WOOD	1A4b i	Residential plants	020200										
					020202										
					020204										
	LIQUID	PETROLEUM COKE	1A1a	Electricity and heat production	010102					60	60				
		RESIDUAL OIL	1A4c i	Agriculture/Forestry/Fishing, Stationary	020304									50	50
	WASTE	INDUSTR. WASTES	1A2f i	Industry-Other	031600										
		WASTE	1A1a	Electricity and heat production	010102									1.126	
					010103					1.126	1.126				
					010104					1.126	1.126	1.126	1.126	1.126	1.126
					010203					5	5	5	5		
			1A2c	Chemicals	030600	5	5	5	5		5	5	5	5	
			1A2d	Pulp, Paper and Print	031100	5	5	5	5		5	5	5	5	5
			1A2e	Food processing, beverages and tobacco	030900	5	5	5	5		5	5		5	5
			1A2f i	Industry-Other	030102										
					030800										
					031000	5	5	5	5		5	5	5	5	5
					031300	5	5	5	5		5	5	5	5	
					031400			5	5		5	5	5	5	5
					031600										
					032000	5	5	5	5		5	5	5	5	5
			1A4a i	Commercial/Institutional plants	020100										
					020103					5	5	5	5	5	
$PM_{2.5}$	BIOMASS	STRAW	1A4c i	Agriculture/Forestry/Fishing, Stationary	020302					12	12	12	12		
		WOOD	1A4b i	Residential plants	020200										
					020202										
					020204										
	LIQUID	PETROLEUM COKE	1A1a	Electricity and heat production	010102					30	30				
		RESIDUAL OIL	1A4c i	Agriculture/Forestry/Fishing, Stationary	020304									40	40
	WASTE	INDUSTR. WASTES	1A2f i	Industry-Other	031600										
		WASTE	1A1a	Electricity and heat production	010102									1.084	
					010103					1.084	1.084				
					010104					1.084	1.084	1.084	1.084	1.084	1.084
					010203					4	4	4	4		
			1A2c	Chemicals	030600	4	4	4	4		4	4	4	4	
			1A2d	Pulp, Paper and Print	031100	4	4	4	4		4	4	4	4	4
			1A2e	Food processing, beverages and tobacco	030900	4	4	4	4		4	4		4	4
			1A2f i	Industry-Other	030102										
					030800										
					031000	4	4	4	4		4	4	4	4	4
					031300	4	4	4	4		4	4	4	4	
					031400			4	4		4	4	4	4	4
					031600										
					032000	4	4	4	4		4	4	4	4	4
			1A4a i	Commercial/Institutional plants	020100										

pollutant	fuel_type	fuel_gr	nfr_id	nfr_name	snap	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
					020103					4	4	4	4	4	
TSP	BIOMASS	STRAW	1A4c i	Agriculture/Forestry/Fishing, Stationary	020302					21	21	21	21	21	21
		WOOD	1A4b i	Residential plants	020200	807	807	807	807	807	807	807	807	807	807
					020202										
					020204										
	LIQUID	PETROLEUM COKE	1A1a	Electricity and heat production	010102					100	100				
		RESIDUAL OIL	1A4c i	Agriculture/Forestry/Fishing, Stationary	020304									60	60
	WASTE	INDUSTR. WASTES	1A2f i	Industry-Other	031600										
		WASTE	1A1a	Electricity and heat production	010102					2.02	2.02	2.02	2.02	2.02	2.02
					010103					2.02	2.02	2.02	2.02	2.02	2.02
					010104					2.02	2.02	2.02	2.02	2.02	2.02
					010203					6	6	6	6	6	6
			1A2c	Chemicals	030600	6	6	6	6	6	6	6	6	6	
			1A2d	Pulp, Paper and Print	031100	6	6	6	6	6	6	6	6	6	6
			1A2e	Food processing, beverages and tobacco	030900	6	6	6	6	6	6	6		6	6
			1A2f i	Industry-Other	030102										
					030800										
					031000	6	6	6	6	6	6	6	6	6	6
					031300	6	6	6	6	6	6	6	6	6	
					031400			6	6	6	6	6	6	6	6
					031600										
					032000	6	6	6	6	6	6	6	6	6	6
			1A4a i	Commercial/Institutional plants	020100	6	6	6	6	6	6	6	6	6	6
					020103					6	6	6	6	6	6

Table 2A-4.4b PM emission factors, time-series for the years 2000 to 2010.

pollutant	fuel_type	fuel_gr	nfr_id	nfr_name	snap	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
PM_{10}	BIOMASS	STRAW	1A4c i	Agriculture/Forestry/Fishing, Stationary	020302	15	15	15	15	15	15	222	15	222	222	
		WOOD	1A4b i	Residential plants	020200	721	647	620	617	612	588	564	574	544	503	479
					020202						588	564	574	544	503	479
					020204									544	503	479
	LIQUID	PETROLEUM COKE	1A1a	Electricity and heat production	010102											7
		RESIDUAL OIL	1A4c i	Agriculture/Forestry/Fishing, Stationary	020304	50	50	50	50							10.5
	WASTE	INDUSTR. WASTES	1A2f i	Industry-Other	031600							3.4	3.2	3.2	3.2	3.2
		WASTE	1A1a	Electricity and heat production	010102	1.126	1.126	1.126	1.126	1.126	0.87	0.29	0.29	0.29	0.29	0.29
					010103	1.126	1.126	1.126	1.126	1.126	0.87	0.29	0.29	0.29	0.29	0.29
					010104	1.126			1.126			0.29				0.29
					010203	4.6	4.4	4.2	4	3.8	3.6	3.4	0.29	0.29	0.29	0.29
			1A2c	Chemicals	030600	4.6			4	3.8	3.6	3.4	3.2	3.2	3.2	3.2
			1A2d	Pulp, Paper and Print	031100	4.6			4		3.6	3.4	3.2	3.2	3.2	3.2
			1A2e	Food processing, beverages and tobacco	030900				4		3.6	3.4	3.2	3.2	3.2	3.2
			1A2f i	Industry-Other	030102				4	3.8	3.6	3.4	3.2	3.2		
					030800						3.6	3.4	3.2	3.2	3.2	3.2
					031000	4.6							3.2	3.2	3.2	3.2
					031300	4.6			4	3.8	3.6	3.4	3.2	3.2	3.2	3.2
					031400	4.6			4	3.8	3.6	3.4	3.2	3.2	3.2	3.2
					031600	4.6	4.4	4.2	4	3.8	3.6					
					032000	4.6			4		3.6	3.4		3.2	3.2	
			1A4a i	Commercial/Institutional plants	020100	4.6			4	3.8						
					020103	4.6	4.4	4.2	4	3.8	3.6	3.4	3.2	3.2	3.2	3.2
$PM_{2.5}$	BIOMASS	STRAW	1A4c i	Agriculture/Forestry/Fishing, Stationary	020302	12	12	12	12	12	12	211	12	211	211	
		WOOD	1A4b i	Residential plants	020200	709	637	610	607	603	579	555	566	536	496	473
					020202						579	555	566	536	496	473
					020204									536	496	473
	LIQUID	PETROLEUM COKE	1A1a	Electricity and heat production	010102											3
		RESIDUAL OIL	1A4c i	Agriculture/Forestry/Fishing, Stationary	020304	40	40	40	40							7
	WASTE	INDUSTR. WASTES	1A2f i	Industry-Other	031600							2.2	2.1	2.1	2.1	2.1
		WASTE	1A1a	Electricity and heat production	010102	1.084	1.084	1.084	1.084	1.084	0.87	0.29	0.29	0.29	0.29	0.29
					010103	1.084	1.084	1.084	1.084	1.084	0.87	0.29	0.29	0.29	0.29	0.29
					010104	1.084			1.084			0.29				0.29
					010203	3	2.9	2.7	2.6	2.5	2.4	2.2	0.29	0.29	0.29	0.29
			1A2c	Chemicals	030600	3			2.6	2.5	2.4	2.2	2.1	2.1	2.1	2.1
			1A2d	Pulp, Paper and Print	031100	3			2.6		2.4	2.2	2.1	2.1	2.1	2.1
			1A2e	Food processing, beverages and tobacco	030900				2.6		2.4	2.2	2.1	2.1	2.1	2.1
			1A2f i	Industry-Other	030102				2.6	2.5	2.4	2.2	2.1	2.1		
					030800						2.4	2.2	2.1	2.1	2.1	2.1
					031000	3							2.1	2.1	2.1	2.1
					031300	3			2.6	2.5	2.4	2.2	2.1	2.1	2.1	2.1
					031400	3			2.6	2.5	2.4	2.2	2.1	2.1	2.1	2.1
					031600	3	2.9	2.7	2.6	2.5	2.4					
					032000	3			2.6		2.4	2.2		2.1	2.1	
			1A4a i	Commercial/Institutional plants	020100	3			2.6	2.5						
					020103	3	2.9	2.7	2.6	2.5	2.4	2.2	2.1	2.1	2.1	2.1
TSP	BIOMASS	STRAW	1A4c i	Agriculture/Forestry/Fishing, Stationary	020302	21	21	21	21	21	21	234	21	234	234	

pollutant	fuel_type	fuel_gr	nfr_id	nfr_name	snap	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
		WOOD	1A4b i	Residential plants	020200	757	680	652	648	643	617	593	604	572	529	503
					020202						617	593	604	572	529	503
					020204									572	529	503
	LIQUID	PETROLEUM COKE	1A1a	Electricity and heat production	010102											10
		RESIDUAL OIL	1A4c i	Agriculture/Forestry/Fishing, Stationary	020304	60	60	60	60							14
	WASTE	INDUSTR. WASTES	1A2f i	Industry-Other	031600							4.5	4.2	4.2	4.2	4.2
		WASTE	1A1a	Electricity and heat production	010102	2.02	2.02	2.02	2.02	1.44	0.87	0.29	0.29	0.29	0.29	0.29
					010103	2.02	2.02	2.02	2.02	1.44	0.87	0.29	0.29	0.29	0.29	0.29
					010104	2.02			2.02			0.29				0.29
					010203	6	5.7	5.5	5.2	5	4.7	4.5	4.2	4.2	4.2	4.2
			1A2c	Chemicals	030600	6			5.2	5	4.7	4.5	4.2	4.2	4.2	4.2
			1A2d	Pulp, Paper and Print	031100	6			5.2		4.7	4.5	4.2	4.2	4.2	4.2
			1A2e	Food processing, beverages and tobacco	030900				5.2		4.7	4.5	4.2	4.2	4.2	4.2
			1A2f i	Industry-Other	030102				5.2	5	4.7	4.5	4.2	4.2		
					030800						4.7	4.5	4.2	4.2	4.2	4.2
					031000	6							4.2	4.2	4.2	4.2
					031300	6			5.2	5	4.7	4.5	4.2	4.2	4.2	4.2
					031400	6			5.2	5	4.7	4.5	4.2	4.2	4.2	4.2
					031600	6	5.7	5.5	5.2	5	4.7					
					032000	6			5.2		4.7	4.5		4.2	4.2	
			1A4a i	Commercial/Institutional plants	020100	6			5.2	5						
					020103	6	5.7	5.5	5.2	5	4.7	4.5	4.2	4.2	4.2	4.2

Table 2A-4.5 HM emission factors (mg per GJ) and references 2010.

fuel_type	fuel_gr_abbr	nfr	nfr_name	snap	As	Cd	Cr	Cu	Hg	Ni	Pb	Se	Zn	Reference
					mg/GJ	mg/GJ	mg/GJ	mg/GJ	mg/GJ	mg/GJ	mg/GJ	mg/GJ	mg/GJ	
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
		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
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	1.8	13.5	17.5	7.9	13	134	1.8	200	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	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.	1A4b i	Residential	020200	2.5	1.5	11.2	22.3	5.1	12.7	130	1	220	2
	COKE OVEN COKE	1A4b i	Residential	020200	2.5	1.5	11.2	22.3	5.1	12.7	130	1	220	2

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	STRAW	1A4c i	Agriculture/Forestry/Fishing, Stationary	020302					1.4	1.4	1.4	1.4	1.4	1.4
	LIQUID	PETROLEUM COKE	1A1a	Electricity and heat production	010102					2.1	2.1				
	SOLID	COAL	1A1a	Electricity and heat production	010100	3.3	2.8	2.4	1.9						
					010101	3.3	2.8	2.4	1.9	1.4	0.93	0.9	0.87	0.83	0.8
					010102	3.3	2.8	2.4	1.9	1.4	0.93	0.9	0.87	0.83	0.8
					010103					1.4	0.93	0.9			
					010104					1.4	0.93	0.9	0.87		
					010200	3.3	2.8	2.4	1.9						
					010202					1.4	0.93				
					010203					1.4	0.93	0.9	0.87	0.83	0.8
		COKE OVEN COKE	1A2e	Food processing, beverages and tobacco	030903										
	WASTE	WASTE	1A1a	Electricity and heat production	010102					7.8	7.8	7.6	7.4	7.2	7
					010103					7.8	7.8	7.6	7.4	7.2	7
					010104					7.8	7.8	7.6	7.4	7.2	7
					010203					7.8	7.8	7.7	7.6	7.4	7.3
			1A2c	Chemicals	030600	7.8	7.8	7.8	7.8	7.8	7.8	7.7	7.6	7.4	
			1A2d	Pulp, Paper and Print	031100	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	030900	7.8	7.8	7.8	7.8	7.8	7.8	7.7		7.4	7.3
			1A2f i	Industry-Other	030102										
					030700	7.8	7.8	7.8	7.8	7.8	7.8			7.4	
					030800										
					031000	7.8	7.8	7.8	7.8	7.8	7.8	7.7	7.6	7.4	7.3
					031300	7.8	7.8	7.8	7.8	7.8	7.8	7.7	7.6	7.4	
					031400			7.8	7.8	7.8	7.8	7.7	7.6	7.4	7.3
					031600										
					032000	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	020100	7.8	7.8	7.8	7.8	7.8	7.8	7.7	7.6	7.4	7.3
					020103					7.8	7.8	7.7	7.6	7.4	7.3
Cd	BIOMASS	STRAW	1A4c i	Agriculture/Forestry/Fishing, Stationary	020302					0.32	0.32	0.32	0.32	0.32	0.32
	LIQUID	PETROLEUM COKE	1A1a	Electricity and heat production	010102					0.53	0.53				
	SOLID	COAL	1A1a	Electricity and heat production	010100	1.1	0.9	0.71	0.51						
					010101	1.1	0.9	0.71	0.51	0.32	0.12	0.11	0.1	0.09	0.08
					010102	1.1	0.9	0.71	0.51	0.32	0.12	0.11	0.1	0.09	0.08
					010103					0.32	0.12	0.11			
					010104					0.32	0.12	0.11	0.1		
					010200	1.1	0.9	0.71	0.51						
					010202					0.32	0.12				
					010203					0.32	0.12	0.11	0.1	0.09	0.08
	WASTE	WASTE	1A1a	Electricity and heat production	010100	31	27	22	18						
					010102					14	9.2	8.3	7.4	6.6	5.7
					010103					14	9.2	8.3	7.4	6.6	5.7
					010104					14	9.2	8.3	7.4	6.6	5.7
					010200	31	27	22	18						
					010203					14	9.2	8.7	8.1	7.6	7
			1A2a	Iron and steel	030400					14	9.2				
			1A2c	Chemicals	030600	31	27	22	18	14	9.2	8.7	8.1	7.6	
			1A2d	Pulp, Paper and Print	031100	31	27	22	18	14	9.2	8.7	8.1	7.6	7

pollutant	fuel_type	fuel_gr_abbr	nfr_id	nfr_name	snap	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
			1A2e	Food processing, beverages and tobacco	030900	31	27	22	18	14	9.2	8.7		7.6	7
			1A2f i	Industry-Other	030102										
					030700	31	27	22	18	14	9.2			7.6	
					030800										
					031000	31	27	22	18	14	9.2	8.7	8.1	7.6	7
					031200	31	27			14	9.2				
					031300	31	27	22	18	14	9.2	8.7	8.1	7.6	
					031400			22	18	14	9.2	8.7	8.1	7.6	7
					031600										
					032000	31	27	22	18	14	9.2	8.7	8.1	7.6	7
			1A4a i	Commercial/Institutional plants	020100	31	27	22	18	14	9.2	8.7	8.1	7.6	7
					020103					14	9.2	8.7	8.1	7.6	7
Cr	BIOMASS	STRAW	1A4c i	Agriculture/Forestry/Fishing, Stationary	020302					1.6	1.6	1.6	1.6	1.6	1.6
	LIQUID	PETROLEUM COKE	1A1a	Electricity and heat production	010102					2.6	2.6				
	SOLID	COAL	1A1a	Electricity and heat production	010100	8	7.3	6.7	6						
					010101	8	7.3	6.7	6	5.4	4.7	4.1	3.5	2.9	2.3
					010102	8	7.3	6.7	6	5.4	4.7	4.1	3.5	2.9	2.3
					010103					5.4	4.7	4.1			
					010104					5.4	4.7	4.1	3.5		
					010200	8	7.3	6.7	6						
					010202					5.4	4.7				
					010203					5.4	4.7	4.1	3.5	2.9	2.3
	WASTE	WASTE	1A1a	Electricity and heat production	010100	186	155	125	94						
					010102					64	33	27	21	15	8.6
					010103					64	33	27	21	15	8.6
					010104					64	33	27	21	15	8.6
					010200	186	155	125	94						
					010203					64	33	29	25	22	18
			1A2a	Iron and steel	030400					64	33				
			1A2c	Chemicals	030600	186	155	125	94	64	33	29	25	22	
			1A2d	Pulp, Paper and Print	031100	186	155	125	94	64	33	29	25	22	18
			1A2e	Food processing, beverages and tobacco	030900	186	155	125	94	64	33	29		22	18
			1A2f i	Industry-Other	030102										
					030700	186	155	125	94	64	33			22	
					030800										
					031000	186	155	125	94	64	33	29	25	22	18
					031200	186	155			64	33				
					031300	186	155	125	94	64	33	29	25	22	
					031400			125	94	64	33	29	25	22	18
					031600										
					032000	186	155	125	94	64	33	29	25	22	18
			1A4a i	Commercial/Institutional plants	020100	186	155	125	94	64	33	29	25	22	18
					020103					64	33	29	25	22	18
Cu	BIOMASS	STRAW	1A4c i	Agriculture/Forestry/Fishing, Stationary	020302					1.7	1.7	1.7	1.7	1.7	1.7
	LIQUID	PETROLEUM COKE	1A1a	Electricity and heat production	010102					2.4	2.4				
	SOLID	COAL	1A1a	Electricity and heat production	010100	4.4	4.2	4	3.7						
					010101	4.4	4.2	4	3.7	3.5	3.3	2.8	2.4	1.9	1.5
					010102	4.4	4.2	4	3.7	3.5	3.3	2.8	2.4	1.9	1.5
					010103					3.5	3.3	2.8			

pollutant	fuel_type	fuel_gr_abbr	nfr_id	nfr_name	snap	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
					010104					3.5	3.3	2.8	2.4		
					010200	4.4	4.2	4	3.7						
					010202					3.5	3.3				
					010203					3.5	3.3	2.8	2.4	1.9	1.5
	WASTE	WASTE	1A1a	Electricity and heat production	010100	123	105	87	68						
					010102					50	32	28	23	19	14
					010103					50	32	28	23	19	14
					010104					50	32	28	23	19	14
					010200	123	105	87	68						
					010203					50	32	29	27	24	21
			1A2a	Iron and steel	030400					50	32				
			1A2c	Chemicals	030600	123	105	87	68	50	32	29	27	24	
			1A2d	Pulp, Paper and Print	031100	123	105	87	68	50	32	29	27	24	21
			1A2e	Food processing, beverages and tobacco	030900	123	105	87	68	50	32	29		24	21
			1A2f i	Industry-Other	030102										
					030700	123	105	87	68	50	32			24	
					030800										
					031000	123	105	87	68	50	32	29	27	24	21
					031200	123	105			50	32				
					031300	123	105	87	68	50	32	29	27	24	
					031400			87	68	50	32	29	27	24	21
					031600										
					032000	123	105	87	68	50	32	29	27	24	21
			1A4a i	Commercial/Institutional plants	020100	123	105	87	68	50	32	29	27	24	21
					020103					50	32	29	27	24	21
Hg	BIOMASS	STRAW	1A4c i	Agriculture/Forestry/Fishing, Stationary	020302					0.31	0.31	0.31	0.31	0.31	0.31
	LIQUID	PETROLEUM COKE	1A1a	Electricity and heat production	010102					0.21	0.21				
	SOLID	COAL	1A1a	Electricity and heat production	010100	2.2	2.1	2	2						
					010101	2.2	2.1	2	2	1.9	1.8	1.7	1.6	1.5	1.4
					010102	2.2	2.1	2	2	1.9	1.8	1.7	1.6	1.5	1.4
					010103					1.9	1.8	1.7			
					010104					1.9	1.8	1.7	1.6		
					010200	2.2	2.1	2	2						
					010202					1.9	1.8				
					010203					1.9	1.8	1.7	1.6	1.5	1.4
	WASTE	WASTE	1A1a	Electricity and heat production	010100	132	117	103	88						
					010102					74	59	49	38	28	18
					010103					74	59	49	38	28	18
					010104					74	59	49	38	28	18
					010200	132	117	103	88						
					010203					74	59	53	46	40	33
			1A2a	Iron and steel	030400					74	59				
			1A2c	Chemicals	030600	132	117	103	88	74	59	53	46	40	
			1A2d	Pulp, Paper and Print	031100	132	117	103	88	74	59	53	46	40	33
			1A2e	Food processing, beverages and tobacco	030900	132	117	103	88	74	59	53		40	33
			1A2f i	Industry-Other	030102										
					030700	132	117	103	88	74	59			40	
					030800										
					031000	132	117	103	88	74	59	53	46	40	33

pollutant	fuel_type	fuel_gr_abbr	nfr_id	nfr_name	snap	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
					031200	132	117			74	59				
					031300	132	117	103	88	74	59	53	46	40	
					031400			103	88	74	59	53	46	40	33
					031600										
					032000	132	117	103	88	74	59	53	46	40	33
			1A4a i	Commercial/Institutional plants	020100	132	117	103	88	74	59	53	46	40	33
					020103					74	59	53	46	40	33
Ni	BIOMASS	STRAW	1A4c i	Agriculture/Forestry/Fishing, Stationary	020302					1.7	1.7	1.7	1.7	1.7	1.7
	SOLID	COAL	1A1a	Electricity and heat production	010101	6.8	6.8	6.8	6.8	6.8	6.8	6.3	5.8	5.4	4.9
					010102	6.8	6.8	6.8	6.8	6.8	6.8	6.3	5.8	5.4	4.9
					010103					6.8	6.8	6.3			
					010104					6.8	6.8	6.3	5.8		
					010203					6.8	6.8	6.3	5.8	5.4	4.9
	WASTE	WASTE	1A1a	Electricity and heat production	010100	192	165	137	110						
					010102					82	55	45	35	25	15
					010103					82	55	45	35	25	15
					010104					82	55	45	35	25	15
					010200	192	165	137	110						
					010203					82	55	49	42	36	30
			1A2a	Iron and steel	030400					82	55				
			1A2c	Chemicals	030600	192	165	137	110	82	55	49	42	36	
			1A2d	Pulp, Paper and Print	031100	192	165	137	110	82	55	49	42	36	30
			1A2e	Food processing, beverages and tobacco	030900	192	165	137	110	82	55	49		36	30
			1A2f i	Industry-Other	030102										
					030700	192	165	137	110	82	55			36	
					030800										
					031000	192	165	137	110	82	55	49	42	36	30
					031200	192	165			82	55				
					031300	192	165	137	110	82	55	49	42	36	
					031400			137	110	82	55	49	42	36	30
					031600										
					032000	192	165	137	110	82	55	49	42	36	30
			1A4a i	Commercial/Institutional plants	020100	192	165	137	110	82	55	49	42	36	30
					020103					82	55	49	42	36	30
Pb	BIOMASS	STRAW	1A4c i	Agriculture/Forestry/Fishing, Stationary	020302					6.2	6.2	6.2	6.2	6.2	6.2
	LIQUID	PETROLEUM COKE	1A1a	Electricity and heat production	010102					2.6	2.6				
	SOLID	COAL	1A1a	Electricity and heat production	010101	6	6	6	6	6	6	5.1	4.2	3.4	2.5
					010102	6	6	6	6	6	6	5.1	4.2	3.4	2.5
					010103					6	6	5.1			
					010104					6	6	5.1	4.2		
					010203					6	6	5.1	4.2	3.4	2.5
	WASTE	WASTE	1A1a	Electricity and heat production	010100	723	606	489	372						
					010102					255	138	135	132	129	126
					010103					255	138	135	132	129	126
					010104					255	138	135	132	129	126
					010200	723	606	489	372						
					010203					255	138	136	134	132	131
			1A2a	Iron and steel	030400					255	138				
			1A2c	Chemicals	030600	723	606	489	372	255	138	136	134	132	

pollutant	fuel_type	fuel_gr_abbr	nfr_id	nfr_name	snap	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
			1A2d	Pulp, Paper and Print	031100	723	606	489	372	255	138	136	134	132	131
			1A2e	Food processing, beverages and tobacco	030900	723	606	489	372	255	138	136		132	131
			1A2f i	Industry-Other	030102										
					030700	723	606	489	372	255	138			132	
					030800										
					031000	723	606	489	372	255	138	136	134	132	131
					031200	723	606			255	138				
					031300	723	606	489	372	255	138	136	134	132	
					031400			489	372	255	138	136	134	132	131
					031600										
					032000	723	606	489	372	255	138	136	134	132	131
			1A4a i	Commercial/Institutional plants	020100	723	606	489	372	255	138	136	134	132	131
					020103					255	138	136	134	132	131
Se	LIQUID	PETROLEUM COKE	1A1a	Electricity and heat production	010102					1.2	1.2				
	SOLID	COAL	1A1a	Electricity and heat production	010100	13	12.6	12.2	11.8						
					010101	13	12.6	12.2	11.8	11.4	11	10	9	7.9	6.9
					010102	13	12.6	12.2	11.8	11.4	11	10	9	7.9	6.9
					010103					11.4	11	10			
					010104					11.4	11	10	9		
					010200	13	12.6	12.2	11.8						
					010202					11.4	11				
					010203					11.4	11	10	9	7.9	6.9
	WASTE	WASTE	1A1a	Electricity and heat production	010102					25	25	25	25	25	25
					010103					25	25	25	25	25	25
					010104					25	25	25	25	25	25
					010203					25	25	25	25	25	25
			1A2c	Chemicals	030600	25	25	25	25	25	25	25	25	25	
			1A2d	Pulp, Paper and Print	031100	25	25	25	25	25	25	25	25	25	25
			1A2e	Food processing, beverages and tobacco	030900	25	25	25	25	25	25	25		25	25
			1A2f i	Industry-Other	030102										
					030800										
					031000	25	25	25	25	25	25	25	25	25	25
					031300	25	25	25	25	25	25	25	25	25	
					031400			25	25	25	25	25	25	25	25
					031600										
					032000	25	25	25	25	25	25	25	25	25	25
			1A4a i	Commercial/Institutional plants	020100	25	25	25	25	25	25	25	25	25	25
					020103					25	25	25	25	25	25
Zn	BIOMASS	STRAW	1A4c i	Agriculture/Forestry/Fishing, Stationary	020302					0.41	0.41	0.41	0.41	0.41	0.41
	LIQUID	PETROLEUM COKE	1A1a	Electricity and heat production	010102					7.4	7.4				
	SOLID	COAL	1A1a	Electricity and heat production	010100	19	18	17	16						
					010101	19	18	17	16	14	13	12	11	10	8.9
					010102	19	18	17	16	14	13	12	11	10	8.9
					010103					14	13	12			
					010104					14	13	12	11		
					010200	19	18	17	16						
					010202					14	13				
					010203					14	13	12	11	10	8.9
	WASTE	WASTE	1A1a	Electricity and heat production	010100	805	716	627	538						

pollutant	fuel_type	fuel_gr_abbr	nfr_id	nfr_name	snap	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
					010102					449	360	298	237	175	114
					010103					449	360	298	237	175	114
					010104					449	360	298	237	175	114
					010200	805	716	627	538						
					010203					449	360	322	283	245	206
			1A2a	Iron and steel	030400					449	360				
			1A2c	Chemicals	030600	805	716	627	538	449	360	322	283	245	
			1A2d	Pulp, Paper and Print	031100	805	716	627	538	449	360	322	283	245	206
			1A2e	Food processing, beverages and tobacco	030900	805	716	627	538	449	360	322		245	206
			1A2f i	Industry-Other	030102										
					030700	805	716	627	538	449	360			245	
					030800										
					031000	805	716	627	538	449	360	322	283	245	206
					031200	805	716			449	360				
					031300	805	716	627	538	449	360	322	283	245	
					031400			627	538	449	360	322	283	245	206
					031600										
					032000	805	716	627	538	449	360	322	283	245	206
			1A4a i	Commercial/Institutional plants	020100	805	716	627	538	449	360	322	283	245	206
					020103					449	360	322	283	245	206

Table 2A-4.7b HM emission factors time-series mg per GJ for the years 2000 to 2010.

pollutant	fuel_type	74	nfr_id	nfr_name	snap	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
As	BIOMASS	STRAW	1A4c i	Agriculture/Forestry/Fishing, Stationary	020302	1.4	1.4	1.4	1.4	1.4	1.4	1	1.4	1	1	
	LIQUID	PETROLEUM COKE	1A1a	Electricity and heat production	010102											4.3
	SOLID	COAL	1A1a	Electricity and heat production	010100											
					010101	0.77	0.72	0.67	0.63	0.58	0.53	0.523	0.517	0.51	0.51	0.51
					010102	0.77	0.72	0.67	0.63	0.58	0.53	0.523	0.517	0.51	0.51	0.51
					010103											
					010104											0.51
					010200											
					010202											
					010203	0.77	0.72	0.67	0.63	0.58	0.53		0.517	0.51		
		COKE OVEN COKE	1A2e	Food processing, beverages and tobacco	030903								3.2	4	4	4
	WASTE	WASTE	1A1a	Electricity and heat production	010102	6.8	6.8	6.8	6.8	4.7	2.7	0.59	0.59	0.59	0.59	0.59
					010103	6.8	6.8	6.8	6.8	4.7	2.7	0.59	0.59	0.59	0.59	0.59
					010104	6.8			6.8			0.59				0.59
					010203	7.2	7.1	6.9	6.8	4.7	2.7	0.59	0.59	0.59	0.59	0.59
			1A2c	Chemicals	030600	7.2			6.8	4.7	2.7	0.59	0.59	0.59	0.59	0.59
			1A2d	Pulp, Paper and Print	031100	7.2			6.8		2.7	0.59	0.59	0.59	0.59	0.59
			1A2e	Food processing, beverages and tobacco	030900				6.8		2.7	0.59	0.59	0.59	0.59	0.59
			1A2f i	Industry-Other	030102				6.8	4.7	2.7	0.59	0.59	0.59		
					030700											
					030800						2.7	0.59	0.59	0.59	0.59	0.59
					031000	7.2							0.59	0.59	0.59	0.59
					031300	7.2			6.8	4.7	2.7	0.59	0.59	0.59	0.59	0.59
					031400	7.2			6.8	4.7	2.7	0.59	0.59	0.59	0.59	0.59
					031600	7.2	7.1	6.9	6.8	4.7	2.7					
					032000	7.2			6.8		2.7	0.59		0.59	0.59	
			1A4a i	Commercial/Institutional plants	020100	7.2			6.8	4.7						
					020103	7.2	7.1	6.9	6.8	4.7	2.7	0.59	0.59	0.59	0.59	0.59
Cd	BIOMASS	STRAW	1A4c i	Agriculture/Forestry/Fishing, Stationary	020302	0.32	0.32	0.32	0.32	0.32	0.32	1.4	0.32	1.4	1.4	
	LIQUID	PETROLEUM COKE	1A1a	Electricity and heat production	010102											1.3
	SOLID	COAL	1A1a	Electricity and heat production	010100											
					010101	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
					010102	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
					010103											
					010104											0.07
					010200											
					010202											
					010203	0.07	0.07	0.07	0.07	0.07	0.07		0.07	0.07		
	WASTE	WASTE	1A1a	Electricity and heat production	010100											
					010102	4.8	4.8	4.8	4.8	3.3	1.9	0.44	0.44	0.44	0.44	0.44
					010103	4.8	4.8	4.8	4.8	3.3	1.9	0.44	0.44	0.44	0.44	0.44
					010104	4.8			4.8			0.44				0.44
					010200											
					010203	6.5	5.9	5.4	4.8	3.3	1.9	0.44	0.44	0.44	0.44	0.44
			1A2a	Iron and steel	030400											
			1A2c	Chemicals	030600	6.5			4.8	3.3	1.9	0.44	0.44	0.44	0.44	0.44
			1A2d	Pulp, Paper and Print	031100	6.5			4.8		1.9	0.44	0.44	0.44	0.44	0.44

pollutant	fuel_type	74	nfr_id	nfr_name	snap	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
			1A2e	Food processing, beverages and tobacco	030900				4.8		1.9	0.44	0.44	0.44	0.44	0.44
			1A2f i	Industry-Other	030102				4.8	3.3	1.9	0.44	0.44	0.44		
					030700											
					030800						1.9	0.44	0.44	0.44	0.44	0.44
					031000	6.5							0.44	0.44	0.44	0.44
					031200											
					031300	6.5			4.8	3.3	1.9	0.44	0.44	0.44	0.44	0.44
					031400	6.5			4.8	3.3	1.9	0.44	0.44	0.44	0.44	0.44
					031600	6.5	5.9	5.4	4.8	3.3	1.9					
					032000	6.5			4.8		1.9	0.44		0.44	0.44	
			1A4a i	Commercial/Institutional plants	020100	6.5			4.8	3.3						
					020103	6.5	5.9	5.4	4.8	3.3	1.9	0.44	0.44	0.44	0.44	0.44
Cr	BIOMASS	STRAW	1A4c i	Agriculture/Forestry/Fishing, Stationary	020302	1.6	1.6	1.6	1.6	1.6	1.6	2.9	1.6	2.9	2.9	
	LIQUID	PETROLEUM COKE	1A1a	Electricity and heat production	010102											2.7
	SOLID	COAL	1A1a	Electricity and heat production	010100											
					010101	1.7	1.6	1.4	1.3	1.1	1	0.95	0.91	0.86	0.86	0.86
					010102	1.7	1.6	1.4	1.3	1.1	1	0.95	0.91	0.86	0.86	0.86
					010103											
					010104											0.86
					010200											
					010202											
					010203	1.7	1.6	1.4	1.3	1.1	1		0.91	0.86		
	WASTE	WASTE	1A1a	Electricity and heat production	010100											
					010102	2.5	2.5	2.5	2.5	2.2	1.9	1.56	1.56	1.56	1.56	1.56
					010103	2.5	2.5	2.5	2.5	2.2	1.9	1.56	1.56	1.56	1.56	1.56
					010104	2.5			2.5			1.56				1.56
					010200											
					010203	14	10	6.3	2.5	2.2	1.9	1.56	1.56	1.56	1.56	1.56
			1A2a	Iron and steel	030400											
			1A2c	Chemicals	030600	14			2.5	2.2	1.9	1.56	1.56	1.56	1.56	1.56
			1A2d	Pulp, Paper and Print	031100	14			2.5		1.9	1.56	1.56	1.56	1.56	1.56
			1A2e	Food processing, beverages and tobacco	030900				2.5		1.9	1.56	1.56	1.56	1.56	1.56
			1A2f i	Industry-Other	030102				2.5	2.2	1.9	1.56	1.56	1.56		
					030700											
					030800						1.9	1.56	1.56	1.56	1.56	1.56
					031000	14							1.56	1.56	1.56	1.56
					031200											
					031300	14			2.5	2.2	1.9	1.56	1.56	1.56	1.56	1.56
					031400	14			2.5	2.2	1.9	1.56	1.56	1.56	1.56	1.56
					031600	14	10	6.3	2.5	2.2	1.9					
					032000	14			2.5		1.9	1.56		1.56	1.56	
			1A4a i	Commercial/Institutional plants	020100	14			2.5	2.2						
					020103	14	10	6.3	2.5	2.2	1.9	1.56	1.56	1.56	1.56	1.56
Cu	BIOMASS	STRAW	1A4c i	Agriculture/Forestry/Fishing, Stationary	020302	1.7	1.7	1.7	1.7	1.7	1.7	8.6	1.7	8.6	8.6	
	LIQUID	PETROLEUM COKE	1A1a	Electricity and heat production	010102											5.7
	SOLID	COAL	1A1a	Electricity and heat production	010100											
					010101	1	0.92	0.84	0.76	0.68	0.6	0.56	0.52	0.48	0.48	0.48
					010102	1	0.92	0.84	0.76	0.68	0.6	0.56	0.52	0.48	0.48	0.48
					010103											

pollutant	fuel_type	74	nfr_id	nfr_name	snap	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
					010104											0.48
					010200											
					010202											
					010203	1	0.92	0.84	0.76	0.68	0.6		0.52	0.48		
	WASTE	WASTE	1A1a	Electricity and heat production	010100											
					010102	10.1	10.1	10.1	10.1	7.2	4.2	1.3	1.3	1.3	1.3	1.3
					010103	10.1	10.1	10.1	10.1	7.2	4.2	1.3	1.3	1.3	1.3	1.3
					010104	10.1			10.1			1.3				1.3
					010200											
					010203	18	16	13	10.1	7.2	4.2	1.3	1.3	1.3	1.3	1.3
			1A2a	Iron and steel	030400											
			1A2c	Chemicals	030600	18			10.1	7.2	4.2	1.3	1.3	1.3	1.3	1.3
			1A2d	Pulp, Paper and Print	031100	18			10.1		4.2	1.3	1.3	1.3	1.3	1.3
			1A2e	Food processing, beverages and tobacco	030900				10.1		4.2	1.3	1.3	1.3	1.3	1.3
			1A2f i	Industry-Other	030102				10.1	7.2	4.2	1.3	1.3	1.3		
					030700											
					030800						4.2	1.3	1.3	1.3	1.3	1.3
					031000	18							1.3	1.3	1.3	1.3
					031200											
					031300	18			10.1	7.2	4.2	1.3	1.3	1.3	1.3	1.3
					031400	18			10.1	7.2	4.2	1.3	1.3	1.3	1.3	1.3
					031600	18	16	13	10.1	7.2	4.2					
					032000	18			10.1		4.2	1.3		1.3	1.3	
			1A4a i	Commercial/Institutional plants	020100	18			10.1	7.2						
					020103	18	16	13	10.1	7.2	4.2	1.3	1.3	1.3	1.3	1.3
Hg	BIOMASS	STRAW	1A4c i	Agriculture/Forestry/Fishing, Stationary	020302	0.31	0.31	0.31	0.31	0.31	0.31	0.5	0.31	0.5	0.5	
	LIQUID	PETROLEUM COKE	1A1a	Electricity and heat production	010102											0.4
	SOLID	COAL	1A1a	Electricity and heat production	010100											
					010101	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3
					010102	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3
					010103											
					010104											1.3
					010200											
					010202											
					010203	1.3	1.3	1.3	1.3	1.3	1.3		1.3	1.3		
	WASTE	WASTE	1A1a	Electricity and heat production	010100											
					010102	7.4	7.4	7.4	7.4	5.5	3.7	1.79	1.79	1.79	1.79	1.79
					010103	7.4	7.4	7.4	7.4	5.5	3.7	1.79	1.79	1.79	1.79	1.79
					010104	7.4			7.4			1.79				1.79
					010200											
					010203	27	20	14	7.4	5.5	3.7	1.79	1.79	1.79	1.79	1.79
			1A2a	Iron and steel	030400											
			1A2c	Chemicals	030600	27			7.4	5.5	3.7	1.79	1.79	1.79	1.79	1.79
			1A2d	Pulp, Paper and Print	031100	27			7.4		3.7	1.79	1.79	1.79	1.79	1.79
			1A2e	Food processing, beverages and tobacco	030900				7.4		3.7	1.79	1.79	1.79	1.79	1.79
			1A2f i	Industry-Other	030102				7.4	5.5	3.7	1.79	1.79	1.79		
					030700											
					030800						3.7	1.79	1.79	1.79	1.79	1.79
					031000	27							1.79	1.79	1.79	1.79

pollutant	fuel_type	74	nfr_id	nfr_name	snap	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
					031200											
					031300	27			7.4	5.5	3.7	1.79	1.79	1.79	1.79	1.79
					031400	27			7.4	5.5	3.7	1.79	1.79	1.79	1.79	1.79
					031600	27	20	14	7.4	5.5	3.7					
					032000	27			7.4		3.7	1.79		1.79	1.79	
			1A4a i	Commercial/Institutional plants	020100	27			7.4	5.5						
					020103	27	20	14	7.4	5.5	3.7	1.79	1.79	1.79	1.79	1.79
Ni	BIOMASS	STRAW	1A4c i	Agriculture/Forestry/Fishing, Stationary	020302	1.7	1.7	1.7	1.7	1.7	1.7	4.4	1.7	4.4	4.4	
	SOLID	COAL	1A1a	Electricity and heat production	010101	4.4	3.8	3.2	2.5	1.9	1.3	1.2	1.1	0.97	0.97	0.97
					010102	4.4	3.8	3.2	2.5	1.9	1.3	1.2	1.1	0.97	0.97	0.97
					010103											
					010104											0.97
					010203	4.4	3.8	3.2	2.5	1.9	1.3		1.1	0.97		
	WASTE	WASTE	1A1a	Electricity and heat production	010100											
					010102	4.8	4.8	4.8	4.8	3.9	3	2.06	2.06	2.06	2.06	2.06
					010103	4.8	4.8	4.8	4.8	3.9	3	2.06	2.06	2.06	2.06	2.06
					010104	4.8			4.8			2.06				2.06
					010200											
					010203	24	17	11	4.8	3.9	3	2.06	2.06	2.06	2.06	2.06
			1A2a	Iron and steel	030400											
			1A2c	Chemicals	030600	24			4.8	3.9	3	2.06	2.06	2.06	2.06	2.06
			1A2d	Pulp, Paper and Print	031100	24			4.8		3	2.06	2.06	2.06	2.06	2.06
			1A2e	Food processing, beverages and tobacco	030900				4.8		3	2.06	2.06	2.06	2.06	2.06
			1A2f i	Industry-Other	030102				4.8	3.9	3	2.06	2.06	2.06		
					030700											
					030800						3	2.06	2.06	2.06	2.06	2.06
					031000	24							2.06	2.06	2.06	2.06
					031200											
					031300	24			4.8	3.9	3	2.06	2.06	2.06	2.06	2.06
					031400	24			4.8	3.9	3	2.06	2.06	2.06	2.06	2.06
					031600	24	17	11	4.8	3.9	3					
					032000	24			4.8		3	2.06		2.06	2.06	
			1A4a i	Commercial/Institutional plants	020100	24			4.8	3.9						
					020103	24	17	11	4.8	3.9	3	2.06	2.06	2.06	2.06	2.06
Pb	BIOMASS	STRAW	1A4c i	Agriculture/Forestry/Fishing, Stationary	020302	6.2	6.2	6.2	6.2	6.2	6.2	40	6.2	40	40	
	LIQUID	PETROLEUM COKE	1A1a	Electricity and heat production	010102											4.9
	SOLID	COAL	1A1a	Electricity and heat production	010101	1.6	1.5	1.4	1.2	1.1	1	0.87	0.75	0.62	0.62	0.62
					010102	1.6	1.5	1.4	1.2	1.1	1	0.87	0.75	0.62	0.62	0.62
					010103											
					010104											0.62
					010203	1.6	1.5	1.4	1.2	1.1	1		0.75	0.62		
	WASTE	WASTE	1A1a	Electricity and heat production	010100											
					010102	123	123	123	123	84	45	5.52	5.52	5.52	5.52	5.52
					010103	123	123	123	123	84	45	5.52	5.52	5.52	5.52	5.52
					010104	123			123			5.52				5.52
					010200											
					010203	129	127	125	123	84	45	5.52	5.52	5.52	5.52	5.52
			1A2a	Iron and steel	030400											
			1A2c	Chemicals	030600	129			123	84	45	5.52	5.52	5.52	5.52	5.52

pollutant	fuel_type	74	nfr_id	nfr_name	snap	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
			1A2d	Pulp, Paper and Print	031100	129			123		45	5.52	5.52	5.52	5.52	5.52
			1A2e	Food processing, beverages and tobacco	030900				123		45	5.52	5.52	5.52	5.52	5.52
			1A2f i	Industry-Other	030102				123	84	45	5.52	5.52	5.52		
					030700											
					030800						45	5.52	5.52	5.52	5.52	5.52
					031000	129							5.52	5.52	5.52	5.52
					031200											
					031300	129			123	84	45	5.52	5.52	5.52	5.52	5.52
					031400	129			123	84	45	5.52	5.52	5.52	5.52	5.52
					031600	129	127	125	123	84	45					
					032000	129			123		45	5.52		5.52	5.52	
			1A4a i	Commercial/Institutional plants	020100	129			123	84						
					020103	129	127	125	123	84	45	5.52	5.52	5.52	5.52	5.52
Se	LIQUID	PETROLEUM COKE	1A1a	Electricity and heat production	010102											2.2
	SOLID	COAL	1A1a	Electricity and heat production	010100											
					010101	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9
					010102	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9
					010103											
					010104											5.9
					010200											
					010202											
					010203	5.9	5.9	5.9	5.9	5.9	5.9		5.9	5.9		
	WASTE	WASTE	1A1a	Electricity and heat production	010102	25	25	25	25	17	9.1	1.11	1.11	1.11	1.11	1.11
					010103	25	25	25	25	17	9.1	1.11	1.11	1.11	1.11	1.11
					010104	25			25			1.11				1.11
					010203	25	25	25	25	17	9.1	1.11	1.11	1.11	1.11	1.11
			1A2c	Chemicals	030600	25			25	17	9.1	1.11	1.11	1.11	1.11	1.11
			1A2d	Pulp, Paper and Print	031100	25			25		9.1	1.11	1.11	1.11	1.11	1.11
			1A2e	Food processing, beverages and tobacco	030900				25		9.1	1.11	1.11	1.11	1.11	1.11
			1A2f i	Industry-Other	030102				25	17	9.1	1.11	1.11	1.11		
					030800						9.1	1.11	1.11	1.11	1.11	1.11
					031000	25							1.11	1.11	1.11	1.11
					031300	25			25	17	9.1	1.11	1.11	1.11	1.11	1.11
					031400	25			25	17	9.1	1.11	1.11	1.11	1.11	1.11
					031600	25	25	25	25	17	9.1					
					032000	25			25		9.1	1.11		1.11	1.11	
			1A4a i	Commercial/Institutional plants	020100	25			25	17						
					020103	25	25	25	25	17	9.1	1.11	1.11	1.11	1.11	1.11
Zn	BIOMASS	STRAW	1A4c i	Agriculture/Forestry/Fishing, Stationary	020302	0.41	0.41	0.41	0.41	0.41	0.41	130	0.41	130	130	
	LIQUID	PETROLEUM COKE	1A1a	Electricity and heat production	010102											94
	SOLID	COAL	1A1a	Electricity and heat production	010100											
					010101	7.7	6.6	5.5	4.4	3.2	2.1	2.03	1.97	1.9	1.9	1.9
					010102	7.7	6.6	5.5	4.4	3.2	2.1	2.03	1.97	1.9	1.9	1.9
					010103											
					010104											1.9
					010200											
					010202											
					010203	7.7	6.6	5.5	4.4	3.2	2.1		1.97	1.9		
	WASTE	WASTE	1A1a	Electricity and heat production	010100											

pollutant	fuel_type	74	nfr_id	nfr_name	snap	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
					010102	52	52	52	52	35	19	2.33	2.33	2.33	2.33	2.33
					010103	52	52	52	52	35	19	2.33	2.33	2.33	2.33	2.33
					010104	52			52			2.33				2.33
					010200											
					010203	168	129	91	52	35	19	2.33	2.33	2.33	2.33	2.33
			1A2a	Iron and steel	030400											
			1A2c	Chemicals	030600	168			52	35	19	2.33	2.33	2.33	2.33	2.33
			1A2d	Pulp, Paper and Print	031100	168			52		19	2.33	2.33	2.33	2.33	2.33
			1A2e	Food processing, beverages and tobacco	030900				52		19	2.33	2.33	2.33	2.33	2.33
			1A2f i	Industry-Other	030102				52	35	19	2.33	2.33	2.33		
					030700											
					030800						19	2.33	2.33	2.33	2.33	2.33
					031000	168							2.33	2.33	2.33	2.33
					031200											
					031300	168			52	35	19	2.33	2.33	2.33	2.33	2.33
					031400	168			52	35	19	2.33	2.33	2.33	2.33	2.33
					031600	168	129	91	52	35	19					
					032000	168			52		19	2.33		2.33	2.33	
			1A4a i	Commercial/Institutional plants	020100	168			52	35						
					020103	168	129	91	52	35	19	2.33	2.33	2.33	2.33	2.33

Table 2A-4.8 PAH emission factors 2010.

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	010101	11	7	15	7	5	7	0.8	7
				010102	11	7	15	7	5	7	0.8	7
				010103	11	7	15	7	5	7	0.8	7
				010104	11	7	15	7	5	7	0.8	7
				010203	6.46	4	1292.52	4	1292.52	4	11.56	4
			1A2f i	030100	6.46	4	1292.52	4	1292.52	4	11.56	4
				030102	6.46	4	1292.52	4	1292.52	4	11.56	4
				030103	6.46	4	1292.52	4	1292.52	4	11.56	4
			1A4a i	020100	168707	4	221769	4	73469	4	119728	4
				020105	6.46	4	1292.52	4	1292.52	4	11.56	4
			1A4b i	020200	117537	9	117484	9	68874	9	80143	9
				020202	117537	9	117484	9	68874	9	80143	9
				020204	117537	9	117484	9	68874	9	80143	9
			1A4c i	020300	168707	4	221769	4	73469	4	119728	4
				020303	168707	4	221769	4	73469	4	119728	4
	117A	STRAW	1A1a	010101	0.5	7	0.5	7	0.5	7	0.5	7
				010102	0.5	7	0.5	7	0.5	7	0.5	7
				010103	0.5	7	0.5	7	0.5	7	0.5	7
				010104	0.5	7	0.5	7	0.5	7	0.5	7
				010203	1529	2	3452	2	1400	2	1029	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	010102	109.6	3	475.41	3	93.21	3	177.28	3
				010105	109.6	3	475.41	3	93.21	3	177.28	3
				010202	109.6	3	475.41	3	93.21	3	177.28	3
				010203	109.6	3	475.41	3	93.21	3	177.28	3
			1A2f i	030105	80	3	42	3	66	3	160	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
			1A2f i	030105	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
			1A2f i	030105	2	7	2	7	2	7	2	7
WASTE	114A	WASTE	1A1a	010102	0.8	7	1.7	7	0.9	7	1.1	7
				010103	0.8	7	1.7	7	0.9	7	1.1	7
				010104	0.8	7	1.7	7	0.9	7	1.1	7
				010203	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
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
			1A2f i	030104	1	8	1	8	2	8	3	8
				030105	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

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	
			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	-	-	-	-
			1A4b i	020200	3184	5	9554	5	-	-	-	-
	203A	RESIDUAL OIL	1A1a	010101	109.6	4	475.41	4	93.21	4	177.28	4
				010102	109.6	4	475.41	4	93.21	4	177.28	4
				010103	109.6	4	475.41	4	93.21	4	177.28	4
				010104	109.6	4	475.41	4	93.21	4	177.28	4
				010202	109.6	4	475.41	4	93.21	4	177.28	4
				010203	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
			1A4a i	020100	80	4	42	4	66	4	160	4
			1A4b i	020200	80	4	42	4	66	4	160	4
			1A4c i	020300	80	4	42	4	66	4	160	4
				020302	80	4	42	4	66	4	160	4
				020304	80	4	42	4	66	4	160	4
	204A	GAS OIL	1A1a	010101	109.6	4	475.41	4	93.21	4	177.28	4
				010102	109.6	4	475.41	4	93.21	4	177.28	4
				010103	109.6	4	475.41	4	93.21	4	177.28	4
				010104	109.6	4	475.41	4	93.21	4	177.28	4
				010105	1.9	7	15	7	1.7	7	1.5	7
				010202	109.6	4	475.41	4	93.21	4	177.28	4
				010203	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
			1A2f i	030102	80	4	42	4	66	4	160	4
				030103	80	4	42	4	66	4	160	4
				030104	80	4	42	4	66	4	160	4
				030105	1.9	7	15	7	1.7	7	1.5	7
			1A4a i	020100	80	4	42	4	66	4	160	4
				020103	80	4	42	4	66	4	160	4
				020105	1.9	7	15	7	1.7	7	1.5	7
			1A4b i	020200	80	4	42	4	66	4	160	4
				020204	1.9	7	15	7	1.7	7	1.5	7
			1A4c i	020302	80	4	42	4	66	4	160	4
SOLID	102A	COAL	1A1a	010101	0.14	4	0.29	4	0.29	4	0.28	4
				010102	0.14	4	0.29	4	0.29	4	0.28	4
				010104	0.14	4	0.29	4	0.29	4	0.28	4
			1A2f i	030102	23	4	929	4	929	4	698	4
				030103	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.	1A4b i	020200	59524	4 (8)	63492	4 (8)	1984	4 (8)	119048	4 (8)
	107A	COKE OVEN COKE	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.

pollutant	fuel_type	fuel_gr_abbr	nfr_id	nfr_name	snap_id	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Benzo(a)pyrene	BIOMASS	BIOGAS	1A1a	Electricity and heat production	010105	1	1	1	1	1	1	1	1	1	1
			1A2f i	Industry-Other	030105										
			1A4a i	Commercial/Institutional plants	020105	1	1	1	1	1	1	1	1	1	1
			1A4c i	Agriculture/Forestry/Fishing, Stationary	020304					1	1	1	1	1	1
		WOOD	1A4a i	Commercial/Institutional plants	020105									168707	168707
			1A4b i	Residential plants	020200 020202 020204	174015	174015	174015	174015	174015	174015	174015	174015	174015	174015
	GAS	NATURAL GAS	1A1a	Electricity and heat production	010105	3	3	3	3	3	3	3	3	3	3
			1A2f i	Industry-Other	030105	3		3	3	3	3	3	3	3	3
			1A4a i	Commercial/Institutional plants	020105	3	3	3	3	3	3	3	3	3	3
			1A4b i	Residential plants	020204		3	3	3	3	3		3	3	3
			1A4c i	Agriculture/Forestry/Fishing, Stationary	020304	3	3	3	3	3	3	3	3	3	3
Benzo(b)flouranthene	BIOMASS	BIOGAS	1A1a	Electricity and heat production	010105	1	1	1	1	1	1	1	1	1	1
			1A2f i	Industry-Other	030105										
			1A4a i	Commercial/Institutional plants	020105	1	1	1	1	1	1	1	1	1	1
			1A4c i	Agriculture/Forestry/Fishing, Stationary	020304					1	1	1	1	1	1
		WOOD	1A4a i	Commercial/Institutional plants	020105									221769	221769
			1A4b i	Residential plants	020200 020202 020204	180157	180157	180157	180157	180157	180157	180157	180157	180157	180157
	GAS	NATURAL GAS	1A1a	Electricity and heat production	010105	42	42	42	42	42	42	42	42	42	42
			1A2f i	Industry-Other	030105	42		42	42	42	42	42	42	42	42
			1A4a i	Commercial/Institutional plants	020105	42	42	42	42	42	42	42	42	42	42
			1A4b i	Residential plants	020204		42	42	42	42	42		42	42	42
			1A4c i	Agriculture/Forestry/Fishing, Stationary	020304	42	42	42	42	42	42	42	42	42	42
Benzo(k)flouranthene	BIOMASS	BIOGAS	1A1a	Electricity and heat production	010105	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
			1A2f i	Industry-Other	030105										
			1A4a i	Commercial/Institutional plants	020105	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	020304					0.4	0.4	0.4	0.4	0.4	0.4
		WOOD	1A4a i	Commercial/Institutional plants	020105									73469	73469
			1A4b i	Residential plants	020200 020202 020204	107493	107493	107493	107493	107493	107493	107493	107493	107493	107493
	GAS	NATURAL GAS	1A1a	Electricity and heat production	010105	24	24	24	24	24	24	24	24	24	24
			1A2f i	Industry-Other	030105	24		24	24	24	24	24	24	24	24
			1A4a i	Commercial/Institutional plants	020105	24	24	24	24	24	24	24	24	24	24
			1A4b i	Residential plants	020204		24	24	24	24	24		24	24	24
			1A4c i	Agriculture/Forestry/Fishing, Stationary	020304	24	24	24	24	24	24	24	24	24	24
Indeno(1,2,3-c,d)pyrene	BIOMASS	BIOGAS	1A1a	Electricity and heat production	010105	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
			1A2f i	Industry-Other	030105										
			1A4a i	Commercial/Institutional plants	020105	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	020304					1.1	1.1	1.1	1.1	1.1	1.1
		WOOD	1A4a i	Commercial/Institutional plants	020105									119728	119728
			1A4b i	Residential plants	020200 020202	122307	122307	122307	122307	122307	122307	122307	122307	122307	122307

pollutant	fuel_type	fuel_gr_abbr	nfr_id	nfr_name	snap_id	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
					020204										
	GAS	NATURAL GAS	1A1a	Electricity and heat production	010105	6	6	6	6	6	6	6	6	6	6
			1A2f i	Industry-Other	030105	6		6	6	6	6	6	6	6	6
			1A4a i	Commercial/Institutional plants	020105	6	6	6	6	6	6	6	6	6	6
			1A4b i	Residential plants	020204		6	6	6	6	6		6	6	6
			1A4c i	Agriculture/Forestry/Fishing, Stationary	020304	6	6	6	6	6	6	6	6	6	6

Table 2A-4.9b PAH emission factors time-series, µg pr GJ for the years 2000 to 2010.

pollutant	fuel_type	fuel_gr_abbr	nfr_id	nfr_name	snap_id	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Benzo(a)pyrene	BIOMASS	BIOGAS	1A1a	Electricity and heat production	010105	1	1.1	1.1	1.2	1.2	1.3	1.3	1.3	1.3	1.3	1.3
			1A2f i	Industry-Other	030105		1.1	1.1	1.2	1.2	1.3	1.3	1.3	1.3	1.3	1.3
			1A4a i	Commercial/Institutional plants	020105	1	1.1	1.1	1.2	1.2	1.3	1.3	1.3	1.3	1.3	1.3
			1A4c i	Agriculture/Forestry/Fishing, Stationary	020304	1	1.1	1.1	1.2	1.2	1.3	1.3	1.3	1.3	1.3	1.3
		WOOD	1A4a i	Commercial/Institutional plants	020105		168707	168707		168707	168707	168707	168707	6.46	6.46	6.46
			1A4b i	Residential plants	020200	174015	157123	150857	149977	148828	142999	134809	137505	130977	122261	117537
					020202						142999	134809	137505	130977	122261	117537
					020204									130977	122261	117537
	GAS	NATURAL GAS	1A1a	Electricity and heat production	010105	3	2.7	2.5	2.2	2	1.7	1.5	1.2	1.2	1.2	1.2
			1A2f i	Industry-Other	030105	3	2.7	2.5	2.2	2	1.7	1.5	1.2	1.2	1.2	1.2
			1A4a i	Commercial/Institutional plants	020105	3	2.7	2.5	2.2	2	1.7	1.5	1.2	1.2	1.2	1.2
			1A4b i	Residential plants	020204	3	2.7	2.5	2.2	2	1.7	1.5	1.2	1.2	1.2	1.2
			1A4c i	Agriculture/Forestry/Fishing, Stationary	020304	3	2.7	2.5	2.2	2	1.7	1.5	1.2	1.2	1.2	1.2
Benzo(b)flouranthene	BIOMASS	BIOGAS	1A1a	Electricity and heat production	010105	1	1	1.1	1.1	1.1	1.2	1.2	1.2	1.2	1.2	1.2
			1A2f i	Industry-Other	030105		1	1.1	1.1	1.1	1.2	1.2	1.2	1.2	1.2	1.2
			1A4a i	Commercial/Institutional plants	020105	1	1	1.1	1.1	1.1	1.2	1.2	1.2	1.2	1.2	1.2
			1A4c i	Agriculture/Forestry/Fishing, Stationary	020304	1	1	1.1	1.1	1.1	1.2	1.2	1.2	1.2	1.2	1.2
		WOOD	1A4a i	Commercial/Institutional plants	020105		221769	221769		221769	221769	221769	221769	1292.52	1292.52	1292.52
			1A4b i	Residential plants	020200	180157	162116	155110	153661	151958	145540	137685	139711	132422	122952	117484
					020202						145540	137685	139711	132422	122952	117484
					020204									132422	122952	117484
	GAS	NATURAL GAS	1A1a	Electricity and heat production	010105	42	37	33	28	23	18	14	9	9	9	9
			1A2f i	Industry-Other	030105	42	37	33	28	23	18	14	9	9	9	9
			1A4a i	Commercial/Institutional plants	020105	42	37	33	28	23	18	14	9	9	9	9
			1A4b i	Residential plants	020204	42	37	33	28	23	18	14	9	9	9	9
			1A4c i	Agriculture/Forestry/Fishing, Stationary	020304	42	37	33	28	23	18	14	9	9	9	9
Benzo(k)flouranthene	BIOMASS	BIOGAS	1A1a	Electricity and heat production	010105	0.4	0.5	0.7	0.8	0.9	1	1.2	1.2	1.2	1.2	1.2
			1A2f i	Industry-Other	030105		0.5	0.7	0.8	0.9	1	1.2	1.2	1.2	1.2	1.2
			1A4a i	Commercial/Institutional plants	020105	0.4	0.5	0.7	0.8	0.9	1	1.2	1.2	1.2	1.2	1.2
			1A4c i	Agriculture/Forestry/Fishing, Stationary	020304	0.4	0.5	0.7	0.8	0.9	1	1.2	1.2	1.2	1.2	1.2
		WOOD	1A4a i	Commercial/Institutional plants	020105		73469	73469		73469	73469	73469	73469	1292.52	1292.52	1292.52
			1A4b i	Residential plants	020200	107493	96657	92377	91385	90236	86303	81221	82230	77790	72142	68874
					020202						86303	81221	82230	77790	72142	68874
					020204									77790	72142	68874
	GAS	NATURAL GAS	1A1a	Electricity and heat production	010105	24	21	18	14	11	8	5	1.7	1.7	1.7	1.7
			1A2f i	Industry-Other	030105	24	21	18	14	11	8	5	1.7	1.7	1.7	1.7
			1A4a i	Commercial/Institutional plants	020105	24	21	18	14	11	8	5	1.7	1.7	1.7	1.7
			1A4b i	Residential plants	020204	24	21	18	14	11	8	5	1.7	1.7	1.7	1.7
			1A4c i	Agriculture/Forestry/Fishing, Stationary	020304	24	21	18	14	11	8	5	1.7	1.7	1.7	1.7
Indeno(1,2,3-c,d)pyrene	BIOMASS	BIOGAS	1A1a	Electricity and heat production	010105	1.1	1	0.9	0.9	0.8	0.7	0.6	0.6	0.6	0.6	0.6
			1A2f i	Industry-Other	030105		1	0.9	0.9	0.8	0.7	0.6	0.6	0.6	0.6	0.6
			1A4a i	Commercial/Institutional plants	020105	1.1	1	0.9	0.9	0.8	0.7	0.6	0.6	0.6	0.6	0.6
			1A4c i	Agriculture/Forestry/Fishing, Stationary	020304	1.1	1	0.9	0.9	0.8	0.7	0.6	0.6	0.6	0.6	0.6
		WOOD	1A4a i	Commercial/Institutional plants	020105		119728	119728		119728	119728	119728	119728	11.56	11.56	11.56
			1A4b i	Residential plants	020200	122307	110051	105383	104544	103515	99189	93064	94720	89908	83616	80143
					020202						99189	93064	94720	89908	83616	80143

pollutant	fuel_type	fuel_gr_abbr	nfr_id	nfr_name	snap_id	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
					020204									89908	83616	80143
	GAS	NATURAL GAS	1A1a	Electricity and heat production	010105	6	5.4	4.8	4.2	3.6	3	2.4	1.8	1.8	1.8	1.8
			1A2f i	Industry-Other	030105	6	5.4	4.8	4.2	3.6	3	2.4	1.8	1.8	1.8	1.8
			1A4a i	Commercial/Institutional plants	020105	6	5.4	4.8	4.2	3.6	3	2.4	1.8	1.8	1.8	1.8
			1A4b i	Residential plants	020204	6	5.4	4.8	4.2	3.6	3	2.4	1.8	1.8	1.8	1.8
			1A4c i	Agriculture/Forestry/Fishing, Stationary	020304	6	5.4	4.8	4.2	3.6	3	2.4	1.8	1.8	1.8	1.8

Table 2A-4.10 Dioxin and HCB emission factors 2010.

fuel_type	fuel_id	fuel_gr_abbr	nfr_id_EA	snap_id	HCB, ng pr GJ	Dioxin, ng pr GJ
BIOMASS	111A	WOOD	1A1a	010101	4000	14
				010102	4000	14
				010103	4000	14
				010104	4000	14
				010203	4000	1
			1A2f i	030100	4000	1
				030102	4000	1
				030103	4000	1
			1A4a i	020100	4000	400
				020105	4000	400
			1A4b i	020200	4000	404
				020202	4000	404
				020204	4000	404
			1A4c i	020300	4000	400
				020303	4000	400
	117A	STRAW	1A1a	010101	113	19
				010102	113	19
				010103	113	19
				010104	113	19
				010203	113	22
			1A4b i	020200	113	500
			1A4c i	020300	113	400
	215A	BIO OIL	1A1a	010102		0.882
				010105		0.882
				010202		0.882
				010203		0.882
			1A2f i	030105		0.882
			1A4b i	020200		10
	309A	BIOGAS	1A1a	010101		0.025
				010102		0.025
				010105	190	0.96
				010203		0.025
			1A2f i	030102		0.025
				030103		0.025
				030105	190	0.96
			1A4a i	020100		2
				020103		2
				020105	190	0.96
			1A4c i	020300		2
				020304	190	0.96
	310A	BIO PROD GAS	1A1a	010105		1.7
			1A2f i	030105		1.7
WASTE	114A	WASTE	1A1a	010102	4300	5
				010103	4300	5
				010104	4300	5
				010203	4300	5
			1A4a i	020103	4300	5
GAS	301A	NATURAL GAS	1A1a	010101		0.025
				010102		0.025
				010103		0.025
				010104		0.025
				010105		0.57
				010202		0.025
				010203		0.025
			1A1c	010504		0.025
			1A2f i	030100		0.025
				030102		0.025
				030103		0.025
				030104		0.025
				030105		0.57
				030106		0.025
			1A4a i	020100		2
				020103		2
				020105		0.57
			1A4b i	020200		2
				020202		2
				020204		0.57
			1A4c i	020300		2
				020304		0.57
LIQUID	110A	PETROLEUM COKE	1A1a	010102		1.32
			1A4b i	020200		800

fuel_type	fuel_id	fuel_gr_abbr	nfr_id_EA	snap_id	HCB, ng pr GJ	Dioxin, ng pr GJ
	203A	RESIDUAL OIL	1A1a	010101		0.882
				010102		0.882
				010103		0.882
				010104		0.882
				010202		0.882
				010203		0.882
			1A1b	010306		0.882
			1A4a i	020100		10
			1A4b i	020200		10
			1A4c i	020300		10
				020302		10
				020304		0.882
	204A	GAS OIL	1A1a	010101		0.882
				010102		0.882
				010103		0.882
				010104		0.882
				010105	220	0.99
				010202		0.882
				010203		0.882
			1A1b	010306		0.882
			1A2f i	030102		0.882
				030103		0.882
				030104		0.882
				030105	220	0.99
			1A4a i	020100		10
				020103		10
				020105	220	0.99
			1A4b i	020200		10
				020204		0.99
			1A4c i	020302		10
	206A	KEROSENE	1A4a i	020100		10
			1A4b i	020200		10
			1A4c i	020300		10
	303A	LPG	1A1a	010101		0.025
				010102		0.025
				010103		0.025
				010203		0.025
			1A4a i	020100		2
				020105		2
			1A4b i	020200		2
			1A4c i	020300		2
	308A	REFINERY GAS	1A1b	010304		0.025
				010306		0.025
SOLID	102A	COAL	1A1a	010101	640	1.32
				010102	640	1.32
				010104	640	1.32
			1A2f i	030102	640	1.32
				030103	640	1.32
			1A4b i	020200	640	800
			1A4c i	020300	640	300
	106A	BROWN COAL BRI.	1A4b i	020200		800
	107A	COKE OVEN COKE	1A4b i	020200		800

Table 2A-4.11a Dioxin and HCB emission factor time-series for the years 1990 to 1999.

pollutant	fuel_type	fuel_gr_abbr	nfr_id	nfr_name	snap_id	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
DIOXIN	BIOMASS	WOOD	1A4b i	Residential plants	020200	587	587	587	587	587	587	587	587	587	587
					020202										
					020204										
	LIQUID	RESIDUAL OIL	1A4c i	Agriculture/Forestry/Fishing, Stationary	020304									10	10
	WASTE	WASTE	1A1a	Electricity and heat production	010100	2095	1746	1396	1047						
					010102					907	767	628	488	348	253
					010103					907	767	628	488	348	253
					010104					907	767	628	488	348	253
					010200	2095	1746	1396	1047						
					010203					907	767	628	488	348	348
			1A2a	Iron and steel	030400					907	767				
			1A2c	Chemicals	030600	2095	1746	1396	1047	907	767	628	488	348	
			1A2d	Pulp, Paper and Print	031100	2095	1746	1396	1047	907	767	628	488	348	348
			1A2e	Food processing, beverages and tobacco	030900	2095	1746	1396	1047	907	767	628		348	348
			1A2f i	Industry-Other	030102										
					030700	2095	1746	1396	1047	907	767			348	
					031000	2095	1746	1396	1047	907	767	628	488	348	348
					031200	2095	1746			907	767				
					031300	2095	1746	1396	1047	907	767	628	488	348	
					031400			1396	1047	907	767	628	488	348	348
					031600										
					032000	2095	1746	1396	1047	907	767	628	488	348	348
			1A4a i	Commercial/Institutional plants	020100	2095	1746	1396	1047	907	767	628	488	348	348
					020103					907	767	628	488	348	348
HCB	BIOMASS	BIO PROD GAS	1A1a	Electricity and heat production	010105					82000	70000	57000	45000	32000	4000
	WASTE	WASTE	1A1a	Electricity and heat production	010100	190000	158000	127000	95000						
					010102					82000	70000	57000	45000	32000	23000
					010103					82000	70000	57000	45000	32000	23000
					010104					82000	70000	57000	45000	32000	23000
					010200	190000	158000	127000	95000						
					010203					82000	70000	57000	45000	32000	23000
			1A2a	Iron and steel	030400					82000	70000				
			1A2c	Chemicals	030600	190000	158000	127000	95000	82000	70000	57000	45000	32000	
			1A2d	Pulp, Paper and Print	031100	190000	158000	127000	95000	82000	70000	57000	45000	32000	23000
			1A2e	Food processing, beverages and tobacco	030900	190000	158000	127000	95000	82000	70000	57000		32000	23000
			1A2f i	Industry-Other	030102										
					030700	190000	158000	127000	95000	82000	70000			32000	
					031000	190000	158000	127000	95000	82000	70000	57000	45000	32000	23000
					031200	190000	158000			82000	70000				
					031300	190000	158000	127000	95000	82000	70000	57000	45000	32000	
					031400			127000	95000	82000	70000	57000	45000	32000	23000
					031600										
					032000	190000	158000	127000	95000	82000	70000	57000	45000	32000	23000
			1A4a i	Commercial/Institutional plants	020100	190000	158000	127000	95000	82000	70000	57000	45000	32000	23000
					020103					82000	70000	57000	45000	32000	23000

Table 2A-4.11b Dioxin and HCB emission factor time-series for the years 2000 to 2010.

pollutant	fuel_type	fuel_gr_abbr	nfr_id	nfr_name	snap	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
DIOXIN	BIOMASS	WOOD	1A4b i	Residential plants	020200	587	528	507	505	502	482	456	468	447	419	404
					020202						482	456	468	447	419	404
					020204									447	419	404
	LIQUID	RESIDUAL OIL	1A4c i	Agriculture/Forestry/Fishing, Stationary	020304	10	10	10	10							0.882
	WASTE	WASTE	1A1 a	Electricity and heat production	010100											
					010102	157	157	157	157	81	5	5	5	5	5	5
					010103	157	157	157	157	81	5	5	5	5	5	5
					010104	157			157			5				5
					010200											
					010203	348	348	348	348	177	5	5	5	5	5	5
			1A2a	Iron and steel	030400											
			1A2c	Chemicals	030600	348			348	177	5	5	5	5	5	5
			1A2d	Pulp, Paper and Print	031100	348			348		5	5	5	5	5	5
			1A2e	Food processing, beverages and tobacco	030900				348		5	5	5	5	5	5
			1A2f i	Industry-Other	030102				348	177	5	5	5	5		
					030700											
					031000	348							5	5	5	5
					031200											
					031300	348			348	177	5	5	5	5	5	5
					031400	348			348	177	5	5	5	5	5	5
					031600	348	348	348	348	177	5					
					032000	348			348		5	5		5	5	
			1A4a i	Commercial/Institutional plants	020100	348			348	177						
					020103	348	348	348	348	177	5	5	5	5	5	5
HCB	BIOMASS	BIO PROD GAS	1A1 a	Electricity and heat production	010105	4000	4000	4000	4000	6000	4300	4300	4300			
	WASTE	WASTE	1A1 a	Electricity and heat production	010100											
					010102	14000	12000	10000	8000	6000	4300	4300	4300	4300	4300	4300
					010103	14000	12000	10000	8000	6000	4300	4300	4300	4300	4300	4300
					010104	14000			8000			4300				4300
					010200											
					010203	14000	12000	10000	8000	6000	4300	4300	4300	4300	4300	4300
			1A2a	Iron and steel	030400											
			1A2c	Chemicals	030600	14000			8000	6000	4300	4300	4300	4300	4300	4300
			1A2d	Pulp, Paper and Print	031100	14000			8000		4300	4300	4300	4300	4300	4300
			1A2e	Food processing, beverages and tobacco	030900				8000		4300	4300	4300	4300	4300	4300
			1A2f i	Industry-Other	030102				8000	6000	4300	4300	4300	4300		
					030700											
					031000	14000							4300	4300	4300	4300
					031200											
					031300	14000			8000	6000	4300	4300	4300	4300	4300	4300
					031400	14000			8000	6000	4300	4300	4300	4300	4300	4300
					031600	14000	12000	10000	8000	6000	4300					
					032000	14000			8000		4300	4300		4300	4300	
			1A4a i	Commercial/Institutional plants	020100	14000			8000	6000						
					020103	14000	12000	10000	8000	6000	4300	4300	4300	4300	4300	4300

Table 2A-4.12 NH_3 emission factors 2010.

Fuel gr	Fuel	NFR		SNAP	NH_3 g/GJ
BIOMASS	WOOD	1A4b i	Residential	020200	5
				020202	5
				020204	5
	STRAW	1A4b i	Residential	020200	3.8
WASTE	MUNICIP. WASTES	1A1a	Electricity and heat production	010101	0.29
				010102	0.29
				010103	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 2010.

Pollutant	Implied Emission factor	Unit
SO_2	5.7	g pr GJ
NO_x	103	g pr GJ
TSP	0.60	g pr GJ
PM_{10}	0.59	g pr GJ
$PM_{2.5}$	0.57	g pr GJ
As	0.51	Mg pr GJ
Cd	0.33	mg pr GJ
Cr	1.31	mg pr GJ
Cu	1.82	mg pr GJ
Hg	1.87	mg pr GJ
Ni	3.27	mg pr GJ
Pb	5.30	mg pr GJ
Se	1.16	mg pr GJ
Zn	2.50	mg pr GJ

Table 75 Implied emission factors for power plants combusting coal, 2010.

Pollutant	Implied Emission factor	Unit
SO_2	10	g pr GJ
NO_x	30	g pr GJ
TSP	1.9	g pr GJ
PM_{10}	1.7	g pr GJ
$PM_{2.5}$	1.4	g pr GJ
As	0.18	mg pr GJ
Cd	0.02	mg pr GJ
Cr	0.44	mg pr GJ
Cu	0.23	mg pr GJ
Hg	0.80	mg pr GJ
Ni	0.48	mg pr GJ
Pb	0.33	mg pr GJ
Se	5.9	mg pr GJ
Zn	0.89	mg pr GJ

Annex 2A-6 Large point sources

Table 2A-6.1 Large point sources, fuel consumption in 2009 (1A1, 1A2 and 1A4).

nfr_id	lps_id	lps_name	fuel_id	fuel_gr_abbr	Fuel consumption, TJ
1A1a	001	Amagervaerket	102A	COAL	14626
1A1a	001	Amagervaerket	111A	WOOD	2921
1A1a	001	Amagervaerket	117A	STRAW	1905
1A1a	001	Amagervaerket	203A	RESIDUAL OIL	704
1A1a	002	Svanemoellevaerket	204A	GAS OIL	15
1A1a	002	Svanemoellevaerket	301A	NATURAL GAS	2765
1A1a	003	H.C.Oerstedsvaerket	203A	RESIDUAL OIL	12
1A1a	003	H.C.Oerstedsvaerket	204A	GAS OIL	351
1A1a	003	H.C.Oerstedsvaerket	301A	NATURAL GAS	6626
1A1a	004	Kyndbyvaerket	204A	GAS OIL	1131
1A1a	005	Masnedoevaerket	111A	WOOD	89
1A1a	005	Masnedoevaerket	117A	STRAW	563
1A1a	005	Masnedoevaerket	204A	GAS OIL	23
1A1a	007	Stigsnaesvaerket	203A	RESIDUAL OIL	1943
1A1a	007	Stigsnaesvaerket	204A	GAS OIL	17
1A1a	008	Asnaesvaerket	102A	COAL	19883
1A1a	008	Asnaesvaerket	203A	RESIDUAL OIL	648
1A1a	008	Asnaesvaerket	204A	GAS OIL	37
1A1a	010	Avedoerevaerket	102A	COAL	11049
1A1a	010	Avedoerevaerket	111A	WOOD	11204
1A1a	010	Avedoerevaerket	117A	STRAW	1976
1A1a	010	Avedoerevaerket	203A	RESIDUAL OIL	832
1A1a	010	Avedoerevaerket	204A	GAS OIL	6
1A1a	010	Avedoerevaerket	301A	NATURAL GAS	9099
1A1a	011	Fynsvaerket	102A	COAL	21149
1A1a	011	Fynsvaerket	117A	STRAW	2775
1A1a	011	Fynsvaerket	203A	RESIDUAL OIL	193
1A1a	011	Fynsvaerket	309A	BIOGAS	24
1A1a	012	Studstrupvaerket	102A	COAL	25689
1A1a	012	Studstrupvaerket	117A	STRAW	1792
1A1a	012	Studstrupvaerket	203A	RESIDUAL OIL	525
1A1a	012	Studstrupvaerket	204A	GAS OIL	8
1A1a	014	Nordjyllandsvaerket	102A	COAL	28784
1A1a	014	Nordjyllandsvaerket	203A	RESIDUAL OIL	150
1A1a	014	Nordjyllandsvaerket	204A	GAS OIL	0
1A1a	014	Nordjyllandsvaerket	303A	LPG	1
1A1a	018	Skaerbaekvaerket	204A	GAS OIL	16
1A1a	018	Skaerbaekvaerket	301A	NATURAL GAS	13532
1A1a	019	Enstedvaerket	102A	COAL	20773
1A1a	019	Enstedvaerket	111A	WOOD	412
1A1a	019	Enstedvaerket	117A	STRAW	1839
1A1a	019	Enstedvaerket	203A	RESIDUAL OIL	126
1A1a	019	Enstedvaerket	204A	GAS OIL	14
1A1a	019	Enstedvaerket	303A	LPG	0
1A1a	020	Esbjergvaerket	102A	COAL	13943
1A1a	020	Esbjergvaerket	203A	RESIDUAL OIL	208
1A1a	020	Esbjergvaerket	303A	LPG	0
1A1a	022	Oestkraft	102A	COAL	697
1A1a	022	Oestkraft	111A	WOOD	105
1A1a	022	Oestkraft	203A	RESIDUAL OIL	193
1A1a	022	Oestkraft	204A	GAS OIL	20
1A1a	022	Oestkraft	303A	LPG	0
1A1a	025	Horsens Kraftvarmevaerk	114A	WASTE	1006
1A1a	025	Horsens Kraftvarmevaerk	301A	NATURAL GAS	967
1A1a	026	Herningvaerket	111A	WOOD	3699
1A1a	026	Herningvaerket	203A	RESIDUAL OIL	6
1A1a	026	Herningvaerket	204A	GAS OIL	0
1A1a	026	Herningvaerket	215A	BIO OIL	3
1A1a	026	Herningvaerket	301A	NATURAL GAS	779
1A1a	026	Herningvaerket	303A	LPG	0
1A1a	027	I/S Vestforbraending	114A	WASTE	5693
1A1a	027	I/S Vestforbraending	204A	GAS OIL	11
1A1a	027	I/S Vestforbraending	301A	NATURAL GAS	26
1A1a	028	Amagerforbraending	111A	WOOD	9
1A1a	028	Amagerforbraending	114A	WASTE	4243
1A1a	028	Amagerforbraending	303A	LPG	66
1A1a	029	Energi Randers Produktion	102A	COAL	442
1A1a	029	Energi Randers Produktion	110A	PETROLEUM COKE	4

1A1a	029	Energi Randers Produktion	111A	WOOD	2988
1A1a	029	Energi Randers Produktion	204A	GAS OIL	75
1A1a	029	Energi Randers Produktion	215A	BIO OIL	55
1A1a	029	Energi Randers Produktion	309A	BIOGAS	8
1A1a	030	Grenaa Kraftvarmevaerk	102A	COAL	565
1A1a	030	Grenaa Kraftvarmevaerk	111A	WOOD	69
1A1a	030	Grenaa Kraftvarmevaerk	117A	STRAW	651
1A1a	030	Grenaa Kraftvarmevaerk	203A	RESIDUAL OIL	26
1A1a	030	Grenaa Kraftvarmevaerk	204A	GAS OIL	4
1A1a	030	Grenaa Kraftvarmevaerk	303A	LPG	0
1A1a	031	Hilleroed Kraftvarmevaerk	301A	NATURAL GAS	2843
1A1a	032	Helsingoer Kraftvarmevaerk	301A	NATURAL GAS	1903
1A1a	036	Kolding Forbraendingsanlaeg TAS	111A	WOOD	231
1A1a	036	Kolding Forbraendingsanlaeg TAS	114A	WASTE	1111
1A1a	036	Kolding Forbraendingsanlaeg TAS	117A	STRAW	6
1A1a	037	Maabjergvaerket	111A	WOOD	600
1A1a	037	Maabjergvaerket	114A	WASTE	1575
1A1a	037	Maabjergvaerket	117A	STRAW	439
1A1a	037	Maabjergvaerket	301A	NATURAL GAS	105
1A1a	038	Soenderborg Kraftvarmevaerk	111A	WOOD	44
1A1a	038	Soenderborg Kraftvarmevaerk	114A	WASTE	708
1A1a	038	Soenderborg Kraftvarmevaerk	301A	NATURAL GAS	869
1A1a	039	I/S Kara Affaldsforbraendingsanlaeg	111A	WOOD	341
1A1a	039	I/S Kara Affaldsforbraendingsanlaeg	114A	WASTE	1826
1A1a	039	I/S Kara Affaldsforbraendingsanlaeg	301A	NATURAL GAS	17
1A1a	040	Viborg Kraftvarme	301A	NATURAL GAS	2380
1A1a	042	I/S Nordforbraending	111A	WOOD	601
1A1a	042	I/S Nordforbraending	114A	WASTE	1072
1A1a	046	Affaldscenter aarhus - Forbraendsanlaegget	114A	WASTE	2485
1A1a	047	I/S Reno Nord	114A	WASTE	1664
1A1a	047	I/S Reno Nord	204A	GAS OIL	6
1A1a	048	Silkeborg Kraftvarmevaerk	204A	GAS OIL	0
1A1a	048	Silkeborg Kraftvarmevaerk	301A	NATURAL GAS	3756
1A1a	050	AffaldPlus+, Naestved Forbraendingsanlaeg	114A	WASTE	1201
1A1a	051	AVV Forbraendingsanlaeg	111A	WOOD	129
1A1a	051	AVV Forbraendingsanlaeg	114A	WASTE	716
1A1a	051	AVV Forbraendingsanlaeg	117A	STRAW	34
1A1a	051	AVV Forbraendingsanlaeg	203A	RESIDUAL OIL	3
1A1a	051	AVV Forbraendingsanlaeg	204A	GAS OIL	2
1A1a	052	Affaldsforbraendingsanlaeg I/S REFA	114A	WASTE	1166
1A1a	053	Svendborg Kraftvarmevaerk	111A	WOOD	33
1A1a	053	Svendborg Kraftvarmevaerk	114A	WASTE	467
1A1a	053	Svendborg Kraftvarmevaerk	301A	NATURAL GAS	4
1A1a	054	Kommunekemi	114A	WASTE	1589
1A1a	054	Kommunekemi	203A	RESIDUAL OIL	130
1A1a	054	Kommunekemi	204A	GAS OIL	40
1A1a	055	I/S Faelles Forbraending	114A	WASTE	328
1A1a	058	I/S Reno Syd	111A	WOOD	48
1A1a	058	I/S Reno Syd	114A	WASTE	639
1A1a	058	I/S Reno Syd	117A	STRAW	7
1A1a	058	I/S Reno Syd	204A	GAS OIL	4
1A1a	059	I/S Kraftvarmevaerk Thisted	111A	WOOD	32
1A1a	059	I/S Kraftvarmevaerk Thisted	114A	WASTE	485
1A1a	059	I/S Kraftvarmevaerk Thisted	117A	STRAW	47
1A1a	060	Knudmosevaerket	111A	WOOD	3
1A1a	060	Knudmosevaerket	114A	WASTE	241
1A1a	060	Knudmosevaerket	301A	NATURAL GAS	16
1A1a	061	Affaldplus+, Slagelse Forbr. and DONG Slagelse KVV	114A	WASTE	622
1A1a	061	Affaldplus+, Slagelse Forbr. and DONG Slagelse KVV	117A	STRAW	453
1A1a	065	Haderslev Kraftvarmevaerk	111A	WOOD	40
1A1a	065	Haderslev Kraftvarmevaerk	114A	WASTE	535
1A1a	065	Haderslev Kraftvarmevaerk	117A	STRAW	3
1A1a	065	Haderslev Kraftvarmevaerk	301A	NATURAL GAS	7
1A1a	066	Frederikshavn Affaldskraftvarmevaerk	111A	WOOD	23
1A1a	066	Frederikshavn Affaldskraftvarmevaerk	114A	WASTE	361
1A1a	066	Frederikshavn Affaldskraftvarmevaerk	204A	GAS OIL	2
1A1a	067	Vejen Kraftvarmevaerk	114A	WASTE	296
1A1a	068	Bofa I/S	114A	WASTE	204
1A1a	069	DTU	301A	NATURAL GAS	1105
1A1a	070	AffaldPlus+, Naestved Kraftvarmevaerk	301A	NATURAL GAS	245
1A1a	072	Hjoerring Varmeforsyning	111A	WOOD	464
1A1a	072	Hjoerring Varmeforsyning	301A	NATURAL GAS	119
1A1a	085	L90 Affaldsforbraending	114A	WASTE	2413

1A1a	085	L90 Affaldsforbraending	204A	GAS OIL	6
1A1a	086	Hammel Fjernvarmeselskab	111A	WOOD	21
1A1a	086	Hammel Fjernvarmeselskab	114A	WASTE	308
1A1a	086	Hammel Fjernvarmeselskab	215A	BIO OIL	25
1A1a	087	Koege Kraftvarmevaerk	111A	WOOD	1364
1A1a	087	Koege Kraftvarmevaerk	203A	RESIDUAL OIL	4
1A1a	087	Koege Kraftvarmevaerk	204A	GAS OIL	0
1A1a	088	Skagen Forbraending	111A	WOOD	25
1A1a	088	Skagen Forbraending	114A	WASTE	102
1A1a	090	Odense Kraftvarmevaerk	111A	WOOD	168
1A1a	090	Odense Kraftvarmevaerk	114A	WASTE	2478
1A1a	090	Odense Kraftvarmevaerk	117A	STRAW	2
1A1a	090	Odense Kraftvarmevaerk	204A	GAS OIL	43
1A1a	091	Centralkommunernes Transmissionsselskab F_berg	204A	GAS OIL	411
1A1a	092	Frederikshavn Kraftvarmevaerk	301A	NATURAL GAS	507
1A1a	093	Fjernvarme Fyn, Centrum Varmecentral	301A	NATURAL GAS	102
1A1a	094	Special Waste System	114A	WASTE	48
1A1a	095	Grenaa Forbraending	114A	WASTE	243
1A1b	009	Statoil Raffinaderi	204A	GAS OIL	3
1A1b	009	Statoil Raffinaderi	308A	REFINERY GAS	8432
1A1b	017	Shell Raffinaderi	203A	RESIDUAL OIL	454
1A1b	017	Shell Raffinaderi	308A	REFINERY GAS	5832
1A1c	024	Nybro Gasbehandlingsanlaeg	301A	NATURAL GAS	295
1A2a	033	DanSteel	301A	NATURAL GAS	1223
1A2c	081	Haldor Topsoee	204A	GAS OIL	0
1A2c	081	Haldor Topsoee	301A	NATURAL GAS	556
1A2c	081	Haldor Topsoee	303A	LPG	0
1A2c	084	Cheminova	204A	GAS OIL	2
1A2c	084	Cheminova	301A	NATURAL GAS	997
1A2d	034	Dalum Papir	111A	WOOD	1187
1A2d	034	Dalum Papir	301A	NATURAL GAS	76
1A2e	023	Danisco Grindsted	102A	COAL	420
1A2e	023	Danisco Grindsted	111A	WOOD	4
1A2e	023	Danisco Grindsted	204A	GAS OIL	10
1A2e	023	Danisco Grindsted	301A	NATURAL GAS	51
1A2e	071	Maricogen	301A	NATURAL GAS	1453
1A2e	082	Nordic Sugar Nakskov	102A	COAL	615
1A2e	082	Nordic Sugar Nakskov	107A	COKE OVEN COKE	28
1A2e	082	Nordic Sugar Nakskov	203A	RESIDUAL OIL	608
1A2e	082	Nordic Sugar Nakskov	204A	GAS OIL	4
1A2e	082	Nordic Sugar Nakskov	309A	BIOGAS	40
1A2e	083	Nordic Sugar Nykoebing	102A	COAL	203
1A2e	083	Nordic Sugar Nykoebing	107A	COKE OVEN COKE	52
1A2e	083	Nordic Sugar Nykoebing	203A	RESIDUAL OIL	965
1A2e	083	Nordic Sugar Nykoebing	309A	BIOGAS	53
1A2e	089	AarhusKarlshamn Denmark A/S	111A	WOOD	35
1A2e	089	AarhusKarlshamn Denmark A/S	203A	RESIDUAL OIL	1262
1A2f i	045	Aalborg Portland	102A	COAL	2019
1A2f i	045	Aalborg Portland	110A	PETROLEUM COKE	5115
1A2f i	045	Aalborg Portland	115A	INDUSTR. WASTES	1355
1A2f i	045	Aalborg Portland	121A	FOSSIL WASTE	1355
1A2f i	045	Aalborg Portland	203A	RESIDUAL OIL	337
1A2f i	045	Aalborg Portland	204A	GAS OIL	5
1A2f i	076	Rockwool A/S Vamdrup	101A	ANODE CARBON	46
1A2f i	076	Rockwool A/S Vamdrup	102A	COAL	87
1A2f i	076	Rockwool A/S Vamdrup	107A	COKE OVEN COKE	181
1A2f i	076	Rockwool A/S Vamdrup	204A	GAS OIL	1
1A2f i	076	Rockwool A/S Vamdrup	301A	NATURAL GAS	134
1A2f i	077	Rockwool A/S Doense	101A	ANODE CARBON	0
1A2f i	077	Rockwool A/S Doense	107A	COKE OVEN COKE	380
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	839
1A2f i	080	Saint-Gobain Isover A/S	301A	NATURAL GAS	104
1A4a i	049	Rensningsanlaegget Lynetten	114A	WASTE	75
1A4a i	049	Rensningsanlaegget Lynetten	204A	GAS OIL	19
1A4a i	049	Rensningsanlaegget Lynetten	309A	BIOGAS	104
Total					**324599**

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																	
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											
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				x	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	x	x	x	x	x	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	x	x	x	x				x
1A1a	039	I/S Kara Affaldsforbraendingsanlaeg	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
1A1a	046	Affaldscenter aarhus - Forbraendsanlaegget	x	x	x			x	x	x					x						x
1A1a	047	I/S Reno Nord	x	x		x		x	x	x											
1A1a	048	Silkeborg Kraftvarmevaerk		x																	
1A1a	050	AffaldPlus+, Naestved Forbraendingsanlaeg	x	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				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	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
1A1a	059	I/S Kraftvarmevaerk Thisted	x	x	x	x	x	x	x											x
1A1a	060	Knudmosevaerket	x	x																
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																		
1A1a	065	Haderslev Kraftvarmevaerk	x	x		x														
1A1a	066	Frederikshavn Affaldskraftvarmevaerk	x	x		x				x	x	x	x	x	x	x				
1A1a	067	Vejen Kraftvarmevaerk	x	x																
1A1a	068	Bofa I/S	x	x		x	x	x	x	x	x	x	x	x	x	x				x
1A1a	069	DTU		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						
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				
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														
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	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																
1A4a i	049	Rensningsanlaegget Lynetten		x	x	x	x	x	x	x					x						
Grand Total			5178	17908	1.1	1551	0.49	540	454	344	30.8	8.6	89.7	70.3	222	111	113	988	271	20	162
Share of total emission from stationary combustion, %			51%	44%	0.01%	1.00%	0.24%	3%	2%	2%	14%	7%	23%	11%	67%	5%	4%	78%	5%	3%	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 2010

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	3940.665	2.000	10.000	10.198	3.983	-0.028	0.025	-0.279	0.072	0.288
02	SO_2	11484.575	2800.924	2.000	20.000	20.100	5.579	0.013	0.018	0.265	0.051	0.270
03	SO_2	16154.543	3349.029	2.000	10.000	10.198	3.385	0.015	0.022	0.148	0.061	0.160
Total	SO_2	154888.330	10090.618				58.445					0.181
Total uncertainties					Overall uncertainty i the year (%):		7.645			Trend uncertainty (%):		0.426

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	NOx	94790.491	26707.387	2.000	20.000	20.100	13.218	-0.057	0.232	-1.147	0.655	1.320
02	NOx	7450.671	8137.991	2.000	50.000	50.040	10.027	0.048	0.071	2.389	0.200	2.397
03	NOx	13108.643	5768.072	2.000	20.000	20.100	2.855	0.010	0.050	0.200	0.141	0.245
Total	NOx	115349.805	40613.450				283.391					7.550
Total uncertainties					Overall uncertainty i the year (%):		16.834			Trend uncertainty (%):		2.748

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	495.825	2445.281	2.000	50.000	50.040	6.667	0.128	0.175	6.422	0.496	6.441
02	NMVOC	12360.811	15607.221	2.000	50.000	50.040	42.552	-0.046	1.118	-2.301	3.163	3.912
03	NMVOC	1099.914	301.266	2.000	50.000	50.040	0.821	-0.082	0.022	-4.099	0.061	4.100
Total	NMVOC	13956.550	18353.768				1855.774					73.598
Total uncertainties					Overall uncertainty i the year (%):		43.079			Trend uncertainty (%):		8.579

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	8104.775	11483.633	2.000	20.000	20.100	1.482	0.015	0.086	0.304	0.243	0.389
02	CO	120674.879	140427.332	2.000	50.000	50.040	45.123	-0.003	1.052	-0.133	2.976	2.979
03	CO	4704.238	3817.154	2.000	20.000	20.100	0.493	-0.013	0.029	-0.250	0.081	0.263
Total	CO	133483.893	155728.119				2038.560					9.092
Total uncertainties					Overall uncertainty i the year (%):		45.150			Trend uncertainty (%):		3.015

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 NH_3	Input data Mg NH_3	Input data %	Input data %	%	%	%	%	%	%	%
01	NH_3	0.287	9.986	2.000	1000.000	1000.002	48.574	0.135	0.149	135.482	0.420	135.483
02	NH_3	66.938	195.602	2.000	1000.000	1000.002	951.428	-0.134	2.910	-134.152	8.230	134.404
03	NH_3			2.000	1000.000	1000.002						
Total	NH_3	67.225	205.589				907574.939					36420.142
Total uncertainties					Overall uncertainty i the year (%):		952.667			Trend uncertainty (%):		190.841

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 Mg TSP	Input data Mg TSP	Input data %	Input data %	%	%	%	%	%	%	%
01	TSP	1167.252	857.342	2.000	50.000	50.040	2.031	-0.057	0.059	-2.827	0.166	2.832
02	TSP	12688.981	19970.179	2.000	500.000	500.004	472.638	0.112	1.365	55.852	3.860	55.985
03	TSP	775.321	298.962	2.000	50.000	50.040	0.708	-0.056	0.020	-2.802	0.058	2.803
Total	TSP	14631.554	21126.483				223390.873					3150.217
Total uncertainties					Overall uncertainty i the year (%):		472.642			Trend uncertainty (%):		56.127

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 Mg PM_{10}	Input data Mg PM_{10}	Input data %	Input data %	%	%	%	%	%	%	%
01	PM_{10}	961.490	682.984	2.000	50.000	50.040	1.716	-0.053	0.050	-2.662	0.142	2.666
02	PM_{10}	12077.785	19015.602	2.000	500.000	500.004	477.339	0.097	1.398	48.487	3.954	48.648
03	PM_{10}	564.087	219.932	2.000	50.000	50.040	0.553	-0.045	0.016	-2.227	0.046	2.227
Total	PM_{10}	13603.361	19918.518				227855.371					2378.695
Total uncertainties					Overall uncertainty i the year (%):		477.342			Trend uncertainty (%):		48.772

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 Mg $PM_{2,5}$	Input data Mg $PM_{2,5}$	Input data %	Input data %	%	%	%	%	%	%	%
01	$PM_{2,5}$	818.343	561.384	2.000	50.000	50.040	1.445	-0.051	0.043	-2.566	0.123	2.569
02	$PM_{2,5}$	11820.516	18725.069	2.000	500.000	500.004	481.704	0.076	1.445	38.224	4.086	38.442
03	$PM_{2,5}$	322.901	149.993	2.000	50.000	50.040	0.386	-0.026	0.012	-1.289	0.033	1.289
Total	$PM_{2,5}$	12961.759	19436.446				232040.759					1486.051
Total uncertainties					Overall uncertainty i the year (%):		481.706			Trend uncertainty (%):		38.549

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	115.903	2.000	100.000	100.020	52.173	-0.057	0.099	-5.668	0.281	5.675
02	As	54.820	37.028	2.000	1000.000	1000.002	166.645	0.023	0.032	22.776	0.090	22.776
03	As	153.201	69.264	2.000	100.000	100.020	31.179	0.034	0.059	3.431	0.168	3.435
Total	As	1166.872	222.194				31464.818					562.748
Total uncertainties					Overall uncertainty i the year (%):		177.383			Trend uncertainty (%):		23.722

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	47.687	2.000	100.000	100.020	41.299	-0.061	0.056	-6.087	0.158	6.089
02	Cd	60.719	46.544	2.000	1000.000	1000.002	403.010	0.045	0.055	44.862	0.154	44.862
03	Cd	53.023	21.261	2.000	100.000	100.020	18.412	0.016	0.025	1.649	0.070	1.651
Total	Cd	853.828	115.492				164461.506					2052.383
Total uncertainties					Overall uncertainty i the year (%):		405.539			Trend uncertainty (%):		45.303

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	205.359	2.000	100.000	100.020	53.257	-0.028	0.040	-2.750	0.113	2.752
02	Cr	282.344	109.268	2.000	1000.000	1000.002	283.316	0.017	0.021	17.078	0.060	17.078
03	Cr	214.523	71.049	2.000	100.000	100.020	18.426	0.011	0.014	1.066	0.039	1.066
Total	Cr	5159.737	385.676				83443.970					300.358
Total uncertainties					Overall uncertainty i the year (%):		288.867			Trend uncertainty (%):		17.331

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	202.753	2.000	100.000	100.020	30.775	-0.093	0.057	-9.334	0.161	9.335
02	Cu	349.404	363.116	2.000	1000.000	1000.002	551.047	0.084	0.102	83.604	0.288	83.605
03	Cu	302.781	93.089	2.000	100.000	100.020	14.129	0.010	0.026	1.041	0.074	1.043
Total	Cu	3567.895	658.957				304799.566					7078.030
Total uncertainties					Overall uncertainty i the year (%):		552.087			Trend uncertainty (%):		84.131

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	240.182	2.000	100.000	100.020	72.535	-0.017	0.085	-1.719	0.240	1.736
02	Hg	166.683	36.321	2.000	1000.000	1000.002	109.668	0.006	0.013	5.937	0.036	5.937
03	Hg	191.750	54.689	2.000	100.000	100.020	16.516	0.011	0.019	1.139	0.055	1.140
Total	Hg	2827.908	331.191				17561.132					39.565
Total uncertainties					Overall uncertainty i the year (%):		132.518			Trend uncertainty (%):		6.290

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	534.321	2.000	100.000	100.020	22.176	-0.044	0.033	-4.417	0.093	4.418
02	Ni	1785.270	339.896	2.000	1000.000	1000.002	141.038	0.005	0.021	4.674	0.059	4.674
03	Ni	6011.187	1535.751	2.000	100.000	100.020	63.738	0.040	0.094	3.957	0.266	3.966
Total	Ni	16328.598	2409.968				24445.952					57.097
Total uncertainties					Overall uncertainty i the year (%):		156.352			Trend uncertainty (%):		7.556

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	421.353	2.000	100.000	100.020	16.456	-0.102	0.027	-10.249	0.077	10.249
02	Pb	1829.065	1804.545	2.000	1000.000	1000.002	704.643	0.097	0.117	97.417	0.332	97.418
03	Pb	1480.369	335.041	2.000	100.000	100.020	13.085	0.006	0.022	0.575	0.062	0.578
Total	Pb	15379.088	2560.940				496964.339					9595.572
Total uncertainties					Overall uncertainty i the year (%):		704.957			Trend uncertainty (%):		97.957

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	1147.185	2.000	100.000	100.020	90.644	0.002	0.291	0.204	0.822	0.847
02	Se	119.948	47.128	2.000	1000.000	1000.002	37.231	0.002	0.012	2.193	0.034	2.193
03	Se	275.326	71.531	2.000	100.000	100.020	5.652	-0.004	0.018	-0.425	0.051	0.428
Total	Se	3946.794	1265.844				9634.455					5.710
Total uncertainties					Overall uncertainty i the year (%):		98.155			Trend uncertainty (%):		2.390

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	540.785	2.000	100.000	100.020	8.993	-0.149	0.023	-14.936	0.064	14.936
02	Zn	3828.241	4595.241	2.000	1000.000	1000.002	763.992	0.152	0.192	151.658	0.544	151.659
03	Zn	3637.755	878.762	2.000	100.000	100.020	14.613	-0.002	0.037	-0.151	0.104	0.184
Total	Zn	23912.349	6014.788				583978.224					23223.560
Total uncertainties					Overall uncertainty i the year (%):		764.185			Trend uncertainty (%):		152.393

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	1.178	2.000	500.000	500.004	30.395	-0.256	0.026	-127.991	0.072	127.991
02	Dioxin	14.158	18.145	2.000	1000.000	1000.002	936.699	0.264	0.395	264.108	1.116	264.110
03	Dioxin	0.903	0.049	2.000	1000.000	1000.002	2.514	-0.007	0.001	-7.218	0.003	7.218
Total	Dioxin	45.974	19.371				878335.409					86188.043
Total uncertainties					Overall uncertainty i the year (%):		937.196			Trend uncertainty (%):		293.578

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)	23.255	35.938	2.000	100.000	100.020	0.748	-0.008	0.017	-0.838	0.049	0.839
02	Benzo(b)	2017.949	4705.250	2.000	1000.000	1000.002	979.438	0.032	2.251	31.835	6.367	32.466
03	Benzo(b)	48.958	62.851	2.000	100.000	100.020	1.309	-0.024	0.030	-2.376	0.085	2.378
Total	Benzo(b)	2090.162	4804.039				959301.371					1060.396
Total uncertainties					Overall uncertainty i the year (%):		979.439			Trend uncertainty (%):		32.564

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)	10.545	20.779	2.000	100.000	100.020	0.771	-0.005	0.019	-0.495	0.054	0.498
02	Benzo(k)	1053.260	2659.720	2.000	1000.000	1000.002	987.074	0.043	2.448	43.287	6.924	43.838
03	Benzo(k)	22.646	14.055	2.000	100.000	100.020	0.522	-0.039	0.013	-3.875	0.037	3.875
Total	Benzo(k)	1086.452	2694.554				974316.815					1936.998
Total uncertainties					Overall uncertainty i the year (%):		987.075			Trend uncertainty (%):		44.011

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(a)	Input data kg Benzo(a)	Input data %	Input data %	%	%	%	%	%	%	%
01	Benzo(a)	7.035	9.384	2.000	100.000	100.020	0.201	-0.004	0.005	-0.386	0.014	0.387
02	Benzo(a)	1926.992	4645.802	2.000	1000.000	1000.002	994.396	0.008	2.389	8.414	6.757	10.791
03	Benzo(a)	10.746	16.806	2.000	100.000	100.020	0.360	-0.005	0.009	-0.463	0.024	0.464
Total	Benzo(a)	1944.773	4671.992				988824.018					116.815
Total uncertainties					Overall uncertainty i the year (%):		994.396			Trend uncertainty (%):		10.808

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 Indeno	Input data kg Indeno	Input data %	Input data %	%	%	%	%	%	%	%
01	Indeno	6.318	7.645	2.000	100.000	100.020	0.236	-0.003	0.005	-0.325	0.014	0.326
02	Indeno	1574.863	3227.819	2.000	1000.000	1000.002	996.452	0.018	2.024	17.813	5.725	18.710
03	Indeno	13.465	3.856	2.000	100.000	100.020	0.119	-0.015	0.002	-1.473	0.007	1.473
Total	Indeno	1594.646	3239.320				992915.829					352.342
Total uncertainties					Overall uncertainty i the year (%):		996.452			Trend uncertainty (%):		18.771

Annex 2A-8 Emission inventory 2010 based on SNAP sectors

Table 104 Emission inventory 2010 based on SNAP sectors.

SNAP	SO2 [Mg]	NOX [Mg]	NMVOC [Mg]	CH4 [Mg]	CO [Mg]	CO2[1)] [Gg]	N2O [Mg]	NH3 [Mg]	TSP [Mg]	PM10 [Mg]	PM2,5 [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	3940.66	26707.39	2445.28	11010.49	11483.63	32517.29	344.67	9.99	857.34	682.98	561.38	115.9	47.69	205.36	202.75	240.18	534.32	421.35	1147.19	540.78	0.41	1.18	35.94	20.78	9.38	7.65
101	2613.4	16136.21	2251.23	10507.63	6951.29	27202.24	249.7	8.92	453.53	372.72	296.9	60.78	20.77	146.38	122.07	201.88	299.16	270.35	1036.87	436.2	0.35	1.02	4.12	0.96	1.18	1.49
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	1668.1	5998.1	249.57	160.31	2539.69	16872.81	136.91	0	329.91	285.32	231.33	28.58	6.77	81.07	42.4	125.92	85.61	58.35	927.42	236.63	0.11	0.36	3.07	0.65	0.75	1.16
10102	646.93	3549.91	66.44	40.43	1032.19	4198.76	39.32	5.9	74.84	60.6	45.73	17.27	8.16	39.48	50.4	40.86	133.71	97.43	37.75	90.53	0.13	0.3	0.44	0.11	0.19	0.11
10103	166.96	1157.64	9.29	7.7	225.56	1357.77	14.44	2.41	11.58	9.47	7.34	9.75	4.44	19.36	21.79	21.47	71.7	97.53	11.36	24.33	0.05	0.13	0.12	0.03	0.04	0.04
10104	87.52	2303.68	106.2	86.37	1293.08	3468.34	43.91	0.6	16.42	12.29	8.52	4.09	1.34	5.13	6.68	11.32	6.73	16.24	59.69	15.99	0.06	0.22	0.31	0.14	0.18	0.14
10105	43.9	3126.88	1819.73	10212.82	1860.77	1304.55	15.13	0	20.78	5.04	3.98	1.08	0.07	1.34	0.81	2.31	1.41	0.81	0.65	68.72	0	0.01	0.18	0.04	0.03	0.04
102	1050.38	2538.06	131.39	441.88	4305	2969.46	65.85	1.07	307.08	219.09	175.85	24.39	6.35	37.76	39.58	15.55	50.34	90.26	12.06	36.06	0.06	0.16	31.57	19.72	8.13	5.99
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	33.74	113.49	3.37	1.09	65.85	150.22	0.55	0	5.5	5.5	5.48	0.21	0.02	0.29	0.21	0.26	11.09	0.09	0.05	0.67	0	0	0.52	0.1	0.12	0.19
10203	1016.64	2424.57	128.02	440.79	4239.16	2819.24	65.3	1.07	301.58	213.59	170.37	24.18	6.33	37.47	39.37	15.29	39.25	90.16	12.01	35.39	0.06	0.15	31.05	19.62	8.01	5.8
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	269.08	1543.53	21.02	16.73	102.41	854.05	3.09	0	94.14	89.58	87.31	27.63	20.56	21.2	41.11	20.15	184.81	60.71	97.99	68.48	0	0	0.22	0.04	0.05	0.08
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	1.7	255.8	2.15	2.61	9.51	89.34	1.53	0	7.67	7.67	7.67	2.76	2.15	2.15	4.14	2.15	2.15	6.29	10.43	2.76	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	267.38	1287.73	18.88	14.13	92.9	764.71	1.55	0	86.47	81.91	79.64	24.87	18.41	19.05	36.97	18	182.66	54.42	87.56	65.72	0	0	0.22	0.04	0.05	0.08
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	7.81	6489.59	41.64	44.25	124.93	1491.54	26.03	0	2.6	1.59	1.33	3.1	0.01	0.02	0	2.6	0.01	0.04	0.26	0.04	0	0	0.03	0.05	0.03	0.08
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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10504	7.81	6489.59	41.64	44.25	124.93	1491.54	26.03	0	2.6	1.59	1.33	3.1	0.01	0.02	0	2.6	0.01	0.04	0.26	0.04	0	0	0.03	0.05	0.03	0.08
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	2800.92	8137.99	15607.22	7797.91	140427.3	9122.51	222.15	195.6	19970.18	19015.6	18725.07	37.03	46.54	109.27	363.12	36.32	339.9	1804.55	47.13	4595.24	0.15	18.14	4705.25	2659.72	4645.8	3227.82
201	122.94	836.56	262.08	661.67	903.9	1132.95	34.12	0	159.1	157.4	149.21	3.08	0.36	3.33	3.56	5.83	15.17	4.26	1	13.42	0	0.45	219.65	72.91	167.22	118.95
20100	108.08	608.19	182.98	50.07	665.52	1017.47	32.34	0	156.53	156.41	148.37	2.96	0.32	3.04	3.25	1.97	14.83	3.8	0.78	8.24	0	0.45	219.64	72.9	167.21	118.93
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	4.55	12.67	0.46	2.9	30.56	26.56	0.48	0	0.55	0.55	0.55	0.06	0.03	0.15	0.14	3.71	0.18	0.42	0.11	0.62	0	0	0	0.01	0.01	0.01
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	10.3	215.7	78.63	608.7	207.82	88.92	1.3	0	2.03	0.45	0.29	0.06	0	0.13	0.17	0.14	0.16	0.04	0.12	4.56	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	1665.65	6614.61	14859.91	5796.23	130609.1	7375.77	172.36	195.6	19317.07	18395.88	18142.51	25.29	41.02	85.73	322.78	21.51	89.16	1595.91	20.39	4083.71	0.15	16.59	4375.52	2562.85	4378.28	2976.03
20200	1664.71	6437.29	14753.03	5248.43	130528.2	7302.48	171.64	195.59	19314.53	18394.06	18140.75	25.21	41.02	85.66	322.74	21.38	89.09	1595.74	20.37	4078.87	0.15	16.59	4375.15	2562.64	4377.92	2975.78
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	0.11	4.03	1.57	0.95	12.06	7.27	0.02	0.02	1.53	1.46	1.44	0.02	0	0.01	0.02	0.01	0.01	0.12	0	0.3	0	0	0.35	0.21	0.35	0.24
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	0.83	173.29	105.31	546.85	68.88	66.02	0.7	0	1.01	0.36	0.33	0.06	0	0.06	0.02	0.12	0.06	0.05	0.02	4.53	0	0	0.02	0.01	0.01	0.01
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	1012.34	686.82	485.23	1340	8914.32	613.78	15.67	0	494.01	462.33	433.35	8.66	5.17	20.21	36.77	8.99	235.56	204.38	25.74	498.11	0	1.11	110.07	23.96	100.3	132.85
20300	997.63	426.72	387.99	594.82	8663.82	505.03	14.1	0	491.45	461.72	432.95	8.56	5.15	20.03	36.52	8.81	232.81	204.3	25.58	492.13	0	1.1	109.96	23.93	100.22	132.79
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	2.07	0.92	0.04	0.01	0.22	0.57	0	0	0.09	0.07	0.05	0.03	0.01	0.02	0.03	0	2.14	0.03	0.01	0.56	0	0	0	0	0	0

SNAP	SO2 [Mg]	NOX [Mg]	NMVOC [Mg]	CH4 [Mg]	CO [Mg]	CO2[1)] [Gg]	N2O [Mg]	NH3 [Mg]	TSP [Mg]	PM10 [Mg]	PM2,5 [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]
20303	0.01	0.04	0.07	0.01	0.11	0.05	0	0	0.06	0.06	0.06	0	0	0	0	0	0	0	0	0	0	0	0.1	0.03	0.08	0.05
20304	12.64	259.15	97.14	745.16	250.17	108.14	1.57	0	2.4	0.48	0.3	0.08	0.01	0.16	0.21	0.17	0.62	0.05	0.14	5.43	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	3349.03	5768.07	341.92	623.7	3829.78	4313.12	78.16	311.17	492.33	345.33	229.1	82.37	27.36	117.82	106.34	60.28	1588.97	705.6	262.87	1197.4	0.04	0.09	63.45	14.66	16.82	4.31
301	129.16	427.02	84.01	370.45	335.25	436.05	8.76	0	23.5	15.89	11.88	2.72	0.59	4.81	5.75	2.33	4.72	27.23	4.96	39.71	0	0	1.49	1.49	0.02	0.15
30100	0.81	5.88	0.46	0.58	9.61	7.57	0.13	0	0.61	0.42	0.32	0.05	0.01	0.07	0.08	0.02	0.07	0.11	0.02	0.07	0	0	0.04	0.04	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	35.92	55.29	5.99	8.73	133.93	67.05	2.26	0	11.13	7.64	5.79	0.93	0.22	1.81	2.1	0.53	1.79	7.11	1.23	8.94	0	0	0.75	0.75	0	0.03
30103	90.54	76.08	6.9	8.85	122.83	94.32	2	0	10.76	7.44	5.44	1.23	0.37	2.88	3.55	1.32	2.82	19.97	3.66	28.55	0	0	0.69	0.69	0.01	0.1
30104	1.17	187.5	6.25	6.64	18.75	221.61	3.91	0	0.39	0.24	0.2	0.46	0	0	0	0.39	0	0.01	0.04	0.01	0	0	0	0.01	0	0.01
30105	0.7	99.39	64.28	345.56	48.22	41.62	0.44	0	0.6	0.14	0.12	0.04	0	0.04	0.01	0.07	0.04	0.03	0.01	2.14	0	0	0.01	0	0	0
30106	0.02	2.87	0.14	0.1	1.91	3.88	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
304	3.1	124.91	3.12	2.18	43.33	88.44	0.2	0	0.23	0.21	0.19	0.22	0.01	0.02	0.04	0.16	2.78	0.04	0.03	0.73	0	0	0	0	0	0
30400	2.73	15.01	0.68	0.47	9.09	19.06	0.07	0	0.11	0.09	0.07	0.07	0.01	0.02	0.04	0.04	2.78	0.04	0.02	0.72	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	0.37	109.9	2.45	1.71	34.24	69.38	0.12	0	0.12	0.12	0.12	0.15	0	0	0	0.12	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	8.03	7.93	0.25	0.19	3.34	8.43	0.13	0	0.23	0.18	0.12	0.11	0.03	0.06	0.13	0.02	8.42	0.11	0.05	2.19	0	0	0	0	0	0
30500	8.03	7.93	0.25	0.19	3.34	8.43	0.13	0	0.23	0.18	0.12	0.11	0.03	0.06	0.13	0.02	8.42	0.11	0.05	2.19	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	123.9	230.83	4.22	4.23	38.22	151.51	2.97	0	3.64	2.73	1.87	1.81	0.47	0.99	2.06	0.39	129.81	1.84	0.83	33.74	0	0	0.02	0.03	0.03	0.06
30600	123.73	74.13	1.51	1.75	17.82	63.21	1.91	0	3.53	2.65	1.81	1.62	0.47	0.99	2.06	0.23	129.81	1.84	0.81	33.73	0	0	0.02	0.02	0.03	0.06
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	0.17	23.4	1.11	0.78	15.58	31.58	0.06	0	0	0	0	0.07	0	0	0	0.06	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	133.3	1.6	1.7	4.82	56.72	1	0	0.11	0.07	0.06	0.12	0	0	0	0.1	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	391.82	314.57	16.15	13.2	161.19	373.66	2.97	0	12.51	9.1	5.82	3.99	1.3	7.54	10.44	4.52	121.83	66.99	12.14	127.54	0	0	0.51	0.52	0.04	0.39
30700	391.82	314.57	16.15	13.2	161.19	373.66	2.97	0	12.51	9.1	5.82	3.99	1.3	7.54	10.44	4.52	121.83	66.99	12.14	127.54	0	0	0.51	0.52	0.04	0.39
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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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	83.13	124.25	5.1	8.76	71.15	134.36	1.94	0	4.83	3.51	2.48	1.24	0.37	1.46	2.08	0.87	55.57	7.83	1.66	23.56	0	0	0.21	0.18	0.02	0.06
30800	83.13	124.25	5.1	8.76	71.15	134.36	1.94	0	4.83	3.51	2.48	1.24	0.37	1.46	2.08	0.87	55.57	7.83	1.66	23.56	0	0	0.21	0.18	0.02	0.06
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	991.95	1060.84	33.66	36.28	312.69	999.6	18.94	0	92.98	69.57	46.59	18.88	6.11	25.71	39.48	12.82	1044	191.08	37.58	530.99	0	0	1.4	1.47	0.26	1.38
30900	4.92	417.8	19.54	15.82	270.11	554.18	1.29	0	1.37	1.28	1.19	1.18	0.04	0.15	0.12	1.09	0.17	0.43	0.18	0.36	0	0	0	0	0	0
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	729.6	403.13	8.37	13.92	28.43	258.99	11.01	0	43.47	32.2	21.32	12.36	4.36	19.5	29.38	9.17	691.1	151.76	30.07	388.72	0	0	1.12	1.16	0.18	1.04
30903	257	156.98	3.43	4.07	7.17	103.98	5.19	0	48	36	24	5.17	1.71	6.06	9.98	2.41	352.73	38.89	7.3	141.92	0	0	0.28	0.3	0.08	0.33
30904	0.44	82.93	2.33	2.47	6.98	82.45	1.45	0	0.15	0.09	0.07	0.17	0	0	0	0.15	0	0	0.01	0	0	0	0	0	0	0
30905	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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	2.72	15.13	0.68	0.5	9.41	19.51	0.08	0	0.12	0.1	0.08	0.07	0.01	0.02	0.05	0.04	2.74	0.04	0.02	0.71	0	0	0	0	0	0
31000	2.72	15.13	0.68	0.5	9.41	19.51	0.08	0	0.12	0.1	0.08	0.07	0.01	0.02	0.05	0.04	2.74	0.04	0.02	0.71	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
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

SNAP	SO2 [Mg]	NOX [Mg]	NMVOC [Mg]	CH4 [Mg]	CO [Mg]	CO2[1)] [Gg]	N2O [Mg]	NH3 [Mg]	TSP [Mg]	PM10 [Mg]	PM2,5 [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]
31005	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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	65.81	228.54	15.71	22.14	335.99	246.73	5.67	0	23.93	16.51	12.65	2.34	0.48	3.14	3.74	0.8	39.47	5.1	0.9	12.37	0	0	1.54	1.54	0.02	0.03
31100	36.11	95.54	3.69	4.23	48.97	111.85	0.91	0	1.37	1.07	0.78	0.67	0.16	0.36	0.65	0.31	36.69	0.81	0.3	9.64	0	0	0	0.01	0.01	0.02
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	29.7	133	12.02	17.91	287.02	134.88	4.76	0	22.56	15.44	11.88	1.67	0.32	2.78	3.09	0.48	2.78	4.3	0.59	2.73	0	0	1.53	1.53	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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	3.74	25.46	1.21	0.91	17.45	33.13	0.14	0	0.3	0.23	0.18	0.12	0.02	0.05	0.08	0.06	3.58	0.08	0.03	0.94	0	0	0.01	0.01	0	0
31200	3.74	25.46	1.21	0.91	17.45	33.13	0.14	0	0.3	0.23	0.18	0.12	0.02	0.05	0.08	0.06	3.58	0.08	0.03	0.94	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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	60.86	188.37	9.43	9.16	150.95	229.79	2.17	0	6.46	4.63	3.52	1.4	0.28	1.05	1.56	0.55	55.68	2.03	0.52	15.37	0	0	0.32	0.32	0.01	0.03
31300	60.86	188.37	9.43	9.16	150.95	229.79	2.17	0	6.46	4.63	3.52	1.4	0.28	1.05	1.56	0.55	55.68	2.03	0.52	15.37	0	0	0.32	0.32	0.01	0.03
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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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	117.48	357.67	37.5	56.21	890.95	431.12	15.16	0	70.56	48.34	37.13	5.51	1.1	8.82	9.99	1.57	35.28	13.75	2.02	15.41	0.01	0	4.75	4.75	0.03	0.05
31400	117.48	357.67	37.5	56.21	890.95	431.12	15.16	0	70.56	48.34	37.13	5.51	1.1	8.82	9.99	1.57	35.28	13.75	2.02	15.41	0.01	0	4.75	4.75	0.03	0.05
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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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	0.13	25.43	1.26	0.73	13.28	28.11	0.1	0	0.06	0.06	0.06	0.05	0	0.02	0.01	0.05	0	0	0	0.04	0	0	0	0	0	0
31500	0.13	25.43	1.26	0.73	13.28	28.11	0.1	0	0.06	0.06	0.06	0.05	0	0.02	0.01	0.05	0	0	0	0.04	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	680	2153	74.37	71.53	1113	829.85	13	0	35	31.5	13.6	29.08	10.18	14.54	14.54	30	29.08	14.54	10.18	72.7	0.01	0.03	50.76	1.9	16.36	1.47
31600	680	2153	74.37	71.53	1113	829.85	13	0	35	31.5	13.6	29.08	10.18	14.54	14.54	30	29.08	14.54	10.18	72.7	0.01	0.03	50.76	1.9	16.36	1.47
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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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	687.2	484.14	14.59	27.22	320.97	302.85	5.94	0	24.62	17.4	13.79	1.73	0.32	2.82	3.13	0.52	2.81	4.36	0.61	2.77	0	0	1.85	1.85	0.02	0.23
32000	687.2	484.14	14.59	27.22	320.97	302.85	5.94	0	24.62	17.4	13.79	1.73	0.32	2.82	3.13	0.52	2.81	4.36	0.61	2.77	0	0	1.85	1.85	0.02	0.23
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. NERI aggregates the official energy statistics to SNAP level based on a source correspondence table.

In cooperation between DEA and NERI, 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, NERI and IPCC is presented in Annex 2A-3.

The mapping between the energy statistics and the SNAP and fuel codes used by NERI 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
- - Wastes, Renewable				0101	114A
Small-Scale CHP Units					
- *Fuels Used for Power Production*					
- - Gas-/Diesel Oil				0101	204A

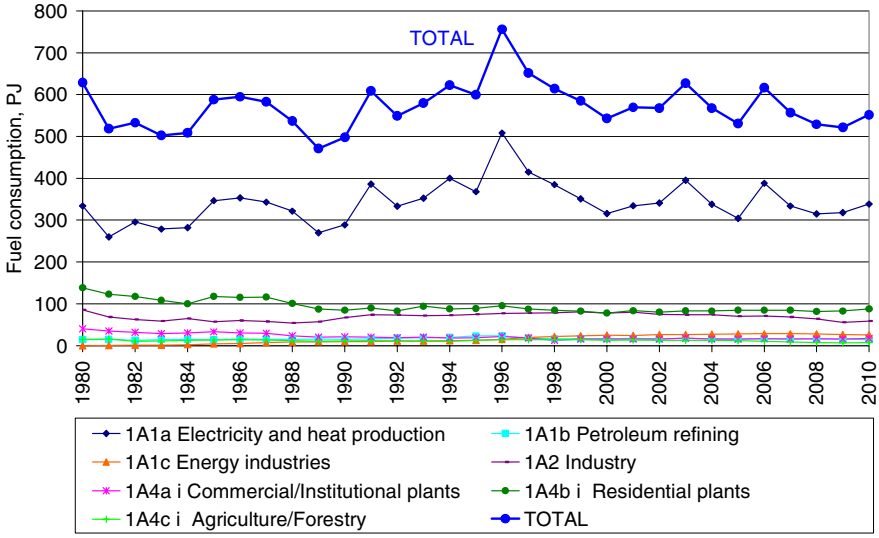
Unit: TJ	End-use		Transformation 1980-1993	
	SNAP	Fuel *(in Danish)*	Fuel-code	SNAP	Fuel-code
- - Fuel Oil				0101	203A
- - Natural Gas				0101	301A
- - Hard Coal				0101	102A
- - Straw				0101	117A
- - Wood Chips				0101	111A
- - Wood Pellets				0101	111A
- - Wood Waste				0101	111A
- - Biogas, Landfill				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				0301	301A
- - Biogas, Landfill				0301	309A
- - Biogas, Sewage Sludge				0301	309A
- - Biogas, Other				0301	309A
Autoproducers, CHP Units					
- *Fuels Used for Power Production*					
- - Refinery Gas				0103	308A
- - Gas-/Diesel Oil				0301	204A
- - Fuel Oil				0301	203A
- - Waste Oil				0301	203A
- - Natural Gas				0301	301A
- - Coal				0301	102A
- - Straw				0301	117A
- - Wood Chips				0301	111A
- - Wood Pellets				0301	111A
- - Wood Waste				0301	111A
- - Biogas, Landfill				0301	309A
- - Biogas, Sludge				0301	309A
- - Biogas, Other				0301	309A
- - Fish Oil				0301	215A
- - Waste, Non-renewable				0301	114A
- - Wastes, Renewable				0301	114A
- *Fuels Used for Heat Production*					
- - Refinery Gas				0103	308A
- - Gas-/Diesel Oil				0301	204A
- - Fuel Oil				0301	203A
- - Waste Oil				0301	203A

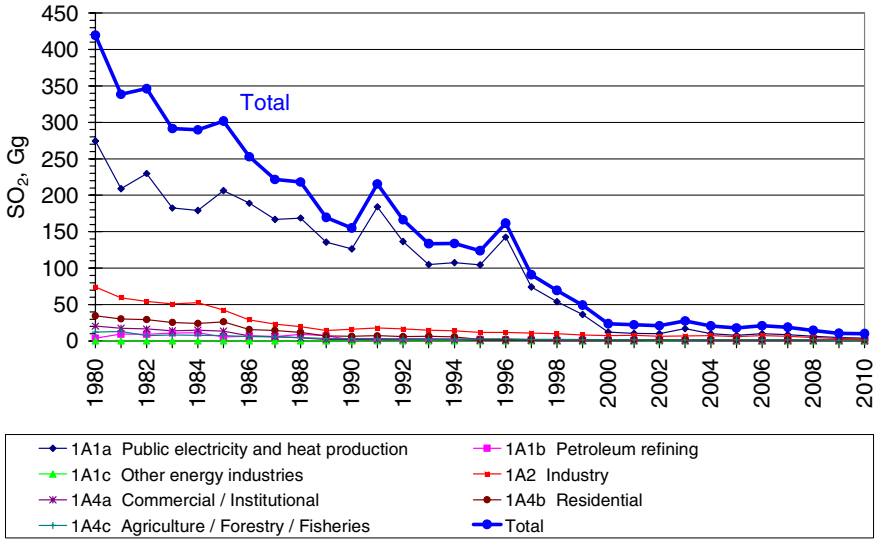
Unit: TJ	End-use			Transformation 1980-1993	
	SNAP	Fuel *(in Danish)*	Fuel-code	SNAP	Fuel-code
- - Natural Gas				0301	301A
- - Coal				0301	102A
- - Wood Chips				0301	111A
- - Wood Waste				0301	111A
- - Biogas, Landfill				0301	309A
- - Biogas, Sludge				0301	309A
- - Biogas, Other				0301	309A
- - Waste, Non-renewable				0301	114A
- - Wastes, Renewable				0301	114A
Autoproducers, Heat Only					
- *Fuels Used for Heat Production*					
- - Gas-/Diesel Oil				0301	204A
- - Fuel Oil				0301	203A
- - Waste Oil				0301	203A
- - Natural Gas				0301	301A
- - Straw				0301	117A
- - Wood Chips				0301	111A
- - Wood Chips				0301	111A
- - Wood Waste				0301	111A
- - Biogas, Landfill				0301	309A
- - Biogas, Sludge				0301	309A
- - Biogas, Other				0301	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					
- 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					

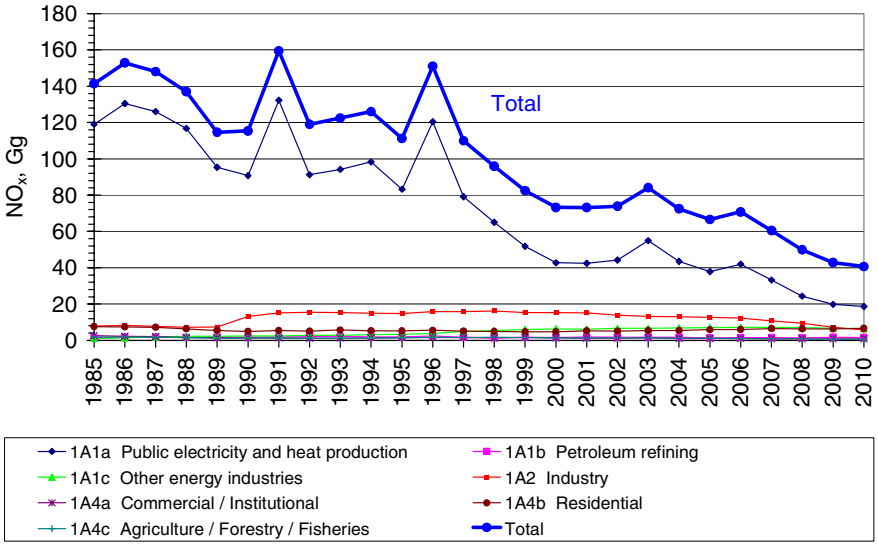
Unit: TJ	End-use			Transformation 1980-1993	
	SNAP	Fuel *(in Danish)*	Fuel-code	SNAP	Fuel-code
- LPG					
- Motor Gasoline					
- Gas-/Diesel Oil					
- Fuel Oil	0203	Fuelolie & Spildolie	203A		
- Petroleum Coke	0203	Petrokoks	110A		
- Natural Gas	0203	Naturgas	301A		
- Coal	0203	Kul	102A		
- Wood Waste	0203	Træ	111A		
Fishing					
- LPG					
- Motor Gasoline					
- Other Kerosene					
- Gas-/Diesel Oil					
- Fuel Oil					
Manufacturing Industry					
- Refinery Gas	0301	Raffinaderigas	308A		
- LPG					
- Naphtha (LVN)					
- Motor Gasoline					
- Other Kerosene	0301	Petroleum	206A		
- Gas-/Diesel Oil					
- Fuel Oil	0301	Fuelolie & Spildolie	203A		
- Waste Oil	0301	Fuelolie & Spildolie	203A		
- Petroleum Coke	0301	Petrokoks	110A		
- Natural Gas	0301	Naturgas	301A		
- Coal	0301	Kul	102A		
- Coke	0301	Koks	107A		
- Brown Coal Briquettes	0301	Brunkul	106A		
- Wood Pellets	0301	Træ	111A		
- Wood Waste	0301	Træ	111A		
- Biogas, Landfill	0301	Biogas	309A		
- Biogas, Other	0301	Biogas	309A		
- Wastes, Non-renewable	0301	Affald	114A		
- Wastes, Renewable	0301	Affald	114A		
- Town Gas	0301	Naturgas	301A		
Construction					
- LPG	0301	LPG	303A		
- Motor Gasoline					
- Other Kerosene	0301	Petroleum	206A		
- Gas-/Diesel Oil					
- Fuel Oil	0301	Fuelolie & Spildolie	203A		
- Natural Gas	0301	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		
- 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		

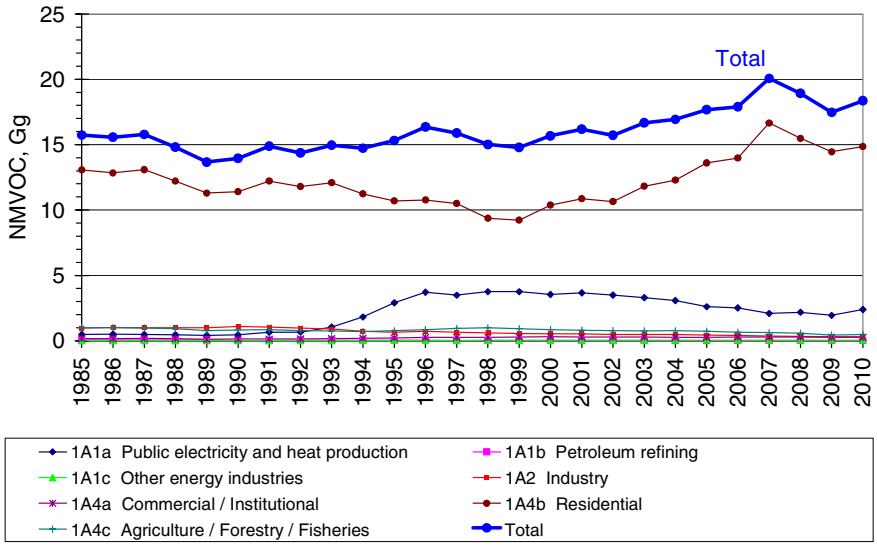
Unit: TJ		End-use		Transformation 1980-1993	
	SNAP	Fuel *(in Danish)*	Fuel-code	SNAP	Fuel-code
Public Service					
- LPG	0201	LPG	303A		
- Other Kerosene	0201	Petroleum	206A		
- Gas-/Diesel Oil	0201	Gas & Dieselolie	204A		
- Fuel Oil	0201	Fuelolie & Spildolie	203A		
- Petroleum Coke	0201	Petrokoks	110A		
- 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 1980/1985-2010









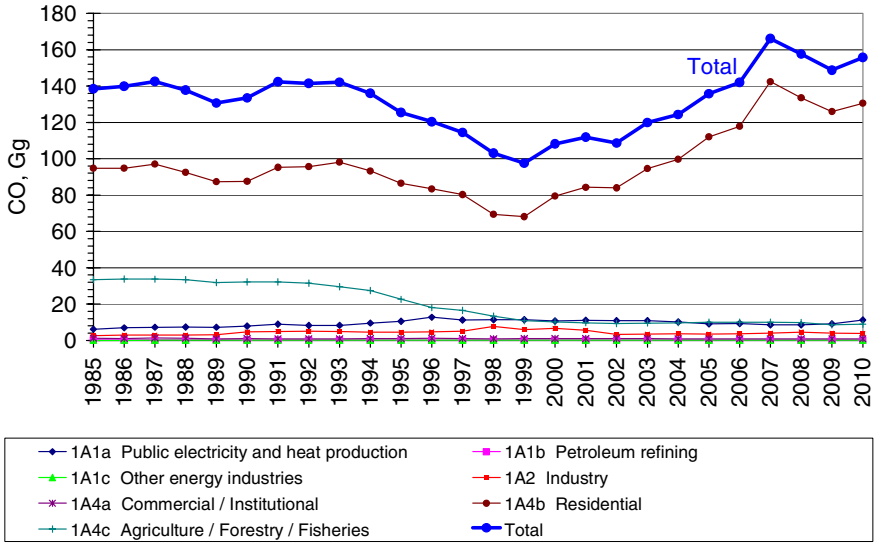


Figure 2A-10.1 Time-series for fuel consumption and emissions, 1980/1985 - 2010.

Annex 2A-11 QA/QC for stationary combustion

A QA/QC plan for the Danish emission inventories has been implemented. 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).

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

Data storage, level 1

Data Storage level 1	1. Accuracy	DS.1.1.1	General level of uncertainty for every dataset including the reasoning for the specific values

Table 61 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)	Peter Dal	Data agreement in place
Gas consumption for gas engines and gas turbines 1990-1994		Activity data	DEA	Peter Dal	No data agreement. Historical data
Basic data (Grunddata.xls)	Data set used for IPCC reference approach	Activity data	DEA	Peter Dal	Not necessary. Published as part of national energy statistics
Energy statistics	The Danish energy statistics on SNAP level	Activity data	DEA	Peter Dal	Data agreement in place
SO_2 & NO_x data, plants>25 MW_e		Emissions	DEA	Rasmus Sørensen	No data agreement in place
Emission factors	Emission factors refer to a large number of sources	Emission factors	See chapter regarding emission factors		
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
Environmental reports	Emissions from plants defined as large point sources	Emissions	Various plants		No data agreement necessary. Plants are obligated by law.
EU ETS data	Plant specific CO_2 emission factors	Emission factors	DEA	Dorte Maimann Helen Falster	Plants are obligated by law. The availability of detailed information is part of a future data agreement with DEA.

Since the DEA are responsible for the official Danish energy statistics as well as reporting to the IEA, NERI regards the data as being complete and in accordance with the official Danish energy statistics and IEA reporting. The uncertainties connected with estimating fuel consumption do not, therefore, influence the accordance between IEA data, the energy statistics and the dataset on SNAP level utilised by NERI. For the remaining datasets, it is assumed that the level of uncertainty is relatively low. For further comments regarding uncertainties, see Chapter 15.

Data Storage level 1	1. Accuracy	DS.1.1.2	Quantification of the uncertainty level of every single data value including the reasoning for the specific values.

The uncertainty for external data is not quantified. The uncertainties of activity data and emission factors are quantified see main report.

Data Storage level 1	2.Comparability	DS.1.2.1	Comparability of the data values with similar data from other countries, which are comparable with Denmark, and evaluation of discrepancy.

On the external data the comparability has not been checked. However, at CRF level a project has been carried out comparing the Danish inventories with those of other countries (Fauser et al. 2007).

Data Storage level 1	3.Completeness	DS.1.3.1	Documentation showing that all possible national data sources are included by setting up the reasoning for the selection of datasets.

See the above Table 61 for an overview of external datasets.

Danish Energy Authority

Statistic on fuel consumption from district heating and power plants

A 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

For the years 1990-1994 DEA has estimated consumption of natural gas and biogas in gas engines and gas turbines. NERI assesses that the estimation by the DEA are the best available data.

Basic data

A spreadsheet from DEA is used for the CO_2 emission calculation in accordance with the IPCC reference approach. It is published annually on DEA's webpage; therefore, a formal data delivery agreement is not deemed necessary.

Energy statistics on SNAP level

The data agreement have been renewed in 2011. NERI aggregates fuel consumption statistics to SNAP level based on a correspondence table developed in co-operation with DEA. 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.

Emissions from non-energy use of fuels have been included in other source categories of the Danish inventory. The non-energy use of fuels is, however, included in the reference approach for Climate Convention reporting.

SO_2 and NO_x emission data from electricity producing plants > 25MWe
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 block level and classified. The data on plant level are part of the plants annually environmental reports. NERI'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 from a wide range of sources
For specific references, see the chapter regarding emission factors.

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. NERI'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 from plants defined as large point sources
A large number of plants are obligated by law to report annual environmental data including emission data. NERI compares the data with those from previous years and large discrepancies are checked.

EU ETS data
EU ETS data are information on fuel consumption, heating values, carbon content of fuel, oxidation factor and CO_2 emissions. NERI receives the verified reports for all plants which utilises a detailed estimation methodology. NERI'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 Storage level 1	4.Consistency	DS.1.4.1	The origin of external data has to be preserved whenever possible without explicit arguments (referring to other PM's)

It is ensured that all external data are archived at NERI. 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.

Data Storage level 1	6.Robustness	DS.1.6.1	Explicit agreements between the external institution of data delivery and NERI about the condition of delivery

For stationary combustion a data delivery agreement is made with the DEA. NERI and DEA have renewed the data delivery agreement 2011. Most of the other external data sources are available due to legislatory requirements. See Table 61.

Data Storage level 1	7.Transparency	DS.1.7.1	Summary of each dataset including the reasoning for selecting the specific dataset

See DS 1.3.1

Data Storage level 1	7.Transparency	DS.1.7.3	References for citation for any external data set have to be available for any single number in any dataset.

See Table 61 for general references. Much documentation already exists. However, some of the information used is classified and therefore not publicly available.

Data Storage level 1	7.Transparency	DS.1.7.4	Listing of external contacts for every dataset

See Table 61.

Data processing, level 1

Data Processing level 1	1. Accuracy	DP.1.1.1	Uncertainty assessment for every data source as input to Data Storage level 2 in relation to type of variability. (Distribution as: normal, log normal or other type of variability)

The uncertainty assessment of activity data and emission factors are discussed in the chapter concerning uncertainties.

Data Processing level 1	1. Accuracy	DP.1.1.2	Uncertainty assessment for every data source as input to Data Storage level 2 in relation to scale of variability (size of variation intervals)

The uncertainty assessment of activity data and emission factors are discussed in the chapter concerning uncertainties.

Data Processing level 1	1. Accuracy	DP.1.1.3	Evaluation of the methodological approach using international guidelines

The methodological approach is consistent with international guidelines. Tier 2 or tier 3 methodologies are used.

Data Processing level 1	1. Accuracy	DP.1.1.4	Verification of calculation results using guideline values

Calculated emission factors are compared with guideline emission factors to ensure that they are within reason.

Data Processing level 1	2.Comparability	DP.1.2.1	The inventory calculation has to follow the international guidelines suggested by UNFCCC and IPCC.

The calculations follow the principle in international guidelines.

Data Processing level 1	3.Completeness	DP.1.3.1	Assessment of the most important quantitative knowledge which is lacking.

Regarding the distribution of energy consumption for industrial sources (CRF sector 1A2), a more detailed and frequently updated data material would be preferred. There is ongoing work to increase the accuracy and completeness of this IPCC source category. It is not assessed that this has any influence on the overall emission level of greenhouse gases.

Data Processing level 1	3.Completeness	DP.1.3.2	Assessment of the most important cases where accessibility to critical data sources that could improve quantitative knowledge is missing.

There is no missing accessibility to critical data sources.

Data Processing level 1	4.Consistency	DP.1.4.1	In order to keep consistency at a higher level, an explicit description of the activities needs to accompany any change in the calculation procedure.

A change in calculation procedure would entail that an updated description would be elaborated.

Data Processing level 1	5.Correctness	DP.1.5.1	Show at least once, by independent calculation, the correctness of every data manipulation.

During data processing it is checked that calculations are done correctly. This is to a wide degree documented in the data processing spreadsheets.

Data Processing level 1	5.Correctness	DP.1.5.2	Verification of calculation results using time-series

Time-series for activity data on SNAP level and sectoral level (see main report) are used to identify possible errors in the calculation procedure. Time-series for emission factors and fuel consumption are also scrutinized.

Data Processing level 1	5.Correctness	DP.1.5.3	Verification of calculation results using other measures

The IPCC reference approach validates the fuel consumption rates and CO_2 emissions of fuel combustion. Fuel consumption rates and CO_2 emissions differ by less than 2.0 % (1990-2009). The reference approach is further discussed in the main report.

Data Processing level 1	5.Correctness	DP.1.5.4	Show one-to-one correctness between external data sources and the databases at Data Storage level 2.

There is a direct line between the external datasets, the calculation process and the input data used to Data Storage level 2. During the calculation process numerous controls are conducted to ensure correctness, e.g. sum checks of the various stages in the calculation procedure.

Data Processing level 1	7.Transparency	DP.1.7.1	The calculation principle and equations used must be described.
Data Processing level 1	7.Transparency	DP.1.7.2	The theoretical reasoning for all methods must be described.
Data Processing level 1	7.Transparency	DP.1.7.3	Explicit listing of assumptions behind all methods

Where appropriate, this is included in the present report with annexes.

Data Processing level 1	7.Transparency	DP.1.7.4	Clear reference to dataset at Data Storage level 1

There is a clear line between the external data and the data processing.

Data Processing level 1	7.Transparency	DP.1.7.5	A manual log to collect information about recalculations

At present, a manual log table is not in place at this level. However, this feature will be implemented in the future. A manual log table is incorporated in the national emission database, Data Storage level 2.

Data storage, level 2

Data Storage level 2	5.Correctness	DS.2.5.1	Documentation of a correct connection between all data types at level 2 to data at level 1

To ensure a correct connection between data on level 2 and data on level 1, different controls are in place, e.g. control of sums and random tests.

Data Storage level 2	5.Correctness	DS.2.5.2	Check if a correct data import to level 2 has been made.

Data import is checked by use of sum control and random testing. The same procedure is applied every year in order to minimise the risk of data import errors.

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.

- Most emission factor references are included in this report (Chapter 3.2 and Appendix 2A-4).
- 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/operator in Denmark, DONG Energy has 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.

Annex 2B - Transport

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Annex 5: Reduction factors for road transport emission factors

Annex 6: Deterioration factors for road transport emission factors

Annex 7: Fuel consumption factors (MJ/km) and emission factors (g/km)

Annex 8: Fuel consumption (GJ) and emissions (tons) per vehicle category and as totals

Annex 9: COPERT IV:DEA statistics fuel use ratios and mileage adjustment factors

Annex 10: Basis fuel consumption and emission factors, deterioration factors, transient factors for non road working machinery and equipment, and recreational craft

Annex 11: Stock and activity data for non-road working machinery and equipment

Annex 12: Traffic data and different technical and operational data for Danish domestic ferries

Annex 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

Annex 14: Fuel sales figures from DEA, and further processed fuel consumption data suited for the Danish inventory

Annex 15: Emission factors and total emissions in CollectER format

Annex 16: Fuel consumption and emissions in NFR format

Annex 17: Uncertainty estimates

Annex 2B-1: Fleet data 1985-2010 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 - 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 >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	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											
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											
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											
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
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	132500	141667	150833
Mopeds	<50 cm³	Euro I	2000	2003											
Mopeds	<50 cm³	Euro II	2004	9999											
Motorcycles	2-stroke >50 cm³	Conventional	0	1999	6209	6617	6804	6904	7111	7406	7672	8214	8980	9598	10385
Motorcycles	4-stroke <250 cm³	Conventional	0	1999	7037	7499	7712	7824	8059	8394	8695	9310	10177	10878	11769
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	19352	20622	21207	21516	22162	23083	23911	25602	27986	29914	32365
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	8796	9374	9639	9780	10074	10492	10869	11637	12721	13597	14712
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
Passenger Cars	Gasoline <1,4 l	PRE ECE	0	1969	4994	4949	4963	5045	5223	5417	5720	6082	6467	6725	6926
Passenger Cars	Gasoline <1,4 l	ECE 15/00-01	1970	1978	9402	7791	6441	5527	4770	4352	4074	4103	4094	4147	4114
Passenger Cars	Gasoline <1,4 l	ECE 15/02	1979	1980	5582	4146	3061	2228	1672	1270	1027	857	728	634	570
Passenger Cars	Gasoline <1,4 l	ECE 15/03	1981	1985	95486	78149	62695	47507	35638	25239	18617	13047	9408	6534	4744
Passenger Cars	Gasoline <1,4 l	ECE 15/04	1986	1990	203911	188827	166452	145685	119764	96438	73966	56842	40817	29940	20925
Passenger Cars	Gasoline <1,4 l	Euro I	1991	1996	212883	211037	207661	203273	197813	189161	177736	161965	144902	127481	107674
Passenger Cars	Gasoline <1,4 l	Euro II	1997	2000	132974	131683	130255	129818	128942	127649	126013	122908	119230	116047	111745
Passenger Cars	Gasoline <1,4 l	Euro III	2001	2005		20508	43702	64814	94621	136765	135422	134549	133140	132632	131095
Passenger Cars	Gasoline <1,4 l	Euro IV	2006	2010							46184	87915	132696	172453	231452
Passenger Cars	Gasoline 1,4 - 2,0 l	PRE ECE	0	1969	8291	8215	8200	8321	8638	9068	9589	10256	10936	11399	11659
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/00-01	1970	1978	11566	9555	7938	6866	5944	5373	5149	5260	5419	5580	5670
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/02	1979	1980	6258	4775	3690	2780	2170	1670	1386	1183	1020	895	801
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/03	1981	1985	94495	78552	64108	49671	37838	27501	20744	15212	11502	8468	6409
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/04	1986	1990	203364	190772	171667	153308	129613	107638	85474	67960	51210	39584	29267
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro I	1991	1996	402938	402008	397847	391775	383212	370014	348949	317429	286209	256600	220109
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro II	1997	2000	363267	359633	355644	355739	352843	349396	344681	334040	320023	310538	298463
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro III	2001	2005		51628	107387	148845	196878	250957	248647	251018	247684	246743	243808
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro IV	2006	2010							55169	101832	129710	145251	160859
Passenger Cars	Gasoline >2,0 l	PRE ECE	0	1969	1024	1079	1128	1237	1391	1600	2060	2628	3224	3589	3776
Passenger Cars	Gasoline >2,0 l	ECE 15/00-01	1970	1978	1181	1034	936	859	830	841	1031	1314	1735	2009	2238
Passenger Cars	Gasoline >2,0 l	ECE 15/02	1979	1980	520	479	444	399	369	318	311	330	319	297	271
Passenger Cars	Gasoline >2,0 l	ECE 15/03	1981	1985	1904	1798	1696	1572	1431	1299	1182	1129	1031	935	835
Passenger Cars	Gasoline >2,0 l	ECE 15/04	1986	1990	4161	4188	4196	4099	3992	3847	3772	3641	3404	3151	2818
Passenger Cars	Gasoline >2,0 l	Euro I	1991	1996	11470	11572	11776	11983	12425	12702	13039	13204	12844	12336	11594
Passenger Cars	Gasoline >2,0 l	Euro II	1997	2000	18867	18776	18757	18984	19326	19848	20510	21171	20918	20652	20096
Passenger Cars	Gasoline >2,0 l	Euro III	2001	2005		4628	9892	14692	21393	29899	30850	32713	33204	33810	33934
Passenger Cars	Gasoline >2,0 l	Euro IV	2006	2010							7690	14232	17902	19391	21351
Passenger Cars	Diesel <2,0 l	Conventional	0	1990	46384	44480	41523	38006	34340	30089	26006	22027	17996	14360	10988
Passenger Cars	Diesel <2,0 l	Euro I	1991	1996	16471	17245	18106	19220	20895	21616	21549	20568	19152	17776	15909
Passenger Cars	Diesel <2,0 l	Euro II	1997	2000	30074	30082	30026	30342	30592	30774	31125	33912	32640	32025	31709
Passenger Cars	Diesel <2,0 l	Euro III	2001	2005		12723	30100	46644	70013	100191	102310	119573	119892	121697	123348
Passenger Cars	Diesel <2,0 l	Euro IV	2006	2010							32073	82104	114599	127116	135759
Passenger Cars	Diesel <2,0 l	Euro V	2011	2014							3564	15517	48853	84084	145874
Passenger Cars	Diesel >2,0 l	Conventional	0	1990	7728	7120	6345	5723	5039	4460	3895	3402	2906	2515	2094
Passenger Cars	Diesel >2,0 l	Euro I	1991	1996	7698	7640	7463	7353	7287	7147	6943	6586	6016	5573	5022
Passenger Cars	Diesel >2,0 l	Euro II	1997	2000	13139	13250	13151	13303	13569	13890	13944	14951	14421	14008	13616
Passenger Cars	Diesel >2,0 l	Euro III	2001	2005		3892	8650	12988	18896	25773	26255	31305	31519	32057	32304
Passenger Cars	Diesel >2,0 l	Euro IV	2006	2010							6437	15561	18440	20382	22310

Passenger Cars	Diesel >2,0 l	Euro V	2011	2014							715	2819	5822	9752	14524
Passenger Cars	LPG cars	Conventional	0	1990	30	24	17	11	10	10	10	7	8	7	6
Passenger Cars	LPG cars	Euro I	1991	1996	2	2	3	2	4	4	3	2	2	2	3
Passenger Cars	LPG cars	Euro II	1997	2000			1	2	1	1	1			1	1
Passenger Cars	LPG cars	Euro III	2001	2005								1	2	4	3
Passenger Cars	LPG cars	Euro IV	2006	2010										1	1
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
Light Duty Vehicles	Gasoline <3,5t	Conventional	0	1994	27140	23832	21083	18787	16405	14063	11895	9932	7990	6333	4955
Light Duty Vehicles	Gasoline <3,5t	Euro I	1995	1998	17103	16862	16703	16454	16011	15464	14728	13331	12214	11199	10027
Light Duty Vehicles	Gasoline <3,5t	Euro II	1999	2001	9655	14319	14153	14012	13791	13616	13420	10302	9608	8984	8074
Light Duty Vehicles	Gasoline <3,5t	Euro III	2002	2006			3784	8014	13934	20623	26271	18997	18312	17579	15860
Light Duty Vehicles	Gasoline <3,5t	Euro IV	2007	2011								3184	3811	4024	4055
Light Duty Vehicles	Diesel <3,5t	Conventional	0	1994	94102	80466	67925	56940	46624	37412	29736	24088	18849	14736	11426
Light Duty Vehicles	Diesel <3,5t	Euro I	1995	1998	74373	72684	71182	69081	66775	63284	58501	52343	46832	41793	36667
Light Duty Vehicles	Diesel <3,5t	Euro II	1999	2001	49951	74831	73532	72069	70326	68384	65625	55257	49899	45253	40307
Light Duty Vehicles	Diesel <3,5t	Euro III	2002	2006			27192	54236	92157	139815	191430	165441	156158	147666	134874
Light Duty Vehicles	Diesel <3,5t	Euro IV	2007	2011								37658	53994	59145	62080
Light Duty Vehicles	Diesel <3,5t	Euro V	2012	2015							2831	11914	20867	26410	34043
Light Duty Vehicles	LPG <3,5t	Conventional	0	1994	60	36	27	21	14	10	9	7	5	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
Light Duty Vehicles	LPG <3,5t	Euro III	2002	2006							5	7	7	8	8
Light Duty Vehicles	LPG <3,5t	Euro IV	2007	2011								1	3	4	3
Light Duty Vehicles	Electric <3,5t	Conventional	0	9999	1								1	7	4
Heavy Duty Vehicles	Gasoline >3,5t	Conventional	0	9999	307	295	291	283	268	287	296	328	324	340	343
Heavy Duty Vehicles	Diesel RT 3,5 - 7,5t	Conventional	0	1993	3011	2552	2088	1709	1430	1244	1075	937	793	653	540
Heavy Duty Vehicles	Diesel RT 3,5 - 7,5t	Euro I	1994	1996	834	769	715	656	594	492	437	360	290	234	189
Heavy Duty Vehicles	Diesel RT 3,5 - 7,5t	Euro II	1997	2001	2136	2254	2161	2078	2003	1901	1722	1504	1250	1062	898
Heavy Duty Vehicles	Diesel RT 3,5 - 7,5t	Euro III	2002	2006		166	460	755	1049	1437	1677	1662	1576	1448	1311
Heavy Duty Vehicles	Diesel RT 3,5 - 7,5t	Euro IV	2007	2009							53	364	758	911	931
Heavy Duty Vehicles	Diesel RT 3,5 - 7,5t	Euro V	2010	2013								2	5	27	191
Heavy Duty Vehicles	Diesel RT 7,5 - 12t	Conventional	0	1993	3782	3406	3069	2766	2503	2241	2077	1899	1682	1418	1251
Heavy Duty Vehicles	Diesel RT 7,5 - 12t	Euro I	1994	1996	1099	1070	1040	985	948	885	827	747	666	544	475
Heavy Duty Vehicles	Diesel RT 7,5 - 12t	Euro II	1997	2001	1575	1783	1840	1884	1858	1838	1706	1587	1357	1207	1085
Heavy Duty Vehicles	Diesel RT 7,5 - 12t	Euro III	2002	2006		155	443	713	1061	1501	1936	1996	1908	1784	1640
Heavy Duty Vehicles	Diesel RT 7,5 - 12t	Euro IV	2007	2009		2	2	2	2	3	93	427	823	890	940
Heavy Duty Vehicles	Diesel RT 7,5 - 12t	Euro V	2010	2013				1	1	1	2	42	180	345	535
Heavy Duty Vehicles	Diesel RT 12 - 14 t	Conventional	0	1993	1368	1094	896	734	612	500	435	367	295	224	191

Heavy Duty Vehicles	Diesel RT 12 - 14 t	Euro I	1994	1996	278	274	248	203	174	152	138	113	99	85	68
Heavy Duty Vehicles	Diesel RT 12 - 14 t	Euro II	1997	2001	298	312	291	285	278	273	267	239	200	157	137
Heavy Duty Vehicles	Diesel RT 12 - 14 t	Euro III	2002	2006		10	32	46	58	82	99	108	107	103	95
Heavy Duty Vehicles	Diesel RT 12 - 14 t	Euro IV	2007	2009					1	1	2	25	49	63	65
Heavy Duty Vehicles	Diesel RT 12 - 14 t	Euro V	2010	2013									8	11	33
Heavy Duty Vehicles	Diesel RT 14 - 20t	Conventional	0	1993	2143	1897	1382	1158	1003	884	895	724	531	427	351
Heavy Duty Vehicles	Diesel RT 14 - 20t	Euro I	1994	1996	905	983	787	701	638	562	574	461	334	246	207
Heavy Duty Vehicles	Diesel RT 14 - 20t	Euro II	1997	2001	1642	1926	1653	1586	1587	1564	1711	1454	1081	855	735
Heavy Duty Vehicles	Diesel RT 14 - 20t	Euro III	2002	2006		194	389	665	919	1245	1740	1655	1464	1326	1208
Heavy Duty Vehicles	Diesel RT 14 - 20t	Euro IV	2007	2009		4	4	6	7	14	101	457	697	747	762
Heavy Duty Vehicles	Diesel RT 14 - 20t	Euro V	2010	2013						3	21	106	255	414	562
Heavy Duty Vehicles	Diesel RT 20 - 26t	Conventional	0	1993	2097	1769	1231	984	797	655	623	463	306	217	163
Heavy Duty Vehicles	Diesel RT 20 - 26t	Euro I	1994	1996	1204	1206	935	815	728	643	654	515	361	271	212
Heavy Duty Vehicles	Diesel RT 20 - 26t	Euro II	1997	2001	2179	2589	2176	2053	1970	1846	1969	1668	1245	986	829
Heavy Duty Vehicles	Diesel RT 20 - 26t	Euro III	2002	2006		197	487	803	1143	1583	2273	2160	1903	1747	1598
Heavy Duty Vehicles	Diesel RT 20 - 26t	Euro IV	2007	2009		3	3	3	3	26	126	593	907	985	1000
Heavy Duty Vehicles	Diesel RT 20 - 26t	Euro V	2010	2013						7	24	124	292	490	678
Heavy Duty Vehicles	Diesel RT 26 - 28t	Conventional	0	1993	4	4	4	4	4	4	4	4	3	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
Heavy Duty Vehicles	Diesel RT 26 - 28t	Euro III	2002	2006				0	2	2	3	3	3	3	3
Heavy Duty Vehicles	Diesel RT 26 - 28t	Euro IV	2007	2009								3	3	1	2
Heavy Duty Vehicles	Diesel RT 26 - 28t	Euro V	2010	2013								1	1	1	1
Heavy Duty Vehicles	Diesel RT 28 - 32t	Conventional	0	1993	185	139	93	70	50	42	36	22	12	9	6
Heavy Duty Vehicles	Diesel RT 28 - 32t	Euro I	1994	1996	239	241	190	157	134	114	95	68	41	27	22
Heavy Duty Vehicles	Diesel RT 28 - 32t	Euro II	1997	2001	618	792	670	641	637	639	702	590	442	332	283
Heavy Duty Vehicles	Diesel RT 28 - 32t	Euro III	2002	2006		82	193	341	509	747	1189	1157	1025	932	884
Heavy Duty Vehicles	Diesel RT 28 - 32t	Euro IV	2007	2009			0	1	1	21	86	400	606	661	672
Heavy Duty Vehicles	Diesel RT 28 - 32t	Euro V	2010	2013							10	69	157	254	338
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
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
Heavy Duty Vehicles	Diesel RT >32t	Euro IV	2007	2009								1	1	1	0
Heavy Duty Vehicles	Diesel RT >32t	Euro V	2010	2013										1	1
Heavy Duty Vehicles	Diesel TT/AT 28 - 34t	Conventional	0	1993	2481	1887	1804	1515	1250	1033	756	655	548	442	365
Heavy Duty Vehicles	Diesel TT/AT 28 - 34t	Euro I	1994	1996	1025	954	1006	898	781	648	475	407	337	248	208
Heavy Duty Vehicles	Diesel TT/AT 28 - 34t	Euro II	1997	2001	1862	1872	2119	2035	1942	1802	1407	1275	1084	857	739
Heavy Duty Vehicles	Diesel TT/AT 28 - 34t	Euro III	2002	2006		188	497	852	1123	1432	1434	1454	1468	1329	1212

Heavy Duty Vehicles	Diesel TT/AT 28 - 34t	Euro IV	2007	2009		3	6	8	8	15	83	402	701	751	770
Heavy Duty Vehicles	Diesel TT/AT 28 - 34t	Euro V	2010	2013						3	17	93	256	415	563
Heavy Duty Vehicles	Diesel TT/AT 34 - 40t	Conventional	0	1993	3173	2250	1980	1585	1255	973	705	576	453	328	254
Heavy Duty Vehicles	Diesel TT/AT 34 - 40t	Euro I	1994	1996	2884	2100	1834	1472	1214	979	713	596	466	346	278
Heavy Duty Vehicles	Diesel TT/AT 34 - 40t	Euro II	1997	2001	7098	7055	6586	5636	4638	3653	2744	2272	1777	1349	1128
Heavy Duty Vehicles	Diesel TT/AT 34 - 40t	Euro III	2002	2006		1009	2342	3625	4439	5378	5558	4873	4142	3372	2837
Heavy Duty Vehicles	Diesel TT/AT 34 - 40t	Euro IV	2007	2009		4	7	6	10	76	213	992	1630	1718	1744
Heavy Duty Vehicles	Diesel TT/AT 34 - 40t	Euro V	2010	2013		1	1	1		27	151	672	1159	1543	1979
Heavy Duty Vehicles	Diesel TT/AT 40 - 50t	Conventional	0	1993	1029	708	549	388	287	219	170	123	94	67	61
Heavy Duty Vehicles	Diesel TT/AT 40 - 50t	Euro I	1994	1996	1215	1060	967	781	616	482	352	286	177	115	97
Heavy Duty Vehicles	Diesel TT/AT 40 - 50t	Euro II	1997	2001	3548	4062	4016	3731	3293	2841	2248	1798	1240	837	676
Heavy Duty Vehicles	Diesel TT/AT 40 - 50t	Euro III	2002	2006		552	1706	3011	4472	6217	7584	7031	5987	4774	4004
Heavy Duty Vehicles	Diesel TT/AT 40 - 50t	Euro IV	2007	2009		1	5	6	6	82	328	2117	3548	3677	3808
Heavy Duty Vehicles	Diesel TT/AT 40 - 50t	Euro V	2010	2013		1	2	2	2	1	68	722	1421	1894	2648
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
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	
Buses	Gasoline Urban Buses	Conventional	0	9999	11	9	7	1	2	2	2	4	7	9	9
Buses	Diesel Urban Buses <15t	Conventional	0	1993	200	183	154	123	101	80	68	56	49	33	25
Buses	Diesel Urban Buses <15t	Euro I	1994	1996	118	118	96	106	88	84	75	57	53	28	16
Buses	Diesel Urban Buses <15t	Euro II	1997	2001	525	542	553	569	535	545	494	427	367	221	117
Buses	Diesel Urban Buses <15t	Euro III	2002	2006			56	155	248	378	461	438	433	416	363
Buses	Diesel Urban Buses <15t	Euro IV	2007	2009								119	261	433	425
Buses	Diesel Urban Buses <15t	Euro V	2010	2013											165
Buses	Diesel Urban Buses 15 - 18t	Conventional	0	1993	1701	1506	1175	1030	880	758	621	538	451	329	276
Buses	Diesel Urban Buses 15 - 18t	Euro I	1994	1996	845	810	749	691	620	561	476	399	338	296	253
Buses	Diesel Urban Buses 15 - 18t	Euro II	1997	2001	1049	1165	1156	1136	1066	1061	1032	1002	919	851	744
Buses	Diesel Urban Buses 15 - 18t	Euro III	2002	2006			288	456	596	733	991	992	989	962	969
Buses	Diesel Urban Buses 15 - 18t	Euro IV	2007	2009								107	327	624	628
Buses	Diesel Urban Buses 15 - 18t	Euro V	2010	2013											217
Buses	Diesel Urban Buses >18t	Conventional	0	1993	37	47	45	25	24	23	16	7	6	5	2
Buses	Diesel Urban Buses >18t	Euro I	1994	1996	28	44	52	51	42	44	44	23	6	4	2
Buses	Diesel Urban Buses >18t	Euro II	1997	2001	106	220	225	224	218	217	215	213	161	147	142
Buses	Diesel Urban Buses >18t	Euro III	2002	2006			135	228	337	388	448	439	414	398	389
Buses	Diesel Urban Buses >18t	Euro IV	2007	2009								124	247	338	340
Buses	Diesel Urban Buses >18t	Euro V	2010	2013											97
Buses	Gasoline Coaches	Conventional	0	9999	1796	1788	1763	1722	1663	1586	1521	1422	1306	1186	1052
Buses	Diesel Coaches <15t	Conventional	0	1993	4340	3989	3649	3360	3029	2726	2438	2162	1928	1661	1439

Buses	Diesel Coaches <15t	Euro I	1994	1996	1079	1053	1031	982	956	920	873	814	732	664	614
Buses	Diesel Coaches <15t	Euro II	1997	2001	1347	1658	1694	1740	1908	2023	2144	2144	2078	2010	1914
Buses	Diesel Coaches <15t	Euro III	2002	2006			253	482	751	1052	1351	1423	1439	1463	1454
Buses	Diesel Coaches <15t	Euro IV	2007	2009								227	478	790	822
Buses	Diesel Coaches <15t	Euro V	2010	2013											204
Buses	Diesel Coaches 15 - 18t	Conventional	0	1993	1133	1061	1013	957	914	847	758	682	598	520	463
Buses	Diesel Coaches 15 - 18t	Euro I	1994	1996	148	161	173	176	176	184	177	177	176	184	179
Buses	Diesel Coaches 15 - 18t	Euro II	1997	2001	173	208	221	220	230	240	238	236	226	245	258
Buses	Diesel Coaches 15 - 18t	Euro III	2002	2006			19	46	61	71	90	81	99	106	107
Buses	Diesel Coaches 15 - 18t	Euro IV	2007	2009								11	38	69	66
Buses	Diesel Coaches 15 - 18t	Euro V	2010	2013											41
Buses	Diesel Coaches >18t	Conventional	0	1993	192	177	157	142	138	121	92	77	56	49	38
Buses	Diesel Coaches >18t	Euro I	1994	1996	78	76	79	74	70	65	60	56	49	46	36
Buses	Diesel Coaches >18t	Euro II	1997	2001	145	190	196	201	192	192	202	199	173	164	156
Buses	Diesel Coaches >18t	Euro III	2002	2006			32	92	152	230	293	302	312	321	322
Buses	Diesel Coaches >18t	Euro IV	2007	2009								55	114	180	194
Buses	Diesel Coaches >18t	Euro V	2010	2013											39
Mopeds	<50 cm³	Conventional	0	1999	143607	136249	128209	120305	112262	103829	94855	86621	78814	71067	63633
Mopeds	<50 cm³	Euro I	2000	2003	16393	28751	42791	48695	46069	43455	40746	37826	35231	32572	30009
Mopeds	<50 cm³	Euro II	2004	9999					10669	21715	33399	44553	50954	56361	59358
Motorcycles	2-stroke >50 cm³	Conventional	0	1999	11054	11367	11582	11850	12326	13158	14241	15400	15790	15474	14877
Motorcycles	4-stroke <250 cm³	Conventional	0	1999	11909	12331	12662	13098	13716	14486	15411	16311	16873	17111	17168
Motorcycles	4-stroke <250 cm³	Euro I	2000	2003	619	1074	1568	2088	2087	2144	2240	2373	2462	2488	2497
Motorcycles	4-stroke <250 cm³	Euro II	2004	2006					694	1791	3236	3221	3196	3132	3067
Motorcycles	4-stroke <250 cm³	Euro III	2007	9999								1798	3021	3649	4045
Motorcycles	4-stroke 250 - 750 cm³	Conventional	0	1999	32749	33910	34821	36019	37720	39837	42380	44855	46402	47054	47213
Motorcycles	4-stroke 250 - 750 cm³	Euro I	2000	2003	1703	2953	4311	5742	5739	5897	6159	6527	6769	6843	6868
Motorcycles	4-stroke 250 - 750 cm³	Euro II	2004	2006					1910	4925	8898	8857	8788	8614	8435
Motorcycles	4-stroke 250 - 750 cm³	Euro III	2007	9999								4945	8307	10034	11123
Motorcycles	4-stroke >750 cm³	Conventional	0	1999	14886	15414	15828	16372	17146	18108	19264	20388	21092	21388	21461
Motorcycles	4-stroke >750 cm³	Euro I	2000	2003	774	1342	1960	2610	2609	2681	2800	2967	3077	3110	3122
Motorcycles	4-stroke >750 cm³	Euro II	2004	2006					868	2239	4045	4026	3995	3915	3834
Motorcycles	4-stroke >750 cm³	Euro III	2007	9999								2248	3776	4561	5056

Annex 2B-2: Mileage data 1985-2010 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	6898	5036	5020	4943	4673	4504	4045	3621	3335	3050	2744
Passenger Cars	Gasoline <1,4 l	ECE 15/00-01	1970	1978	11952	9124	9315	9465	9104	8935	8056	7246	6688	6086	5464
Passenger Cars	Gasoline <1,4 l	ECE 15/02	1979	1980	15828	12187	12126	11958	11339	11098	10021	9034	8382	7701	7030
Passenger Cars	Gasoline <1,4 l	ECE 15/03	1981	1985	18153	15198	15457	15563	14954	14699	13299	12029	11221	10402	9502
Passenger Cars	Gasoline <1,4 l	ECE 15/04	1986	1990		19297	21313	20826	19613	19184	17328	15634	14538	13432	12228
Passenger Cars	Gasoline <1,4 l	Euro I	1991	1996			13079	20210	22114	22138	22063	21152	21962	20228	18379
Passenger Cars	Gasoline <1,4 l	Euro II	1997	2000									13663	19661	20283
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 - 2,0 l	PRE ECE	0	1969	8160	6115	6116	6100	5825	5614	5036	4501	4137	3778	3392
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/00-01	1970	1978	14463	10969	11159	11343	10885	10701	9655	8692	8036	7327	6590
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/02	1979	1980	19291	14852	14777	14614	13831	13540	12229	11031	10238	9411	8586
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/03	1981	1985	21834	18592	18837	18953	18207	17880	16173	14625	13636	12624	11513
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/04	1986	1990		23244	26518	25834	24228	23698	21402	19308	17952	16579	15090
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro I	1991	1996			16047	24225	26429	26559	26647	25578	27351	25181	22862
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro II	1997	2000									16672	23262	25144
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 >2,0 l	PRE ECE	0	1969	9805	7331	7272	7165	6780	6612	5940	5318	4900	4488	4043
Passenger Cars	Gasoline >2,0 l	ECE 15/00-01	1970	1978	16733	12955	13258	13416	13025	12726	11473	10336	9561	8813	7985
Passenger Cars	Gasoline >2,0 l	ECE 15/02	1979	1980	24142	18422	18247	18037	17270	16905	15279	13773	12797	11791	10705
Passenger Cars	Gasoline >2,0 l	ECE 15/03	1981	1985	27306	23829	23741	23384	22167	21704	19580	17656	16427	15159	13795
Passenger Cars	Gasoline >2,0 l	ECE 15/04	1986	1990		28853	33993	32962	30950	30306	27330	24598	22851	21104	19203
Passenger Cars	Gasoline >2,0 l	Euro I	1991	1996			20240	30057	32754	33711	32616	31675	33844	31105	28213
Passenger Cars	Gasoline >2,0 l	Euro II	1997	2000									20657	28412	29771
Passenger Cars	Gasoline >2,0 l	Euro III	2001	2005											
Passenger Cars	Gasoline >2,0 l	Euro IV	2006	2010											
Passenger Cars	Diesel <2,0 l	Conventional	0	1990	32155	38541	39573	37387	36179	37017	34100	31914	30123	27778	25630
Passenger Cars	Diesel <2,0 l	Euro I	1991	1996			65391	84050	77145	67118	62343	60019	60341	50849	44321
Passenger Cars	Diesel <2,0 l	Euro II	1997	2000									40538	50785	48691
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	Diesel >2,0 l	Conventional	0	1990	46264	53249	53444	45968	41172	40970	37093	34359	32040	29482	27287

Passenger Cars	Diesel >2,0 l	Euro I	1991	1996			73922	98829	96065	97027	90763	83591	82535	63238	51172
Passenger Cars	Diesel >2,0 l	Euro II	1997	2000									63924	84599	77084
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	19437	20317	21540	22701	23076	22930	20921	19064	17909	16523	15301
Passenger Cars	LPG cars	Euro I	1991	1996				50845	46204	44966	44030	39027	36223	33377	34870
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	17823	15382	15347	15187	14504	14198	12814	11547	10718	9875	8972
Passenger Cars	Electric cars	Conventional	0	9999	11658	12344	13110	13845	14116	17157	16281	14919	14394	13460	13737
Light Duty Vehicles	Gasoline <3,5t	Conventional	0	1994	17881	16906	17319	17990	18103	18964	18746	17579	16799	16095	15204
Light Duty Vehicles	Gasoline <3,5t	Euro I	1995	1998							14993	20931	21758	21886	24249
Light Duty Vehicles	Gasoline <3,5t	Euro II	1999	2001											14121
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	29031	31758	31868	30545	29838	30783	30397	28749	27220	25447	23936
Light Duty Vehicles	Diesel <3,5t	Euro I	1995	1998							23800	33458	35423	36060	38876
Light Duty Vehicles	Diesel <3,5t	Euro II	1999	2001											22770
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	16914	15982	16371	17004	17110	17029	15916	15322	14658	13958	13040
Light Duty Vehicles	LPG <3,5t	Euro I	1995	1998										18592	34023
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	8346	7895	8089	8402	8456	8708	6937	6318	8434	7850	7183
Heavy Duty Vehicles	Gasoline >3,5t	Conventional	0	9999	21156	19192	20660	21163	19525	18688	18802	17867	16851	15925	16000
Heavy Duty Vehicles	Diesel RT 3,5 - 7,5t	Conventional	0	1993	31577	30571	33054	29490	24866	24174	25842	23826	22069	20712	18897
Heavy Duty Vehicles	Diesel RT 3,5 - 7,5t	Euro I	1994	1996					20754	23816	33598	35053	37440	34688	31372
Heavy Duty Vehicles	Diesel RT 3,5 - 7,5t	Euro II	1997	2001								22262	24890	29087	32264
Heavy Duty Vehicles	Diesel RT 3,5 - 7,5t	Euro III	2002	2006											
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	35381	34158	36921	32934	27760	27083	29125	26789	24841	23413	21356
Heavy Duty Vehicles	Diesel RT 7,5 - 12t	Euro I	1994	1996					23771	27223	36875	39999	43102	39923	36017

Heavy Duty Vehicles	Diesel RT 7,5 - 12t	Euro II	1997	2001								25498	29613	36054	36597
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	28543	31445	34106	32527	27693	30447	30623	25147	23906	23653	25610
Heavy Duty Vehicles	Diesel RT 12 - 14 t	Euro I	1994	1996					22369	30180	41679	37797	40184	39158	41670
Heavy Duty Vehicles	Diesel RT 12 - 14 t	Euro II	1997	2001								23450	26721	36760	46467
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	47566	52415	56851	54218	46211	51455	52070	42803	40823	40463	43512
Heavy Duty Vehicles	Diesel RT 14 - 20t	Euro I	1994	1996					36330	47626	61552	59731	66448	64783	68835
Heavy Duty Vehicles	Diesel RT 14 - 20t	Euro II	1997	2001								38086	44241	58918	69595
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	75373	83146	78512	83072	79757	79515	77648	75508	67041	66058	58006
Heavy Duty Vehicles	Diesel RT 20 - 26t	Euro I	1994	1996					60796	69440	88873	100795	105755	102894	89413
Heavy Duty Vehicles	Diesel RT 20 - 26t	Euro II	1997	2001								64908	71163	92551	90591
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	73707	81339	76954	81334	77957	81279	79781	80178	69911	67861	58458
Heavy Duty Vehicles	Diesel RT 26 - 28t	Euro I	1994	1996							112697	87402	109362	105438	91468
Heavy Duty Vehicles	Diesel RT 26 - 28t	Euro II	1997	2001								65722	79051	81209	92406
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	81567	90014	85161	90008	87117	89994	87174	84244	74920	74454	65581
Heavy Duty Vehicles	Diesel RT 28 - 32t	Euro I	1994	1996					61934	72773	87231	99988	107395	104246	90473
Heavy Duty Vehicles	Diesel RT 28 - 32t	Euro II	1997	2001								65722	71485	91030	88752
Heavy Duty Vehicles	Diesel RT 28 - 32t	Euro III	2002	2006											
Heavy Duty Vehicles	Diesel RT 28 - 32t	Euro IV	2007	2009											
Heavy Duty Vehicles	Diesel RT 28 - 32t	Euro V	2010	2013											
Heavy Duty Vehicles	Diesel RT >32t	Conventional	0	1993	59804	65997	62439	65992	63253	60159	80838	54865	47831	77251	67015
Heavy Duty Vehicles	Diesel RT >32t	Euro I	1994	1996							64455	98396	111670	108396	87291
Heavy Duty Vehicles	Diesel RT >32t	Euro II	1997	2001								65722	79429	111234	59026
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	51513	57170	62045	59093	50993	56747	57319	47507	45573	45055	48204
Heavy Duty Vehicles	Diesel TT/AT 28 - 34t	Euro I	1994	1996					39923	52387	67789	65871	73373	71695	76046
Heavy Duty Vehicles	Diesel TT/AT 28 - 34t	Euro II	1997	2001								41921	48779	65145	76850
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	82664	88351	84555	81135	82070	85575	79845	80836	75719	71864	65188
Heavy Duty Vehicles	Diesel TT/AT 34 - 40t	Euro I	1994	1996					57281	67012	78849	97650	112854	103407	97109
Heavy Duty Vehicles	Diesel TT/AT 34 - 40t	Euro II	1997	2001								62509	76667	89662	97570
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	107012	111733	108316	98187	101912	106526	94437	94229	91732	82757	77559
Heavy Duty Vehicles	Diesel TT/AT 40 - 50t	Euro I	1994	1996					74677	87663	95089	116300	134272	119004	110151
Heavy Duty Vehicles	Diesel TT/AT 40 - 50t	Euro II	1997	2001								75360	88695	102707	106992
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								134176	132165	114243	108634
Heavy Duty Vehicles	Diesel TT/AT 50 - 60t	Euro II	1997	2001										69882	132901
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	28119	27614	22913	21004	16584	24890	22570	18774	20954	20270	17859
Buses	Diesel Urban Buses <15t	Conventional	0	1993	178201	202121	164267	138931	106475	115554	106869	101303	95018	91205	81174
Buses	Diesel Urban Buses <15t	Euro I	1994	1996						91234	135731	138230	151691	142301	125821
Buses	Diesel Urban Buses <15t	Euro II	1997	2001									86798	114360	128118
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	169795	192827	156723	132557	101596	110825	102563	98901	91958	87443	79633
Buses	Diesel Urban Buses 15 - 18t	Euro I	1994	1996						91234	136323	133072	151602	142559	125315
Buses	Diesel Urban Buses 15 - 18t	Euro II	1997	2001									86798	111710	128861
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	216968	246398	200264	169384	129821	143068	126078	115033	113550	93849	72821

Buses	Diesel Urban Buses >18t	Euro I	1994	1996						91234	165134	110540	155508	145293	133337
Buses	Diesel Urban Buses >18t	Euro II	1997	2001										86734	102849
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	16996	17254	14369	13229	12238	13298	16452	18269	17679	16981	15951
Buses	Diesel Coaches <15t	Conventional	0	1993	31790	37351	30471	25888	23251	24530	28493	32603	31547	29819	28288
Buses	Diesel Coaches <15t	Euro I	1994	1996						17395	32539	38186	45895	42610	39640
Buses	Diesel Coaches <15t	Euro II	1997	2001									26168	37700	39613
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	42777	50286	41025	34855	31305	29375	34809	40314	39123	36987	35313
Buses	Diesel Coaches 15 - 18t	Euro I	1994	1996						28616	48203	63296	75783	70278	65473
Buses	Diesel Coaches 15 - 18t	Euro II	1997	2001									43049	64008	64928
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	91765	107883	88016	74780	67164	65632	75927	87500	83935	79067	73524
Buses	Diesel Coaches >18t	Euro I	1994	1996						45525	76764	98544	121168	112452	104770
Buses	Diesel Coaches >18t	Euro II	1997	2001									68486	94315	98009
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	2331	2210	2309	2427	2494	2546	2495	2460	2484	2506	2135
Mopeds	<50 cm³	Euro I	2000	2003											
Mopeds	<50 cm³	Euro II	2004	9999											
Motorcycles	2-stroke >50 cm³	Conventional	0	1999	8367	8199	8195	8650	8890	9054	8763	8246	7858	7626	7137
Motorcycles	4-stroke <250 cm³	Conventional	0	1999	8367	8199	8195	8650	8890	9054	8763	8246	7858	7626	7137
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	8367	8199	8195	8650	8890	9054	8763	8246	7858	7626	7137
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	8367	8199	8195	8650	8890	9054	8763	8246	7858	7626	7137
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
Passenger Cars	Gasoline <1,4 l	PRE ECE	0	1969	2505	2305	2204	2088	1971	1772	1616	1500	1379	1250	1137
Passenger Cars	Gasoline <1,4 l	ECE 15/00-01	1970	1978	4954	4539	4285	4015	3730	3308	2964	2684	2436	2190	1973
Passenger Cars	Gasoline <1,4 l	ECE 15/02	1979	1980	6464	5985	5714	5433	5116	4608	4184	3868	3558	3228	2931
Passenger Cars	Gasoline <1,4 l	ECE 15/03	1981	1985	8791	8276	7956	7570	7185	6502	5970	5336	4973	4502	4085
Passenger Cars	Gasoline <1,4 l	ECE 15/04	1986	1990	11295	10582	10205	9735	9273	8408	7725	7060	6565	5977	5454
Passenger Cars	Gasoline <1,4 l	Euro I	1991	1996	16912	15695	15053	14304	13521	12188	11134	10323	9558	8732	7985
Passenger Cars	Gasoline <1,4 l	Euro II	1997	2000	20496	21281	20393	19345	18266	16390	14905	13874	12745	11556	10509
Passenger Cars	Gasoline <1,4 l	Euro III	2001	2005		12643	18141	20266	20046	18959	20866	19458	17859	16182	14709
Passenger Cars	Gasoline <1,4 l	Euro IV	2006	2010							12372	17930	18560	18493	17259
Passenger Cars	Gasoline 1,4 - 2,0 l	PRE ECE	0	1969	3091	2837	2712	2568	2426	2182	1990	1854	1707	1548	1408
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/00-01	1970	1978	5990	5480	5181	4858	4519	3996	3571	3249	2934	2636	2378
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/02	1979	1980	7899	7291	6969	6626	6243	5615	5097	4736	4346	3944	3580
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/03	1981	1985	10639	9913	9522	9039	8553	7692	7021	6408	5916	5349	4855
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/04	1986	1990	13929	12963	12492	11909	11321	10230	9357	8643	7979	7248	6593
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro I	1991	1996	21034	19511	18705	17763	16783	15114	13796	12787	11817	10773	9837
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro II	1997	2000	25394	25961	24869	23586	22269	19993	18188	16891	15537	14090	12816
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro III	2001	2005		15494	22341	25376	25267	23985	24945	23191	21352	19368	17618
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro IV	2006	2010							15158	22119	24021	23625	22009
Passenger Cars	Gasoline >2,0 l	PRE ECE	0	1969	3676	3373	3238	3080	2927	2654	2450	2307	2134	1939	1764
Passenger Cars	Gasoline >2,0 l	ECE 15/00-01	1970	1978	7339	6776	6463	6099	5743	5056	4411	3944	3525	3157	2861
Passenger Cars	Gasoline >2,0 l	ECE 15/02	1979	1980	9872	9096	8714	8280	7800	6989	6337	5887	5390	4889	4448
Passenger Cars	Gasoline >2,0 l	ECE 15/03	1981	1985	12704	11696	11216	10646	10058	9023	8190	7625	6983	6321	5747
Passenger Cars	Gasoline >2,0 l	ECE 15/04	1986	1990	17707	16301	15650	14876	14075	12654	11523	10748	9875	8962	8175
Passenger Cars	Gasoline >2,0 l	Euro I	1991	1996	25933	23894	22857	21662	20462	18382	16728	15538	14279	12952	11785
Passenger Cars	Gasoline >2,0 l	Euro II	1997	2000	30442	32640	31249	29623	27964	25097	22811	21136	19454	17640	16039
Passenger Cars	Gasoline >2,0 l	Euro III	2001	2005		19170	27446	30525	30428	29248	31201	28857	26552	24099	21928
Passenger Cars	Gasoline >2,0 l	Euro IV	2006	2010							18725	27438	29806	29543	27488
Passenger Cars	Diesel <2,0 l	Conventional	0	1990	22745	21289	19979	19914	19320	17886	16591	11394	11186	9990	9422
Passenger Cars	Diesel <2,0 l	Euro I	1991	1996	38263	33888	31038	30250	28739	25920	23508	17942	16697	14747	13789
Passenger Cars	Diesel <2,0 l	Euro II	1997	2000	47378	50015	44648	42796	40183	35485	31475	26529	24198	21258	19846
Passenger Cars	Diesel <2,0 l	Euro III	2001	2005		28653	37698	43030	42443	39538	41367	36182	32578	28596	26678
Passenger Cars	Diesel <2,0 l	Euro IV	2006	2010							24865	32533	35294	35054	33605
Passenger Cars	Diesel <2,0 l	Euro V	2011	2014							24865	28908	28253	30916	30228

Passenger Cars	Diesel >2,0 l	Conventional	0	1990	24140	20380	18827	18424	17539	15546	13812	12463	10891	9522	8868
Passenger Cars	Diesel >2,0 l	Euro I	1991	1996	43038	35677	32263	30994	28943	25285	22279	20287	17587	15365	14268
Passenger Cars	Diesel >2,0 l	Euro II	1997	2000	69425	67770	53118	46099	41563	35872	31358	27287	24305	21246	19781
Passenger Cars	Diesel >2,0 l	Euro III	2001	2005		45589	61667	66611	61080	54224	52262	39979	34245	29581	27345
Passenger Cars	Diesel >2,0 l	Euro IV	2006	2010							35790	47348	50916	44411	38914
Passenger Cars	Diesel >2,0 l	Euro V	2011	2014							35790	41659	45556	45700	45128
Passenger Cars	LPG cars	Conventional	0	1990	14846	13717	12218	10556	9806	8692	7851	6109	5267	4621	3768
Passenger Cars	LPG cars	Euro I	1991	1996	28759	26291	23458	22787	22494	19728	16926	14750	13368	12005	11073
Passenger Cars	LPG cars	Euro II	1997	2000			43768	37006	40514	39833	39231			20077	18543
Passenger Cars	LPG cars	Euro III	2001	2005								20002	27043	26386	24238
Passenger Cars	LPG cars	Euro IV	2006	2010										17582	31815
Passenger Cars	2-Stroke	Conventional	0	9999	8247	7570	7258	6886	6501						
Passenger Cars	Electric cars	Conventional	0	9999	13340	13406	13072	12352	11223	10054	9349	6755	7594	7696	8924
Light Duty Vehicles	Gasoline <3,5t	Conventional	0	1994	14616	13566	13032	12507	11751	10376	9288	9578	8081	7680	7422
Light Duty Vehicles	Gasoline <3,5t	Euro I	1995	1998	22825	20675	19530	18492	17255	15127	13526	14008	12007	11636	11621
Light Duty Vehicles	Gasoline <3,5t	Euro II	1999	2001	20896	21150	24338	23019	21451	18778	16781	17351	14859	14372	14339
Light Duty Vehicles	Gasoline <3,5t	Euro III	2002	2006			13917	19847	20585	19958	19628	23201	19882	19214	19179
Light Duty Vehicles	Gasoline <3,5t	Euro IV	2007	2011								13912	21825	22626	22850
Light Duty Vehicles	Diesel <3,5t	Conventional	0	1994	21822	19569	18352	18091	17336	15668	14061	13973	12283	11368	11287
Light Duty Vehicles	Diesel <3,5t	Euro I	1995	1998	34817	30590	28287	27538	26176	23485	21082	20958	18449	17088	17041
Light Duty Vehicles	Diesel <3,5t	Euro II	1999	2001	31033	31438	35527	34559	32821	29387	26367	26186	23046	21303	21244
Light Duty Vehicles	Diesel <3,5t	Euro III	2002	2006			20258	30170	31499	30733	29954	35281	31113	28771	28717
Light Duty Vehicles	Diesel <3,5t	Euro IV	2007	2011								20870	31321	33151	34025
Light Duty Vehicles	Diesel <3,5t	Euro V	2012	2015							19651	24679	28916	31296	31989
Light Duty Vehicles	LPG <3,5t	Conventional	0	1994	12711	11299	10423	9277	7618	6008	5864	5408	4221	4122	4000
Light Duty Vehicles	LPG <3,5t	Euro I	1995	1998	32025	27762									
Light Duty Vehicles	LPG <3,5t	Euro II	1999	2001	18316				27349	23470	22276	21885	20179	18381	17836
Light Duty Vehicles	LPG <3,5t	Euro III	2002	2006							22965	27145	25718	24751	24426
Light Duty Vehicles	LPG <3,5t	Euro IV	2007	2011								16378	25518	29713	29154
Light Duty Vehicles	Electric <3,5t	Conventional	0	9999	6761								8923	8622	10534
Heavy Duty Vehicles	Gasoline >3,5t	Conventional	0	9999	15471	16386	17426	16472	15933	14390	15767	17431	16055	14867	15235
Heavy Duty Vehicles	Diesel RT 3,5 - 7,5t	Conventional	0	1993	17998	19427	17832	17427	17356	13770	12326	11299	9527	7503	7335
Heavy Duty Vehicles	Diesel RT 3,5 - 7,5t	Euro I	1994	1996	29567	31641	28972	28313	28171	22483	20536	19157	16533	13396	13498
Heavy Duty Vehicles	Diesel RT 3,5 - 7,5t	Euro II	1997	2001	33621	38852	37231	36385	36178	28983	26510	24630	21322	17270	17427
Heavy Duty Vehicles	Diesel RT 3,5 - 7,5t	Euro III	2002	2006		23999	30457	37037	40438	33904	33864	33957	29442	23883	24144
Heavy Duty Vehicles	Diesel RT 3,5 - 7,5t	Euro IV	2007	2009							21495	24072	27799	28066	31249
Heavy Duty Vehicles	Diesel RT 3,5 - 7,5t	Euro V	2010	2013								21330	26509	20103	20500
Heavy Duty Vehicles	Diesel RT 7,5 - 12t	Conventional	0	1993	20385	21977	20204	19835	19740	15661	14103	12881	10762	8522	8199

Heavy Duty Vehicles	Diesel RT 7,5 - 12t	Euro I	1994	1996	34028	36267	33253	32312	32138	25565	23309	21638	18652	15249	15270
Heavy Duty Vehicles	Diesel RT 7,5 - 12t	Euro II	1997	2001	38039	43965	42648	41760	41691	33322	30444	28296	24580	20104	20096
Heavy Duty Vehicles	Diesel RT 7,5 - 12t	Euro III	2002	2006		27938	35690	43799	45881	38559	37944	38831	34004	27959	28122
Heavy Duty Vehicles	Diesel RT 7,5 - 12t	Euro IV	2007	2009		27347	50073	43000	42745	31082	25152	29235	32789	33756	35450
Heavy Duty Vehicles	Diesel RT 7,5 - 12t	Euro V	2010	2013				42615	42362	33706	27678	25018	27054	28476	32060
Heavy Duty Vehicles	Diesel RT 12 - 14 t	Conventional	0	1993	19428	19932	18403	17977	17596	16328	14851	13724	11802	9451	9655
Heavy Duty Vehicles	Diesel RT 12 - 14 t	Euro I	1994	1996	31236	31904	29199	28575	27842	25897	23692	21822	18862	15220	15387
Heavy Duty Vehicles	Diesel RT 12 - 14 t	Euro II	1997	2001	36467	39369	36463	35771	34936	32685	30039	27915	24400	19565	19935
Heavy Duty Vehicles	Diesel RT 12 - 14 t	Euro III	2002	2006		24773	31764	38763	39702	38256	39574	39863	34739	28046	28613
Heavy Duty Vehicles	Diesel RT 12 - 14 t	Euro IV	2007	2009					43062	40064	30462	26732	32423	32216	37073
Heavy Duty Vehicles	Diesel RT 12 - 14 t	Euro V	2010	2013									23342	32517	27743
Heavy Duty Vehicles	Diesel RT 14 - 20t	Conventional	0	1993	32862	33635	30971	30536	29809	27892	25357	23336	20040	15985	16119
Heavy Duty Vehicles	Diesel RT 14 - 20t	Euro I	1994	1996	51549	52457	48183	47430	46367	43139	39394	36454	31410	25315	25739
Heavy Duty Vehicles	Diesel RT 14 - 20t	Euro II	1997	2001	57665	64423	61815	60780	59420	55441	50761	47189	40825	32993	33611
Heavy Duty Vehicles	Diesel RT 14 - 20t	Euro III	2002	2006		41358	53911	61347	66642	65459	64274	65746	57079	46091	47215
Heavy Duty Vehicles	Diesel RT 14 - 20t	Euro IV	2007	2009		39875	62922	64039	71783	56467	46090	48277	57189	55784	59133
Heavy Duty Vehicles	Diesel RT 14 - 20t	Euro V	2010	2013						42569	47256	47763	50168	48542	55490
Heavy Duty Vehicles	Diesel RT 20 - 26t	Conventional	0	1993	54320	48744	45352	44778	43238	39974	36392	33774	28941	23205	23132
Heavy Duty Vehicles	Diesel RT 20 - 26t	Euro I	1994	1996	82609	73422	67978	67079	64314	59362	54134	50451	43464	35271	35456
Heavy Duty Vehicles	Diesel RT 20 - 26t	Euro II	1997	2001	92771	89979	86706	85646	82303	76040	69477	64932	56155	45672	46012
Heavy Duty Vehicles	Diesel RT 20 - 26t	Euro III	2002	2006		57240	72653	88121	92122	89652	88352	92512	80247	65446	66214
Heavy Duty Vehicles	Diesel RT 20 - 26t	Euro IV	2007	2009		55991	96623	101964	91312	61937	68990	66793	78889	77283	81664
Heavy Duty Vehicles	Diesel RT 20 - 26t	Euro V	2010	2013						58803	73185	66845	70129	66931	75787
Heavy Duty Vehicles	Diesel RT 26 - 28t	Conventional	0	1993	56076	49143	46523	44877	42931	39707	35968	33382	28908	22389	23889
Heavy Duty Vehicles	Diesel RT 26 - 28t	Euro I	1994	1996	84127	72631	67577	66326	62299	62261	56064	52032	44700	38083	37994
Heavy Duty Vehicles	Diesel RT 26 - 28t	Euro II	1997	2001	100442	89831	83181	81643	78782	73085	65810	60681	54484	42466	48097
Heavy Duty Vehicles	Diesel RT 26 - 28t	Euro III	2002	2006				58837	73291	99846	100664	93424	80261	65257	69630
Heavy Duty Vehicles	Diesel RT 26 - 28t	Euro IV	2007	2009								57095	87698	82535	88489
Heavy Duty Vehicles	Diesel RT 26 - 28t	Euro V	2010	2013								57095	98102	79762	85108
Heavy Duty Vehicles	Diesel RT 28 - 32t	Conventional	0	1993	61225	54790	50623	49375	47758	44506	40728	37044	32070	25640	28165
Heavy Duty Vehicles	Diesel RT 28 - 32t	Euro I	1994	1996	83315	74284	69375	68365	65209	60404	54354	50250	43011	35164	37770
Heavy Duty Vehicles	Diesel RT 28 - 32t	Euro II	1997	2001	88982	90606	90550	89296	85683	79627	72049	67121	58005	47481	50916
Heavy Duty Vehicles	Diesel RT 28 - 32t	Euro III	2002	2006		56936	74759	87145	91990	89917	86613	93909	81853	66906	71585
Heavy Duty Vehicles	Diesel RT 28 - 32t	Euro IV	2007	2009			56049	75899	110131	62495	71635	66913	79090	77509	87209
Heavy Duty Vehicles	Diesel RT 28 - 32t	Euro V	2010	2013							57521	64027	70613	67878	82098
Heavy Duty Vehicles	Diesel RT >32t	Conventional	0	1993	62601	58944	54842	33182	31817	29603	24520	22757	19550		
Heavy Duty Vehicles	Diesel RT >32t	Euro I	1994	1996	77588	70375	70188	68889	65902	61136	55051	51092	43893	35688	40635
Heavy Duty Vehicles	Diesel RT >32t	Euro II	1997	2001	74901	101905	97999								

Heavy Duty Vehicles	Diesel RT >32t	Euro III	2002	2006		56325	104812	91020	96425	82252	77789	76167	69980	71115	75882
Heavy Duty Vehicles	Diesel RT >32t	Euro IV	2007	2009								57095	98102	79762	52060
Heavy Duty Vehicles	Diesel RT >32t	Euro V	2010	2013										79762	63863
Heavy Duty Vehicles	Diesel TT/AT 28 - 34t	Conventional	0	1993	36076	34714	31912	31679	31465	29326	27630	25994	23311	17470	19092
Heavy Duty Vehicles	Diesel TT/AT 28 - 34t	Euro I	1994	1996	56115	53711	49296	48918	48698	45272	42683	40442	36612	27930	30900
Heavy Duty Vehicles	Diesel TT/AT 28 - 34t	Euro II	1997	2001	62828	66074	63335	62750	62418	58145	54696	52002	47267	36175	40350
Heavy Duty Vehicles	Diesel TT/AT 28 - 34t	Euro III	2002	2006		42316	55119	63223	69921	68620	69299	72567	66101	50517	56565
Heavy Duty Vehicles	Diesel TT/AT 28 - 34t	Euro IV	2007	2009		40799	64332	65996	75262	59079	49746	53335	66363	61232	71317
Heavy Duty Vehicles	Diesel TT/AT 28 - 34t	Euro V	2010	2013						44538	50839	52517	58052	53295	66437
Heavy Duty Vehicles	Diesel TT/AT 34 - 40t	Conventional	0	1993	59837	51470	47377	47198	46345	42965	41598	39893	36626	28318	31436
Heavy Duty Vehicles	Diesel TT/AT 34 - 40t	Euro I	1994	1996	88793	77589	71212	70815	69287	64202	62048	59312	54020	41602	46677
Heavy Duty Vehicles	Diesel TT/AT 34 - 40t	Euro II	1997	2001	97141	96740	93155	93303	91674	84982	83403	79107	71782	55184	61440
Heavy Duty Vehicles	Diesel TT/AT 34 - 40t	Euro III	2002	2006		64475	81407	95848	102774	101252	112344	120094	110384	85386	94695
Heavy Duty Vehicles	Diesel TT/AT 34 - 40t	Euro IV	2007	2009		58478	89659	111095	86241	72927	83389	82946	106080	98463	114013
Heavy Duty Vehicles	Diesel TT/AT 34 - 40t	Euro V	2010	2013		60693	112110	112129		66899	85541	88563	107392	97527	116118
Heavy Duty Vehicles	Diesel TT/AT 40 - 50t	Conventional	0	1993	73942	77821	71029	68073	63925	57917	54553	50254	42285	36771	33357
Heavy Duty Vehicles	Diesel TT/AT 40 - 50t	Euro I	1994	1996	103698	109404	100120	96430	91138	83280	78475	73799	62772	57395	54418
Heavy Duty Vehicles	Diesel TT/AT 40 - 50t	Euro II	1997	2001	110324	134290	131843	127772	121151	111339	104759	97068	81876	74135	69609
Heavy Duty Vehicles	Diesel TT/AT 40 - 50t	Euro III	2002	2006		85450	105378	123178	128215	126280	131263	140652	121314	111852	105841
Heavy Duty Vehicles	Diesel TT/AT 40 - 50t	Euro IV	2007	2009		83955	97398	140287	147386	85879	98969	94782	114344	129025	128962
Heavy Duty Vehicles	Diesel TT/AT 40 - 50t	Euro V	2010	2013		83955	118025	153422	145858	129694	86281	92355	110209	119657	120157
Heavy Duty Vehicles	Diesel TT/AT 50 - 60t	Euro I	1994	1996	102248	112188	102762	99064	94180	86654					
Heavy Duty Vehicles	Diesel TT/AT 50 - 60t	Euro II	1997	2001	125089	137250	125719	121194	115219	106012	101625	95118	81958	75984	72075
Heavy Duty Vehicles	Diesel TT/AT 50 - 60t	Euro IV	2007	2009								87082	150067	139129	131971
Heavy Duty Vehicles	Diesel TT/AT >60t	Euro V	2010	2013									80250	102649	
Buses	Gasoline Urban Buses	Conventional	0	9999	15801	15469	15262	14610	12816	17679	17823	33299	30963	34224	30311
Buses	Diesel Urban Buses <15t	Conventional	0	1993	73704	69555	65973	63516	60209	55726	50795	47221	44449	39163	36136
Buses	Diesel Urban Buses <15t	Euro I	1994	1996	113375	105491	98660	94825	90297	82525	76773	73252	66207	59119	55131
Buses	Diesel Urban Buses <15t	Euro II	1997	2001	126818	125943	122778	118677	113321	103362	96682	92361	83241	75928	72292
Buses	Diesel Urban Buses <15t	Euro III	2002	2006			77218	104396	123458	120207	122546	133140	120242	106697	100328
Buses	Diesel Urban Buses <15t	Euro IV	2007	2009								80502	106873	111220	131333
Buses	Diesel Urban Buses <15t	Euro V	2010	2013											74487
Buses	Diesel Urban Buses 15 - 18t	Conventional	0	1993	72610	68150	64917	62950	60082	55042	52409	50205	46021	41624	39883
Buses	Diesel Urban Buses 15 - 18t	Euro I	1994	1996	112238	103891	96819	92706	88492	80900	75874	72615	65528	58620	55334
Buses	Diesel Urban Buses 15 - 18t	Euro II	1997	2001	123334	124475	125185	120556	115115	104997	98202	94098	85460	76384	72149
Buses	Diesel Urban Buses 15 - 18t	Euro III	2002	2006			77218	123225	129727	124894	117172	131589	119314	106491	100100
Buses	Diesel Urban Buses 15 - 18t	Euro IV	2007	2009								80502	100595	106405	133010
Buses	Diesel Urban Buses 15 - 18t	Euro V	2010	2013											74487

Buses	Diesel Urban Buses >18t	Conventional	0	1993	85502	80053	75911	73414	69467	64654	60909	56380	53371	43923	40378
Buses	Diesel Urban Buses >18t	Euro I	1994	1996	109194	102039	97540	93824	89504	81849	76464	74727	62198	55090	50827
Buses	Diesel Urban Buses >18t	Euro II	1997	2001	97862	113068	136013	130814	124514	113816	106091	101716	91824	82521	77396
Buses	Diesel Urban Buses >18t	Euro III	2002	2006			77218	120043	124379	129423	123893	128295	116682	104390	98193
Buses	Diesel Urban Buses >18t	Euro IV	2007	2009								80502	112083	118033	129601
Buses	Diesel Urban Buses >18t	Euro V	2010	2013											74487
Buses	Gasoline Coaches	Conventional	0	9999	15331	14610	14368	13776	13279	12518	11817	11340	10805	9917	9239
Buses	Diesel Coaches <15t	Conventional	0	1993	25816	24981	24029	24070	23909	22168	20561	19793	17929	15846	15032
Buses	Diesel Coaches <15t	Euro I	1994	1996	35800	34011	32350	32035	31604	29178	26916	25823	23414	20740	19736
Buses	Diesel Coaches <15t	Euro II	1997	2001	39702	40077	41985	41416	40778	37702	34880	33573	30504	27047	25740
Buses	Diesel Coaches <15t	Euro III	2002	2006			25866	40567	44023	44313	43678	46855	42426	37560	35755
Buses	Diesel Coaches <15t	Euro IV	2007	2009								28605	38702	39423	46768
Buses	Diesel Coaches <15t	Euro V	2010	2013											26662
Buses	Diesel Coaches 15 - 18t	Conventional	0	1993	32808	31527	30668	30759	30634	28915	27028	26295	24133	21777	20969
Buses	Diesel Coaches 15 - 18t	Euro I	1994	1996	59248	56132	53179	52678	51874	47871	43982	42185	38089	33805	32103
Buses	Diesel Coaches 15 - 18t	Euro II	1997	2001	63867	66866	69171	68608	67457	61924	56923	54622	49646	43951	41971
Buses	Diesel Coaches 15 - 18t	Euro III	2002	2006			42553	61143	77824	75987	72217	75315	67838	59795	56739
Buses	Diesel Coaches 15 - 18t	Euro IV	2007	2009								47058	58106	63988	77970
Buses	Diesel Coaches 15 - 18t	Euro V	2010	2013											43862
Buses	Diesel Coaches >18t	Conventional	0	1993	67418	64351	61817	61719	61578	56880	52648	51019	46690	40889	39438
Buses	Diesel Coaches >18t	Euro I	1994	1996	94564	89990	86004	84786	83217	76411	70956	67835	61629	54514	51947
Buses	Diesel Coaches >18t	Euro II	1997	2001	101528	103472	113133	112138	110603	101413	92833	88694	80654	71976	68493
Buses	Diesel Coaches >18t	Euro III	2002	2006			67697	93888	114101	114157	116516	123137	111570	98836	94266
Buses	Diesel Coaches >18t	Euro IV	2007	2009								74865	105169	109410	121458
Buses	Diesel Coaches >18t	Euro V	2010	2013											69779
Mopeds	<50 cm³	Conventional	0	1999	1939	1528	1550	1551	1523	1500	1497	1503	1514	1498	1485
Mopeds	<50 cm³	Euro I	2000	2003	1939	1528	1550	1551	1523	1500	1497	1503	1514	1498	1485
Mopeds	<50 cm³	Euro II	2004	9999					1523	1500	1497	1503	1514	1498	1485
Motorcycles	2-stroke >50 cm³	Conventional	0	1999	6945	6567	6354	6017	5540	5076	4722	4426	4250	3971	3973
Motorcycles	4-stroke <250 cm³	Conventional	0	1999	6945	6567	6354	6017	5540	5076	4722	4426	4250	3971	3973
Motorcycles	4-stroke <250 cm³	Euro I	2000	2003	6945	6567	6354	6017	5540	5076	4722	4426	4250	3971	3973
Motorcycles	4-stroke <250 cm³	Euro II	2004	2006					5540	5076	4722	4426	4250	3971	3973
Motorcycles	4-stroke <250 cm³	Euro III	2007	9999								4426	4250	3971	3973
Motorcycles	4-stroke 250 - 750 cm³	Conventional	0	1999	6945	6567	6354	6017	5540	5076	4722	4426	4250	3971	3973
Motorcycles	4-stroke 250 - 750 cm³	Euro I	2000	2003	6945	6567	6354	6017	5540	5076	4722	4426	4250	3971	3973
Motorcycles	4-stroke 250 - 750 cm³	Euro II	2004	2006					5540	5076	4722	4426	4250	3971	3973
Motorcycles	4-stroke 250 - 750 cm³	Euro III	2007	9999								4426	4250	3971	3973
Motorcycles	4-stroke >750 cm³	Conventional	0	1999	6945	6567	6354	6017	5540	5076	4722	4426	4250	3971	3973

Motorcycles	4-stroke >750 cm³	Euro I	2000	2003	6945	6567	6354	6017	5540	5076	4722	4426	4250	3971	3973
Motorcycles	4-stroke >750 cm³	Euro II	2004	2006					5540	5076	4722	4426	4250	3971	3973
Motorcycles	4-stroke >750 cm³	Euro III	2007	9999								4426	4250	3971	3973

Annex 2B-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
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.

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
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

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
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

Heavy duty diesel vehicles

(g pr kWh)	Test[1)]	EURO I 1993	EURO II 1996	EURO III 2001	EURO IV 2006	EURO V 2009	EURO VI 2014	EEV[2)] 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 - 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 >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	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
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	0,740	0,634	0,664
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	0,319	0,273	0,286
Light Duty Vehicles	Diesel <3,5t	Euro V	2012	2015	68,860	58,185	63,660	0,255	0,213	0,275	0,003	0,003	0,004	0,228	0,195	0,204
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
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 I	1994	1996	286,465	225,388	206,076	2,162	1,647	1,535	0,398	0,281	0,244	9,122	7,308	6,742
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
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 IV	2007	2009	316,444	252,503	229,586	1,151	0,839	0,723	0,049	0,037	0,033	6,270	5,071	4,708
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 50 - 60t	Euro IV	2007	2009	440,973	342,585	300,013	1,445	1,038	0,878	0,064	0,047	0,041	8,477	6,746	5,764
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
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	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
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	CH4u	CH4r	CH4h	N2Ou	N2Or	N2Oh	NH3u	NH3r	NH3h	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	0,024	0,009	0,005	0,070	0,132	0,074	0,177	0,121	0,111
Passenger Cars	Gasoline <1,4 l	Euro II	1997	2000	0,017	0,013	0,011	0,012	0,005	0,003	0,163	0,149	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 - 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	0,024	0,009	0,005	0,070	0,132	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	0,012	0,005	0,003	0,163	0,149	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 >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	0,024	0,009	0,005	0,070	0,132	0,074	0,177	0,121	0,111
Passenger Cars	Gasoline >2,0 l	Euro II	1997	2000	0,017	0,013	0,011	0,012	0,005	0,003	0,163	0,149	0,084	0,071	0,047	0,042
Passenger Cars	Gasoline >2,0 l	Euro III	2001	2005	0,003	0,002	0,004	0,001	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	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	0,038	0,017	0,012
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	0,038	0,017	0,012
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	0,034	0,020	0,010	0,070	0,132	0,074	0,220	0,109	0,078
Light Duty Vehicles	Gasoline <3,5t	Euro II	1999	2001	0,017	0,013	0,011	0,023	0,013	0,008	0,163	0,149	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
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 I	1994	1996	0,175	0,080	0,070	0,030	0,030	0,030	0,003	0,003	0,003	0,736	0,488	0,394
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
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 IV	2007	2009	0,005	0,006	0,004	0,030	0,030	0,030	0,003	0,003	0,003	0,070	0,048	0,041
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 50 - 60t	Euro IV	2007	2009	0,005	0,006	0,004	0,030	0,030	0,030	0,003	0,003	0,003	0,090	0,063	0,053
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
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 cm³	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 cm³	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 cm³	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 cm³	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	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 - 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 >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	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
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	27,61	44,26	51,85
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	27,61	44,26	51,85

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	35,00	35,00	35,00	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	72,00	72,00	72,00	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	95,63	95,63	95,63	80,00	80,00	80,00	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 Veh.	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 Veh.	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 Veh.	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 Veh.	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 Veh.	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
Heavy Duty Veh.	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 Veh.	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 Veh.	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 Veh.	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 Veh.	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 Veh.	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 Veh.	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 Veh.	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 Veh.	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 Veh.	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 Veh.	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 Veh.	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 Veh.	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 Veh.	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 Veh.	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 Veh.	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 Veh.	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 Veh.	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 Veh.	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 Veh.	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 Veh.	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 Veh.	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 Veh.	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 Veh.	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 Veh.	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 Veh.	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 Veh.	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 Veh.	Diesel RT 26 - 28t	Euro I	1994	1996	14,23	12,62	11,74	20,03	17,07	15,21	22,33	25,06	27,38	29,11	29,59	29,23	12,60	9,85	8,38
Heavy Duty Veh.	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 Veh.	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 Veh.	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 Veh.	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 Veh.	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 Veh.	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 Veh.	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 Veh.	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 Veh.	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
Heavy Duty Veh.	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 Veh.	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 Veh.	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 Veh.	Diesel RT >32t	Euro IV	2007	2009	15,80	12,78	12,01	61,10	61,71	64,74	91,36	91,17	91,27	57,90	57,34	56,23	92,18	91,31	90,51

Heavy Duty Veh.	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 Veh.	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 Veh.	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 Veh.	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 Veh.	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 Veh.	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 Veh.	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 Veh.	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 Veh.	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 Veh.	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 Veh.	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 Veh.	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 Veh.	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 Veh.	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 Veh.	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 Veh.	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 Veh.	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 Veh.	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 Veh.	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 Veh.	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 Veh.	Diesel TT/AT 50 - 60t	Euro IV	2007	2009	14,82	12,10	11,08	62,26	63,07	67,40	91,40	91,54	91,89	59,93	58,30	58,71	91,05	90,11	89,38
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
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 cm³	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 cm³	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 cm³	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 cm³	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	4-stroke <250 cm³	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 cm³	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 cm³	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
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

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	2,0508818	1,888	1,888	1,8627364	1,5974	1,5974
Passenger Cars	Gasoline <1,4 l	Euro II	1997	2000	2,456763636	2,5358	2,5358	2,0508818	1,888	1,888	1,8627364	1,5974	1,5974
Passenger Cars	Gasoline <1,4 l	Euro III	2001	2005	1,417018479	1,144042107	1,144042107	1	1	1	1,1679608	1	1
Passenger Cars	Gasoline <1,4 l	Euro IV	2006	2010	1,080190658	1,030184039	1,030184039	1	1	1	1,032483	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	2,0508818	1,888	1,888	1,8916591	1,7868	1,7868
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro II	1997	2000	1,848646364	1,76984	1,76984	2,0508818	1,888	1,888	1,8916591	1,7868	1,7868
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro III	2001	2005	1,184210095	1	1	1,2745755	1	1	1	1	1
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro IV	2006	2010	1,082566466	1	1	1,1228334	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	2,0508818	1,888	1,888	1,6774609	1,45388	1,45388
Passenger Cars	Gasoline >2,0 l	Euro II	1997	2000	1,446653636	1,19748	1,19748	2,0508818	1,888	1,888	1,6774609	1,45388	1,45388
Passenger Cars	Gasoline >2,0 l	Euro III	2001	2005	1,198355499	1	1	1,295693	1	1	1	1	1
Passenger Cars	Gasoline >2,0 l	Euro IV	2006	2010	1,114643111	1	1	1,1707201	1	1	1	1	1
Passenger Cars	Diesel <2,0 l	Conventional	0	1990	1	1	1	1	1	1	1	1	1
Passenger Cars	Diesel <2,0 l	Euro I	1991	1996	1	1	1	1	1	1	1	1	1
Passenger Cars	Diesel <2,0 l	Euro II	1997	2000	1	1	1	1	1	1	1	1	1
Passenger Cars	Diesel <2,0 l	Euro III	2001	2005	1	1	1	1	1	1	1	1	1
Passenger Cars	Diesel <2,0 l	Euro IV	2006	2010	1	1	1	1	1	1	1	1	1
Passenger Cars	Diesel <2,0 l	Euro V	2011	2014	1	1	1	1	1	1	1	1	1

Passenger Cars	Diesel >2,0 l	Conventional	0	1990	1	1	1	1	1	1	1	1	1
Passenger Cars	Diesel >2,0 l	Euro I	1991	1996	1	1	1	1	1	1	1	1	1
Passenger Cars	Diesel >2,0 l	Euro II	1997	2000	1	1	1	1	1	1	1	1	1
Passenger Cars	Diesel >2,0 l	Euro III	2001	2005	1	1	1	1	1	1	1	1	1
Passenger Cars	Diesel >2,0 l	Euro IV	2006	2010	1	1	1	1	1	1	1	1	1
Passenger Cars	Diesel >2,0 l	Euro V	2011	2014	1	1	1	1	1	1	1	1	1
Passenger Cars	LPG cars	Conventional	0	1990	1	1	1	1	1	1	1	1	1
Passenger Cars	LPG cars	Euro I	1991	1996	1	1	1	1	1	1	1	1	1
Passenger Cars	LPG cars	Euro II	1997	2000	1	1	1	1	1	1	1	1	1
Passenger Cars	LPG cars	Euro III	2001	2005	1	1	1	1	1	1	1	1	1
Passenger Cars	LPG cars	Euro IV	2006	2010	1	1	1	1	1	1	1	1	1
Passenger Cars	Electric cars	Conventional	0	9999	1	1	1	1	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	2,0508818	1,888	1,888	1,8627364	1,5974	1,5974
Light Duty Vehicles	Gasoline <3,5t	Euro II	1999	2001	2,456763636	2,5358	2,5358	2,0508818	1,888	1,888	1,8627364	1,5974	1,5974
Light Duty Vehicles	Gasoline <3,5t	Euro III	2002	2006	1,148767586	1	1	1,221664	1	1	1	1	1
Light Duty Vehicles	Gasoline <3,5t	Euro IV	2007	2011	1,0721928	1	1	1,1073467	1	1	1	1	1

Annex 2B-7: Fuel consumption factors (MJ per km) and emission factors (g per km)

Sector	ForecastYear	FCu (MJ)	FCr (MJ)	FCh (MJ)	CO_2u	CO_2r	CO_2h	CH_4u	CH_4r	CH_4h	N_2Ou	N_2Or	N_2Oh	SO_2u	SO_2r	SO_2h	NO_xu	NO_xr	NO_xh
Passenger Cars	1985	3,388	2,108	2,435	248	154	178	0,147	0,027	0,024	0,009	0,006	0,006	0,086	0,052	0,063	1,884	2,175	2,682
Passenger Cars	1986	3,335	2,095	2,415	244	153	177	0,146	0,027	0,024	0,009	0,006	0,006	0,057	0,034	0,042	1,853	2,163	2,722
Passenger Cars	1987	3,313	2,083	2,390	242	152	175	0,147	0,027	0,024	0,009	0,006	0,006	0,056	0,034	0,041	1,851	2,172	2,772
Passenger Cars	1988	3,237	2,074	2,370	237	152	173	0,145	0,027	0,024	0,009	0,006	0,006	0,055	0,034	0,041	1,833	2,183	2,814
Passenger Cars	1989	3,199	2,066	2,353	234	151	172	0,144	0,027	0,024	0,009	0,006	0,006	0,040	0,025	0,030	1,821	2,184	2,835
Passenger Cars	1990	3,180	2,059	2,338	232	151	171	0,144	0,027	0,024	0,009	0,006	0,006	0,040	0,025	0,030	1,821	2,190	2,853
Passenger Cars	1991	3,192	2,055	2,323	233	150	170	0,141	0,026	0,023	0,009	0,006	0,006	0,040	0,025	0,029	1,773	2,106	2,749
Passenger Cars	1992	3,149	2,051	2,305	230	150	169	0,131	0,026	0,022	0,010	0,006	0,006	0,026	0,017	0,020	1,666	1,949	2,551
Passenger Cars	1993	3,152	2,044	2,282	230	149	167	0,124	0,025	0,022	0,011	0,006	0,005	0,014	0,009	0,010	1,585	1,804	2,366
Passenger Cars	1994	3,110	2,043	2,268	227	149	166	0,112	0,023	0,020	0,011	0,006	0,005	0,014	0,009	0,010	1,459	1,616	2,138
Passenger Cars	1995	3,108	2,044	2,258	227	149	165	0,102	0,022	0,019	0,012	0,007	0,005	0,014	0,009	0,010	1,356	1,443	1,924
Passenger Cars	1996	3,132	2,047	2,251	229	150	165	0,093	0,021	0,018	0,013	0,007	0,005	0,014	0,009	0,010	1,273	1,291	1,738
Passenger Cars	1997	3,082	2,048	2,238	225	150	164	0,083	0,020	0,017	0,013	0,007	0,005	0,013	0,009	0,010	1,170	1,144	1,551
Passenger Cars	1998	3,077	2,049	2,222	225	150	162	0,075	0,019	0,016	0,013	0,007	0,005	0,013	0,009	0,010	1,072	1,002	1,362
Passenger Cars	1999	3,055	2,049	2,209	223	150	162	0,068	0,017	0,015	0,013	0,006	0,004	0,010	0,007	0,008	0,985	0,879	1,196
Passenger Cars	2000	3,037	2,050	2,202	222	150	161	0,063	0,016	0,014	0,013	0,006	0,004	0,007	0,005	0,005	0,924	0,791	1,074
Passenger Cars	2001	3,063	2,052	2,200	224	150	161	0,058	0,015	0,013	0,012	0,006	0,004	0,007	0,005	0,005	0,885	0,733	0,990
Passenger Cars	2002	3,037	2,057	2,200	222	150	161	0,052	0,014	0,012	0,012	0,006	0,004	0,007	0,005	0,005	0,832	0,672	0,900
Passenger Cars	2003	3,042	2,060	2,200	223	151	161	0,047	0,012	0,011	0,012	0,005	0,003	0,007	0,005	0,005	0,783	0,612	0,813
Passenger Cars	2004	2,993	2,062	2,200	219	151	161	0,041	0,011	0,010	0,011	0,005	0,003	0,007	0,005	0,005	0,726	0,554	0,729
Passenger Cars	2005	3,020	2,064	2,198	221	151	161	0,037	0,010	0,009	0,011	0,005	0,003	0,001	0,001	0,001	0,678	0,497	0,646
Passenger Cars	2006	3,001	2,067	2,198	219	151	161	0,032	0,008	0,008	0,010	0,004	0,003	0,001	0,001	0,001	0,619	0,441	0,568
Passenger Cars	2007	2,981	2,073	2,201	218	152	161	0,026	0,007	0,006	0,010	0,004	0,003	0,001	0,001	0,001	0,567	0,392	0,503
Passenger Cars	2008	2,976	2,065	2,191	218	151	160	0,023	0,006	0,005	0,009	0,003	0,003	0,001	0,001	0,001	0,529	0,356	0,456
Passenger Cars	2009	2,945	2,053	2,176	215	150	159	0,020	0,005	0,004	0,009	0,003	0,002	0,001	0,001	0,001	0,499	0,330	0,421
Passenger Cars	2010	2,955	2,033	2,155	214	148	156	0,017	0,004	0,004	0,009	0,003	0,002	0,001	0,001	0,001	0,480	0,310	0,394
Light Duty Vehicles	1985	4,021	2,786	2,987	297	206	221	0,049	0,017	0,011	0,002	0,001	0,001	0,771	0,555	0,607	2,072	1,208	1,244
Light Duty Vehicles	1986	4,001	2,788	2,993	295	206	221	0,048	0,016	0,011	0,001	0,001	0,001	0,467	0,337	0,369	2,054	1,186	1,220
Light Duty Vehicles	1987	4,013	2,788	2,993	296	206	221	0,048	0,016	0,011	0,001	0,001	0,001	0,468	0,337	0,368	2,061	1,187	1,221
Light Duty Vehicles	1988	3,958	2,788	2,993	292	206	221	0,048	0,016	0,011	0,001	0,001	0,001	0,462	0,337	0,369	2,026	1,185	1,218
Light Duty Vehicles	1989	3,935	2,789	2,997	290	206	221	0,047	0,016	0,010	0,001	0,001	0,001	0,310	0,227	0,248	2,008	1,170	1,201
Light Duty Vehicles	1990	3,930	2,790	2,998	290	206	221	0,046	0,016	0,010	0,001	0,001	0,001	0,310	0,227	0,249	2,004	1,165	1,196
Light Duty Vehicles	1991	3,968	2,789	2,997	293	206	221	0,047	0,016	0,010	0,001	0,001	0,001	0,312	0,227	0,248	2,028	1,171	1,202

Light Duty Vehicles	1992	3,956	2,787	2,991	292	206	221	0,048	0,016	0,011	0,002	0,001	0,001	0,200	0,146	0,160	2,025	1,194	1,228
Light Duty Vehicles	1993	3,995	2,786	2,989	295	206	221	0,049	0,016	0,011	0,002	0,001	0,001	0,078	0,056	0,062	2,050	1,203	1,238
Light Duty Vehicles	1994	3,970	2,786	2,988	293	206	221	0,049	0,016	0,011	0,002	0,001	0,001	0,078	0,057	0,062	2,034	1,197	1,232
Light Duty Vehicles	1995	3,964	2,770	2,971	293	205	219	0,046	0,016	0,010	0,002	0,001	0,001	0,078	0,056	0,062	1,980	1,170	1,205
Light Duty Vehicles	1996	3,964	2,738	2,938	293	202	217	0,042	0,015	0,009	0,002	0,002	0,002	0,078	0,056	0,061	1,889	1,125	1,160
Light Duty Vehicles	1997	3,879	2,706	2,904	286	200	214	0,038	0,014	0,008	0,003	0,002	0,002	0,077	0,055	0,060	1,755	1,087	1,124
Light Duty Vehicles	1998	3,856	2,680	2,874	285	198	212	0,034	0,013	0,008	0,004	0,003	0,003	0,076	0,055	0,060	1,663	1,058	1,097
Light Duty Vehicles	1999	3,816	2,656	2,847	282	196	210	0,031	0,012	0,007	0,004	0,004	0,003	0,042	0,030	0,033	1,572	1,029	1,070
Light Duty Vehicles	2000	3,784	2,636	2,824	279	195	209	0,027	0,011	0,006	0,005	0,004	0,004	0,009	0,006	0,007	1,497	1,010	1,052
Light Duty Vehicles	2001	3,800	2,619	2,805	281	193	207	0,024	0,010	0,006	0,006	0,005	0,004	0,009	0,006	0,007	1,453	0,992	1,035
Light Duty Vehicles	2002	3,757	2,604	2,789	277	192	206	0,021	0,008	0,005	0,007	0,005	0,005	0,009	0,006	0,007	1,357	0,951	0,994
Light Duty Vehicles	2003	3,747	2,589	2,776	277	191	205	0,018	0,007	0,004	0,008	0,005	0,004	0,009	0,006	0,006	1,265	0,894	0,935
Light Duty Vehicles	2004	3,681	2,576	2,765	272	190	204	0,015	0,006	0,003	0,009	0,005	0,004	0,009	0,006	0,006	1,150	0,836	0,876
Light Duty Vehicles	2005	3,701	2,564	2,755	273	189	204	0,013	0,004	0,003	0,010	0,005	0,004	0,002	0,001	0,001	1,075	0,780	0,817
Light Duty Vehicles	2006	3,671	2,554	2,748	271	189	203	0,010	0,003	0,002	0,011	0,005	0,004	0,002	0,001	0,001	0,996	0,732	0,767
Light Duty Vehicles	2007	3,635	2,543	2,743	268	188	203	0,009	0,003	0,002	0,011	0,004	0,004	0,002	0,001	0,001	0,912	0,676	0,708
Light Duty Vehicles	2008	3,641	2,536	2,739	269	187	202	0,007	0,002	0,001	0,011	0,004	0,004	0,002	0,001	0,001	0,825	0,608	0,637
Light Duty Vehicles	2009	3,635	2,534	2,737	268	187	202	0,006	0,002	0,001	0,012	0,004	0,004	0,002	0,001	0,001	0,772	0,570	0,598
Light Duty Vehicles	2010	3,684	2,530	2,735	272	187	202	0,006	0,002	0,001	0,012	0,004	0,004	0,002	0,001	0,001	0,747	0,541	0,567
Heavy Duty Vehicles	1985	12,721	9,865	8,986	941	730	665	0,150	0,064	0,056	0,030	0,030	0,030	2,967	2,302	2,095	11,955	9,685	8,925
Heavy Duty Vehicles	1986	12,852	9,956	9,058	951	737	670	0,151	0,065	0,057	0,030	0,030	0,030	1,799	1,395	1,268	12,076	9,765	8,983
Heavy Duty Vehicles	1987	12,933	10,012	9,102	957	741	673	0,152	0,066	0,057	0,030	0,030	0,030	1,811	1,403	1,274	12,149	9,813	9,017
Heavy Duty Vehicles	1988	13,094	10,123	9,190	969	749	680	0,154	0,067	0,058	0,030	0,030	0,030	1,834	1,418	1,287	12,303	9,918	9,093
Heavy Duty Vehicles	1989	13,150	10,162	9,221	973	752	682	0,154	0,067	0,058	0,030	0,030	0,030	1,228	0,950	0,861	12,357	9,953	9,119
Heavy Duty Vehicles	1990	13,432	10,358	9,374	994	766	694	0,156	0,068	0,060	0,030	0,030	0,030	1,255	0,968	0,876	12,613	10,123	9,239
Heavy Duty Vehicles	1991	13,400	10,336	9,356	992	765	692	0,156	0,068	0,060	0,030	0,030	0,030	1,252	0,966	0,874	12,593	10,111	9,230
Heavy Duty Vehicles	1992	13,566	10,450	9,448	1004	773	699	0,158	0,069	0,060	0,030	0,030	0,030	0,824	0,635	0,574	12,739	10,209	9,302
Heavy Duty Vehicles	1993	13,802	10,613	9,575	1021	785	708	0,160	0,070	0,061	0,030	0,030	0,030	0,322	0,248	0,224	12,925	10,327	9,377
Heavy Duty Vehicles	1994	13,781	10,600	9,558	1020	784	707	0,160	0,071	0,062	0,030	0,030	0,030	0,322	0,248	0,223	12,739	10,163	9,218
Heavy Duty Vehicles	1995	13,450	10,372	9,370	995	768	693	0,160	0,071	0,062	0,030	0,030	0,030	0,314	0,243	0,219	12,096	9,661	8,780
Heavy Duty Vehicles	1996	13,452	10,377	9,362	995	768	693	0,160	0,072	0,063	0,030	0,030	0,030	0,315	0,243	0,219	11,728	9,334	8,456
Heavy Duty Vehicles	1997	13,311	10,288	9,287	985	761	687	0,155	0,071	0,063	0,030	0,030	0,030	0,311	0,241	0,217	11,395	9,045	8,180
Heavy Duty Vehicles	1998	13,072	10,134	9,171	967	750	679	0,146	0,070	0,062	0,030	0,030	0,030	0,306	0,237	0,215	11,111	8,805	7,961
Heavy Duty Vehicles	1999	12,941	10,054	9,113	958	744	674	0,138	0,069	0,062	0,030	0,030	0,030	0,167	0,129	0,117	10,937	8,644	7,803
Heavy Duty Vehicles	2000	12,950	10,073	9,135	958	745	676	0,131	0,068	0,061	0,030	0,030	0,030	0,030	0,024	0,021	10,892	8,585	7,731
Heavy Duty Vehicles	2001	12,817	9,993	9,082	948	739	672	0,123	0,067	0,061	0,030	0,030	0,030	0,030	0,023	0,021	10,613	8,361	7,534
Heavy Duty Vehicles	2002	12,997	10,114	9,163	962	748	678	0,118	0,067	0,060	0,030	0,030	0,030	0,030	0,024	0,021	10,441	8,195	7,363

Heavy Duty Vehicles	2003	13,099	10,180	9,198	969	753	681	0,113	0,067	0,060	0,030	0,030	0,030	0,031	0,024	0,022	10,150	7,948	7,134
Heavy Duty Vehicles	2004	13,149	10,211	9,208	973	756	681	0,109	0,067	0,060	0,030	0,030	0,030	0,031	0,024	0,022	9,865	7,715	6,924
Heavy Duty Vehicles	2005	13,366	10,359	9,310	989	767	689	0,106	0,068	0,060	0,030	0,030	0,030	0,006	0,005	0,004	9,688	7,554	6,766
Heavy Duty Vehicles	2006	13,450	10,420	9,348	995	771	692	0,101	0,067	0,059	0,030	0,030	0,030	0,006	0,005	0,004	9,409	7,319	6,551
Heavy Duty Vehicles	2007	13,531	10,493	9,394	1001	776	695	0,088	0,060	0,052	0,030	0,030	0,030	0,006	0,005	0,004	8,933	6,886	6,127
Heavy Duty Vehicles	2008	13,532	10,516	9,401	1001	778	696	0,069	0,048	0,041	0,030	0,030	0,030	0,006	0,005	0,004	8,271	6,274	5,527
Heavy Duty Vehicles	2009	13,563	10,556	9,428	1002	780	697	0,056	0,039	0,034	0,030	0,030	0,030	0,006	0,005	0,004	7,803	5,810	5,061
Heavy Duty Vehicles	2010	13,479	10,504	9,381	997	777	694	0,048	0,034	0,029	0,030	0,030	0,030	0,006	0,005	0,004	7,482	5,430	4,666
Buses	1985	13,770	10,397	9,025	1019	769	667	0,174	0,081	0,070	0,030	0,029	0,029	3,180	2,389	2,035	13,534	10,591	9,165
Buses	1986	13,773	10,401	9,027	1019	769	668	0,174	0,081	0,070	0,030	0,029	0,029	1,910	1,436	1,224	13,540	10,591	9,165
Buses	1987	13,777	10,408	9,033	1019	770	668	0,174	0,081	0,070	0,030	0,029	0,029	1,911	1,437	1,225	13,552	10,604	9,176
Buses	1988	13,783	10,419	9,044	1020	771	669	0,174	0,081	0,070	0,030	0,029	0,029	1,913	1,440	1,228	13,573	10,626	9,195
Buses	1989	13,786	10,422	9,046	1020	771	669	0,174	0,081	0,070	0,030	0,029	0,029	1,276	0,961	0,820	13,577	10,626	9,195
Buses	1990	13,776	10,404	9,028	1019	770	668	0,174	0,081	0,070	0,030	0,029	0,029	1,275	0,959	0,818	13,543	10,588	9,162
Buses	1991	13,774	10,401	9,026	1019	770	668	0,174	0,081	0,070	0,030	0,029	0,029	1,275	0,958	0,818	13,539	10,585	9,159
Buses	1992	13,768	10,391	9,019	1019	769	667	0,174	0,081	0,070	0,030	0,029	0,029	0,827	0,621	0,530	13,524	10,576	9,152
Buses	1993	13,760	10,379	9,008	1018	768	666	0,174	0,081	0,070	0,030	0,029	0,029	0,318	0,239	0,204	13,501	10,555	9,134
Buses	1994	13,619	10,281	8,939	1008	761	661	0,174	0,081	0,070	0,029	0,029	0,029	0,314	0,236	0,201	13,131	10,290	8,933
Buses	1995	13,391	10,095	8,804	991	747	651	0,174	0,081	0,070	0,029	0,029	0,029	0,308	0,231	0,197	12,505	9,806	8,569
Buses	1996	13,206	9,951	8,700	977	736	643	0,174	0,081	0,070	0,029	0,029	0,029	0,303	0,227	0,194	11,987	9,406	8,271
Buses	1997	13,021	9,845	8,628	963	728	638	0,171	0,080	0,069	0,029	0,029	0,029	0,299	0,225	0,193	11,626	9,136	8,063
Buses	1998	12,739	9,697	8,546	942	717	632	0,163	0,077	0,067	0,029	0,029	0,029	0,292	0,221	0,191	11,254	8,872	7,885
Buses	1999	12,483	9,566	8,477	924	708	627	0,156	0,074	0,064	0,029	0,029	0,029	0,158	0,120	0,105	10,885	8,610	7,709
Buses	2000	12,379	9,519	8,448	916	704	625	0,150	0,071	0,062	0,029	0,029	0,029	0,029	0,022	0,020	10,689	8,458	7,588
Buses	2001	12,368	9,525	8,450	915	705	625	0,146	0,069	0,061	0,029	0,029	0,029	0,029	0,022	0,020	10,601	8,374	7,510
Buses	2002	12,370	9,543	8,461	915	706	626	0,141	0,067	0,059	0,029	0,029	0,029	0,029	0,022	0,020	10,355	8,155	7,329
Buses	2003	12,383	9,575	8,484	916	708	627	0,135	0,064	0,057	0,029	0,029	0,029	0,029	0,022	0,020	10,088	7,896	7,104
Buses	2004	12,421	9,605	8,500	919	711	629	0,131	0,062	0,055	0,030	0,029	0,029	0,029	0,022	0,020	9,895	7,691	6,916
Buses	2005	12,406	9,610	8,506	918	711	629	0,127	0,060	0,053	0,030	0,029	0,029	0,006	0,004	0,004	9,697	7,490	6,726
Buses	2006	12,417	9,631	8,521	919	712	630	0,123	0,058	0,052	0,030	0,029	0,029	0,006	0,005	0,004	9,518	7,303	6,546
Buses	2007	12,432	9,669	8,558	920	715	633	0,115	0,054	0,048	0,030	0,029	0,029	0,006	0,005	0,004	9,240	7,066	6,333
Buses	2008	12,374	9,679	8,591	915	716	635	0,101	0,048	0,044	0,030	0,030	0,029	0,006	0,005	0,004	8,748	6,704	6,032
Buses	2009	12,338	9,709	8,642	912	717	638	0,086	0,042	0,038	0,030	0,030	0,029	0,006	0,005	0,004	8,233	6,324	5,714
Buses	2010	12,292	9,723	8,673	909	719	641	0,073	0,036	0,033	0,030	0,030	0,030	0,006	0,005	0,004	7,853	5,952	5,379
Mopeds	1985	1,095	1,095		80	80		0,219	0,219		0,001	0,001		0,003	0,003		0,020	0,020	
Mopeds	1986	1,095	1,095		80	80		0,219	0,219		0,001	0,001		0,003	0,003		0,020	0,020	
Mopeds	1987	1,095	1,095		80	80		0,219	0,219		0,001	0,001		0,003	0,003		0,020	0,020	

Mopeds	1988	1,095	1,095		80	80		0,219	0,219		0,001	0,001		0,003	0,003		0,020	0,020	
Mopeds	1989	1,095	1,095		80	80		0,219	0,219		0,001	0,001		0,003	0,003		0,020	0,020	
Mopeds	1990	1,095	1,095		80	80		0,219	0,219		0,001	0,001		0,003	0,003		0,020	0,020	
Mopeds	1991	1,095	1,095		80	80		0,219	0,219		0,001	0,001		0,003	0,003		0,020	0,020	
Mopeds	1992	1,095	1,095		80	80		0,219	0,219		0,001	0,001		0,003	0,003		0,020	0,020	
Mopeds	1993	1,095	1,095		80	80		0,219	0,219		0,001	0,001		0,003	0,003		0,020	0,020	
Mopeds	1994	1,095	1,095		80	80		0,219	0,219		0,001	0,001		0,003	0,003		0,020	0,020	
Mopeds	1995	1,095	1,095		80	80		0,219	0,219		0,001	0,001		0,003	0,003		0,020	0,020	
Mopeds	1996	1,095	1,095		80	80		0,219	0,219		0,001	0,001		0,003	0,003		0,020	0,020	
Mopeds	1997	1,095	1,095		80	80		0,219	0,219		0,001	0,001		0,003	0,003		0,020	0,020	
Mopeds	1998	1,095	1,095		80	80		0,219	0,219		0,001	0,001		0,003	0,003		0,020	0,020	
Mopeds	1999	1,095	1,095		80	80		0,219	0,219		0,001	0,001		0,003	0,003		0,020	0,020	
Mopeds	2000	1,050	1,050		77	77		0,201	0,201		0,001	0,001		0,002	0,002		0,020	0,020	
Mopeds	2001	1,019	1,019		74	74		0,188	0,188		0,001	0,001		0,002	0,002		0,020	0,020	
Mopeds	2002	0,985	0,985		72	72		0,175	0,175		0,001	0,001		0,002	0,002		0,020	0,020	
Mopeds	2003	0,969	0,969		71	71		0,169	0,169		0,001	0,001		0,002	0,002		0,020	0,020	
Mopeds	2004	0,940	0,940		69	69		0,159	0,159		0,001	0,001		0,002	0,002		0,035	0,035	
Mopeds	2005	0,910	0,910		66	66		0,149	0,149		0,001	0,001		0,000	0,000		0,051	0,051	
Mopeds	2006	0,876	0,876		64	64		0,138	0,138		0,001	0,001		0,000	0,000		0,067	0,067	
Mopeds	2007	0,848	0,848		62	62		0,128	0,128		0,001	0,001		0,000	0,000		0,083	0,083	
Mopeds	2008	0,827	0,827		60	60		0,121	0,121		0,001	0,001		0,000	0,000		0,094	0,094	
Mopeds	2009	0,806	0,806		59	59		0,115	0,115		0,001	0,001		0,000	0,000		0,105	0,105	
Mopeds	2010	0,790	0,790		57	57		0,109	0,109		0,001	0,001		0,000	0,000		0,113	0,113	
Motorcycles	1985	1,241	1,208	1,481	91	88	108	0,193	0,193	0,193	0,002	0,002	0,002	0,003	0,003	0,003	0,140	0,224	0,391
Motorcycles	1986	1,241	1,208	1,481	91	88	108	0,193	0,193	0,193	0,002	0,002	0,002	0,003	0,003	0,003	0,140	0,224	0,391
Motorcycles	1987	1,241	1,208	1,481	91	88	108	0,193	0,193	0,193	0,002	0,002	0,002	0,003	0,003	0,003	0,140	0,224	0,391
Motorcycles	1988	1,241	1,208	1,481	91	88	108	0,193	0,193	0,193	0,002	0,002	0,002	0,003	0,003	0,003	0,140	0,224	0,391
Motorcycles	1989	1,241	1,208	1,481	91	88	108	0,193	0,193	0,193	0,002	0,002	0,002	0,003	0,003	0,003	0,140	0,224	0,391
Motorcycles	1990	1,241	1,208	1,481	91	88	108	0,193	0,193	0,193	0,002	0,002	0,002	0,003	0,003	0,003	0,140	0,224	0,391
Motorcycles	1991	1,241	1,208	1,481	91	88	108	0,193	0,193	0,193	0,002	0,002	0,002	0,003	0,003	0,003	0,140	0,224	0,391
Motorcycles	1992	1,241	1,208	1,481	91	88	108	0,193	0,193	0,193	0,002	0,002	0,002	0,003	0,003	0,003	0,140	0,224	0,391
Motorcycles	1993	1,241	1,208	1,481	91	88	108	0,193	0,193	0,193	0,002	0,002	0,002	0,003	0,003	0,003	0,140	0,224	0,391
Motorcycles	1994	1,241	1,208	1,481	91	88	108	0,193	0,193	0,193	0,002	0,002	0,002	0,003	0,003	0,003	0,140	0,224	0,391
Motorcycles	1995	1,241	1,208	1,481	91	88	108	0,193	0,193	0,193	0,002	0,002	0,002	0,003	0,003	0,003	0,140	0,224	0,391
Motorcycles	1996	1,241	1,208	1,481	91	88	108	0,193	0,193	0,193	0,002	0,002	0,002	0,003	0,003	0,003	0,140	0,224	0,391
Motorcycles	1997	1,241	1,208	1,481	91	88	108	0,193	0,193	0,193	0,002	0,002	0,002	0,003	0,003	0,003	0,140	0,224	0,391
Motorcycles	1998	1,241	1,208	1,481	91	88	108	0,193	0,193	0,193	0,002	0,002	0,002	0,003	0,003	0,003	0,140	0,224	0,391

Motorcycles	1999	1,241	1,208	1,481	91	88	108	0,193	0,193	0,193	0,002	0,002	0,002	0,003	0,003	0,003	0,140	0,224	0,391
Motorcycles	2000	1,256	1,224	1,499	92	89	109	0,190	0,190	0,190	0,002	0,002	0,002	0,003	0,003	0,003	0,143	0,228	0,395
Motorcycles	2001	1,266	1,233	1,509	92	90	110	0,188	0,189	0,189	0,002	0,002	0,002	0,003	0,003	0,003	0,146	0,231	0,400
Motorcycles	2002	1,276	1,243	1,519	93	91	111	0,187	0,188	0,188	0,002	0,002	0,002	0,003	0,003	0,003	0,148	0,235	0,404
Motorcycles	2003	1,285	1,251	1,528	94	91	112	0,185	0,187	0,187	0,002	0,002	0,002	0,003	0,003	0,003	0,151	0,238	0,409
Motorcycles	2004	1,290	1,257	1,534	94	92	112	0,184	0,184	0,185	0,002	0,002	0,002	0,003	0,003	0,004	0,154	0,243	0,413
Motorcycles	2005	1,299	1,265	1,545	95	92	113	0,181	0,180	0,181	0,002	0,002	0,002	0,001	0,001	0,001	0,158	0,248	0,419
Motorcycles	2006	1,306	1,273	1,554	95	93	113	0,179	0,175	0,177	0,002	0,002	0,002	0,001	0,001	0,001	0,162	0,254	0,426
Motorcycles	2007	1,310	1,277	1,559	95	93	113	0,172	0,166	0,168	0,002	0,002	0,002	0,001	0,001	0,001	0,158	0,249	0,421
Motorcycles	2008	1,311	1,278	1,560	95	93	114	0,169	0,161	0,163	0,002	0,002	0,002	0,001	0,001	0,001	0,157	0,247	0,420
Motorcycles	2009	1,312	1,279	1,560	95	93	114	0,167	0,159	0,160	0,002	0,002	0,002	0,001	0,001	0,001	0,156	0,246	0,420
Motorcycles	2010	1,312	1,279	1,560	94	92	112	0,166	0,158	0,159	0,002	0,002	0,002	0,001	0,001	0,001	0,156	0,246	0,421

Sector	ForecastYear	NMVOCu (exh)	NMVOCr (exh)	NMVOCh (exh)	NMVOCu (tot)	NMVOCr (tot)	NMVOCh (tot)	COu	COr	COh	NH_3u	NH_3r	NH_3h	TSPu	TSPr	TSPh
Passenger Cars	1985	3,237	1,047	0,923	5,341	1,421	0,977	39,399	10,545	11,644	0,002	0,002	0,002	0,096	0,050	0,053
Passenger Cars	1986	3,137	1,013	0,892	5,246	1,387	0,946	36,856	9,698	10,490	0,002	0,002	0,002	0,095	0,049	0,052
Passenger Cars	1987	3,112	0,983	0,859	5,208	1,354	0,912	35,289	8,909	9,428	0,002	0,002	0,002	0,093	0,047	0,051
Passenger Cars	1988	2,877	0,956	0,829	5,057	1,340	0,884	31,432	8,287	8,533	0,002	0,002	0,002	0,086	0,045	0,049
Passenger Cars	1989	2,753	0,929	0,800	4,957	1,316	0,855	29,276	7,750	7,764	0,002	0,002	0,002	0,084	0,044	0,048
Passenger Cars	1990	2,688	0,910	0,778	4,889	1,294	0,832	28,035	7,363	7,236	0,002	0,002	0,002	0,082	0,043	0,047
Passenger Cars	1991	2,697	0,863	0,735	4,768	1,224	0,786	27,914	6,886	6,695	0,004	0,007	0,005	0,079	0,040	0,044
Passenger Cars	1992	2,507	0,793	0,673	4,445	1,129	0,720	25,422	6,287	6,116	0,008	0,017	0,010	0,070	0,036	0,040
Passenger Cars	1993	2,463	0,720	0,607	4,175	1,016	0,648	24,342	5,577	5,416	0,011	0,026	0,015	0,065	0,033	0,037
Passenger Cars	1994	2,231	0,634	0,533	3,779	0,900	0,570	21,489	4,893	4,733	0,016	0,038	0,022	0,058	0,029	0,034
Passenger Cars	1995	2,131	0,559	0,471	3,470	0,789	0,502	20,275	4,402	4,317	0,021	0,050	0,028	0,053	0,026	0,030
Passenger Cars	1996	2,112	0,493	0,415	3,233	0,685	0,442	19,894	3,971	3,958	0,025	0,060	0,034	0,049	0,023	0,027
Passenger Cars	1997	1,839	0,427	0,360	2,829	0,597	0,384	17,032	3,528	3,578	0,032	0,072	0,040	0,041	0,020	0,024
Passenger Cars	1998	1,682	0,364	0,307	2,481	0,500	0,325	15,581	3,077	3,174	0,041	0,082	0,046	0,035	0,017	0,021
Passenger Cars	1999	1,462	0,308	0,259	2,143	0,424	0,275	13,417	2,680	2,822	0,048	0,090	0,051	0,032	0,016	0,019
Passenger Cars	2000	1,332	0,268	0,226	1,781	0,344	0,236	12,210	2,403	2,580	0,054	0,095	0,054	0,029	0,014	0,018
Passenger Cars	2001	1,294	0,240	0,202	1,679	0,305	0,211	12,013	2,222	2,437	0,054	0,095	0,055	0,029	0,014	0,017
Passenger Cars	2002	1,135	0,210	0,178	1,471	0,266	0,186	10,635	2,037	2,291	0,052	0,090	0,055	0,026	0,013	0,016
Passenger Cars	2003	1,046	0,180	0,154	1,320	0,226	0,160	9,969	1,833	2,113	0,048	0,085	0,055	0,025	0,012	0,016
Passenger Cars	2004	0,871	0,152	0,131	1,097	0,190	0,136	8,385	1,634	1,934	0,045	0,080	0,054	0,023	0,012	0,016
Passenger Cars	2005	0,834	0,125	0,109	1,024	0,157	0,113	8,367	1,433	1,745	0,041	0,074	0,054	0,023	0,012	0,016
Passenger Cars	2006	0,709	0,101	0,090	0,864	0,127	0,093	7,218	1,235	1,542	0,036	0,067	0,052	0,022	0,011	0,015
Passenger Cars	2007	0,589	0,080	0,072	0,704	0,099	0,074	6,009	1,018	1,300	0,031	0,059	0,049	0,021	0,011	0,014
Passenger Cars	2008	0,533	0,066	0,060	0,622	0,080	0,061	5,492	0,864	1,125	0,026	0,052	0,047	0,022	0,011	0,014

Passenger Cars	2009	0,470	0,055	0,051	0,547	0,068	0,053	4,862	0,753	0,998	0,023	0,047	0,045	0,021	0,010	0,013
Passenger Cars	2010	0,444	0,046	0,043	0,504	0,056	0,044	4,633	0,640	0,862	0,020	0,042	0,042	0,022	0,010	0,012
Light Duty Vehicles	1985	0,758	0,189	0,146	1,073	0,241	0,156	7,118	1,810	2,091	0,001	0,001	0,001	0,487	0,261	0,277
Light Duty Vehicles	1986	0,716	0,184	0,143	1,016	0,232	0,153	6,697	1,763	2,031	0,001	0,001	0,001	0,482	0,264	0,279
Light Duty Vehicles	1987	0,727	0,184	0,143	1,025	0,232	0,153	6,791	1,765	2,033	0,001	0,001	0,001	0,489	0,264	0,279
Light Duty Vehicles	1988	0,678	0,183	0,143	0,988	0,234	0,153	6,361	1,760	2,027	0,001	0,001	0,001	0,451	0,264	0,280
Light Duty Vehicles	1989	0,642	0,179	0,141	0,944	0,228	0,150	6,018	1,727	1,984	0,001	0,001	0,001	0,441	0,266	0,282
Light Duty Vehicles	1990	0,633	0,178	0,140	0,930	0,226	0,149	5,927	1,716	1,971	0,001	0,001	0,001	0,439	0,266	0,282
Light Duty Vehicles	1991	0,669	0,180	0,141	0,967	0,227	0,150	6,251	1,729	1,987	0,001	0,001	0,001	0,462	0,266	0,281
Light Duty Vehicles	1992	0,684	0,186	0,144	1,008	0,238	0,154	6,437	1,780	2,053	0,001	0,001	0,001	0,444	0,263	0,279
Light Duty Vehicles	1993	0,726	0,188	0,145	1,046	0,239	0,155	6,828	1,800	2,078	0,001	0,001	0,001	0,465	0,262	0,277
Light Duty Vehicles	1994	0,701	0,186	0,144	1,031	0,239	0,154	6,617	1,791	2,055	0,001	0,001	0,001	0,451	0,262	0,278
Light Duty Vehicles	1995	0,683	0,179	0,140	0,986	0,227	0,149	6,392	1,679	1,925	0,002	0,002	0,002	0,437	0,248	0,264
Light Duty Vehicles	1996	0,659	0,165	0,132	0,907	0,204	0,140	6,055	1,478	1,699	0,002	0,004	0,003	0,415	0,220	0,237
Light Duty Vehicles	1997	0,576	0,153	0,126	0,793	0,187	0,132	5,230	1,295	1,496	0,003	0,006	0,004	0,341	0,193	0,210
Light Duty Vehicles	1998	0,549	0,144	0,121	0,727	0,172	0,126	4,977	1,152	1,340	0,004	0,008	0,005	0,300	0,168	0,186
Light Duty Vehicles	1999	0,500	0,135	0,116	0,651	0,159	0,120	4,482	1,017	1,194	0,005	0,010	0,006	0,257	0,146	0,165
Light Duty Vehicles	2000	0,465	0,129	0,112	0,566	0,145	0,115	4,187	0,919	1,090	0,007	0,012	0,007	0,222	0,127	0,146
Light Duty Vehicles	2001	0,459	0,124	0,108	0,542	0,137	0,111	4,091	0,830	0,993	0,008	0,014	0,008	0,208	0,111	0,131
Light Duty Vehicles	2002	0,409	0,116	0,103	0,481	0,127	0,105	3,681	0,749	0,906	0,008	0,014	0,009	0,175	0,097	0,117
Light Duty Vehicles	2003	0,375	0,107	0,095	0,432	0,115	0,097	3,369	0,667	0,813	0,007	0,012	0,008	0,158	0,085	0,104
Light Duty Vehicles	2004	0,312	0,097	0,088	0,357	0,104	0,089	2,812	0,586	0,721	0,006	0,011	0,008	0,129	0,074	0,092
Light Duty Vehicles	2005	0,293	0,089	0,081	0,329	0,094	0,082	2,620	0,509	0,631	0,005	0,010	0,008	0,121	0,064	0,082
Light Duty Vehicles	2006	0,257	0,082	0,075	0,285	0,086	0,076	2,252	0,448	0,561	0,005	0,008	0,007	0,107	0,057	0,074
Light Duty Vehicles	2007	0,227	0,074	0,069	0,249	0,078	0,069	1,924	0,410	0,515	0,004	0,007	0,007	0,096	0,051	0,067
Light Duty Vehicles	2008	0,206	0,066	0,061	0,223	0,069	0,062	1,725	0,370	0,468	0,003	0,006	0,006	0,088	0,045	0,060
Light Duty Vehicles	2009	0,191	0,062	0,057	0,205	0,064	0,058	1,633	0,352	0,445	0,003	0,006	0,006	0,081	0,041	0,055
Light Duty Vehicles	2010	0,194	0,058	0,054	0,206	0,060	0,055	1,623	0,335	0,425	0,003	0,006	0,006	0,083	0,039	0,052
Heavy Duty Vehicles	1985	0,865	0,581	0,442	0,865	0,581	0,442	3,120	2,307	2,152	0,003	0,003	0,003	0,479	0,349	0,318
Heavy Duty Vehicles	1986	0,855	0,575	0,438	0,855	0,575	0,438	3,088	2,282	2,127	0,003	0,003	0,003	0,482	0,352	0,320
Heavy Duty Vehicles	1987	0,851	0,572	0,436	0,851	0,572	0,436	3,085	2,279	2,125	0,003	0,003	0,003	0,484	0,353	0,321
Heavy Duty Vehicles	1988	0,843	0,567	0,433	0,843	0,567	0,433	3,079	2,275	2,120	0,003	0,003	0,003	0,488	0,356	0,324
Heavy Duty Vehicles	1989	0,839	0,564	0,431	0,839	0,564	0,431	3,061	2,260	2,106	0,003	0,003	0,003	0,490	0,357	0,325
Heavy Duty Vehicles	1990	0,825	0,556	0,425	0,825	0,556	0,425	3,056	2,257	2,104	0,003	0,003	0,003	0,497	0,362	0,330
Heavy Duty Vehicles	1991	0,829	0,558	0,427	0,829	0,558	0,427	3,063	2,262	2,109	0,003	0,003	0,003	0,496	0,362	0,330
Heavy Duty Vehicles	1992	0,821	0,553	0,424	0,821	0,553	0,424	3,078	2,274	2,122	0,003	0,003	0,003	0,500	0,365	0,332
Heavy Duty Vehicles	1993	0,808	0,545	0,418	0,808	0,545	0,418	3,080	2,277	2,127	0,003	0,003	0,003	0,505	0,368	0,336
Heavy Duty Vehicles	1994	0,788	0,534	0,410	0,788	0,534	0,410	2,999	2,218	2,074	0,003	0,003	0,003	0,500	0,363	0,331

Heavy Duty Vehicles	1995	0,762	0,519	0,399	0,762	0,519	0,399	2,883	2,139	2,003	0,003	0,003	0,003	0,481	0,349	0,317
Heavy Duty Vehicles	1996	0,719	0,492	0,380	0,719	0,492	0,380	2,768	2,063	1,943	0,003	0,003	0,003	0,466	0,336	0,307
Heavy Duty Vehicles	1997	0,671	0,459	0,354	0,671	0,459	0,354	2,628	1,971	1,879	0,003	0,003	0,003	0,431	0,312	0,289
Heavy Duty Vehicles	1998	0,617	0,421	0,323	0,617	0,421	0,323	2,482	1,876	1,818	0,003	0,003	0,003	0,385	0,281	0,266
Heavy Duty Vehicles	1999	0,570	0,387	0,297	0,570	0,387	0,297	2,361	1,798	1,770	0,003	0,003	0,003	0,345	0,255	0,247
Heavy Duty Vehicles	2000	0,533	0,360	0,275	0,533	0,360	0,275	2,280	1,748	1,744	0,003	0,003	0,003	0,317	0,236	0,235
Heavy Duty Vehicles	2001	0,499	0,334	0,254	0,499	0,334	0,254	2,209	1,701	1,705	0,003	0,003	0,003	0,286	0,214	0,217
Heavy Duty Vehicles	2002	0,475	0,315	0,239	0,475	0,315	0,239	2,225	1,711	1,715	0,003	0,003	0,003	0,270	0,202	0,204
Heavy Duty Vehicles	2003	0,453	0,296	0,225	0,453	0,296	0,225	2,228	1,706	1,703	0,003	0,003	0,003	0,256	0,190	0,189
Heavy Duty Vehicles	2004	0,435	0,282	0,214	0,435	0,282	0,214	2,231	1,701	1,691	0,003	0,003	0,003	0,242	0,179	0,175
Heavy Duty Vehicles	2005	0,420	0,269	0,204	0,420	0,269	0,204	2,265	1,719	1,701	0,003	0,003	0,003	0,234	0,171	0,164
Heavy Duty Vehicles	2006	0,403	0,255	0,194	0,403	0,255	0,194	2,277	1,720	1,692	0,003	0,003	0,003	0,223	0,162	0,152
Heavy Duty Vehicles	2007	0,358	0,226	0,172	0,358	0,226	0,172	2,211	1,666	1,619	0,003	0,003	0,003	0,199	0,144	0,133
Heavy Duty Vehicles	2008	0,291	0,184	0,141	0,291	0,184	0,141	2,068	1,554	1,482	0,003	0,003	0,003	0,163	0,118	0,108
Heavy Duty Vehicles	2009	0,245	0,156	0,119	0,245	0,156	0,119	2,003	1,505	1,412	0,003	0,003	0,003	0,140	0,101	0,092
Heavy Duty Vehicles	2010	0,214	0,136	0,105	0,214	0,136	0,105	1,971	1,483	1,375	0,003	0,003	0,003	0,117	0,084	0,077
Buses	1985	1,517	0,973	0,696	1,517	0,973	0,696	5,571	4,331	4,505	0,003	0,003	0,003	0,629	0,411	0,320
Buses	1986	1,509	0,963	0,686	1,509	0,963	0,686	5,493	4,235	4,351	0,003	0,003	0,003	0,629	0,410	0,320
Buses	1987	1,511	0,964	0,688	1,511	0,964	0,688	5,482	4,224	4,340	0,003	0,003	0,003	0,629	0,411	0,320
Buses	1988	1,512	0,965	0,689	1,512	0,965	0,689	5,453	4,191	4,295	0,003	0,003	0,003	0,630	0,412	0,321
Buses	1989	1,506	0,958	0,682	1,506	0,958	0,682	5,398	4,124	4,187	0,003	0,003	0,003	0,630	0,412	0,320
Buses	1990	1,501	0,954	0,676	1,501	0,954	0,676	5,416	4,140	4,200	0,003	0,003	0,003	0,629	0,410	0,319
Buses	1991	1,503	0,956	0,679	1,503	0,956	0,679	5,441	4,169	4,245	0,003	0,003	0,003	0,628	0,410	0,319
Buses	1992	1,510	0,966	0,688	1,510	0,966	0,688	5,537	4,286	4,427	0,003	0,003	0,003	0,628	0,410	0,319
Buses	1993	1,512	0,969	0,690	1,512	0,969	0,690	5,594	4,352	4,522	0,003	0,003	0,003	0,627	0,409	0,319
Buses	1994	1,455	0,954	0,692	1,455	0,954	0,692	5,657	4,536	4,894	0,003	0,003	0,003	0,604	0,397	0,313
Buses	1995	1,349	0,907	0,662	1,349	0,907	0,662	5,659	4,649	5,091	0,003	0,003	0,003	0,568	0,376	0,300
Buses	1996	1,247	0,853	0,625	1,247	0,853	0,625	5,529	4,577	4,992	0,003	0,003	0,003	0,537	0,359	0,289
Buses	1997	1,152	0,801	0,595	1,152	0,801	0,595	5,261	4,385	4,810	0,003	0,003	0,003	0,503	0,340	0,277
Buses	1998	1,049	0,747	0,565	1,049	0,747	0,565	4,968	4,192	4,668	0,003	0,003	0,003	0,455	0,314	0,261
Buses	1999	0,943	0,688	0,530	0,943	0,688	0,530	4,631	3,949	4,453	0,003	0,003	0,003	0,409	0,288	0,245
Buses	2000	0,867	0,647	0,507	0,867	0,647	0,507	4,433	3,819	4,359	0,003	0,003	0,003	0,375	0,269	0,232
Buses	2001	0,813	0,614	0,485	0,813	0,614	0,485	4,244	3,656	4,183	0,003	0,003	0,003	0,335	0,245	0,217
Buses	2002	0,748	0,577	0,463	0,748	0,577	0,463	4,077	3,529	4,070	0,003	0,003	0,003	0,308	0,230	0,206
Buses	2003	0,683	0,532	0,433	0,683	0,532	0,433	3,810	3,273	3,773	0,003	0,003	0,003	0,272	0,206	0,189
Buses	2004	0,639	0,500	0,408	0,639	0,500	0,408	3,642	3,091	3,524	0,003	0,003	0,003	0,257	0,196	0,180
Buses	2005	0,597	0,469	0,386	0,597	0,469	0,386	3,469	2,918	3,312	0,003	0,003	0,003	0,233	0,180	0,167
Buses	2006	0,560	0,442	0,367	0,560	0,442	0,367	3,322	2,769	3,132	0,003	0,003	0,003	0,221	0,171	0,159

Buses	2007	0,515	0,408	0,340	0,515	0,408	0,340	3,125	2,579	2,896	0,003	0,003	0,003	0,204	0,159	0,148
Buses	2008	0,459	0,368	0,311	0,459	0,368	0,311	2,909	2,402	2,703	0,003	0,003	0,003	0,181	0,141	0,132
Buses	2009	0,394	0,320	0,274	0,394	0,320	0,274	2,645	2,174	2,438	0,003	0,003	0,003	0,156	0,123	0,117
Buses	2010	0,337	0,275	0,239	0,337	0,275	0,239	2,456	1,973	2,165	0,003	0,003	0,003	0,135	0,106	0,100
Mopeds	1985	13,691	13,691		14,110	13,838		13,800	13,800		0,001	0,001		0,188	0,188	
Mopeds	1986	13,691	13,691		14,118	13,841		13,800	13,800		0,001	0,001		0,188	0,188	
Mopeds	1987	13,691	13,691		14,115	13,840		13,800	13,800		0,001	0,001		0,188	0,188	
Mopeds	1988	13,691	13,691		14,144	13,850		13,800	13,800		0,001	0,001		0,188	0,188	
Mopeds	1989	13,691	13,691		14,161	13,856		13,800	13,800		0,001	0,001		0,188	0,188	
Mopeds	1990	13,691	13,691		14,151	13,853		13,800	13,800		0,001	0,001		0,188	0,188	
Mopeds	1991	13,691	13,691		14,131	13,846		13,800	13,800		0,001	0,001		0,188	0,188	
Mopeds	1992	13,691	13,691		14,135	13,847		13,800	13,800		0,001	0,001		0,188	0,188	
Mopeds	1993	13,691	13,691		14,106	13,837		13,800	13,800		0,001	0,001		0,188	0,188	
Mopeds	1994	13,691	13,691		14,124	13,843		13,800	13,800		0,001	0,001		0,188	0,188	
Mopeds	1995	13,691	13,691		14,125	13,844		13,800	13,800		0,001	0,001		0,188	0,188	
Mopeds	1996	13,691	13,691		14,108	13,838		13,800	13,800		0,001	0,001		0,188	0,188	
Mopeds	1997	13,691	13,691		14,131	13,846		13,800	13,800		0,001	0,001		0,188	0,188	
Mopeds	1998	13,691	13,691		14,111	13,839		13,800	13,800		0,001	0,001		0,188	0,188	
Mopeds	1999	13,691	13,691		14,157	13,855		13,800	13,800		0,001	0,001		0,188	0,188	
Mopeds	2000	12,563	12,563		12,948	12,699		12,960	12,960		0,001	0,001		0,176	0,176	
Mopeds	2001	11,773	11,773		12,193	11,921		12,371	12,371		0,001	0,001		0,168	0,168	
Mopeds	2002	10,937	10,937		11,368	11,089		11,748	11,748		0,001	0,001		0,160	0,160	
Mopeds	2003	10,520	10,520		10,948	10,671		11,437	11,437		0,001	0,001		0,156	0,156	
Mopeds	2004	9,924	9,924		10,353	10,075		10,776	10,776		0,001	0,001		0,148	0,148	
Mopeds	2005	9,299	9,299		9,766	9,464		10,085	10,085		0,001	0,001		0,140	0,140	
Mopeds	2006	8,636	8,636		9,119	8,806		9,353	9,353		0,001	0,001		0,131	0,131	
Mopeds	2007	8,023	8,023		8,496	8,190		8,669	8,669		0,001	0,001		0,123	0,123	
Mopeds	2008	7,588	7,588		8,047	7,749		8,189	8,189		0,001	0,001		0,118	0,118	
Mopeds	2009	7,169	7,169		7,637	7,334		7,727	7,727		0,001	0,001		0,112	0,112	
Mopeds	2010	6,817	6,817		7,261	6,973		7,342	7,342		0,001	0,001		0,108	0,108	
Motorcycles	1985	1,426	1,186	1,588	2,189	1,401	1,624	18,848	19,069	24,147	0,002	0,002	0,002	0,047	0,047	0,047
Motorcycles	1986	1,426	1,186	1,588	2,196	1,403	1,624	18,848	19,069	24,147	0,002	0,002	0,002	0,047	0,047	0,047
Motorcycles	1987	1,426	1,186	1,588	2,192	1,401	1,624	18,848	19,069	24,147	0,002	0,002	0,002	0,047	0,047	0,047
Motorcycles	1988	1,426	1,186	1,588	2,226	1,410	1,625	18,848	19,069	24,147	0,002	0,002	0,002	0,047	0,047	0,047
Motorcycles	1989	1,426	1,186	1,588	2,244	1,414	1,625	18,848	19,069	24,147	0,002	0,002	0,002	0,047	0,047	0,047
Motorcycles	1990	1,426	1,186	1,588	2,241	1,412	1,625	18,848	19,069	24,147	0,002	0,002	0,002	0,047	0,047	0,047
Motorcycles	1991	1,426	1,186	1,588	2,228	1,408	1,624	18,848	19,069	24,147	0,002	0,002	0,002	0,047	0,047	0,047
Motorcycles	1992	1,426	1,186	1,588	2,238	1,410	1,624	18,848	19,069	24,147	0,002	0,002	0,002	0,047	0,047	0,047

Motorcycles	1993	1,426	1,186	1,588	2,204	1,400	1,623	18,848	19,069	24,147	0,002	0,002	0,002	0,047	0,047	0,047
Motorcycles	1994	1,426	1,186	1,588	2,234	1,407	1,624	18,848	19,069	24,147	0,002	0,002	0,002	0,047	0,047	0,047
Motorcycles	1995	1,426	1,186	1,588	2,236	1,407	1,623	18,848	19,069	24,147	0,002	0,002	0,002	0,047	0,047	0,047
Motorcycles	1996	1,426	1,186	1,588	2,218	1,402	1,622	18,848	19,069	24,147	0,002	0,002	0,002	0,047	0,047	0,047
Motorcycles	1997	1,426	1,186	1,588	2,262	1,413	1,624	18,848	19,069	24,147	0,002	0,002	0,002	0,047	0,047	0,047
Motorcycles	1998	1,426	1,186	1,588	2,241	1,406	1,623	18,848	19,069	24,147	0,002	0,002	0,002	0,047	0,047	0,047
Motorcycles	1999	1,426	1,186	1,588	2,278	1,416	1,624	18,848	19,069	24,147	0,002	0,002	0,002	0,047	0,047	0,047
Motorcycles	2000	1,503	1,232	1,624	2,181	1,415	1,653	18,476	18,693	23,725	0,002	0,002	0,002	0,047	0,047	0,047
Motorcycles	2001	1,511	1,228	1,600	2,188	1,409	1,628	18,260	18,455	23,434	0,002	0,002	0,002	0,046	0,046	0,046
Motorcycles	2002	1,519	1,223	1,575	2,220	1,408	1,603	18,047	18,219	23,145	0,002	0,002	0,002	0,045	0,045	0,045
Motorcycles	2003	1,524	1,216	1,548	2,226	1,402	1,577	17,851	18,002	22,877	0,002	0,002	0,002	0,044	0,044	0,044
Motorcycles	2004	1,498	1,193	1,513	2,224	1,385	1,542	17,330	17,497	22,330	0,002	0,002	0,002	0,043	0,043	0,043
Motorcycles	2005	1,485	1,178	1,484	2,272	1,386	1,516	16,604	16,797	21,579	0,002	0,002	0,002	0,041	0,041	0,041
Motorcycles	2006	1,475	1,165	1,458	2,300	1,383	1,491	15,823	16,046	20,773	0,002	0,002	0,002	0,040	0,040	0,040
Motorcycles	2007	1,424	1,132	1,420	2,249	1,348	1,453	14,954	15,190	19,752	0,002	0,002	0,002	0,038	0,038	0,038
Motorcycles	2008	1,380	1,099	1,379	2,200	1,313	1,411	14,464	14,697	19,156	0,002	0,002	0,002	0,037	0,037	0,037
Motorcycles	2009	1,337	1,065	1,334	2,182	1,285	1,367	14,245	14,467	18,862	0,002	0,002	0,002	0,035	0,035	0,035
Motorcycles	2010	1,296	1,031	1,288	2,109	1,243	1,320	14,103	14,310	18,655	0,002	0,002	0,002	0,034	0,034	0,034

Annex 2B-8: Fuel consumption (GJ) and emissions (tonne) 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	65,6	1657	53694	69153	1756	530222	4792	171	47	1672
Passenger Cars	1986	66,3	1116	54682	69163	1780	502728	4845	174	48	1695
Passenger Cars	1987	66,5	1114	55580	68858	1803	478298	4858	176	48	1658
Passenger Cars	1988	67,3	1133	57253	68847	1831	441728	4919	180	50	1605
Passenger Cars	1989	66,7	823	57248	67317	1815	410172	4876	179	49	1561
Passenger Cars	1990	70,8	881	61299	70630	1931	416786	5176	191	53	1622
Passenger Cars	1991	75,3	924	63019	72507	2006	432028	5505	208	166	1646
Passenger Cars	1992	78,7	652	61810	70857	1989	414275	5751	231	398	1540
Passenger Cars	1993	80,7	356	59406	67515	1942	398195	5898	248	618	1466
Passenger Cars	1994	83,6	372	56202	63295	1849	365718	6112	271	929	1374
Passenger Cars	1995	84,3	372	51422	57853	1711	343506	6165	288	1220	1245
Passenger Cars	1996	85,1	373	47170	53176	1588	331359	6224	302	1477	1140
Passenger Cars	1997	87,3	380	43810	47947	1489	296092	6380	314	1842	1005
Passenger Cars	1998	89,0	389	39871	42437	1391	273244	6508	312	2222	891
Passenger Cars	1999	89,6	307	35944	36797	1280	238468	6549	307	2506	810
Passenger Cars	2000	89,2	204	32784	30394	1182	215843	6519	300	2682	742
Passenger Cars	2001	88,6	203	30416	27907	1091	206787	6479	287	2659	707
Passenger Cars	2002	89,8	206	28568	24736	996	187506	6567	278	2601	656
Passenger Cars	2003	91,9	211	26870	22407	914	177974	6721	269	2519	659
Passenger Cars	2004	92,7	213	24891	18936	818	154698	6783	259	2424	634
Passenger Cars	2005	91,8	42	22323	16936	714	147170	6718	239	2211	625
Passenger Cars	2006	92,3	42	20147	14286	619	128092	6748	225	2045	604
Passenger Cars	2007	97,0	44	19083	12146	538	112065	7091	223	1900	608
Passenger Cars	2008	98,0	45	17761	10681	465	101924	7172	217	1726	614
Passenger Cars	2009	95,3	44	16233	9123	398	88048	6970	206	1548	571
Passenger Cars	2010	94,8	43	15372	8218	344	81554	6879	202	1376	574
Light Duty Vehicles	1985	12,7	2503	5966	2081	108	14785	941	5	5	1351
Light Duty Vehicles	1986	14,6	1747	6772	2277	121	16165	1081	5	5	1552
Light Duty Vehicles	1987	15,4	1831	7105	2397	127	17079	1133	5	5	1637
Light Duty Vehicles	1988	15,8	1886	7282	2414	131	16881	1166	6	6	1627
Light Duty Vehicles	1989	16,4	1317	7487	2411	133	16795	1210	6	6	1679
Light Duty Vehicles	1990	17,6	1414	7995	2547	142	17762	1296	6	6	1797
Light Duty Vehicles	1991	18,2	1462	8326	2705	148	19031	1344	6	6	1900
Light Duty Vehicles	1992	18,1	936	8372	2806	151	19505	1336	7	6	1845

Light Duty Vehicles	1993	18,6	373	8659	2952	156	20837	1374	7	7	1930
Light Duty Vehicles	1994	20,0	401	9245	3134	167	21866	1473	7	7	2046
Light Duty Vehicles	1995	20,0	403	9086	3013	160	21049	1478	9	12	1971
Light Duty Vehicles	1996	20,4	412	8917	2824	150	19934	1505	13	22	1857
Light Duty Vehicles	1997	20,6	418	8708	2577	141	17792	1525	17	32	1623
Light Duty Vehicles	1998	21,2	426	8654	2443	135	17123	1563	22	43	1471
Light Duty Vehicles	1999	21,6	242	8575	2279	125	15810	1597	27	56	1314
Light Duty Vehicles	2000	22,0	51	8525	2067	114	15003	1626	33	69	1171
Light Duty Vehicles	2001	21,8	51	8260	1955	101	14198	1609	37	77	1054
Light Duty Vehicles	2002	22,5	52	8151	1827	92	13273	1661	42	82	942
Light Duty Vehicles	2003	24,4	57	8313	1794	84	13133	1801	48	81	914
Light Duty Vehicles	2004	26,3	61	8386	1669	76	12131	1945	54	79	843
Light Duty Vehicles	2005	28,1	13	8367	1632	65	11831	2078	60	74	817
Light Duty Vehicles	2006	30,3	14	8468	1561	56	11101	2241	67	70	785
Light Duty Vehicles	2007	31,7	15	8184	1453	49	10164	2340	72	63	741
Light Duty Vehicles	2008	30,1	14	7007	1227	38	8663	2220	69	53	635
Light Duty Vehicles	2009	28,3	13	6187	1069	32	7728	2087	65	49	549
Light Duty Vehicles	2010	27,6	13	5753	1015	28	7362	2038	64	45	523
Heavy Duty Vehicles	1985	25,0	5837	24341	1474	199	5972	1852	73	7	902
Heavy Duty Vehicles	1986	28,2	3951	27421	1628	225	6599	2088	81	8	1015
Heavy Duty Vehicles	1987	27,7	3875	26876	1580	221	6429	2047	79	8	994
Heavy Duty Vehicles	1988	27,2	3806	26381	1522	217	6231	2011	77	8	973
Heavy Duty Vehicles	1989	28,3	2643	27461	1570	226	6421	2093	80	8	1012
Heavy Duty Vehicles	1990	29,1	2719	28191	1560	232	6473	2154	81	8	1036
Heavy Duty Vehicles	1991	29,6	2763	28678	1596	235	6608	2189	83	8	1054
Heavy Duty Vehicles	1992	29,0	1763	28112	1534	232	6449	2148	80	8	1031
Heavy Duty Vehicles	1993	28,1	656	27093	1440	224	6154	2079	76	8	993
Heavy Duty Vehicles	1994	30,0	701	28517	1506	241	6412	2220	82	8	1048
Heavy Duty Vehicles	1995	30,2	706	27894	1503	247	6358	2234	84	8	1035
Heavy Duty Vehicles	1996	31,0	725	27668	1462	255	6297	2293	86	9	1026
Heavy Duty Vehicles	1997	31,5	737	27513	1399	258	6183	2331	89	9	980
Heavy Duty Vehicles	1998	32,0	748	27597	1320	257	6078	2365	91	9	913
Heavy Duty Vehicles	1999	33,2	427	28381	1272	261	6117	2457	96	10	871
Heavy Duty Vehicles	2000	32,1	75	27164	1140	245	5745	2372	92	9	780
Heavy Duty Vehicles	2001	33,2	78	27613	1107	248	5835	2455	96	10	742
Heavy Duty Vehicles	2002	33,0	77	26640	1029	240	5778	2444	95	10	689
Heavy Duty Vehicles	2003	34,8	81	27034	1016	248	6027	2572	99	10	676

Heavy Duty Vehicles	2004	36,0	84	27088	1000	253	6200	2662	103	10	653
Heavy Duty Vehicles	2005	36,5	17	26536	959	251	6266	2700	103	10	623
Heavy Duty Vehicles	2006	39,0	18	27315	969	260	6656	2883	109	11	624
Heavy Duty Vehicles	2007	40,9	19	26824	895	239	6705	3025	114	11	577
Heavy Duty Vehicles	2008	38,4	18	22966	684	179	5840	2842	107	11	442
Heavy Duty Vehicles	2009	32,7	15	18088	491	124	4777	2417	91	9	321
Heavy Duty Vehicles	2010	33,8	16	17594	445	111	4866	2498	94	9	279
Buses	1985	7,0	1622	7041	713	74	2939	521	17	2	300
Buses	1986	7,6	1047	7568	761	79	3099	561	19	2	322
Buses	1987	7,4	1026	7419	746	77	3028	549	18	2	316
Buses	1988	7,5	1031	7455	749	78	3016	551	19	2	317
Buses	1989	7,6	704	7630	762	79	3044	564	19	2	324
Buses	1990	8,1	751	8133	810	85	3267	602	20	2	345
Buses	1991	8,2	752	8150	813	85	3295	604	20	2	346
Buses	1992	7,8	467	7785	783	81	3227	577	19	2	331
Buses	1993	7,9	182	7874	795	82	3314	584	20	2	334
Buses	1994	8,4	194	8273	833	88	3686	624	21	2	349
Buses	1995	8,7	200	8325	823	93	3954	647	22	2	347
Buses	1996	9,2	209	8492	813	98	4129	678	24	2	349
Buses	1997	9,1	208	8285	761	97	3966	673	24	2	331
Buses	1998	8,9	203	7996	698	92	3757	657	24	2	301
Buses	1999	8,6	109	7652	628	87	3483	638	24	2	270
Buses	2000	8,3	19	7282	566	81	3254	614	23	2	243
Buses	2001	8,3	19	7195	532	79	3108	612	23	2	219
Buses	2002	8,3	19	6992	494	76	2986	611	23	2	203
Buses	2003	8,7	20	7135	477	77	2919	643	24	2	190
Buses	2004	8,9	21	7103	455	75	2821	657	24	2	183
Buses	2005	8,8	4	6861	422	72	2644	649	24	2	166
Buses	2006	8,7	4	6658	394	69	2498	645	24	2	156
Buses	2007	8,9	4	6551	369	66	2371	657	25	2	147
Buses	2008	8,5	4	5960	318	56	2119	629	24	2	125
Buses	2009	8,2	4	5435	266	46	1858	608	23	2	105
Buses	2010	8,4	4	5279	234	41	1742	624	23	2	93
Mopeds	1985	0,4	1	7	4929	77	4858	28	0	0	66
Mopeds	1986	0,3	1	6	4424	69	4359	25	0	0	59
Mopeds	1987	0,3	1	6	4095	64	4035	23	0	0	55
Mopeds	1988	0,3	1	5	3855	60	3793	22	0	0	52

Mopeds	1989	0,3	1	5	3660	57	3598	21	0	0	49
Mopeds	1990	0,3	1	5	3722	58	3660	21	0	0	50
Mopeds	1991	0,3	1	5	3820	60	3761	22	0	0	51
Mopeds	1992	0,3	1	5	3844	60	3784	22	0	0	52
Mopeds	1993	0,3	1	5	3806	60	3752	22	0	0	51
Mopeds	1994	0,3	1	5	3745	59	3689	21	0	0	50
Mopeds	1995	0,3	1	6	3992	62	3931	23	0	0	54
Mopeds	1996	0,3	1	6	4247	66	4186	24	0	0	57
Mopeds	1997	0,4	1	7	4614	72	4542	26	0	0	62
Mopeds	1998	0,4	1	7	4972	78	4900	28	0	0	67
Mopeds	1999	0,4	1	6	4519	71	4443	26	0	0	61
Mopeds	2000	0,3	1	6	3987	62	4021	24	0	0	55
Mopeds	2001	0,3	1	5	3046	48	3118	19	0	0	42
Mopeds	2002	0,3	1	5	2984	46	3115	19	0	0	42
Mopeds	2003	0,3	1	5	2841	44	2998	19	0	0	41
Mopeds	2004	0,2	1	9	2636	41	2774	18	0	0	38
Mopeds	2005	0,2	0	13	2445	38	2557	17	0	0	35
Mopeds	2006	0,2	0	17	2276	35	2367	16	0	0	33
Mopeds	2007	0,2	0	21	2128	33	2203	16	0	0	31
Mopeds	2008	0,2	0	24	1981	30	2046	15	0	0	29
Mopeds	2009	0,2	0	25	1801	27	1852	14	0	0	27
Mopeds	2010	0,2	0	26	1624	25	1669	13	0	0	24
Motorcycles	1985	0,4	1	71	628	67	6792	32	1	1	16
Motorcycles	1986	0,4	1	71	630	67	6799	32	1	1	16
Motorcycles	1987	0,4	1	69	614	65	6636	31	1	1	16
Motorcycles	1988	0,4	1	70	628	66	6722	32	1	1	16
Motorcycles	1989	0,4	1	69	620	65	6606	31	1	1	16
Motorcycles	1990	0,5	1	74	665	70	7099	33	1	1	17
Motorcycles	1991	0,5	1	76	681	72	7299	34	1	1	17
Motorcycles	1992	0,5	1	82	731	77	7818	37	1	1	19
Motorcycles	1993	0,5	1	87	765	81	8277	39	1	1	20
Motorcycles	1994	0,6	1	92	819	86	8783	41	1	1	21
Motorcycles	1995	0,6	1	93	821	86	8807	41	1	1	21
Motorcycles	1996	0,6	1	93	822	87	8876	42	1	1	21
Motorcycles	1997	0,6	1	97	868	91	9248	43	1	1	22
Motorcycles	1998	0,6	1	101	894	94	9595	45	1	1	23
Motorcycles	1999	0,6	1	103	915	95	9718	46	1	1	23

Motorcycles	2000	0,7	1	108	926	97	9873	48	1	1	24
Motorcycles	2001	0,7	2	111	930	97	9812	48	1	1	24
Motorcycles	2002	0,7	2	115	954	99	9901	50	1	1	24
Motorcycles	2003	0,7	2	117	957	98	9836	50	1	1	23
Motorcycles	2004	0,7	2	118	945	97	9511	50	1	1	23
Motorcycles	2005	0,7	0	123	971	97	9294	52	1	1	22
Motorcycles	2006	0,7	0	132	1022	99	9315	54	1	1	22
Motorcycles	2007	0,8	0	138	1055	100	9331	57	1	1	22
Motorcycles	2008	0,8	0	140	1060	101	9298	59	1	1	22
Motorcycles	2009	0,8	0	135	1001	95	8783	57	1	1	21
Motorcycles	2010	0,8	0	136	976	96	8780	57	1	1	20
Total	1985	111,2	11621	91119	78978	2281	565567	8165	267	61	4307
Total	1986	117,5	7862	96521	78883	2341	539748	8631	280	64	4659
Total	1987	117,7	7847	97055	78290	2357	515504	8642	280	64	4675
Total	1988	118,4	7857	98447	78014	2382	478371	8700	283	66	4589
Total	1989	119,7	5488	99900	76340	2375	446637	8795	285	66	4641
Total	1990	126,3	5767	105699	79934	2518	455048	9282	299	70	4867
Total	1991	132,0	5903	108255	82122	2605	472022	9697	318	183	5014
Total	1992	134,4	3820	106166	80556	2590	455058	9870	338	415	4817
Total	1993	136,1	1569	103124	77271	2544	440529	9995	352	635	4794
Total	1994	142,9	1669	102335	73332	2489	410153	10491	383	948	4887
Total	1995	144,2	1682	96825	68005	2359	387606	10588	405	1244	4671
Total	1996	146,6	1721	92346	63344	2245	374781	10766	426	1511	4451
Total	1997	149,5	1744	88420	58165	2147	337823	10978	446	1886	4023
Total	1998	152,0	1768	84227	52763	2047	314697	11167	451	2278	3666
Total	1999	154,0	1088	80661	46410	1919	278038	11312	455	2575	3348
Total	2000	152,5	352	75869	39079	1783	253738	11203	449	2764	3015
Total	2001	152,8	353	73599	35477	1664	242858	11223	445	2749	2787
Total	2002	154,5	357	70472	32024	1549	222559	11352	438	2696	2556
Total	2003	160,6	371	69474	29492	1465	212885	11806	442	2613	2502
Total	2004	164,8	381	67595	25642	1359	188134	12115	442	2517	2374
Total	2005	166,1	77	64224	23365	1237	179761	12214	428	2299	2287
Total	2006	171,3	79	62738	20509	1139	160030	12587	426	2130	2224
Total	2007	179,5	83	60801	18046	1025	142838	13187	434	1979	2126
Total	2008	176,0	81	53858	15951	869	129890	12937	417	1793	1868
Total	2009	165,5	76	46103	13751	723	113046	12154	386	1610	1594
Total	2010	165,6	76	44159	12514	644	105972	12108	385	1433	1513

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
Fuel ratio	Gasoline	DEA:COPERT IV	1,03	0,98	1,02	1,08	1,11	1,13	1,11	1,09	1,10	1,11	1,09
	Diesel	DEA:COPERT IV	1,19	1,30	1,33	1,29	1,29	1,37	1,36	1,37	1,39	1,38	1,37
Consumption													
Fuel ratio	Gasoline	DEA:COPERT IV	1,07	1,08	1,07	1,08	1,09	1,10	1,10	1,10	1,11	1,12	1,14
	Diesel	DEA:COPERT IV	1,11	1,19	1,27	1,24	1,23	1,27	1,25	1,25	1,27	1,26	1,25

Continued

Sales			2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Fuel ratio	Gasoline	DEA:COPERT IV	1,11	1,10	1,11	1,11	1,09	1,08	1,07	1,08	1,07	1,08	1,06
	Diesel	DEA:COPERT IV	1,32	1,32	1,31	1,37	1,40	1,37	1,35	1,37	1,32	1,27	1,29
Consumption													
Fuel ratio	Gasoline	DEA:COPERT IV	1,16	1,14	1,14	1,13	1,11	1,10	1,09	1,08	1,07	1,09	1,08
	Diesel	DEA:COPERT IV	1,22	1,23	1,21	1,23	1,25	1,24	1,23	1,23	1,19	1,15	1,18

Annex 2B-10: Basis fuel consumption and emission factors, deterioration factors, transient factors and specific operational 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)	0.27	20
650 (>=50 kW and >10 years old)		
650 (<50 kW)		

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

Annex 2B-11: Stock data for non-road working machinery and equipment

Stock data for diesel tractors 1985-2010.

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
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															
186	1991-Stage I															23
186	Stage I															
186	Stage II															
186	Stage IIIA															

Size (kW)	Emission Level	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2009	2010
37	<1981	1601	1449	1298	1148	993	833	664	504	342	176	176	
37	1981-1990	871	876	882	892	900	906	903	914	930	959	959	991
37	1991-Stage I	568	572	576	582	587	592	590	597	607	626	626	647
37	Stage I		33	56	83	84	84	84	85	86	89	89	92
37	Stage II					23	53	162	324	330	340	340	351
37	Stage IIIA									109	205	205	333
45	<1981	10715	9700	8690	7685	6646	5577	4447	3376	2290	1180	1180	
45	1981-1990	8681	8731	8800	8894	8974	9037	9006	9116	9274	9563	9563	9883
45	1991-Stage I	199	200	202	204	206	207	207	209	213	219	219	227
49	1991-Stage I	750	754	760	768	775	780	778	787	801	826	826	853
52	1991-Stage I	358	360	363	367	370	373	372	376	383	395	395	408
52	Stage I		132	242	377	381	383	382	387	393	406	406	419
52	Stage II					68	147	241	347	353	364	364	377
52	Stage IIIA									86	133	133	202
56	1991-Stage I	1281	1289	1299	1313	1325	1334	1329	1346	1369	1412	1412	1459
60	<1981	22533	20397	18273	16162	13976	11729	9351	7099	4815	2482	2482	
60	1981-1990	20333	20451	20612	20834	21019	21167	21096	21353	21723	22401	22401	23150
60	1991-Stage I	845	850	856	866	873	879	876	887	903	931	931	962
63	1991-Stage I	3015	3033	3057	3090	3117	3139	3128	3167	3221	3322	3322	3433
67	1991-Stage I	1343	1351	1361	1376	1388	1398	1393	1410	1435	1479	1479	1529
67	Stage I		533	835	1113	1123	1131	1127	1141	1161	1197	1197	1237
67	Stage II					375	729	1144	1524	1550	1599	1599	1652
67	Stage IIIA									303	472	472	658
71	1991-Stage I	3600	3620	3649	3688	3721	3747	3735	3780	3846	3966	3966	4098
78	<1981	6002	5433	4868	4305	3723	3124	2491	1891	1283	661	661	
78	1981-1990	11208	11273	11361	11484	11586	11668	11628	11770	11974	12348	12348	12761
78	1991-Stage I	3436	3727	3756	3797	3830	3857	3844	3891	3959	4082	4082	4219
78	Stage I			325	329	332	334	333	337	343	354	354	365
78	Stage II				227	310	400	463	469	477	492	492	508
78	Stage IIIA								63	121	147	147	183
86	1991-Stage I	1876	2023	2039	2061	2079	2094	2087	2112	2149	2216	2216	2290
86	Stage I			134	136	137	138	137	139	142	146	146	151
86	Stage II				91	343	530	760	769	783	807	807	834
86	Stage IIIA								226	434	529	529	657
93	1991-Stage I	245	325	327	331	334	336	335	339	345	356	356	368
93	Stage I			114	115	116	117	116	118	120	123	123	128

93	Stage II				107	186	313	512	518	527	544	544	562
93	Stage IIIA								264	470	574	574	682
97	1991-Stage I	2642	2657	2678	2707	2731	2750	2741	2774	2822	2911	2911	3008
101	<1981	1921	1739	1558	1378	1191	1000	797	605	410	212	212	
101	1981-1990	2353	2367	2385	2411	2432	2449	2441	2471	2514	2592	2592	2679
101	1991-Stage I	1116	1567	1579	1596	1611	1622	1616	1636	1664	1716	1716	1774
101	Stage I			232	234	236	238	237	240	244	252	252	260
101	Stage II				136	357	635	776	785	799	824	824	851
101	Stage IIIA								188	336	410	410	487
112	1991-Stage I	1265	1626	1639	1656	1671	1683	1677	1698	1727	1781	1781	1841
112	Stage I			465	470	474	478	476	482	490	505	505	522
112	Stage II				337	732	1170	1763	1785	1815	1872	1872	1935
112	Stage IIIA								378	663	823	823	971
127	1991-Stage I	707	847	854	863	871	877	874	884	900	928	928	959
127	Stage I			152	154	155	156	156	158	161	166	166	171
127	Stage II				78	268	453	591	599	609	628	628	649
127	Stage IIIA								292	675	880	880	1048
131	<1981	329	298	267	236	204	171	137	104	70	36	36	
131	1981-1990	878	883	890	899	907	914	911	922	938	967	967	999
131	1991-Stage I	95	96	96	97	98	99	99	100	102	105	105	108
157	1981-1990	15	15	15	15	16	16	16	16	16	17	17	17
157	1991-Stage I	900	905	912	922	930	937	934	945	961	991	991	1025
157	Stage I		89	89	90	91	92	91	92	94	97	97	100
157	Stage II			149	415	695	1089	1085	1098	1117	1152	1152	1191
157	Stage IIIA							623	1453	2140	2586	2586	3047
186	1991-Stage I	53	54	54	55	55	56	55	56	57	59	59	61
186	Stage I		47	48	48	49	49	49	49	50	52	52	54
186	Stage II			68	207	320	481	480	486	494	509	509	526
186	Stage IIIA							272	685	1103	1427	1427	1665

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

Size (kW)	Emission Level	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 1985-2010.

Size Group	Emission Level	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
0<S<=50	<1981	26601	24394	22599	22144	19842	18915	17241	15607	14575	12673	10700	9491	6966	5446	3589
0<S<=50	1981-1990	519	534	550	582	566	591	594	601	635	636	633	683	641	686	672
50<S<=60	<1981	2703	2648	2634	2785	2711	2828	2847	2876	3040	3044	3029	3271	3068	2930	2235
50<S<=60	1981-1990	853	1102	1164	1275	1258	1333	1341	1355	1432	1434	1427	1541	1446	1548	1516
50<S<=60	1991-Stage I							8	8	8	8	8	9	9	9	9
60<S<=70	<1981	1786	1750	1741	1841	1792	1869	1881	1901	2009	2012	2002	2162	2028	2171	2127
60<S<=70	1981-1990	1138	1679	1943	2237	2213	2348	2363	2388	2524	2527	2515	2716	2547	2727	2671
60<S<=70	1991-Stage I							8	16	18	21	22	24	23	24	24
70<S<=80	<1981	929	910	905	958	932	972	979	989	1045	1046	1041	1125	1055	1129	1106
70<S<=80	1981-1990	383	699	1026	1165	1318	1493	1502	1518	1604	1606	1598	1726	1619	1733	1698
70<S<=80	1991-Stage I							72	77	83	86	87	96	91	98	96
70<S<=80	Stage I															1
80<S<=90	<1981	323	317	315	333	324	338	340	344	363	364	362	391	367	393	385
80<S<=90	1981-1990	383	562	645	967	1107	1466	1475	1491	1575	1577	1570	1695	1590	1702	1667
80<S<=90	1991-Stage I							61	158	181	200	200	217	207	222	217
80<S<=90	Stage I															1
90<S<=100	1981-1990	89	175	235	387	515	670	674	681	720	721	717	775	726	778	762
90<S<=100	1991-Stage I							180	257	320	329	351	382	367	393	385
90<S<=100	Stage I															1
100<S<=120	1981-1990		54	106	219	334	589	592	599	633	634	630	681	639	684	670
100<S<=120	1991-Stage I							129	253	316	375	440	567	586	673	660
100<S<=120	Stage I															2
120<S<=140	1981-1990				4	69	183	184	186	197	197	196	212	199	213	208
120<S<=140	1991-Stage I							70	148	189	215	319	484	626	804	860
120<S<=140	Stage I															21

120<S<=140	Stage II											
120<S<=140	Stage IIIA											
140<S<=160	1991-Stage I							8	36	69	112	271	354	554	632
140<S<=160	Stage II											
140<S<=160	Stage IIIA											
160<S<=180	1991-Stage I										26	69	200	374	440
160<S<=180	Stage II											
160<S<=180	Stage IIIA											
180<S<=200	1991-Stage I											20	67	117	193
180<S<=200	Stage II											
180<S<=200	Stage IIIA											
200<S<=220	1991-Stage I													45	92
200<S<=220	Stage II											
200<S<=220	Stage IIIA											
220<S<=240	1991-Stage I														3
220<S<=240	Stage II											
220<S<=240	Stage IIIA											
240<S<=260	1991-Stage I														3
240<S<=260	Stage II											
240<S<=260	Stage IIIA											
260<S<=280	1991-Stage I														14
260<S<=280	Stage II											
260<S<=280	Stage IIIA											
280<S<=300	1991-Stage I											
280<S<=300	Stage II											
280<S<=300	Stage IIIA											
300<S<=320	Stage II											
300<S<=320	Stage IIIA											

Size Group	Emission Level	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
0<S<=50	<1981	2873	1854	1275	754	269						
0<S<=50	1981-1990	715	758	778	816	882	913	779	628	448	268	78
50<S<=60	<1981	1999	1570	1260	897	391						
50<S<=60	1981-1990	1612	1711	1755	1841	1990	2060	1856	1645	1335	1034	730
50<S<=60	1991-Stage I	10	10	10	11	12	12	12	12	12	12	13
60<S<=70	<1981	2073	1648	1340	981	482						
60<S<=70	1981-1990	2841	3014	3093	3243	3506	3630	3344	3062	2659	2284	1922
60<S<=70	1991-Stage I	25	27	27	29	31	32	32	32	32	33	35

70<S<=80	<1981	1176	1248	1105	735	216						
70<S<=80	1981-1990	1806	1916	1966	2061	2229	2307	2164	2043	1939	1862	1813
70<S<=80	1991-Stage I	102	109	112	117	126	131	130	129	131	134	141
70<S<=80	Stage I	1	1	1	1	1	1	1	1	1	1	2
80<S<=90	<1981	409	434	445	467	216						
80<S<=90	1981-1990	1773	1881	1931	2024	2189	2266	2123	2002	1897	1819	1768
80<S<=90	1991-Stage I	231	245	252	264	285	295	294	292	295	303	317
80<S<=90	Stage I	1	1	1	1	1	1	1	1	1	1	2
90<S<=100	1981-1990	810	860	882	925	1000	1035	1031	1023	986	964	957
90<S<=100	1991-Stage I	410	435	446	468	506	524	521	518	523	538	563
90<S<=100	Stage I	1	1	1	1	1	1	1	1	1	1	2
100<S<=120	1981-1990	712	756	775	813	879	910	906	900	909	934	978
100<S<=120	1991-Stage I	702	744	764	801	866	896	892	886	896	920	963
100<S<=120	Stage I	2	2	2	3	3	3	3	3	3	3	3
120<S<=140	1981-1990	222	235	241	253	274	283	282	280	283	291	304
120<S<=140	1991-Stage I	918	977	1003	1051	1137	1177	1172	1163	1176	1208	1264
120<S<=140	Stage I	26	31	32	33	36	37	37	37	37	38	40
120<S<=140	Stage II					3	4	4	4	4	4	4
120<S<=140	Stage IIIA							1	1	1	4	5
140<S<=160	1991-Stage I	715	795	816	855	925	957	953	946	957	983	1028
140<S<=160	Stage II			20	35	48	56	56	56	56	58	60
140<S<=160	Stage IIIA							5	8	12	16	18
160<S<=180	1991-Stage I	533	602	618	648	700	725	722	716	724	744	779
160<S<=180	Stage II			40	70	91	105	105	104	105	108	113
160<S<=180	Stage IIIA							9	14	20	24	27
180<S<=200	1991-Stage I	249	300	308	323	349	362	360	357	361	371	389
180<S<=200	Stage II			61	91	114	129	128	127	129	132	138
180<S<=200	Stage IIIA							9	14	20	24	27
200<S<=220	1991-Stage I	142	187	192	201	218	225	224	223	225	231	242
200<S<=220	Stage II			40	70	91	105	105	104	105	108	113
200<S<=220	Stage IIIA							9	14	20	24	27
220<S<=240	1991-Stage I	48	151	155	162	175	181	181	179	181	186	195
220<S<=240	Stage II			72	114	164	221	220	219	221	227	238
220<S<=240	Stage IIIA							61	123	196	237	276
240<S<=260	1991-Stage I	71	142	145	152	165	170	170	169	170	175	183
240<S<=260	Stage II			72	125	201	301	299	297	301	309	323
240<S<=260	Stage IIIA							113	232	371	450	525

260<S<=280	1991-Stage I	61	131	134	140	152	157	157	155	157	161	169
260<S<=280	Stage II			72	125	201	301	299	297	301	309	323
260<S<=280	Stage IIIA							113	232	371	450	525
280<S<=300	1991-Stage I		33,2	34	36	39	40	40	40	40	41	43
280<S<=300	Stage II			72	125	201	301	299	297	301	309	323
280<S<=300	Stage IIIA							113	232	371	450	525
300<S<=320	Stage II				25	60	108	108	107	108	111	116
300<S<=320	Stage IIIA							57	116	185	225	262

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

FuelCode	Size (kW)	Emission Level	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
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
205B	35	Stage II		23	53	75	89	117	152	152	152	152	152
205B	35	Stage IIIA								41	76	92	99
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
205B	45	Stage I	303	422	524	664	664	664	664	664	664	664	664
205B	45	Stage II					104	232	452	612	612	612	612
205B	45	Stage IIIA									126	181	225
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
205B	50	Stage I	461	682	897	1135	1135	1135	1135	1135	1135	1135	1135
205B	50	Stage II					187	447	818	1134	1134	1134	1134
205B	50	Stage IIIA									181	275	354
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
205B	75	Stage I	162	234	311	311	311	311	311	311	311	311	311
205B	75	Stage II				58	129	208	326	326	326	326	326
205B	75	Stage IIIA								142	213	252	294
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
205B	120	Stage I	71	89	118	118	118	118	118	118	118	118	118

205B	120	Stage II				16	38	58	112	112	112	112	112
205B	120	Stage IIIA								58	70	76	140
3030	33		4718	4677	4655	4595	4494	4345	4220	4154	4043	3941	3746
3030	40		4218	4214	4244	4224	4166	4116	4048	4005	3951	3878	3723
3030	50		1897	1938	2003	2020	2018	2029	2061	2136	2198	2192	2142
3030	78		88	95	98	99	104	104	114	123	147	149	151
3030	120		2	2	3	3	3	3	3	3	3	3	7

Stock data for construction machinery 1985-2010.

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 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															
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
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															

EquipmentName (Eng)	Emission Level	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
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
Track type dozers	Stage IIIA							25	58	95	119	137

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
Track type loaders	Stage IIIA							14	34	55	76	94
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
Wheel loaders (0-5 tonnes)	Stage IIIA								348	726	1058	1349
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
Wheel loaders (> 5,1 tonnes)	Stage II				218	431	677	969	1092	1174	1138	1094
Wheel loaders (> 5,1 tonnes)	Stage IIIA								273	587	854	1094
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
Wheel type excavators	Stage II				45	81	118	148	152	146	138	124
Wheel type excavators	Stage IIIA								38	73	103	124
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
Track type excavators (0-5 tonnes)	Stage IIIA								1009	2073	2984	3702
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
Track type excavators (>5,1 tonnes)	Stage II				197	393	683	1073	1251	1338	1307	1245
Track type excavators (>5,1 tonnes)	Stage IIIA								313	669	980	1245
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
Excavators/Loaders	Stage II					462	913	1406	1922	1851	1688	1516
Excavators/Loaders	Stage IIIA									463	844	1137

Dump trucks	<1981											
Dump trucks	1981-1990											
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
Dump trucks	Stage II					110	257	451	704	754	739	685
Dump trucks	Stage IIIA									189	369	514
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
Mini loaders	Stage II		330	684	1061	1462	1531	1720	923	715	597	494
Mini loaders	Stage IIIA								154	238	299	329
Telescopic loaders	1981-1990	398	348	265	149							
Telescopic loaders	1991-Stage I	994	1160	1326	1491	1657	1740	1837	1846	1687	1343	1009
Telescopic loaders	Stage II		116	265	447	663	966	1378	1582	1687	1612	1514
Telescopic loaders	Stage IIIA								264	562	806	1009

Stock data for machine pools 1985-2010.

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															
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															

EquipmentName (Eng)	Emission Level	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
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	487		
Tractors (machine pools)	Stage II				513	1033	1421	1855	1946	1946	1946	1460
Tractors (machine pools)	Stage IIIA								487	973	1460	1946
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
Harvesters (machine pools)	Stage II			65	118	177	171	172	169	169	169	169
Harvesters (machine pools)	Stage IIIA							43	85	127	169	211
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

Stock data for household and gardening 1985-2010.

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

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															

SNAP	EquipmentName (Eng)	Emission Level	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
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
0809	Lawn movers (private)	Stage I						85000	171250	256875	256875	256875	256875
0809	Lawn movers (private)	Stage II									85625	171250	256875

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
0809	Cultivators (private-large)	Stage II						7333	14667	22000	29333	36667	44000
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
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
0809	Chain saws (private)	Stage I						29800	59600	89400	89400	89400	89400
0809	Chain saws (private)	Stage II									29800	59600	89400
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
0809	Riders (private)	Stage I						10704	22863	23925	24762	24762	24762
0809	Riders (private)	Stage II								11963	24762	37143	49523
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
0809	Shrub clearers (private)	Stage I						14000	28000	42000	42000	42000	42000
0809	Shrub clearers (private)	Stage II									14000	28000	42000
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
0809	Hedge cutters (private)	Stage I						7360	14720	22080	22080	22080	22080
0809	Hedge cutters (private)	Stage II									7360	14720	22080
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
0809	Trimmers (private)	Stage I						8500	17000	25500	25500	25500	25500
0809	Trimmers (private)	Stage II									8500	17000	25500
0811	Lawn movers (professional)	1981-1990											
0811	Lawn movers (professional)	1991-Stage I	25000	25000	25000	25000	25000	18750	12500	6250			
0811	Lawn movers (professional)	Stage I						6250	12500	18750	18750	12500	6250
0811	Lawn movers (professional)	Stage II									6250	12500	18750
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
0811	Cultivators (professional)	Stage I						1250	2500	3750	3750	3750	3750
0811	Cultivators (professional)	Stage II									1250	2500	3750
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
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
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
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
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

Stock data for small boats and pleasure crafts 1985-2010.

Fuel	Engine	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
Gasoline	2-stroke	Other boats (< 20 ft)	4000	4000	4056	4111	4167	4222	4278	4333	4389	4444	4500	4556	4565	4527	4439
Gasoline	2-stroke	Yawls and cabin boats	4000	4000	4056	4111	4167	4222	4278	4333	4389	4444	4500	4556	4565	4527	4439
Gasoline	2-stroke	Sailing boats (< 26 ft)	19000	19000	18778	18556	18333	18111	17889	17667	17444	17222	17000	16778	16390	15843	15144
Gasoline	2-stroke	Speed boats	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	2970	2910	2820
Gasoline	2-stroke	Water scooters	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	990	970	940
Gasoline	4-stroke	Other boats (< 20 ft)													46	140	283
Gasoline	4-stroke	Yawls and cabin boats													46	140	283
Gasoline	4-stroke	Sailing boats (< 26 ft)													166	490	967
Gasoline	4-stroke	Speed boats	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000
Gasoline	4-stroke	Speed boats													30	90	180
Gasoline	4-stroke	Water scooters													10	30	60

Fuel	Engine	Boat type	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Diesel		Motor boats (27-34 ft)	3922	4092	4261	4431	4600	4600	4600	4600	4600	4600	4600
Diesel		Motor boats (> 34 ft)	1189	1242	1294	1347	1400	1400	1400	1400	1400	1400	1400
Diesel		Motor boats <(27 ft)	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
Diesel		Sailing boats (> 26 ft)	13333	13750	14167	14583	15000	15000	15000	15000	15000	15000	15000
Gasoline	2-stroke	Other boats (< 20 ft)	4300	4108	3862	3560	3200	2750	2250	1800	1400	1050	750
Gasoline	2-stroke	Yawls and cabin boats	4300	4108	3862	3560	3200	2750	2250	1800	1400	1050	750
Gasoline	2-stroke	Sailing boats (< 26 ft)	14300	13317	12201	10960	9600	8250	6750	5400	4200	3150	2250
Gasoline	2-stroke	Speed boats	2700	2550	2370	2160	1920	1650	1350	1080	840	630	450
Gasoline	2-stroke	Water scooters	900	850	790	720	640	550	450	360	280	210	150
Gasoline	4-stroke	Other boats (< 20 ft)	478	725	1027	1384	1800	2250	2750	3200	3600	3950	4250
Gasoline	4-stroke	Yawls and cabin boats	478	725	1027	1384	1800	2250	2750	3200	3600	3950	4250
Gasoline	4-stroke	Sailing boats (< 26 ft)	1589	2350	3243	4262	5400	6750	8250	9600	10800	11850	12750
Gasoline	4-stroke	Speed boats	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000
Gasoline	4-stroke	Speed boats	300	450	630	840	1080	1350	1650	1920	2160	2370	2550
Gasoline	4-stroke	Water scooters	100	150	210	280	360	450	550	640	720	790	850

Engine sizes (kW) for recreational craft 1985-2010.

Engine	Boat type	1985	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004-2010
2-stroke	Other boats (< 20 ft)	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
2-stroke	Yawls and cabin boats	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
2-stroke	Sailing boats (< 26 ft)	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
2-stroke	Speed boats	25	31	32	33	35	36	38	39	40	42	43	44	46	47	49	50
2-stroke	Water scooters	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45
4-stroke	Other boats (< 20 ft)									8	8	8	8	8	8	8	8
4-stroke	Yawls and cabin boats									20	20	20	20	20	20	20	20
4-stroke	Sailing boats (< 26 ft)									10	10	10	10	10	10	10	10
4-stroke	Speed boats (in board eng.)	45	55	58	60	63	65	68	70	73	75	78	80	83	85	88	90
4-stroke	Speed boats (out board eng.)									40	42	43	44	46	47	49	50
4-stroke	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.

	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

Continued	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Korsør-Nyborg, DSB	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
Halsskov-Knudshoved	0	0	0	0	0	0	0	0	0	0	0
Kalundborg-Juelsminde	0	0	0	0	0	0	0	0	0	0	0
Kalundborg-Århus	1870	1804	2037	1800	1750	1725	1724	1695	1694	1668	1552
Sjællands Odde-Ebeltoft	4775	4226	3597	3191	2906	2889	2690	2670	2577	2454	2409
Sjællands Odde-Århus	1799	1817	1825	2359	2863	2795	2853	2810	2814	2810	2735
Hundested-Grenaa	0	0	0	0	0	0	0	0	0	0	0
København-Rønne	491	430	413	397	293	0	0	0	0	0	0
Køge-Rønne	0	0	0	0	154	488	436	399	428	407	459
Kalundborg-Samsø	828	817	833	831	841	867	862	887	921	969	937
Tårs-Spodsbjerg	6477	6498	6468	6516	6497	6494	6460	6493	6504	6474	6529
Hirtshals-Torshavn	0	0	0	0	0	0	0	0	0	0	13
Hanstholm-Torshavn	67	94	85	50	59	51	51	48	52	27	20
Esbjerg-Torshavn	0	0	0	0	0	0	0	0	0	35	30
Local ferries	201833	200130	208396	208501	206297	205564	203413	205260	210089	209082	205461

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

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
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
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									
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										
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	2008	2009	2010
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	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	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	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											
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	80	80
Kalundborg-Århus	METTE MOLS											85	85	85	85	85	85	82	80	80	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	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	31	31
Køge-Rønne	DUEODDE																69	65	65	65	65	65
Køge-Rønne	HAMMERODDE																69	65	66	66	66	66
Køge-Rønne	JENS KOFOED															31	31					
Køge-Rønne	POVL ANKER															31	31	45	49	49	49	49
Sjællands Odde-Ebeltoft	MAI MOLS							80	80	80	80	80	80	80	80	80	80	79	78	78	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											
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	78	78
Sjællands Odde-Århus	MADS MOLS										90	85	85	85	85	85	85	67	67	67	67	67
Sjællands Odde-Århus	MAI MOLS													75	75	75	75	69	69	69	69	69
Sjællands Odde-Århus	MAX MOLS										90	85	85	85	85	85	85	67	67	67	67	67
Sjællands Odde-Århus	MIE MOLS													75	75	75	75	69	69	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	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	80	80
Tårs-Spodsbjerg	SPODSBJERG	75	80	80	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	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	2007-2009	2010
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
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	HELMDAL	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
Hirtshals-Torshavn	Nye Norrøna																			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												
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
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
Kalundborg-Århus	METTE MOLS											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
København-Rønne	POVL ANKER	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
Køge-Rønne	DUEODDE																25	49	47	47
Køge-Rønne	HAMMERODDE																35	49	53	53
Køge-Rønne	JENS KOFOED															50	20			
Køge-Rønne	POVL ANKER															50	20	3	1	1
Sjællands Odde-Ebeltoft	MAI MOLS							21	35	35	35	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
Sjællands Odde-Århus	MADS MOLS										50	95	90	95	60	60	35	30	31	31
Sjællands Odde-Århus	MAI MOLS													1	10	15	15	20	19	19
Sjællands Odde-Århus	MAX MOLS										50	5	10	3	20	10	35	30	31	31
Sjællands Odde-Århus	MIE MOLS													1	10	15	15	20	19	19
Tårs-Spodsbjerg	FRIGG SYDFYEN	41	40	39	38	36	36	36	32	33	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

Tårs-Spodsbjerg	SPODSBJERG	4	2	8	8	9	8	8	19	20	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

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

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)
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

CO, VOC, NMVOC and CH_4 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
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

	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
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	2,64	52,8	6,1	6,0	6,0	1291,0	149,2	147,8	147,0
Fuel	National sea	1991	2,35	47,0	4,9	4,9	4,8	1149,1	120,2	119,0	118,4
Fuel	National sea	1992	1,80	36,0	3,3	3,2	3,2	880,2	79,8	79,0	78,6
Fuel	National sea	1993	2,39	47,8	5,1	5,0	5,0	1168,7	123,9	122,6	122,0
Fuel	National sea	1994	2,62	52,4	6,0	6,0	5,9	1281,2	147,0	145,6	144,8
Fuel	National sea	1995	2,95	59,0	7,7	7,6	7,6	1442,5	188,0	186,1	185,2
Fuel	National sea	1996	2,57	51,4	5,8	5,7	5,7	1256,7	141,7	140,2	139,5
Fuel	National sea	1997	2,74	54,8	6,6	6,5	6,5	1339,9	160,8	159,2	158,4
Fuel	National sea	1998	1,97	39,4	3,7	3,7	3,6	963,3	90,6	89,7	89,2
Fuel	National sea	1999	1,97	39,4	3,7	3,7	3,6	963,3	90,6	89,7	89,2
Fuel	National sea	2000	1,81	36,2	3,3	3,3	3,2	885,1	80,4	79,6	79,2
Fuel	National sea	2001	1,70	34,0	3,0	3,0	3,0	831,3	74,1	73,4	73,0
Fuel	National sea	2002	1,51	30,2	2,6	2,6	2,6	738,4	64,3	63,7	63,3
Fuel	National sea	2003	1,62	32,4	2,9	2,8	2,8	792,2	69,8	69,1	68,8
Fuel	National sea	2004	1,98	39,6	3,7	3,7	3,7	968,2	91,3	90,4	89,9
Fuel	National sea	2005	2,00	40,0	3,8	3,8	3,7	978,0	92,6	91,7	91,3
Fuel	National sea	2006	1,94	38,8	3,6	3,6	3,6	948,7	88,6	87,7	87,3
Fuel	National sea	2007	1,20	24,0	2,1	2,1	2,1	586,8	51,0	50,5	50,3
Fuel	National sea	2008	1,20	24,0	2,1	2,1	2,1	586,8	51,0	50,5	50,3
Fuel	National sea	2009	1,20	24,0	2,1	2,1	2,1	586,8	51,0	50,5	50,3
Fuel	International sea	1990	2,96	59,2	7,7	7,7	7,6	1447,4	189,4	187,5	186,6
Fuel	International sea	1991	2,89	57,8	7,4	7,3	7,2	1413,2	179,8	178,0	177,1
Fuel	International sea	1992	2,88	57,6	7,3	7,2	7,2	1408,3	178,5	176,7	175,8
Fuel	International sea	1993	3,20	64,0	9,3	9,2	9,1	1564,8	226,5	224,2	223,1
Fuel	International sea	1994	3,03	60,6	8,2	8,1	8,0	1481,7	199,6	197,6	196,6
Fuel	International sea	1995	3,30	66,0	10,0	9,9	9,8	1613,7	244,0	241,6	240,4
Fuel	International sea	1996	3,42	68,4	10,9	10,8	10,8	1672,4	266,9	264,2	262,9
Fuel	International sea	1997	3,45	69,0	11,2	11,0	11,0	1687,0	272,9	270,2	268,8
Fuel	International sea	1998	3,42	68,4	10,9	10,8	10,8	1672,4	266,9	264,2	262,9
Fuel	International sea	1999	3,45	69,0	11,2	11,0	11,0	1687,0	272,9	270,2	268,8
Fuel	International sea	2000	3,36	67,2	10,4	10,3	10,3	1643,0	255,2	252,6	251,4
Fuel	International sea	2001	3,42	68,4	10,9	10,8	10,8	1672,4	266,9	264,2	262,9
Fuel	International sea	2002	3,44	68,8	11,1	11,0	10,9	1682,2	270,9	268,2	266,8
Fuel	International sea	2003	3,11	62,2	8,7	8,6	8,5	1520,8	211,8	209,7	208,6
Fuel	International sea	2004	3,20	64,0	9,3	9,2	9,1	1564,8	226,5	224,2	223,1
Fuel	International sea	2005	3,50	70,0	11,6	11,5	11,4	1711,5	283,2	280,4	279,0

Fuel	International sea	2006	3,35	67,0	10,4	10,3	10,2	1638,1	253,3	250,8	249,5
Fuel	International sea	2007	1,50	30,0	2,6	2,6	2,6	733,5	63,8	63,2	62,9
Fuel	International sea	2008	1,50	30,0	2,6	2,6	2,6	733,5	63,8	63,2	62,9
Fuel	International sea	2009	1,50	30,0	2,6	2,6	2,6	733,5	63,8	63,2	62,9
Fuel	International sea	1990	0,20	4,0	1,0	1,0	1,0	93,7	23,2	23,0	22,9
Diesel	-	1991	0,20	4,0	1,0	1,0	1,0	93,7	23,2	23,0	22,9
Diesel	-	1992	0,20	4,0	1,0	1,0	1,0	93,7	23,2	23,0	22,9
Diesel	-	1993	0,20	4,0	1,0	1,0	1,0	93,7	23,2	23,0	22,9
Diesel	-	1994	0,20	4,0	1,0	1,0	1,0	93,7	23,2	23,0	22,9
Diesel	-	1995	0,20	4,0	1,0	1,0	1,0	93,7	23,2	23,0	22,9
Diesel	-	1996	0,20	4,0	1,0	1,0	1,0	93,7	23,2	23,0	22,9
Diesel	-	1997	0,20	4,0	1,0	1,0	1,0	93,7	23,2	23,0	22,9
Diesel	-	1998	0,20	4,0	1,0	1,0	1,0	93,7	23,2	23,0	22,9
Diesel	-	1999	0,20	4,0	1,0	1,0	1,0	93,7	23,2	23,0	22,9
Diesel	-	2000	0,20	4,0	1,0	1,0	1,0	93,7	23,2	23,0	22,9
Diesel	-	2001	0,20	4,0	1,0	1,0	1,0	93,7	23,2	23,0	22,9
Diesel	-	2002	0,20	4,0	1,0	1,0	1,0	93,7	23,2	23,0	22,9
Diesel	-	2003	0,20	4,0	1,0	1,0	1,0	93,7	23,2	23,0	22,9
Diesel	-	2004	0,20	4,0	1,0	1,0	1,0	93,7	23,2	23,0	22,9
Diesel	-	2005	0,20	4,0	1,0	1,0	1,0	93,7	23,2	23,0	22,9
Diesel	-	2006	0,20	4,0	1,0	1,0	1,0	93,7	23,2	23,0	22,9
Diesel	-	2007	0,20	4,0	1,0	1,0	1,0	93,7	23,2	23,0	22,9
Diesel	-	2008	0,10	2,0	0,9	0,9	0,9	46,8	21,5	21,3	21,2
Diesel	-	2009	0,10	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
Agriculture and forestry, DEA statistics															
- LPG	88	84	354	311	457	438	412	359	234	205	204	212	184	219	162
- gasoline	425	184	315	317	304	274	251	240	208	166	161	191	70	61	56
- gas/diesel oil	9 199	9 634	9 498	9 520	10 605	10 528	10 700	11 028	11 423	11 494	11 585	13 088	13 875	13 310	13 909
Nurseries, DEA statistics															
- LPG	8	5	47	47	53	50	47	39	26	23	23	22	20	24	17
- gasoline	10	3	6	6	11	10	10	12	23	18	18	19	7	6	6
- gas/diesel oil	1 705	1 270	1 405	1 383	1 231	1 409	1 687	1 887	1 205	963	1 138	487	356	341	347
Fishery, DEA statistics															
- LPG	-	-	34	29	50	42	34	30	12	18	16	36	5	1	16
- gasoline	-	1	2	2	9	9	10	8	7	7	8	7	6	6	60
- kerosene	7	2	9	5	12	26	9	5	4	3	4	3	3	2	0
- gas/diesel oil	9 152	10 248	8 390	9 499	10 038	10 422	10 809	10 868	8 843	8 796	8 277	8 750	8 748	9 186	9 282
- fuel oil	27	5	82	68	251	285	113	231	146	8	19	219	260	27	-
Manufacturing industry, DEA statistics															
- LPG	2 860	2 839	2 688	2 553	2 080	2 032	2 076	1 827	1 858	2 029	2 234	2 404	2 106	2 017	1 917
- gasoline	262	273	453	326	136	177	161	158	145	138	110	86	82	137	80
- gas/diesel oil	15 576	15 441	14 743	13 346	12 670	12 259	12 934	11 901	11 323	10 154	10 401	10 184	8 921	8 720	8 852
- fuel oil	29 465	29 451	21 518	19 056	16 741	15 989	17 133	16 694	14 600	15 438	14 000	12 632	11 009	10 943	8 704
Building and construction, DEA statistics															
- LPG	305	343	500	451	575	500	573	708	579	522	501	509	471	575	422
- gasoline	19	85	52	48	36	34	26	24	20	23	25	34	27	23	27
- gas/diesel oil	5 313	4 962	4 378	4 220	3 945	3 548	3 797	3 839	3 871	4 145	5 317	5 572	6 079	5 947	6 556
Housing, DEA statistics															
- gasoline	1 006	1 046	1 073	1 114	1 128	1 131	1 146	1 158	1 168	1 194	1 233	1 258	1 299	1 317	1 357
- gas/dieselolie	74 257	69 392	68 349	59 832	46 935	41 152	45 219	38 406	45 029	39 770	40 004	41 836	36 491	34 902	32 936
Tower blocks															
- gas/dieselolie	10 584	9 968	10 112	7 266	7 350	5 311	5 420	4 507	4 938	3 909	3 284	3 460	3 105	2 948	2 739
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	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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
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, output 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	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Road transport, input NERI model incl. traded fuels															
- gasoline	62 077	62 442	62 716	63 442	62 546	66 279	70 589	74 320	76 459	79 209	80 101	80 958	83 089	84 832	84 506
- gas/diesel oil	49 016	54 939	54 827	54 887	57 055	59 947	61 296	59 950	59 522	63 561	64 013	65 590	66 374	67 206	69 501
- bioethanol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
- biodiesel	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Continued

Enhed: TJ	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Agriculture and forestry, DEA statistics											
- LPG	179	190	159	153	138	121	116	110	103	114	126
- gasoline	38	39	28	42	51	52	20	21	20	31	31
- gas/diesel oil	13 689	13 437	13706	13463	12934	12464	13047	12481	13658	14346	14471
Nurseries, DEA statistics											
- LPG	19	20	17	16	14	12	12	11	10	11	13
- gasoline	4	4	3	5	6	6	2	2	2	3	3
- gas/diesel oil	698	581	529	556	488	407	391	418	483	508	513
Fishery, DEA statistics											
- LPG	13	19	21	20	18	20	20	18	12	12	12
- gasoline	67	3	3	0	0	0	1	1	1	1	1
- kerosene	25	1	1	1	1	1	0	0	0	0	0
- gas/diesel oil	9 347	8 908	8888	8428	7337	7340	7362	6854	6258	6075	6037
- fuel oil	-	-	4	84	35	126	86	13	14	17	0
Manufacturing industry, DEA statistics											
- LPG	1 819	1 526	1405	1472	1488	1478	1482	1216	1178	1029	1093
- gasoline	97	69	42	26	30	21	32	16	15	97	84
- gas/diesel oil	8 635	10 099	9155	9964	10515	10022	9132	8170	7449	6141	6244
- fuel oil	8 221	7 395	7818	6916	6940	6055	8527	6422	5319	4256	5281
Building and construction, DEA statistics											
- LPG	165	179	236	226	228	224	248	222	172	103	94
- gasoline	33	24	26	27	27	27	27	28	26	20	22
- gas/diesel oil	5 950	6 356	6226	6226	6227	6338	6187	6410	6339	5429	5341
Housing, DEA statistics											
- gasoline	1 355	1 317	1313	1303	1288	1250	1216	1193	1135	1092	1016
- gas/dieselolie	27 929	28 996	26967	24932	22863	21712	19572	18012	16585	15625	16536
Tower blocks											
- gas/dieselolie	2 346	2 511	2031	2095	2427	2151	1625	1411	1610	1658	1460
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
- gas/diesel oil	64 282	66 254	66 814	70 875	75 422	79 476	86 223	93 111	93 437	88 454	92 718
- bioethanol	-	-	-	-	-	-	151	252	210	204	1 118
- biodiesel	-	-	-	-	-	-	-	-	10	139	16
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

- gasoline	1 525	1 453	1 412	1 404	1 402	1 356	1 296	1 259	1 199	1 242	1 155
- 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
Non-road, NERI model											
- LPG	1071	1073	1084	1079	1065	1049	1038	1040	986	817	985
- gasoline	2458	2622	2833	3090	3391	3604	3807	3923	3975	3942	3957
- gas/diesel oil	24630	24923	25100	25301	25670	26361	27733	29495	30490	27022	29882
Recreational craft, NERI model											
- gasoline	396	400	403	404	404	393	382	371	361	353	346
- gas/diesel oil	777	831	886	944	1002	1002	1002	1002	1002	1002	1002
Non-road, added 0202											
- gas/diesel oil	0	0	0	0	0	0	0	-2016	-2561	-598	-3314
Non-road, added 0203 and 0301											
- gas/diesel oil	4342	5550	4516	4908	4494	2871	1025	0	0	0	0
- LPG	947	662	497	563	575	562	572	298	306	338	247
Non-road, added 0203											
- gas/diesel oil	2156	2553	2171	2278	2000	1264	479	0	0	0	0
- LPG	93	80	55	58	53	46	46	27	27	37	28
Non-road, added 0301											
- gas/diesel oil	2186	2997	2346	2630	2494	1607	546	0	0	0	0
- LPG	854	582	442	505	522	516	526	271	279	301	219
Non-road, added road transport											
- gasoline	-932	-1169	-1421	-1686	-1990	-2248	-2511	-2663	-2776	-2700	-2802
Fisheries, added national sea transport											
- fuel oil	0	0	4	84	35	126	86	13	14	17	0
Fisheries, consumed by recreational craft											
- gasoline	67	3	3	0	0	0	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
- fuel oil	1 509	1 513	2 068	1 907	1 704	1 506	1 367	1 110	1 174	1 062	868
Fisheries, input NERI model											
- LPG	13	19	21	20	18	20	20	18	12	12	12
- gasoline	-	-	-	-	-	-	-	-	-	-	-
- 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

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
- fuel oil	33 165	25 924	17 547	20 462	17 298	20 591	31 565	35 243	27 164	11 091	17 493
National sea transport, output NERI model											
- gas/diesel oil	5258	5233	5061	4475	4591	4559	4427	4435	4393	4315	4071
- fuel oil	1444	1400	1387	1862	1853	1859	2026	2005	2142	2289	2459
- kerosene	1	1	1	1	1	1	0	0	0	0	0
- LPG	0	0	0	0	0	0	0	0	0	0	12
Fisheries, output NERI model											
- gas/diesel oil	7422	9384	9664	9294	7286	8725	8166	6966	8106	7517	7768
- kerosene	25	1	1	1	1	1	0	0	0	0	0
- LPG	13	19	21	20	18	20	20	18	12	12	0
International sea transport, output NERI model											
- gas/diesel oil	22129	18090	18636	18273	14074	11330	10583	8809	10928	10164	11356
- fuel oil	32437	25195	16818	19247	16118	19411	30172	33848	25650	9416	15808
National sea transport, added 0301											
- fuel oil	65	113	681	45	- 148	- 353	- 659	- 895	- 968	-1 227	-1 591
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
- gas/diesel oil	64 282	66 254	66 814	70 875	75 422	79 476	86 223	93 111	93 437	88 454	92 718
- bioethanol	-	-	-	-	-	-	151	252	210	204	1 118
- biodiesel	-	-	-	-	-	-	-	-	10	139	16
Road transport, input NERI model incl. traded fuels											
- gasoline	83 312	81 852	81 963	81 878	80 593	77 835	76 109	75 292	71 409	67 815	62 782
- gas/diesel oil	69 196	70 916	72 552	78 766	84 209	88 264	95 010	103 871	103 480	97 421	101 685
- bioethanol	-	-	-	-	-	-	151	252	210	204	1 118
- biodiesel	-	-	-	-	-	-	-	-	10	139	16

Annex 2B-15: Emission factors and total emissions in CollectER format

1990 emission factors for CO_2, CH_4, N_2O, SO_2, NO_x; NMVOC, NH_3 and TSP.

Year		SNAP ID	Category		Fuel type	SO_2	NO_x	NMVOC	CH_4	CO	CO_2	N_2O	NH_3	TSP
						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	281,80	25,07	3,74	179,70	74,00	0,00	0,47	79,48
1990	A	070101	Passenger cars	Highway	Gasoline	2,28	1341,85	372,77	10,99	3471,98	73,00	2,75	0,85	12,32
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
1990	A	070102	Passenger cars	Rural	Diesel	93,68	282,97	42,09	6,82	268,08	74,00	0,00	0,57	75,13
1990	A	070102	Passenger cars	Rural	Gasoline	2,28	1157,33	489,92	13,86	3975,56	73,00	3,09	0,95	14,22
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
1990	A	070103	Passenger cars	Urban	Diesel	93,68	228,36	83,84	8,41	317,11	74,00	0,00	0,35	122,24
1990	A	070103	Passenger cars	Urban	Gasoline	2,28	616,49	943,13	49,98	9909,86	73,00	3,10	0,62	13,42
1990	A	070103	Passenger cars	Urban	LPG	0,00	620,57	439,16	23,63	1315,38	63,10	0,00	0,00	11,82
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
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
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
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
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
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
1990	A	070203	Light duty vehicles	Urban	Diesel	93,68	487,30	55,86	6,31	411,00	74,00	0,00	0,26	131,44
1990	A	070203	Light duty vehicles	Urban	Gasoline	2,28	626,69	712,66	40,57	7326,15	73,00	2,22	0,44	8,90
1990	A	070203	Light duty vehicles	Urban	LPG	0,00	620,31	439,26	23,62	1316,15	63,10	0,00	0,00	11,81
1990	A	070301	Heavy duty vehicles	Highway	Diesel	93,68	987,62	45,46	6,46	204,32	74,00	3,21	0,32	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
1990	A	070302	Heavy duty vehicles	Rural	Diesel	93,68	984,23	57,01	6,77	210,50	74,00	2,89	0,29	35,69
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
1990	A	070303	Heavy duty vehicles	Urban	Diesel	93,68	957,32	74,12	11,98	243,37	74,00	2,21	0,22	39,97
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
1990	A	070400	Mopeds	Urban	Gasoline	2,28	18,26	12503,20	200,00	12602,74	73,00	0,91	0,91	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
1990	A	070502	Motorcycles	Rural	Gasoline	2,28	185,41	981,69	159,32	15782,07	73,00	1,66	1,66	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
1990	A	080100	Military		AvGas	22,83	859,00	1242,60	21,90	6972,00	73,00	2,00	1,60	10,00
1990	A	080100	Military		Diesel	93,68	785,58	58,23	7,33	258,20	74,00	1,72	0,30	65,61
1990	A	080100	Military		Gasoline	2,28	932,90	1154,80	31,10	6608,56	73,00	2,99	0,78	14,43
1990	A	080100	Military		Jet fuel	22,99	250,57	24,94	2,65	229,89	72,00	2,30	0,00	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
1990	A	080200	Railways	Kerosene	5,00	50,00	3,00	7,00	20,00	72,00	2,00	0,00	121,95
1990	A	080300	Inland waterways	Diesel	93,68	983,64	171,79	2,79	453,65	74,00	2,96	0,17	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
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
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
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
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
1990	A	080403	Fishing	Diesel	93,68	1052,12	49,13	1,52	162,08	74,00	4,68	0,00	23,21
1990	A	080403	Fishing	Kerosene	2,30	50,00	3,00	7,00	20,00	72,00	0,00	0,00	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
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
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
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
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
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
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
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
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
1990	A	080600	Agriculture	Diesel	93,68	758,87	156,85	2,55	635,53	74,00	2,93	0,17	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
1990	A	080700	Forestry	Diesel	93,68	857,48	156,47	2,54	645,65	74,00	2,97	0,17	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
1990	A	080800	Industry	Diesel	93,68	933,58	178,23	2,90	655,80	74,00	2,94	0,17	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
1990	A	080800	Industry	LPG	0,00	1328,11	146,09	7,69	104,85	63,10	3,50	0,21	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
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
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
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
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
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
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
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

1990 emission factors for Arsenic, Cadmium, Chromium, ,Copper, Mercury, Nickel, Lead, Selenium, Zinc

Year		SNAP ID	Category		Fuel type	Arsenic	Cadmium	Chromium	Copper	Mercury	Nickel	Lead	Selenium	Zinc
						mg pr GJ	mg pr GJ	mg pr GJ	mg pr GJ	mg pr GJ	mg pr GJ	mg pr GJ	mg pr GJ	mg pr GJ
1990	A	070101	Passenger cars	Highway	Diesel	0,002	0,287	0,914	0,648	0,124	0,291	1,727	0,002	57,591
1990	A	070101	Passenger cars	Highway	Gasoline	0,007	0,266	0,379	1,016	0,199	0,314	1471,982	0,005	52,967
1990	A	070101	Passenger cars	Highway	LPG	0,000	0,295	0,266	1,034	0,000	0,295	0,886	0,000	59,059
1990	A	070102	Passenger cars	Rural	Diesel	0,002	0,349	1,068	0,759	0,124	0,352	2,096	0,002	69,910
1990	A	070102	Passenger cars	Rural	Gasoline	0,007	0,299	0,408	1,132	0,199	0,346	1472,080	0,005	59,541
1990	A	070102	Passenger cars	Rural	LPG	0,000	0,354	0,319	1,240	0,000	0,354	1,063	0,000	70,871
1990	A	070103	Passenger cars	Urban	Diesel	0,002	0,214	0,731	0,516	0,124	0,217	1,287	0,002	42,946
1990	A	070103	Passenger cars	Urban	Gasoline	0,007	0,196	0,316	0,774	0,199	0,244	1471,774	0,005	39,083
1990	A	070103	Passenger cars	Urban	LPG	0,000	0,217	0,195	0,758	0,000	0,217	0,650	0,000	43,335
1990	A	070201	Light duty vehicles	Highway	Diesel	0,002	0,190	0,672	0,474	0,124	0,194	1,147	0,002	38,267
1990	A	070201	Light duty vehicles	Highway	Gasoline	0,007	0,245	0,360	0,944	0,199	0,293	1471,920	0,005	48,812
1990	A	070201	Light duty vehicles	Highway	LPG	0,000	0,195	0,175	0,681	0,000	0,195	0,584	0,000	38,924
1990	A	070202	Light duty vehicles	Rural	Diesel	0,002	0,208	0,717	0,506	0,124	0,212	1,254	0,002	41,830
1990	A	070202	Light duty vehicles	Rural	Gasoline	0,007	0,231	0,348	0,896	0,199	0,279	1471,878	0,005	46,074
1990	A	070202	Light duty vehicles	Rural	LPG	0,000	0,234	0,210	0,817	0,000	0,234	0,701	0,000	46,709
1990	A	070203	Light duty vehicles	Urban	Diesel	0,002	0,153	0,579	0,407	0,124	0,157	0,924	0,002	30,817
1990	A	070203	Light duty vehicles	Urban	Gasoline	0,007	0,137	0,263	0,565	0,199	0,185	1471,595	0,005	27,191
1990	A	070203	Light duty vehicles	Urban	LPG	0,000	0,143	0,128	0,500	0,000	0,143	0,428	0,000	28,551
1990	A	070301	Heavy duty vehicles	Highway	Diesel	0,002	0,158	0,590	0,415	0,124	0,161	0,950	0,002	31,694
1990	A	070301	Heavy duty vehicles	Highway	Gasoline	0,007	0,207	0,326	0,812	0,199	0,255	1471,806	0,005	41,266
1990	A	070302	Heavy duty vehicles	Rural	Diesel	0,002	0,142	0,552	0,388	0,124	0,146	0,859	0,002	28,664
1990	A	070302	Heavy duty vehicles	Rural	Gasoline	0,007	0,221	0,338	0,859	0,199	0,269	1471,847	0,005	43,989
1990	A	070303	Heavy duty vehicles	Urban	Diesel	0,002	0,110	0,471	0,329	0,124	0,113	0,664	0,002	22,165
1990	A	070303	Heavy duty vehicles	Urban	Gasoline	0,007	0,146	0,271	0,597	0,199	0,194	1471,622	0,005	29,002
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	0,106	0,235	0,456	0,199	0,153	1471,501	0,005	20,940
1990	A	070502	Motorcycles	Rural	Gasoline	0,007	0,128	0,255	0,536	0,199	0,176	1471,570	0,005	25,500
1990	A	070503	Motorcycles	Urban	Gasoline	0,007	0,125	0,252	0,524	0,199	0,173	1471,560	0,005	24,847
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	0,186	0,660	0,465	0,124	0,189	1,118	0,002	37,295
1990	A	080100	Military		Gasoline	0,007	0,253	0,367	0,972	0,198	0,301	0,773	0,005	50,452
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
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), 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	8,506	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	9,539	0,620	0,477	0,524	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	6,426	0,418	0,321	0,353	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
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

2010 emission factors for CO_2, CH_4, N_2O, SO_2, NO_x; NMVOC, NH_3 and TSP.

Year		SNAP ID	Category		Fuel type	SO_2	NO_x	NMVOC	CH_4	CO	CO_2	N_2O	NH_3	TSP
						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
2010	A	070101	Passenger cars	Highway	Diesel	0,47	284,85	5,92	0,11	12,74	73,99	2,02	0,49	13,92
2010	A	070101	Passenger cars	Highway	Gasoline	0,44	121,50	28,25	2,64	632,54	71,72	0,63	30,82	0,83
2010	A	070101	Passenger cars	Highway	LPG	0,00	186,36	29,88	4,13	1272,01	63,10	0,91	0,00	10,04
2010	A	070102	Passenger cars	Rural	Diesel	0,47	241,95	8,57	0,22	24,56	73,99	2,15	0,53	11,52
2010	A	070102	Passenger cars	Rural	Gasoline	0,44	99,05	31,18	3,20	487,36	71,72	1,19	32,47	0,77
2010	A	070102	Passenger cars	Rural	LPG	0,00	204,10	43,03	6,93	523,16	63,10	1,88	0,00	14,45
2010	A	070103	Passenger cars	Urban	Diesel	0,47	242,76	26,57	0,62	65,38	73,99	4,76	0,38	19,49
2010	A	070103	Passenger cars	Urban	Gasoline	0,44	118,76	217,20	8,76	2381,85	71,72	2,20	10,20	0,82
2010	A	070103	Passenger cars	Urban	LPG	0,00	126,34	105,19	10,96	809,82	63,10	3,79	0,00	13,34
2010	A	070201	Light duty vehicles	Highway	Diesel	0,47	212,34	20,08	0,20	126,33	73,99	1,52	0,37	20,34
2010	A	070201	Light duty vehicles	Highway	Gasoline	0,44	146,85	17,21	2,62	513,88	71,72	1,46	22,97	1,24
2010	A	070201	Light duty vehicles	Highway	LPG	0,00	78,50	11,18	1,84	889,72	63,10	0,44	0,00	10,04
2010	A	070202	Light duty vehicles	Rural	Diesel	0,47	221,92	22,73	0,45	108,30	73,99	1,66	0,40	16,61
2010	A	070202	Light duty vehicles	Rural	Gasoline	0,44	128,51	25,37	2,77	388,59	71,72	2,24	21,80	1,10
2010	A	070202	Light duty vehicles	Rural	LPG	0,00	86,46	15,69	3,08	398,46	63,10	0,99	0,00	14,45
2010	A	070203	Light duty vehicles	Urban	Diesel	0,47	213,35	41,33	0,97	136,53	73,99	3,16	0,28	25,16
2010	A	070203	Light duty vehicles	Urban	Gasoline	0,44	112,14	150,53	6,68	3040,41	71,72	3,84	5,51	0,76
2010	A	070203	Light duty vehicles	Urban	LPG	0,00	57,09	41,77	4,96	458,44	63,10	2,28	0,00	13,56
2010	A	070301	Heavy duty vehicles	Highway	Diesel	0,47	506,51	11,35	3,17	135,97	73,99	3,22	0,32	8,38
2010	A	070301	Heavy duty vehicles	Highway	Gasoline	0,44	1037,78	474,61	9,69	7610,35	71,72	0,83	0,28	55,35
2010	A	070302	Heavy duty vehicles	Rural	Diesel	0,47	532,88	13,72	3,29	131,60	73,99	2,89	0,29	8,42
2010	A	070302	Heavy duty vehicles	Rural	Gasoline	0,44	1141,55	820,40	16,74	8371,39	71,72	0,91	0,30	60,88
2010	A	070303	Heavy duty vehicles	Urban	Diesel	0,47	582,20	17,38	4,29	141,03	73,99	2,29	0,23	9,32
2010	A	070303	Heavy duty vehicles	Urban	Gasoline	0,44	456,62	696,09	14,21	7102,99	71,72	0,61	0,20	40,59
2010	A	070400	Mopeds	Urban	Gasoline	0,44	143,26	8633,88	138,08	9299,22	71,72	1,27	1,27	136,26
2010	A	070501	Motorcycles	Highway	Gasoline	0,44	270,09	826,21	101,94	11962,07	71,72	1,28	1,28	22,07
2010	A	070502	Motorcycles	Rural	Gasoline	0,44	192,34	806,39	123,40	11187,72	71,72	1,56	1,56	26,91
2010	A	070503	Motorcycles	Urban	Gasoline	0,44	118,68	987,22	126,73	10745,90	71,72	1,52	1,52	26,22
2010	A	080100	Military		AvGas	22,99	859,00	1242,60	21,90	6972,00	73,00	2,00	1,60	10,00
2010	A	080100	Military		Diesel	0,47	362,43	18,55	1,76	99,64	74,00	2,80	0,36	13,88
2010	A	080100	Military		Gasoline	0,44	114,24	166,31	7,28	1499,83	73,00	1,58	21,86	1,59
2010	A	080100	Military		Jet fuel	22,99	250,57	24,94	2,65	229,89	72,00	2,30	0,00	1,16
2010	A	080200	Railways		Diesel	0,47	861,00	57,78	2,22	147,00	74,00	2,04	0,20	29,00
2010	A	080300	Inland waterways		Diesel	46,84	834,21	160,37	2,61	443,15	74,00	2,97	0,17	98,22
2010	A	080300	Inland waterways		Gasoline	0,46	536,58	1176,04	62,64	13132,16	73,00	1,46	0,10	36,12
2010	A	080402	National sea traffic		Diesel	46,84	950,95	51,95	1,51	84,45	74,00	4,68	0,00	21,55
2010	A	080402	National sea traffic		Residual oil	489,00	1901,30	62,53	1,93	206,29	78,00	4,89	0,00	43,98
2010	A	080403	Fishing		Diesel	46,84	1373,14	57,40	1,78	189,36	74,00	4,68	0,00	21,55
2010	A	080403	Fishing		LPG									

2010	A	080404	International sea traffic	Residual oil	489,00	2114,39	62,58	1,94	206,46	78,00	4,89	0,00	43,98
2010	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
2010	A	080501	Air traffic, Dom. < 3000 ft.	Jet fuel	22,99	284,91	12,67	1,35	135,85	72,00	10,60	0,00	1,16
2010	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
2010	A	080502	Air traffic, Int. < 3000 ft.	Jet fuel	22,99	300,20	21,33	2,27	172,31	72,00	7,43	0,00	1,16
2010	A	080503	Air traffic, Dom. > 3000 ft.	Jet fuel	22,99	259,66	8,48	0,90	107,16	72,00	2,30	0,00	1,16
2010	A	080504	Air traffic, Int. > 3000 ft.	Jet fuel	22,99	238,78	6,06	0,64	50,18	72,00	2,30	0,00	1,16
2010	A	080600	Agriculture	Diesel	2,34	597,19	57,54	0,94	339,56	74,00	3,17	0,18	45,70
2010	A	080600	Agriculture	Gasoline	0,46	111,24	1198,22	160,47	21839,49	73,00	1,72	1,52	31,17
2010	A	080700	Forestry	Diesel	2,34	410,67	30,56	0,50	245,71	74,00	3,21	0,18	27,30
2010	A	080700	Forestry	Gasoline	0,46	65,70	5061,02	40,93	17576,18	73,00	0,45	0,09	80,63
2010	A	080800	Industry	Diesel	2,34	553,14	60,60	0,99	320,23	74,00	3,10	0,18	52,14
2010	A	080800	Industry	Gasoline	0,46	209,05	1535,64	108,73	13878,11	73,00	1,48	0,10	17,69
2010	A	080800	Industry	LPG	0,00	1328,11	146,09	7,69	104,85	63,10	3,50	0,21	4,89
2010	A	080900	Household and gardening	Gasoline	0,46	100,65	2363,13	75,84	29784,64	73,00	1,25	0,09	16,72
2010	A	081100	Commercial and institutional	Gasoline	0,46	91,81	1867,73	67,37	30544,46	73,00	1,12	0,09	28,18
2010	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
2010	P	080501	Air traffic, Dom. < 3000 ft.	Jet fuel	22,99	277,85	14,59	1,55	181,79	72,00	7,00	0,00	1,16
2010	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
2010	P	080502	Air traffic, Int. < 3000 ft.	Jet fuel	22,99	336,87	32,23	3,42	239,55	72,00	3,96	0,00	1,16
2010	P	080503	Air traffic, Dom. > 3000 ft.	Jet fuel	22,99	269,07	11,59	1,23	59,94	72,00	2,30	0,00	1,16
2010	P	080504	Air traffic, Int. > 3000 ft.	Jet fuel	22,99	305,04	9,40	1,00	32,03	72,00	2,30	0,00	1,16

2010 emission factors for Arsenic, Cadmium, Chromium, Copper, Mercury, Nickel, Lead, Selenium, 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
2010	A	070101	Passenger cars	Highway	Diesel	0,002	0,275	0,883	0,626	0,124	0,278	1,653	0,002	55,126
2010	A	070101	Passenger cars	Highway	Gasoline	0,007	0,289	0,397	1,096	0,195	0,336	0,880	0,004	57,609
2010	A	070101	Passenger cars	Highway	LPG	0,000	0,269	0,242	0,941	0,000	0,269	0,806	0,000	53,758
2010	A	070102	Passenger cars	Rural	Diesel	0,002	0,293	0,928	0,658	0,124	0,296	1,761	0,002	58,729
2010	A	070102	Passenger cars	Rural	Gasoline	0,007	0,305	0,412	1,153	0,195	0,352	0,928	0,004	60,831
2010	A	070102	Passenger cars	Rural	LPG	0,000	0,322	0,290	1,128	0,000	0,322	0,967	0,000	64,446
2010	A	070103	Passenger cars	Urban	Diesel	0,002	0,214	0,732	0,517	0,124	0,218	1,291	0,002	43,052
2010	A	070103	Passenger cars	Urban	Gasoline	0,007	0,204	0,321	0,800	0,195	0,251	0,626	0,004	40,681
2010	A	070103	Passenger cars	Urban	LPG	0,000	0,223	0,201	0,781	0,000	0,223	0,669	0,000	44,624
2010	A	070201	Light duty vehicles	Highway	Diesel	0,002	0,216	0,735	0,520	0,124	0,219	1,299	0,002	43,323
2010	A	070201	Light duty vehicles	Highway	Gasoline	0,007	0,227	0,342	0,880	0,195	0,274	0,695	0,004	45,251
2010	A	070201	Light duty vehicles	Highway	LPG	0,000	0,158	0,142	0,553	0,000	0,158	0,474	0,000	31,621
2010	A	070202	Light duty vehicles	Rural	Diesel	0,002	0,236	0,786	0,556	0,124	0,239	1,420	0,002	47,360
2010	A	070202	Light duty vehicles	Rural	Gasoline	0,007	0,215	0,330	0,836	0,195	0,262	0,657	0,004	42,759
2010	A	070202	Light duty vehicles	Rural	LPG	0,000	0,190	0,171	0,663	0,000	0,190	0,569	0,000	37,905
2010	A	070203	Light duty vehicles	Urban	Diesel	0,002	0,166	0,610	0,430	0,124	0,169	0,999	0,002	33,323
2010	A	070203	Light duty vehicles	Urban	Gasoline	0,007	0,123	0,248	0,516	0,195	0,170	0,383	0,004	24,454
2010	A	070203	Light duty vehicles	Urban	LPG	0,000	0,133	0,120	0,467	0,000	0,133	0,400	0,000	26,689
2010	A	070301	Heavy duty vehicles	Highway	Diesel	0,002	0,153	0,579	0,407	0,124	0,157	0,925	0,002	30,859
2010	A	070301	Heavy duty vehicles	Highway	Gasoline	0,007	0,245	0,358	0,944	0,195	0,293	0,750	0,004	48,931
2010	A	070302	Heavy duty vehicles	Rural	Diesel	0,002	0,139	0,543	0,381	0,124	0,142	0,838	0,002	27,956
2010	A	070302	Heavy duty vehicles	Rural	Gasoline	0,007	0,279	0,388	1,061	0,195	0,326	0,850	0,004	55,588
2010	A	070303	Heavy duty vehicles	Urban	Diesel	0,002	0,111	0,473	0,331	0,124	0,114	0,670	0,002	22,352
2010	A	070303	Heavy duty vehicles	Urban	Gasoline	0,007	0,191	0,309	0,752	0,195	0,238	0,585	0,004	37,944
2010	A	070400	Mopeds	Urban	Gasoline	0,007	0,004	0,141	0,101	0,195	0,052	0,027	0,004	0,740
2010	A	070501	Motorcycles	Highway	Gasoline	0,007	0,136	0,260	0,563	0,195	0,184	0,423	0,004	27,124
2010	A	070502	Motorcycles	Rural	Gasoline	0,007	0,165	0,286	0,664	0,195	0,212	0,509	0,004	32,909
2010	A	070503	Motorcycles	Urban	Gasoline	0,007	0,161	0,282	0,650	0,195	0,208	0,497	0,004	32,093
2010	A	080100	Military		AvGas	0,007	0,253	0,367	0,972	0,198	0,301	12785,390	0,005	50,452
2010	A	080100	Military		Diesel	0,002	0,193	0,679	0,479	0,124	0,197	1,163	0,002	38,796
2010	A	080100	Military		Gasoline	0,007	0,253	0,365	0,971	0,195	0,300	0,773	0,004	50,470
2010	A	080100	Military		Jet fuel	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
2010	A	080200	Railways		Diesel	0,002	0,186	0,660	0,465	0,124	0,189	1,118	0,002	37,295
2010	A	080300	Inland waterways		Diesel	0,002	0,186	0,660	0,465	0,124	0,189	1,118	0,002	37,295
2010	A	080300	Inland waterways		Gasoline	0,007	0,253	0,367	0,972	0,198	0,301	0,773	0,005	50,452
2010	A	080402	National sea traffic		Diesel	1,170	0,230	0,940	1,170	1,170	1,640	2,340	4,680	11,710
2010	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
2010	A	080403	Fishing		Diesel	1,170	0,230	0,940	1,170	1,170	1,640	2,340	4,680	11,710
2010	A	080403	Fishing		LPG									
2010	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

2010	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
2010	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
2010	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
2010	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
2010	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
2010	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
2010	A	080600	Agriculture	Diesel	0,002	0,186	0,660	0,465	0,124	0,189	1,118	0,002	37,295
2010	A	080600	Agriculture	Gasoline	0,007	0,253	0,367	0,972	0,198	0,301	0,773	0,005	50,452
2010	A	080700	Forestry	Diesel	0,002	0,186	0,660	0,465	0,124	0,189	1,118	0,002	37,295
2010	A	080700	Forestry	Gasoline	0,007	0,253	0,367	0,972	0,198	0,301	0,773	0,005	50,452
2010	A	080800	Industry	Diesel	0,002	0,186	0,660	0,465	0,124	0,189	1,118	0,002	37,295
2010	A	080800	Industry	Gasoline	0,007	0,253	0,367	0,972	0,198	0,301	0,773	0,005	50,452
2010	A	080800	Industry	LPG	0,000	0,131	0,118	0,457	0,000	0,131	0,392	0,000	26,126
2010	A	080900	Household and gardening	Gasoline	0,007	0,253	0,367	0,972	0,198	0,301	0,773	0,005	50,452
2010	A	081100	Commercial and institutional	Gasoline	0,007	0,253	0,367	0,972	0,198	0,301	0,773	0,005	50,452
2010	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
2010	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
2010	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
2010	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
2010	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
2010	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

2010 emission factors for Dioxins, Flouranthene, Benzo(b), Benzo(k), Benzo(a), Benzo(g,h,i), 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
2010	A	070101	Passenger cars	Highway	Diesel	0,000	12,815	0,782	0,709	0,856	1,663	0,807
2010	A	070101	Passenger cars	Highway	Gasoline	0,000	1,043	0,204	0,249	0,202	0,408	0,297
2010	A	070101	Passenger cars	Highway	LPG	0,000	0,000	0,000	0,000	0,000	0,000	0,000
2010	A	070102	Passenger cars	Rural	Diesel	0,001	14,593	0,891	0,807	0,975	1,894	0,919
2010	A	070102	Passenger cars	Rural	Gasoline	0,000	1,155	0,227	0,278	0,225	0,454	0,332
2010	A	070102	Passenger cars	Rural	LPG	0,000	0,000	0,000	0,000	0,000	0,000	0,000
2010	A	070103	Passenger cars	Urban	Diesel	0,001	9,684	0,591	0,536	0,647	1,257	0,610
2010	A	070103	Passenger cars	Urban	Gasoline	0,000	0,655	0,125	0,153	0,124	0,251	0,182
2010	A	070103	Passenger cars	Urban	LPG	0,000	0,000	0,000	0,000	0,000	0,000	0,000
2010	A	070201	Light duty vehicles	Highway	Diesel	0,001	9,234	0,564	0,511	0,617	1,198	0,581
2010	A	070201	Light duty vehicles	Highway	Gasoline	0,001	0,972	0,156	0,183	0,152	0,311	0,215
2010	A	070201	Light duty vehicles	Highway	LPG	0,000	0,000	0,000	0,000	0,000	0,000	0,000
2010	A	070202	Light duty vehicles	Rural	Diesel	0,001	10,103	0,617	0,559	0,675	1,311	0,636
2010	A	070202	Light duty vehicles	Rural	Gasoline	0,001	0,917	0,147	0,172	0,143	0,294	0,203
2010	A	070202	Light duty vehicles	Rural	LPG	0,000	0,000	0,000	0,000	0,000	0,000	0,000
2010	A	070203	Light duty vehicles	Urban	Diesel	0,000	7,261	0,443	0,402	0,485	0,942	0,457
2010	A	070203	Light duty vehicles	Urban	Gasoline	0,000	0,530	0,085	0,100	0,083	0,170	0,117
2010	A	070203	Light duty vehicles	Urban	LPG	0,000	0,000	0,000	0,000	0,000	0,000	0,000
2010	A	070301	Heavy duty vehicles	Highway	Diesel	0,001	2,030	0,512	0,759	0,095	0,076	0,133
2010	A	070301	Heavy duty vehicles	Highway	Gasoline	0,000	0,000	0,000	0,000	0,000	0,000	0,000
2010	A	070302	Heavy duty vehicles	Rural	Diesel	0,001	2,066	0,521	0,772	0,096	0,077	0,135
2010	A	070302	Heavy duty vehicles	Rural	Gasoline	0,000	0,000	0,000	0,000	0,000	0,000	0,000
2010	A	070303	Heavy duty vehicles	Urban	Diesel	0,001	1,676	0,423	0,626	0,078	0,063	0,110
2010	A	070303	Heavy duty vehicles	Urban	Gasoline	0,000	0,000	0,000	0,000	0,000	0,000	0,000
2010	A	070400	Mopeds	Urban	Gasoline	0,000	0,000	0,000	0,000	0,000	0,000	0,000
2010	A	070501	Motorcycles	Highway	Gasoline	0,020	12,799	0,832	0,640	0,704	1,664	0,640
2010	A	070502	Motorcycles	Rural	Gasoline	0,024	15,331	0,996	0,766	0,843	1,993	0,766
2010	A	070503	Motorcycles	Urban	Gasoline	0,024	15,500	1,007	0,775	0,852	2,015	0,775
2010	A	080100	Military		AvGas	0,005	4,329	0,209	0,071	0,114	0,689	0,245
2010	A	080100	Military		Diesel	0,001	4,350	0,510	0,496	0,256	0,464	0,264
2010	A	080100	Military		Gasoline	0,007	2,152	0,180	0,115	0,118	0,358	0,179
2010	A	080100	Military		Jet fuel	0,000	0,000	0,000	0,000	0,000	0,000	0,000
2010	A	080200	Railways		Diesel	0,001	1,411	0,360	0,402	0,059	0,051	0,092
2010	A	080300	Inland waterways		Diesel	0,001	4,350	0,510	0,496	0,256	0,464	0,264
2010	A	080300	Inland waterways		Gasoline	0,005	4,329	0,209	0,071	0,114	0,689	0,245
2010	A	080402	National sea traffic		Diesel	0,012	7,420	0,640	0,300	0,150	1,430	1,180
2010	A	080402	National sea traffic		Residual oil	0,013	5,190	0,270	0,050	0,020	0,070	0,030
2010	A	080403	Fishing		Diesel	0,012	7,420	0,640	0,300	0,150	1,430	1,180
2010	A	080403	Fishing		LPG							
2010	A	080404	International sea traffic		Residual oil	0,013	4,120	0,200	0,090	0,070	0,260	0,200

2010	A	080501	Air traffic, Dom. < 3000 ft.	AvGas	0,005	4,329	0,209	0,071	0,114	0,689	0,245
2010	A	080501	Air traffic, Dom. < 3000 ft.	Jet fuel	0,000	0,000	0,000	0,000	0,000	0,000	0,000
2010	A	080502	Air traffic, Int. < 3000 ft.	AvGas	0,005	4,329	0,209	0,071	0,114	0,689	0,245
2010	A	080502	Air traffic, Int. < 3000 ft.	Jet fuel	0,000	0,000	0,000	0,000	0,000	0,000	0,000
2010	A	080503	Air traffic, Dom. > 3000 ft.	Jet fuel	0,000	0,000	0,000	0,000	0,000	0,000	0,000
2010	A	080504	Air traffic, Int. > 3000 ft.	Jet fuel	0,000	0,000	0,000	0,000	0,000	0,000	0,000
2010	A	080600	Agriculture	Diesel	0,001	4,350	0,510	0,496	0,256	0,464	0,264
2010	A	080600	Agriculture	Gasoline	0,005	4,329	0,209	0,071	0,114	0,689	0,245
2010	A	080700	Forestry	Diesel	0,001	4,350	0,510	0,496	0,256	0,464	0,264
2010	A	080700	Forestry	Gasoline	0,005	4,329	0,209	0,071	0,114	0,689	0,245
2010	A	080800	Industry	Diesel	0,001	4,350	0,510	0,496	0,256	0,464	0,264
2010	A	080800	Industry	Gasoline	0,005	4,329	0,209	0,071	0,114	0,689	0,245
2010	A	080800	Industry	LPG	0,000	0,000	0,000	0,000	0,000	0,000	0,000
2010	A	080900	Household and gardening	Gasoline	0,005	4,329	0,209	0,071	0,114	0,689	0,245
2010	A	081100	Commercial and institutional	Gasoline	0,005	4,329	0,209	0,071	0,114	0,689	0,245
2010	P	080501	Air traffic, Dom. < 3000 ft.	AvGas	0,005	4,329	0,209	0,071	0,114	0,689	0,245
2010	P	080501	Air traffic, Dom. < 3000 ft.	Jet fuel	0,000	0,000	0,000	0,000	0,000	0,000	0,000
2010	P	080502	Air traffic, Int. < 3000 ft.	AvGas	0,005	4,329	0,209	0,071	0,114	0,689	0,245
2010	P	080502	Air traffic, Int. < 3000 ft.	Jet fuel	0,000	0,000	0,000	0,000	0,000	0,000	0,000
2010	P	080503	Air traffic, Dom. > 3000 ft.	Jet fuel	0,000	0,000	0,000	0,000	0,000	0,000	0,000
2010	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 CO_2, CH_4, N_2O, SO_2, NO_x; NMVOC, NH_3 and TSP.

Year		SNAP ID	Category		Fuel type	Fuel	SO_2	NO_x	NMVOC	CH_4	CO	CO_2	N_2O	NH_3	TSP
						PJ	tonnes	tonnes	tonnes	Tonnes	tonnes	ktonnes	tonnes	tonnes	tonnes
1990	A	070101	Passenger cars	Highway	Diesel	1,3624	127,63	383,94	34,15	5,10	244,82	100,82	0,00	0,64	108,29
1990	A	070101	Passenger cars	Highway	Gasoline	10,513	24,00	14106,72	3918,93	115,49	36500,40	767,44	28,88	8,88	129,48
1990	A	070101	Passenger cars	Highway	LPG	0,0106	0,00	12,21	1,98	0,11	41,48	0,67	0,00	0,00	0,11
1990	A	070102	Passenger cars	Rural	Diesel	2,8483	266,82	806,00	119,90	19,42	763,57	210,78	0,00	1,62	213,99
1990	A	070102	Passenger cars	Rural	Gasoline	23,727	54,17	27460,47	11624,47	328,81	94329,55	1732,10	73,38	22,58	337,30
1990	A	070102	Passenger cars	Rural	LPG	0,0224	0,00	28,02	6,85	0,38	25,73	1,42	0,00	0,00	0,33
1990	A	070103	Passenger cars	Urban	Diesel	3,6613	342,98	836,08	306,97	30,81	1161,04	270,93	0,00	1,27	447,55
1990	A	070103	Passenger cars	Urban	Gasoline	28,626	65,36	17647,76	26998,31	1430,70	283681,58	2089,71	88,80	17,76	384,24
1990	A	070103	Passenger cars	Urban	LPG	0,0289	0,00	17,92	12,68	0,68	37,98	1,82	0,00	0,00	0,34
1990	A	070201	Light duty vehicles	Highway	Diesel	2,0446	191,53	553,43	61,73	5,31	703,63	151,30	0,00	0,66	213,62
1990	A	070201	Light duty vehicles	Highway	Gasoline	0,2642	0,60	361,80	45,00	2,67	789,37	19,29	0,69	0,21	4,27
1990	A	070201	Light duty vehicles	Highway	LPG	0,0075	0,00	8,67	1,41	0,08	29,47	0,48	0,00	0,00	0,08
1990	A	070202	Light duty vehicles	Rural	Diesel	6,5399	612,64	1957,06	217,28	27,88	2344,06	483,95	0,00	2,32	704,56
1990	A	070202	Light duty vehicles	Rural	Gasoline	0,9806	2,24	1165,83	257,50	14,96	2271,31	71,59	2,43	0,75	14,96
1990	A	070202	Light duty vehicles	Rural	LPG	0,022	0,00	27,41	6,70	0,37	25,17	1,39	0,00	0,00	0,32
1990	A	070203	Light duty vehicles	Urban	Diesel	6,4489	604,11	3142,56	360,27	40,67	2650,51	477,22	0,00	1,68	847,63
1990	A	070203	Light duty vehicles	Urban	Gasoline	1,2168	2,78	762,54	867,15	49,36	8914,36	88,83	2,71	0,54	10,82
1990	A	070203	Light duty vehicles	Urban	LPG	0,026	0,00	16,13	11,42	0,61	34,22	1,64	0,00	0,00	0,31
1990	A	070301	Heavy duty vehicles	Highway	Diesel	8,6373	809,11	8530,39	392,61	55,81	1764,75	639,16	27,68	2,77	303,17
1990	A	070301	Heavy duty vehicles	Highway	Gasoline	0,0467	0,11	48,43	22,15	0,45	355,19	3,41	0,04	0,01	2,58
1990	A	070302	Heavy duty vehicles	Rural	Diesel	15,813	1481,29	15563,42	901,53	107,06	3328,63	1170,15	45,62	4,56	564,38
1990	A	070302	Heavy duty vehicles	Rural	Gasoline	0,0815	0,19	93,08	66,89	1,37	682,60	5,95	0,07	0,02	4,96
1990	A	070303	Heavy duty vehicles	Urban	Diesel	12,591	1179,53	12054,04	933,28	150,80	3064,32	931,77	27,82	2,78	503,32
1990	A	070303	Heavy duty vehicles	Urban	Gasoline	0,0766	0,17	35,00	53,36	1,09	544,44	5,60	0,05	0,02	3,11
1990	A	070400	Mopeds	Urban	Gasoline	0,2904	0,66	5,30	3631,21	58,08	3660,12	21,20	0,27	0,27	49,86
1990	A	070501	Motorcycles	Highway	Gasoline	0,0704	0,16	18,59	75,46	9,15	1147,38	5,14	0,10	0,10	2,23
1990	A	070502	Motorcycles	Rural	Gasoline	0,1687	0,39	31,28	165,63	26,88	2662,69	12,32	0,28	0,28	6,56
1990	A	070503	Motorcycles	Urban	Gasoline	0,2166	0,49	24,46	248,88	33,59	3289,15	15,81	0,35	0,35	8,20
1990	A	080100	Military		AvGas	0,0049	0,11	4,22	6,11	0,11	34,26	0,36	0,01	0,01	0,05
1990	A	080100	Military		Diesel	0,1462	13,69	114,82	8,51	1,07	37,74	10,82	0,25	0,04	9,59
1990	A	080100	Military		Gasoline	0,001	0,00	0,92	1,14	0,03	6,51	0,07	0,00	0,00	0,01
1990	A	080100	Military		Jet fuel	1,4968	34,41	375,06	37,33	3,96	344,09	107,77	3,44		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
1990	A	080200	Railways		Gasoline	0	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
1990	A	080300	Inland waterways		Diesel	0,3426	32,10	337,02	58,86	0,96	155,43	25,35	1,01	0,06	36,64

1990	A	080300	Inland waterways	Gasoline	0,3091	0,71	90,06	1114,91	15,58	4282,54	22,57	0,24	0,02	56,40
1990	A	080402	National sea traffic	Diesel	5,2854	495,12	5836,01	267,28	8,27	881,74	391,12	24,76		122,69
1990	A	080402	National sea traffic	Residual oil	4,5713	5901,32	7383,82	244,28	7,56	805,87	356,56	22,35		682,25
1990	A	080403	Fishing	Diesel	7,9199	741,91	8332,71	389,10	12,03	1283,63	586,07	37,10		183,85
1990	A	080403	Fishing	Gasoline	0	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
1990	A	080404	International sea traffic	Diesel	11,289	1057,56	13644,52	558,38	17,27	1842,07	835,42	52,88		262,07
1990	A	080404	International sea traffic	Residual oil	27,815	40259,78	46994,61	1501,54	46,44	4953,54	2169,54	136,01		5268,82
1990	A	080501	Air traffic, Dom. < 3000 ft.	AvGas	0,1049	2,40	90,15	130,41	2,30	731,69	7,66	0,21	0,17	1,05
1990	A	080501	Air traffic, Dom. < 3000 ft.	Jet fuel	0,4222	9,71	132,78	6,30	0,67	38,17	30,40	2,40		0,49
1990	A	080502	Air traffic, Int. < 3000 ft.	AvGas	0,0307	0,70	26,34	38,10	0,67	213,76	2,24	0,06	0,05	0,31
1990	A	080502	Air traffic, Int. < 3000 ft.	Jet fuel	0,1323	3,04	40,93	2,18	0,23	22,36	9,53	0,94		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
1990	A	080504	Air traffic, Int. > 3000 ft.	Jet fuel	1,6119	37,06	393,62	10,45	1,11	87,20	116,06	3,71		1,87
1990	A	080600	Agriculture	Diesel	16,496	1545,32	12518,46	2587,36	42,07	10483,86	1220,72	48,34	2,76	2382,90
1990	A	080600	Agriculture	Gasoline	0,7089	1,62	22,40	673,10	62,68	33688,19	51,75	0,91	0,06	4,65
1990	A	080700	Forestry	Diesel	0,1453	13,62	124,63	22,74	0,37	93,84	10,76	0,43	0,02	21,66
1990	A	080700	Forestry	Gasoline	0,3414	0,78	13,79	2460,65	20,63	6165,33	24,92	0,13	0,03	34,56
1990	A	080800	Industry	Diesel	10,158	951,61	9483,66	1810,53	29,44	6661,90	751,72	29,87	1,71	1569,49
1990	A	080800	Industry	Gasoline	0,1752	0,40	23,88	282,25	21,13	2592,92	12,79	0,23	0,02	2,17
1990	A	080800	Industry	LPG	1,1849	0,00	1573,62	173,10	9,11	124,23	74,76	4,14	0,25	5,80
1990	A	080900	Household and gardening	Gasoline	0,5351	1,22	34,24	1801,26	50,96	17606,46	39,06	0,62	0,04	11,10
1990	A	081100	Commercial and institutional	Gasoline	1,0098	2,31	69,51	2303,07	98,83	30181,04	73,72	1,10	0,08	24,24
1990	P	080501	Air traffic, Dom. < 3000 ft.	AvGas	0,0086	0,20	7,42	10,74	0,19	60,25	0,63	0,02	0,01	0,09
1990	P	080501	Air traffic, Dom. < 3000 ft.	Jet fuel	0,5022	11,54	142,54	10,41	1,11	65,13	36,16	2,30		0,58
1990	P	080502	Air traffic, Int. < 3000 ft.	AvGas	0,0056	0,13	4,82	6,97	0,12	39,13	0,41	0,01	0,01	0,06
1990	P	080502	Air traffic, Int. < 3000 ft.	Jet fuel	2,0012	46,00	650,12	68,54	7,28	314,49	144,09	7,58		2,32
1990	P	080503	Air traffic, Dom. > 3000 ft.	Jet fuel	1,3052	30,00	410,96	15,38	1,63	109,71	93,97	3,00		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

1990 emissions for Arsenic, Cadmium, Chromium, Copper, Mercury, Nickel, Lead, Selenium, 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	1,3624	0,00	0,39	1,24	0,88	0,17	0,40	2,35	0,00	78,46
1990	A	070101	Passenger cars	Highway	Gasoline	10,513	0,07	2,79	3,98	10,69	2,09	3,30	15474,75	0,05	556,83
1990	A	070101	Passenger cars	Highway	LPG	0,0106	0,00	0,00	0,00	0,01	0,00	0,00	0,01	0,00	0,63
1990	A	070102	Passenger cars	Rural	Diesel	2,8483	0,01	0,99	3,04	2,16	0,35	1,00	5,97	0,01	199,13
1990	A	070102	Passenger cars	Rural	Gasoline	23,727	0,16	7,08	9,69	26,85	4,71	8,22	34928,57	0,11	1412,74
1990	A	070102	Passenger cars	Rural	LPG	0,0224	0,00	0,01	0,01	0,03	0,00	0,01	0,02	0,00	1,59
1990	A	070103	Passenger cars	Urban	Diesel	3,6613	0,01	0,78	2,67	1,89	0,45	0,80	4,71	0,01	157,24
1990	A	070103	Passenger cars	Urban	Gasoline	28,626	0,20	5,62	9,05	22,14	5,69	6,99	42131,27	0,13	1118,79
1990	A	070103	Passenger cars	Urban	LPG	0,0289	0,00	0,01	0,01	0,02	0,00	0,01	0,02	0,00	1,25
1990	A	070201	Light duty vehicles	Highway	Diesel	2,0446	0,00	0,39	1,37	0,97	0,25	0,40	2,35	0,00	78,24
1990	A	070201	Light duty vehicles	Highway	Gasoline	0,2642	0,00	0,06	0,10	0,25	0,05	0,08	388,93	0,00	12,90
1990	A	070201	Light duty vehicles	Highway	LPG	0,0075	0,00	0,00	0,00	0,01	0,00	0,00	0,00	0,00	0,29
1990	A	070202	Light duty vehicles	Rural	Diesel	6,5399	0,02	1,36	4,69	3,31	0,81	1,38	8,20	0,02	273,57
1990	A	070202	Light duty vehicles	Rural	Gasoline	0,9806	0,01	0,23	0,34	0,88	0,19	0,27	1443,36	0,00	45,18
1990	A	070202	Light duty vehicles	Rural	LPG	0,022	0,00	0,01	0,00	0,02	0,00	0,01	0,02	0,00	1,03
1990	A	070203	Light duty vehicles	Urban	Diesel	6,4489	0,02	0,99	3,73	2,63	0,80	1,01	5,96	0,02	198,74
1990	A	070203	Light duty vehicles	Urban	Gasoline	1,2168	0,01	0,17	0,32	0,69	0,24	0,22	1790,62	0,01	33,09
1990	A	070203	Light duty vehicles	Urban	LPG	0,026	0,00	0,00	0,00	0,01	0,00	0,00	0,01	0,00	0,74
1990	A	070301	Heavy duty vehicles	Highway	Diesel	8,6373	0,02	1,36	5,10	3,58	1,07	1,39	8,20	0,02	273,75
1990	A	070301	Heavy duty vehicles	Highway	Gasoline	0,0467	0,00	0,01	0,02	0,04	0,01	0,01	68,69	0,00	1,93
1990	A	070302	Heavy duty vehicles	Rural	Diesel	15,813	0,04	2,25	8,73	6,13	1,96	2,31	13,58	0,04	453,25
1990	A	070302	Heavy duty vehicles	Rural	Gasoline	0,0815	0,00	0,02	0,03	0,07	0,02	0,02	120,01	0,00	3,59
1990	A	070303	Heavy duty vehicles	Urban	Diesel	12,591	0,03	1,38	5,93	4,14	1,56	1,43	8,36	0,03	279,09
1990	A	070303	Heavy duty vehicles	Urban	Gasoline	0,0766	0,00	0,01	0,02	0,05	0,02	0,01	112,80	0,00	2,22
1990	A	070400	Mopeds	Urban	Gasoline	0,2904	0,00	0,00	0,04	0,03	0,06	0,02	427,27	0,00	0,22
1990	A	070501	Motorcycles	Highway	Gasoline	0,0704	0,00	0,01	0,02	0,03	0,01	0,01	103,57	0,00	1,47
1990	A	070502	Motorcycles	Rural	Gasoline	0,1687	0,00	0,02	0,04	0,09	0,03	0,03	248,28	0,00	4,30
1990	A	070503	Motorcycles	Urban	Gasoline	0,2166	0,00	0,03	0,05	0,11	0,04	0,04	318,69	0,00	5,38
1990	A	080100	Military		AvGas	0,0049	0,00	0,00	0,00	0,00	0,00	0,00	62,82	0,00	0,25
1990	A	080100	Military		Diesel	0,1462	0,00	0,03	0,10	0,07	0,02	0,03	0,16	0,00	5,45
1990	A	080100	Military		Gasoline	0,001	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,05
1990	A	080100	Military		Jet fuel	1,4968		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	0,3426	0,00	0,06	0,23	0,16	0,04	0,06	0,38	0,00	12,78

1990	A	080300	Inland waterways	Gasoline	0,3091	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	5,2854	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	4,5713	55,88	3,35	22,35	55,88	2,24	3353,02	22,35	44,71	100,59
1990	A	080403	Fishing	Diesel	7,9199	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	11,289	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	27,815	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	0,1049	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	0,4222		0,00	0,00	0,00		0,00		0,00	0,00
1990	A	080502	Air traffic, Int. < 3000 ft.	AvGas	0,0307	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	0,1323		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	1,6119		0,00	0,00	0,00		0,00		0,00	0,00
1990	A	080600	Agriculture	Diesel	16,496	0,04	3,06	10,88	7,67	2,04	3,12	18,44	0,04	615,23
1990	A	080600	Agriculture	Gasoline	0,7089	0,00	0,18	0,26	0,69	0,14	0,21	0,55	0,00	35,76
1990	A	080700	Forestry	Diesel	0,1453	0,00	0,03	0,10	0,07	0,02	0,03	0,16	0,00	5,42
1990	A	080700	Forestry	Gasoline	0,3414	0,00	0,09	0,13	0,33	0,07	0,10	0,26	0,00	17,23
1990	A	080800	Industry	Diesel	10,158	0,02	1,88	6,70	4,73	1,26	1,92	11,36	0,02	378,86
1990	A	080800	Industry	Gasoline	0,1752	0,00	0,04	0,06	0,17	0,03	0,05	0,14	0,00	8,84
1990	A	080800	Industry	LPG	1,1849	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	0,5351	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	1,0098	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	0,0086	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	0,5022		0,00	0,00	0,00		0,00		0,00	0,00
1990	P	080502	Air traffic, Int. < 3000 ft.	AvGas	0,0056	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	2,0012		0,00	0,00	0,00		0,00		0,00	0,00
1990	P	080503	Air traffic, Dom. > 3000 ft.	Jet fuel	1,3052		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), 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	1,3624	0,00	16,69	1,02	0,92	1,11	2,17	1,05
1990	A	070101	Passenger cars	Highway	Gasoline	10,513	0,14	89,42	5,81	4,47	4,92	11,62	4,47
1990	A	070101	Passenger cars	Highway	LPG	0,0106							
1990	A	070102	Passenger cars	Rural	Diesel	2,8483	0,00	42,41	2,59	2,35	2,83	5,50	2,67
1990	A	070102	Passenger cars	Rural	Gasoline	23,727	0,36	226,34	14,71	11,31	12,44	29,42	11,31
1990	A	070102	Passenger cars	Rural	LPG	0,0224							
1990	A	070103	Passenger cars	Urban	Diesel	3,6613	0,00	34,06	2,08	1,88	2,27	4,42	2,14
1990	A	070103	Passenger cars	Urban	Gasoline	28,626	0,29	183,96	11,96	9,20	10,12	23,91	9,20
1990	A	070103	Passenger cars	Urban	LPG	0,0289							
1990	A	070201	Light duty vehicles	Highway	Diesel	2,0446	0,00	17,39	1,06	0,96	1,16	2,26	1,10
1990	A	070201	Light duty vehicles	Highway	Gasoline	0,2642	0,00	2,14	0,14	0,11	0,12	0,28	0,11
1990	A	070201	Light duty vehicles	Highway	LPG	0,0075	0,00	0,00	0,00	0,00	0,00	0,00	0,00
1990	A	070202	Light duty vehicles	Rural	Diesel	6,5399	0,00	60,86	3,72	3,37	4,06	7,90	3,83
1990	A	070202	Light duty vehicles	Rural	Gasoline	0,9806	0,01	7,48	0,49	0,37	0,41	0,97	0,37
1990	A	070202	Light duty vehicles	Rural	LPG	0,022	0,00	0,00	0,00	0,00	0,00	0,00	0,00
1990	A	070203	Light duty vehicles	Urban	Diesel	6,4489	0,00	44,85	2,74	2,48	2,99	5,82	2,82
1990	A	070203	Light duty vehicles	Urban	Gasoline	1,2168	0,01	5,55	0,36	0,28	0,31	0,72	0,28
1990	A	070203	Light duty vehicles	Urban	LPG	0,026	0,00	0,00	0,00	0,00	0,00	0,00	0,00
1990	A	070301	Heavy duty vehicles	Highway	Diesel	8,6373	0,01	18,01	4,55	6,73	0,84	0,67	1,18
1990	A	070301	Heavy duty vehicles	Highway	Gasoline	0,0467							
1990	A	070302	Heavy duty vehicles	Rural	Diesel	15,813	0,02	34,91	8,81	13,05	1,63	1,30	2,28
1990	A	070302	Heavy duty vehicles	Rural	Gasoline	0,0815							
1990	A	070303	Heavy duty vehicles	Urban	Diesel	12,591	0,01	22,51	5,68	8,41	1,05	0,84	1,47
1990	A	070303	Heavy duty vehicles	Urban	Gasoline	0,0766							
1990	A	070400	Mopeds	Urban	Gasoline	0,2904							
1990	A	070501	Motorcycles	Highway	Gasoline	0,0704	0,00	0,89	0,06	0,04	0,05	0,12	0,04
1990	A	070502	Motorcycles	Rural	Gasoline	0,1687	0,00	2,56	0,17	0,13	0,14	0,33	0,13
1990	A	070503	Motorcycles	Urban	Gasoline	0,2166	0,01	3,31	0,22	0,17	0,18	0,43	0,17
1990	A	080100	Military		AvGas	0,0049	0,00	0,02	0,00	0,00	0,00	0,00	0,00
1990	A	080100	Military		Diesel	0,1462	0,00	0,64	0,08	0,08	0,04	0,08	0,04
1990	A	080100	Military		Gasoline	0,001	0,00	0,01	0,00	0,00	0,00	0,00	0,00
1990	A	080100	Military		Jet fuel	1,4968	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	0,3426	0,00	1,50	0,20	0,19	0,10	0,19	0,10

1990	A	080300	Inland waterways	Gasoline	0,3091	0,00	1,34	0,06	0,02	0,04	0,21	0,08
1990	A	080402	National sea traffic	Diesel	5,2854	0,06	39,22	3,38	1,59	0,79	7,56	6,24
1990	A	080402	National sea traffic	Residual oil	4,5713	0,06	23,72	1,23	0,23	0,09	0,32	0,14
1990	A	080403	Fishing	Diesel	7,9199	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	11,289	0,14	83,77	7,23	3,39	1,69	16,14	13,32
1990	A	080404	International sea traffic	Residual oil	27,815	0,37	114,60	5,56	2,50	1,95	7,23	5,56
1990	A	080501	Air traffic, Dom. < 3000 ft.	AvGas	0,1049	0,00	0,45	0,02	0,01	0,01	0,07	0,03
1990	A	080501	Air traffic, Dom. < 3000 ft.	Jet fuel	0,4222	0,00	0,00	0,00	0,00	0,00	0,00	0,00
1990	A	080502	Air traffic, Int. < 3000 ft.	AvGas	0,0307	0,00	0,13	0,01	0,00	0,00	0,02	0,01
1990	A	080502	Air traffic, Int. < 3000 ft.	Jet fuel	0,1323	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	1,6119	0,00	0,00	0,00	0,00	0,00	0,00	0,00
1990	A	080600	Agriculture	Diesel	16,496	0,01	72,44	9,41	9,37	4,78	9,07	4,79
1990	A	080600	Agriculture	Gasoline	0,7089	0,00	3,07	0,15	0,05	0,08	0,49	0,17
1990	A	080700	Forestry	Diesel	0,1453	0,00	0,64	0,08	0,08	0,04	0,08	0,04
1990	A	080700	Forestry	Gasoline	0,3414	0,00	1,48	0,07	0,02	0,04	0,24	0,08
1990	A	080800	Industry	Diesel	10,158	0,01	44,61	5,80	5,77	2,94	5,59	2,95
1990	A	080800	Industry	Gasoline	0,1752	0,00	0,76	0,04	0,01	0,02	0,12	0,04
1990	A	080800	Industry	LPG	1,1849							
1990	A	080900	Household and gardening	Gasoline	0,5351	0,00	2,32	0,11	0,04	0,06	0,37	0,13
1990	A	081100	Commercial and institutional	Gasoline	1,0098	0,01	4,37	0,21	0,07	0,12	0,70	0,25
1990	P	080501	Air traffic, Dom. < 3000 ft.	AvGas	0,0086	0,00	0,04	0,00	0,00	0,00	0,01	0,00
1990	P	080501	Air traffic, Dom. < 3000 ft.	Jet fuel	0,5022	0,00	0,00	0,00	0,00	0,00	0,00	0,00
1990	P	080502	Air traffic, Int. < 3000 ft.	AvGas	0,0056	0,00	0,02	0,00	0,00	0,00	0,00	0,00
1990	P	080502	Air traffic, Int. < 3000 ft.	Jet fuel	2,0012	0,00	0,00	0,00	0,00	0,00	0,00	0,00
1990	P	080503	Air traffic, Dom. > 3000 ft.	Jet fuel	1,3052	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

2010 emissions for CO_2, CH_4, N_2O, SO_2, NO_x; NMVOC, NH_3 and TSP.

Year		SNAP ID	Category		Fuel type	Fuel	SO_2	NO_x	NMVOC	CH_4	CO	CO_2	N_2O	NH_3	TSP
						PJ	tonnes	tonnes	tonnes	tonnes	tonnes	ktonnes	tonnes	tonnes	tonnes
2010	A	070101	Passenger cars	Highway	Diesel	6,4666	3,03	1841,97	38,27	0,73	82,38	478,45	13,03	3,19	89,98
2010	A	070101	Passenger cars	Highway	Gasoline	10,76	4,77	1307,36	303,95	28,45	6806,03	771,73	6,82	331,58	8,98
2010	A	070101	Passenger cars	Highway	LPG	9E-05	0,00	0,02	0,00	0,00	0,11	0,01	0,00	0,00	0,00
2010	A	070102	Passenger cars	Rural	Diesel	13,997	6,55	3386,42	119,91	3,13	343,79	1035,58	30,07	7,37	161,17
2010	A	070102	Passenger cars	Rural	Gasoline	23,492	10,42	2326,86	732,57	75,16	11448,93	1684,92	28,01	762,84	18,10
2010	A	070102	Passenger cars	Rural	LPG	0,0002	0,00	0,03	0,01	0,00	0,09	0,01	0,00	0,00	0,00
2010	A	070103	Passenger cars	Urban	Diesel	14,088	6,60	3420,03	374,30	8,72	921,12	1042,34	67,00	5,42	274,60
2010	A	070103	Passenger cars	Urban	Gasoline	26,01	11,54	3088,90	5649,29	227,80	61951,38	1865,53	57,20	265,19	21,35
2010	A	070103	Passenger cars	Urban	LPG	0,0002	0,00	0,02	0,02	0,00	0,15	0,01	0,00	0,00	0,00
2010	A	070201	Light duty vehicles	Highway	Diesel	3,7375	1,75	793,62	75,04	0,73	472,16	276,53	5,68	1,37	76,02
2010	A	070201	Light duty vehicles	Highway	Gasoline	0,3037	0,13	44,60	5,23	0,80	156,06	21,78	0,44	6,97	0,38
2010	A	070201	Light duty vehicles	Highway	LPG	0,0002	0,00	0,02	0,00	0,00	0,18	0,01	0,00	0,00	0,00
2010	A	070202	Light duty vehicles	Rural	Diesel	10,854	5,08	2408,59	246,66	4,89	1175,43	803,03	18,04	4,36	180,28
2010	A	070202	Light duty vehicles	Rural	Gasoline	1,0221	0,45	131,35	25,93	2,83	397,19	73,31	2,29	22,28	1,12
2010	A	070202	Light duty vehicles	Rural	LPG	0,0006	0,00	0,05	0,01	0,00	0,22	0,03	0,00	0,00	0,01
2010	A	070203	Light duty vehicles	Urban	Diesel	10,485	4,91	2237,06	433,33	10,21	1431,60	775,79	33,16	2,95	263,83
2010	A	070203	Light duty vehicles	Urban	Gasoline	1,2265	0,54	137,53	184,62	8,19	3728,99	87,97	4,71	6,76	0,93
2010	A	070203	Light duty vehicles	Urban	LPG	0,0005	0,00	0,03	0,02	0,00	0,24	0,03	0,00	0,00	0,01
2010	A	070301	Heavy duty vehicles	Highway	Diesel	10,936	5,12	5539,16	124,13	34,65	1487,02	809,14	35,19	3,52	91,61
2010	A	070301	Heavy duty vehicles	Highway	Gasoline	0,0285	0,01	29,55	13,52	0,28	216,72	2,04	0,02	0,01	1,58
2010	A	070302	Heavy duty vehicles	Rural	Diesel	18,166	8,51	9680,08	249,28	59,84	2390,59	1344,05	52,57	5,26	152,95
2010	A	070302	Heavy duty vehicles	Rural	Gasoline	0,0463	0,02	52,89	38,01	0,78	387,86	3,32	0,04	0,01	2,82
2010	A	070303	Heavy duty vehicles	Urban	Diesel	12,972	6,07	7552,31	225,52	55,65	1829,45	959,78	29,73	2,97	120,95
2010	A	070303	Heavy duty vehicles	Urban	Gasoline	0,0416	0,02	19,01	28,99	0,59	295,77	2,99	0,03	0,01	1,69
2010	A	070400	Mopeds	Urban	Gasoline	0,1794	0,08	25,71	1549,32	24,78	1668,71	12,87	0,23	0,23	24,45
2010	A	070501	Motorcycles	Highway	Gasoline	0,1358	0,06	36,68	112,21	13,84	1624,55	9,74	0,17	0,17	3,00
2010	A	070502	Motorcycles	Rural	Gasoline	0,2972	0,13	57,16	239,63	36,67	3324,58	21,31	0,46	0,46	8,00
2010	A	070503	Motorcycles	Urban	Gasoline	0,3565	0,16	42,31	351,93	45,18	3830,78	25,57	0,54	0,54	9,35
2010	A	080100	Military		AvGas	0,0062	0,14	5,32	7,69	0,14	43,15	0,45	0,01	0,01	0,06
2010	A	080100	Military		Diesel	0,5963	0,28	216,13	11,06	1,05	59,42	44,13	1,67	0,21	8,28
2010	A	080100	Military		Gasoline	0,0057	0,00	0,65	0,95	0,04	8,52	0,41	0,01	0,12	0,01
2010	A	080100	Military		Jet fuel	0,8618	19,81	215,95	21,49	2,28	198,12	62,05	1,98	0,00	1,00
2010	A	080200	Railways		Diesel	3,2728	1,53	2817,86	189,10	7,27	481,10	242,19	6,68	0,65	94,91
2010	A	080200	Railways		Gasoline	0	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2010	A	080300	Inland waterways		Diesel	1,0021	46,94	836,00	160,72	2,61	444,10	74,16	2,98	0,17	98,43

2010	A	080300	Inland waterways	Gasoline	0,3458	0,16	185,55	406,67	21,66	4541,02	25,24	0,50	0,04	12,49
2010	A	080402	National sea traffic	Diesel	4,0709	190,67	3871,19	211,47	6,13	343,78	301,24	19,07	0,00	87,71
2010	A	080402	National sea traffic	Residual oil	2,4588	1202,35	4674,93	153,75	4,76	507,22	191,79	12,02		108,15
2010	A	080403	Fishing	Diesel	7,7679	363,84	10666,46	445,87	13,79	1470,92	574,83	36,38	0,00	167,38
2010	A	080403	Fishing	Gasoline	0	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2010	A	080404	International sea traffic	Diesel	11,356	531,89	17907,60	646,66	20,00	2133,32	840,33	53,19		244,68
2010	A	080404	International sea traffic	Residual oil	15,808	7730,14	33424,56	989,32	30,60	3263,74	1233,03	77,30		695,29
2010	A	080501	Air traffic, Dom. < 3000 ft.	AvGas	0,0682	1,56	58,62	84,80	1,49	475,78	4,98	0,14	0,11	0,68
2010	A	080501	Air traffic, Dom. < 3000 ft.	Jet fuel	0,2571	5,91	73,26	3,26	0,35	34,93	18,51	2,73		0,30
2010	A	080502	Air traffic, Int. < 3000 ft.	AvGas	0,0007	0,01	0,56	0,81	0,01	4,54	0,05	0,00	0,00	0,01
2010	A	080502	Air traffic, Int. < 3000 ft.	Jet fuel	0,3084	7,09	92,59	6,58	0,70	53,14	22,21	2,29		0,36
2010	A	080503	Air traffic, Dom. > 3000 ft.	Jet fuel	0,5834	13,41	151,48	4,95	0,53	62,52	42,00	1,34		0,68
2010	A	080504	Air traffic, Int. > 3000 ft.	Jet fuel	3,4263	78,77	818,13	20,77	2,21	171,92	246,69	7,88		3,97
2010	A	080600	Agriculture	Diesel	16,708	39,13	9977,82	961,34	15,63	5673,29	1236,39	53,02	3,03	763,57
2010	A	080600	Agriculture	Gasoline	0,501	0,23	55,73	600,29	80,39	10941,16	36,57	0,86	0,76	15,62
2010	A	080700	Forestry	Diesel	0,1591	0,37	65,32	4,86	0,08	39,08	11,77	0,51	0,03	4,34
2010	A	080700	Forestry	Gasoline	0,0714	0,03	4,69	361,53	2,92	1255,55	5,21	0,03	0,01	5,76
2010	A	080800	Industry	Diesel	13,015	30,48	7199,37	788,73	12,82	4167,94	963,14	40,30	2,30	678,64
2010	A	080800	Industry	Gasoline	0,1567	0,07	32,75	240,60	17,04	2174,38	11,44	0,23	0,02	2,77
2010	A	080800	Industry	LPG	0,9849	0,00	1308,04	143,88	7,57	103,27	62,15	3,44	0,21	4,82
2010	A	080900	Household and gardening	Gasoline	0,86	0,39	86,56	2032,41	65,22	25616,27	62,78	1,08	0,08	14,38
2010	A	081100	Commercial and institutional	Gasoline	2,3683	1,08	217,44	4423,32	159,55	72338,05	172,88	2,65	0,21	66,75
2010	P	080501	Air traffic, Dom. < 3000 ft.	AvGas	0,0005	0,01	0,47	0,68	0,01	3,81	0,04	0,00	0,00	0,01
2010	P	080501	Air traffic, Dom. < 3000 ft.	Jet fuel	0,2971	6,83	82,55	4,33	0,46	54,01	21,39	2,08		0,34
2010	P	080502	Air traffic, Int. < 3000 ft.	AvGas	9E-05	0,00	0,08	0,12	0,00	0,66	0,01	0,00	0,00	0,00
2010	P	080502	Air traffic, Int. < 3000 ft.	Jet fuel	2,5457	58,52	857,57	82,06	8,71	609,82	183,29	10,09	0,00	2,95
2010	P	080503	Air traffic, Dom. > 3000 ft.	Jet fuel	0,954	21,93	256,68	11,05	1,17	57,18	68,68	2,19	0,00	1,11
2010	P	080504	Air traffic, Int. > 3000 ft.	Jet fuel	27,343	628,57	8340,59	257,10	27,30	875,66	1968,68	62,86	0,00	31,72

2010 emissions for Arsenic, Cadmium, Chromium, Copper, Mercury, Nickel, Lead, Selenium, 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
2010	A	070101	Passenger cars	Highway	Diesel	6,4666	0,02	1,78	5,71	4,05	0,80	1,80	10,69	0,02	356,48
2010	A	070101	Passenger cars	Highway	Gasoline	10,76	0,07	3,11	4,27	11,79	2,10	3,61	9,47	0,05	619,86
2010	A	070101	Passenger cars	Highway	LPG	9E-05	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2010	A	070102	Passenger cars	Rural	Diesel	13,997	0,03	4,10	12,99	9,21	1,74	4,15	24,65	0,03	821,99
2010	A	070102	Passenger cars	Rural	Gasoline	23,492	0,16	7,16	9,67	27,07	4,58	8,27	21,81	0,11	1429,02
2010	A	070102	Passenger cars	Rural	LPG	0,0002	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,01
2010	A	070103	Passenger cars	Urban	Diesel	14,088	0,03	3,02	10,31	7,29	1,75	3,07	18,18	0,03	606,52
2010	A	070103	Passenger cars	Urban	Gasoline	26,01	0,18	5,31	8,35	20,81	5,08	6,54	16,28	0,12	1058,10
2010	A	070103	Passenger cars	Urban	LPG	0,0002	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,01
2010	A	070201	Light duty vehicles	Highway	Diesel	3,7375	0,01	0,81	2,75	1,94	0,46	0,82	4,85	0,01	161,92
2010	A	070201	Light duty vehicles	Highway	Gasoline	0,3037	0,00	0,07	0,10	0,27	0,06	0,08	0,21	0,00	13,74
2010	A	070201	Light duty vehicles	Highway	LPG	0,0002	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,01
2010	A	070202	Light duty vehicles	Rural	Diesel	10,854	0,03	2,56	8,53	6,03	1,35	2,60	15,41	0,03	514,02
2010	A	070202	Light duty vehicles	Rural	Gasoline	1,0221	0,01	0,22	0,34	0,85	0,20	0,27	0,67	0,00	43,71
2010	A	070202	Light duty vehicles	Rural	LPG	0,0006	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,02
2010	A	070203	Light duty vehicles	Urban	Diesel	10,485	0,02	1,74	6,40	4,50	1,30	1,77	10,47	0,02	349,41
2010	A	070203	Light duty vehicles	Urban	Gasoline	1,2265	0,01	0,15	0,30	0,63	0,24	0,21	0,47	0,01	29,99
2010	A	070203	Light duty vehicles	Urban	LPG	0,0005	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,01
2010	A	070301	Heavy duty vehicles	Highway	Diesel	10,936	0,03	1,68	6,34	4,46	1,36	1,72	10,11	0,03	337,47
2010	A	070301	Heavy duty vehicles	Highway	Gasoline	0,0285	0,00	0,01	0,01	0,03	0,01	0,01	0,02	0,00	1,39
2010	A	070302	Heavy duty vehicles	Rural	Diesel	18,166	0,04	2,52	9,87	6,93	2,25	2,59	15,22	0,04	507,84
2010	A	070302	Heavy duty vehicles	Rural	Gasoline	0,0463	0,00	0,01	0,02	0,05	0,01	0,02	0,04	0,00	2,58
2010	A	070303	Heavy duty vehicles	Urban	Diesel	12,972	0,03	1,44	6,14	4,29	1,61	1,48	8,69	0,03	289,95
2010	A	070303	Heavy duty vehicles	Urban	Gasoline	0,0416	0,00	0,01	0,01	0,03	0,01	0,01	0,02	0,00	1,58
2010	A	070400	Mopeds	Urban	Gasoline	0,1794	0,00	0,00	0,03	0,02	0,04	0,01	0,00	0,00	0,13
2010	A	070501	Motorcycles	Highway	Gasoline	0,1358	0,00	0,02	0,04	0,08	0,03	0,02	0,06	0,00	3,68
2010	A	070502	Motorcycles	Rural	Gasoline	0,2972	0,00	0,05	0,09	0,20	0,06	0,06	0,15	0,00	9,78
2010	A	070503	Motorcycles	Urban	Gasoline	0,3565	0,00	0,06	0,10	0,23	0,07	0,07	0,18	0,00	11,44
2010	A	080100	Military		AvGas	0,0062	0,00	0,00	0,00	0,01	0,00	0,00	79,12	0,00	0,31
2010	A	080100	Military		Diesel	0,5963	0,00	0,12	0,40	0,29	0,07	0,12	0,69	0,00	23,14
2010	A	080100	Military		Gasoline	0,0057	0,00	0,00	0,00	0,01	0,00	0,00	0,00	0,00	0,29
2010	A	080100	Military		Jet fuel	0,8618	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2010	A	080200	Railways		Diesel	3,2728	0,01	0,61	2,16	1,52	0,41	0,62	3,66	0,01	122,06
2010	A	080200	Railways		Gasoline	0		0,00	0,00	0,00		0,00	0,00	0,00	0,00
2010	A	080300	Inland waterways		Diesel	1,0021	0,00	0,19	0,66	0,47	0,12	0,19	1,12	0,00	37,38

2010	A	080300	Inland waterways	Gasoline	0,3458	0,00	0,09	0,13	0,34	0,07	0,10	0,27	0,00	17,45
2010	A	080402	National sea traffic	Diesel	4,0709	4,76	0,94	3,83	4,76	4,76	6,68	9,53	19,05	47,67
2010	A	080402	National sea traffic	Residual oil	2,4588	30,05	1,79	12,02	30,05	1,20	1803,54	12,02	24,05	54,09
2010	A	080403	Fishing	Diesel	7,7679	9,09	1,79	7,30	9,09	9,09	12,74	18,18	36,35	90,96
2010	A	080403	Fishing	Gasoline	0		0,00	0,00	0,00		0,00	0,00	0,00	0,00
2010	A	080404	International sea traffic	Diesel	11,356	13,29	2,61	10,67	13,29	13,29	18,62	26,57	53,15	132,98
2010	A	080404	International sea traffic	Residual oil	15,808	193,18	11,54	77,30	193,18	7,75	11595,26	77,30	154,60	347,78
2010	A	080501	Air traffic, Dom. < 3000 ft.	AvGas	0,0682	0,00	0,02	0,03	0,07	0,01	0,02	921,66	0,00	3,44
2010	A	080501	Air traffic, Dom. < 3000 ft.	Jet fuel	0,2571		0,00	0,00	0,00		0,00	0,00	0,00	0,00
2010	A	080502	Air traffic, Int. < 3000 ft.	AvGas	0,0007	0,00	0,00	0,00	0,00	0,00	0,00	8,80	0,00	0,03
2010	A	080502	Air traffic, Int. < 3000 ft.	Jet fuel	0,3084		0,00	0,00	0,00		0,00	0,00	0,00	0,00
2010	A	080503	Air traffic, Dom. > 3000 ft.	Jet fuel	0,5834		0,00	0,00	0,00		0,00	0,00	0,00	0,00
2010	A	080504	Air traffic, Int. > 3000 ft.	Jet fuel	3,4263		0,00	0,00	0,00		0,00	0,00	0,00	0,00
2010	A	080600	Agriculture	Diesel	16,708	0,04	3,10	11,02	7,77	2,07	3,16	18,68	0,04	623,13
2010	A	080600	Agriculture	Gasoline	0,501	0,00	0,13	0,18	0,49	0,10	0,15	0,39	0,00	25,28
2010	A	080700	Forestry	Diesel	0,1591	0,00	0,03	0,10	0,07	0,02	0,03	0,18	0,00	5,93
2010	A	080700	Forestry	Gasoline	0,0714	0,00	0,02	0,03	0,07	0,01	0,02	0,06	0,00	3,60
2010	A	080800	Industry	Diesel	13,015	0,03	2,41	8,59	6,05	1,61	2,46	14,55	0,03	485,41
2010	A	080800	Industry	Gasoline	0,1567	0,00	0,04	0,06	0,15	0,03	0,05	0,12	0,00	7,90
2010	A	080800	Industry	LPG	0,9849	0,00	0,13	0,12	0,45	0,00	0,13	0,39	0,00	25,73
2010	A	080900	Household and gardening	Gasoline	0,86	0,01	0,22	0,32	0,84	0,17	0,26	0,66	0,00	43,39
2010	A	081100	Commercial and institutional	Gasoline	2,3683	0,02	0,60	0,87	2,30	0,47	0,71	1,83	0,01	119,49
2010	P	080501	Air traffic, Dom. < 3000 ft.	AvGas	0,0005	0,00	0,00	0,00	0,00	0,00	0,00	7,38	0,00	0,03
2010	P	080501	Air traffic, Dom. < 3000 ft.	Jet fuel	0,2971		0,00	0,00	0,00		0,00		0,00	0,00
2010	P	080502	Air traffic, Int. < 3000 ft.	AvGas	9E-05	0,00	0,00	0,00	0,00	0,00	0,00	1,28	0,00	0,00
2010	P	080502	Air traffic, Int. < 3000 ft.	Jet fuel	2,5457	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2010	P	080503	Air traffic, Dom. > 3000 ft.	Jet fuel	0,954	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2010	P	080504	Air traffic, Int. > 3000 ft.	Jet fuel	27,343	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00

2010 emissions for Dioxins, Flouranthene, Benzo(b), Benzo(k), Benzo(a), Benzo(g,h,i), 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
2010	A	070101	Passenger cars	Highway	Diesel	6,4666	0,00	82,87	5,06	4,58	5,54	10,75	5,22
2010	A	070101	Passenger cars	Highway	Gasoline	10,76	0,00	11,22	2,19	2,68	2,17	4,39	3,20
2010	A	070101	Passenger cars	Highway	LPG	9E-05							
2010	A	070102	Passenger cars	Rural	Diesel	13,997	0,01	204,25	12,47	11,30	13,64	26,50	12,86
2010	A	070102	Passenger cars	Rural	Gasoline	23,492	0,01	27,12	5,34	6,53	5,29	10,68	7,79
2010	A	070102	Passenger cars	Rural	LPG	0,0002							
2010	A	070103	Passenger cars	Urban	Diesel	14,088	0,01	136,42	8,33	7,55	9,11	17,70	8,59
2010	A	070103	Passenger cars	Urban	Gasoline	26,01	0,01	17,05	3,26	3,97	3,23	6,53	4,73
2010	A	070103	Passenger cars	Urban	LPG	0,0002							
2010	A	070201	Light duty vehicles	Highway	Diesel	3,7375	0,00	34,51	2,11	1,91	2,30	4,48	2,17
2010	A	070201	Light duty vehicles	Highway	Gasoline	0,3037	0,00	0,30	0,05	0,06	0,05	0,09	0,07
2010	A	070201	Light duty vehicles	Highway	LPG	0,0002	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2010	A	070202	Light duty vehicles	Rural	Diesel	10,854	0,01	109,65	6,70	6,07	7,32	14,23	6,90
2010	A	070202	Light duty vehicles	Rural	Gasoline	1,0221	0,00	0,94	0,15	0,18	0,15	0,30	0,21
2010	A	070202	Light duty vehicles	Rural	LPG	0,0006	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2010	A	070203	Light duty vehicles	Urban	Diesel	10,485	0,00	76,14	4,65	4,21	5,08	9,88	4,79
2010	A	070203	Light duty vehicles	Urban	Gasoline	1,2265	0,00	0,65	0,10	0,12	0,10	0,21	0,14
2010	A	070203	Light duty vehicles	Urban	LPG	0,0005	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2010	A	070301	Heavy duty vehicles	Highway	Diesel	10,936	0,01	22,20	5,60	8,30	1,04	0,83	1,45
2010	A	070301	Heavy duty vehicles	Highway	Gasoline	0,0285							
2010	A	070302	Heavy duty vehicles	Rural	Diesel	18,166	0,02	37,53	9,47	14,03	1,75	1,40	2,45
2010	A	070302	Heavy duty vehicles	Rural	Gasoline	0,0463							
2010	A	070303	Heavy duty vehicles	Urban	Diesel	12,972	0,01	21,74	5,48	8,12	1,01	0,81	1,42
2010	A	070303	Heavy duty vehicles	Urban	Gasoline	0,0416							
2010	A	070400	Mopeds	Urban	Gasoline	0,1794							
2010	A	070501	Motorcycles	Highway	Gasoline	0,1358	0,00	1,74	0,11	0,09	0,10	0,23	0,09
2010	A	070502	Motorcycles	Rural	Gasoline	0,2972	0,01	4,56	0,30	0,23	0,25	0,59	0,23
2010	A	070503	Motorcycles	Urban	Gasoline	0,3565	0,01	5,53	0,36	0,28	0,30	0,72	0,28
2010	A	080100	Military		AvGas	0,0062	0,00	0,03	0,00	0,00	0,00	0,00	0,00
2010	A	080100	Military		Diesel	0,5963	0,00	2,59	0,30	0,30	0,15	0,28	0,16
2010	A	080100	Military		Gasoline	0,0057	0,00	0,01	0,00	0,00	0,00	0,00	0,00
2010	A	080100	Military		Jet fuel	0,8618	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2010	A	080200	Railways		Diesel	3,2728	0,00	4,62	1,18	1,32	0,19	0,17	0,30
2010	A	080200	Railways		Gasoline	0	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2010	A	080300	Inland waterways		Diesel	1,0021	0,00	4,36	0,51	0,50	0,26	0,47	0,26

2010	A	080300	Inland waterways	Gasoline	0,3458	0,00	1,50	0,07	0,02	0,04	0,24	0,08
2010	A	080402	National sea traffic	Diesel	4,0709	0,05	30,21	2,61	1,22	0,61	5,82	4,80
2010	A	080402	National sea traffic	Residual oil	2,4588	0,03	12,76	0,66	0,12	0,05	0,17	0,07
2010	A	080403	Fishing	Diesel	7,7679	0,09	57,64	4,97	2,33	1,17	11,11	9,17
2010	A	080403	Fishing	Gasoline	0	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2010	A	080404	International sea traffic	Diesel	11,356	0,14	84,26	7,27	3,41	1,70	16,24	13,40
2010	A	080404	International sea traffic	Residual oil	15,808	0,21	65,13	3,16	1,42	1,11	4,11	3,16
2010	A	080501	Air traffic, Dom. < 3000 ft.	AvGas	0,0682	0,00	0,30	0,01	0,00	0,01	0,05	0,02
2010	A	080501	Air traffic, Dom. < 3000 ft.	Jet fuel	0,2571	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2010	A	080502	Air traffic, Int. < 3000 ft.	AvGas	0,0007	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2010	A	080502	Air traffic, Int. < 3000 ft.	Jet fuel	0,3084	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2010	A	080503	Air traffic, Dom. > 3000 ft.	Jet fuel	0,5834	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2010	A	080504	Air traffic, Int. > 3000 ft.	Jet fuel	3,4263	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2010	A	080600	Agriculture	Diesel	16,708	0,01	72,68	8,53	8,29	4,27	7,76	4,42
2010	A	080600	Agriculture	Gasoline	0,501	0,00	2,17	0,10	0,04	0,06	0,35	0,12
2010	A	080700	Forestry	Diesel	0,1591	0,00	0,69	0,08	0,08	0,04	0,07	0,04
2010	A	080700	Forestry	Gasoline	0,0714	0,00	0,31	0,01	0,01	0,01	0,05	0,02
2010	A	080800	Industry	Diesel	13,015	0,01	56,61	6,64	6,45	3,33	6,05	3,44
2010	A	080800	Industry	Gasoline	0,1567	0,00	0,68	0,03	0,01	0,02	0,11	0,04
2010	A	080800	Industry	LPG	0,9849							
2010	A	080900	Household and gardening	Gasoline	0,86	0,00	3,72	0,18	0,06	0,10	0,59	0,21
2010	A	081100	Commercial and institutional	Gasoline	2,3683	0,01	10,25	0,50	0,17	0,27	1,63	0,58
2010	P	080501	Air traffic, Dom. < 3000 ft.	AvGas	0,0005	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2010	P	080501	Air traffic, Dom. < 3000 ft.	Jet fuel	0,2971	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2010	P	080502	Air traffic, Int. < 3000 ft.	AvGas	9E-05	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2010	P	080502	Air traffic, Int. < 3000 ft.	Jet fuel	2,5457	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2010	P	080503	Air traffic, Dom. > 3000 ft.	Jet fuel	0,954	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2010	P	080504	Air traffic, Int. > 3000 ft.	Jet fuel	27,343	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
2010	Brake wear	1	40007188	7,5	7,3	2,9	0,1	0,1	0,8	787,9	0,0	0,8	103,9	0,1	151,2
2010	Brake wear	2	9350794	13,6	13,3	5,3	0,1	0,1	1,4	1426,6	0,0	1,4	188,1	0,3	273,8
2010	Brake wear	3	3141941	34,7	34,0	13,5	0,3	0,1	5,7	261,5	0,0	4,0	14,1	0,7	260,7
2010	Brake wear	4	789670	47,2	46,3	18,4	0,5	0,1	3,0	646,4	0,0	7,5	34,5	0,9	440,7
2010	Brake wear	5	227278	6,2	6,1	2,4	0,1	0,1	0,7	649,2	0,0	0,7	85,6	0,1	124,6
2010	Brake wear	6	591045	4,2	4,1	1,6	0,0	0,0	0,4	440,4	0,0	0,4	58,1	0,1	84,5
2010	Road abrasion	1	40007188	15,0	7,5	4,1	0,0	0,0	0,3	0,1	0,0	0,2	0,7	0,0	1,1
2010	Road abrasion	2	9350794	15,0	7,5	4,1	0,0	0,0	0,3	0,1	0,0	0,2	0,7	0,0	1,1
2010	Road abrasion	3	3141941	76,0	38,0	20,5	0,0	0,0	1,5	0,8	0,0	1,2	3,6	0,0	5,7
2010	Road abrasion	4	789670	76,0	38,0	20,5	0,0	0,0	1,5	0,8	0,0	1,2	3,6	0,0	5,7
2010	Road abrasion	5	227278	6,0	3,0	1,6	0,0	0,0	0,1	0,1	0,0	0,1	0,3	0,0	0,5
2010	Road abrasion	6	591045	6,0	3,0	1,6	0,0	0,0	0,1	0,1	0,0	0,1	0,3	0,0	0,5
2010	Tyre wear	1	40007188	10,8	6,5	4,6	0,0	0,0	0,0	0,2	0,0	0,3	0,9	0,2	118,5
2010	Tyre wear	2	9350794	17,2	10,3	7,2	0,0	0,0	0,1	0,3	0,0	0,4	1,4	0,3	187,7
2010	Tyre wear	3	3141941	65,1	39,1	27,4	0,1	0,2	0,2	1,0	0,0	1,7	5,2	1,3	712,4
2010	Tyre wear	4	789670	61,1	36,6	25,7	0,0	0,2	0,2	1,0	0,0	1,6	4,9	1,2	667,9
2010	Tyre wear	5	227278	14,2	8,5	6,0	0,0	0,0	0,1	0,2	0,0	0,4	1,1	0,3	154,9
2010	Tyre wear	6	591045	17,8	10,7	7,5	0,0	0,0	0,1	0,3	0,0	0,5	1,4	0,4	194,1
2010	Total	1	40007188	33,3	21,3	11,5	0,1	0,1	1,1	788,3	0,0	1,3	105,5	0,4	270,8
2010	Total	2	9350794	45,7	31,1	16,6	0,1	0,2	1,8	1427,0	0,0	2,1	190,2	0,6	462,6
2010	Total	3	3141941	175,8	111,1	61,4	0,4	0,3	7,4	263,3	0,0	6,8	22,9	2,0	978,8
2010	Total	4	789670	184,3	120,9	64,6	0,5	0,3	4,8	648,1	0,0	10,3	43,0	2,2	1114,3
2010	Total	5	227278	26,3	17,6	10,0	0,1	0,1	0,8	649,5	0,0	1,1	87,0	0,4	280,0
2010	Total	6	591045	27,9	17,8	10,7	0,1	0,1	0,6	440,7	0,0	1,0	59,8	0,4	279,1

Year	Source	Category	TSP	PM_{10}	$PM_{2.5}$	As	Cd	Cr	Cu	Hg	Ni	Pb	Se	Zn
			tonnes	tonnes	tonnes	kg	kg	kg	kg	kg	kg	kg	kg	kg
2010	Brake wear	1	300	294	117	3,000	2,943	31,563	31523,585		31,593	4156,411	6,001	6049,725
2010	Brake wear	2	127	124	50	1,270	1,245	13,356	13339,791		13,369	1758,862	2,539	2560,054
2010	Brake wear	3	109	107	43	1,090	0,335	17,876	821,693		12,426	44,363	2,180	818,973
2010	Brake wear	4	37	37	15	0,373	0,113	2,387	510,445		5,927	27,229	0,745	347,996
2010	Brake wear	5	1	1	1	0,014	0,014	0,148	147,554		0,148	19,455	0,028	28,317
2010	Brake wear	6	2	2	1	0,025	0,024	0,261	260,289		0,261	34,319	0,050	49,952
2010	Road abrasion	1	600	300	162	0,000	0,057	11,909	5,995	0,034	9,527	28,220	0,000	45,344
2010	Road abrasion	2	140	70	38	0,000	0,013	2,783	1,401	0,008	2,227	6,596	0,000	10,598
2010	Road abrasion	3	239	119	64	0,000	0,023	4,739	2,385	0,014	3,791	11,229	0,000	18,043
2010	Road abrasion	4	60	30	16	0,000	0,006	1,191	0,600	0,003	0,953	2,822	0,000	4,535
2010	Road abrasion	5	1	1	0	0,000	0,000	0,027	0,014	0,000	0,022	0,064	0,000	0,103
2010	Road abrasion	6	4	2	1	0,000	0,000	0,070	0,035	0,000	0,056	0,167	0,000	0,268
2010	Tyre wear	1	433	260	182	0,347	1,127	1,560	6,761		11,052	34,890	8,668	4739,806
2010	Tyre wear	2	161	96	67	0,128	0,417	0,578	2,504		4,093	12,922	3,210	1755,468
2010	Tyre wear	3	205	123	86	0,164	0,532	0,737	3,193		5,219	16,476	4,094	2238,340
2010	Tyre wear	4	48	29	20	0,039	0,125	0,174	0,752		1,230	3,882	0,965	527,405
2010	Tyre wear	5	3	2	1	0,003	0,008	0,012	0,050		0,082	0,259	0,064	35,211
2010	Tyre wear	6	10	6	4	0,008	0,027	0,038	0,164		0,268	0,845	0,210	114,730
2010	Total	1	1334	854	461	3,347	4,127	45,032	31536,342	0,034	52,172	4219,521	14,669	10834,875
2010	Total	2	428	291	155	1,398	1,676	16,718	13343,697	0,008	19,689	1778,380	5,750	4326,120
2010	Total	3	552	349	193	1,254	0,890	23,352	827,271	0,014	21,436	72,069	6,274	3075,356
2010	Total	4	146	95	51	0,411	0,244	3,751	511,797	0,003	8,109	33,934	1,710	879,936
2010	Total	5	6	4	2	0,017	0,022	0,186	147,618	0,000	0,252	19,778	0,092	63,632
2010	Total	6	17	10	6	0,033	0,052	0,369	260,488	0,000	0,585	35,331	0,259	164,950

Annex 2B-15: Fuel consumption and emissions in NFR format

Fuel

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	65,6	66,3	66,5	67,3	66,7	70,8	75,3	78,7	80,7	83,6	84,3	85,1	87,3	89,0	89,6
Road transport:Light duty vehicles	12,7	14,6	15,4	15,8	16,4	17,6	18,2	18,1	18,6	20,0	20,0	20,4	20,6	21,2	21,6
Road transport:Heavy duty vehicles	32,1	35,8	35,1	34,6	35,9	37,2	37,7	36,8	36,0	38,4	38,9	40,2	40,6	40,8	41,8
Road transport: Mopeds & motorcycles	0,8	0,8	0,7	0,7	0,7	0,7	0,8	0,8	0,8	0,9	0,9	0,9	1,0	1,0	1,0
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

NFR category	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
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
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
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
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
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
Road transport: Passenger cars	89,2	88,6	89,8	91,9	92,7	91,8	92,3	97,0	98,0	95,3	94,8
Road transport:Light duty vehicles	22,0	21,8	22,5	24,4	26,3	28,1	30,3	31,7	30,1	28,3	27,6
Road transport:Heavy duty vehicles	40,4	41,5	41,3	43,5	44,8	45,3	47,7	49,8	46,9	40,9	42,2
Road transport: Mopeds & motorcycles	1,0	0,9	0,9	0,9	0,9	0,9	1,0	1,0	1,0	1,0	1,0
Railways	3,1	2,9	2,8	3,0	2,9	3,1	3,1	3,1	3,2	3,1	3,3
International navigation (Shipping)	54,6	43,3	35,5	37,5	30,2	30,7	40,8	42,7	36,6	19,6	27,2
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
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
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

Continued											
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	17,4
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
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

Emissions 1985-1999

pol_name	NFR category	Unit	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
SO2	Manufacturing industries/Construction (mobile)	[tonnes]						952	955	957	957	959	968	244	246	249	251
SO2	Civil aviation (International, LTO)	[tonnes]						50	48	52	53	55	59	63	68	69	73
SO2	Civil aviation (International, Cruise)	[tonnes]						504	473	488	476	525	537	566	574	620	658
SO2	Civil aviation (Domestic, LTO)	[tonnes]						24	20	20	20	20	21	22	23	20	18
SO2	Civil aviation (Domestic, Cruise)	[tonnes]						54	44	42	41	42	42	44	45	42	38
SO2	Road transport: Passenger cars	[tonnes]						881	924	652	356	372	372	373	380	389	307
SO2	Road transport:Light duty vehicles	[tonnes]						1414	1462	936	373	401	403	412	418	426	242
SO2	Road transport:Heavy duty vehicles	[tonnes]						3470	3516	2230	838	895	906	934	945	951	536
SO2	Road transport: Mopeds & motorcycles	[tonnes]						2	2	2	2	2	2	2	2	2	2
SO2	Railways	[tonnes]						376	382	263	105	95	96	95	93	78	40
SO2	International navigation (Shipping)	[tonnes]						41317	33277	30084	58492	58965	65049	61075	55822	46756	49282
SO2	National navigation (Shipping)	[tonnes]						6429	5111	3506	4410	4974	5588	4400	3650	2283	2051
SO2	Commercial/Institutional: Mobile	[tonnes]						2	2	2	2	2	2	2	3	3	3
SO2	Residential: Household and gardening (mobile)	[tonnes]						1	1	1	1	1	1	1	1	1	1
SO2	Agriculture/Forestry/Fishing: Off-road agriculture/forestry	[tonnes]						1561	1552	1485	1487	1407	1451	347	353	335	334
SO2	Agriculture/Forestry/Fishing: National fishing	[tonnes]						742	765	701	663	665	668	632	499	521	597
SO2	Other, Mobile (military)	[tonnes]						48	206	82	76	80	80	56	54	65	47
NOx	Manufacturing industries/Construction (mobile)	[tonnes]						11081	11282	11440	11558	11677	11882	12080	12248	12425	12262
NOx	Civil aviation (International, LTO)	[tonnes]						722	687	752	768	773	829	882	941	972	1030
NOx	Civil aviation (International, Cruise)	[tonnes]						6293	5899	6094	5935	6543	6688	7022	7117	7690	8174
NOx	Civil aviation (Domestic, LTO)	[tonnes]						373	312	321	335	353	371	369	381	334	296
NOx	Civil aviation (Domestic, Cruise)	[tonnes]						750	608	581	564	586	587	602	617	577	520
NOx	Road transport: Passenger cars	[tonnes]						61299	63019	61810	59406	56202	51422	47170	43810	39871	35944
NOx	Road transport:Light duty vehicles	[tonnes]						7995	8326	8372	8659	9245	9086	8917	8708	8654	8575
NOx	Road transport:Heavy duty vehicles	[tonnes]						36324	36829	35897	34967	36790	36219	36160	35797	35593	36033
NOx	Road transport: Mopeds & motorcycles	[tonnes]						80	82	87	92	98	98	99	104	108	109
NOx	Railways	[tonnes]						4913	4995	5284	5485	4971	5015	4977	4846	4089	3730
NOx	International navigation (Shipping)	[tonnes]						60639	53939	55808	87852	99296	105113	100507	93239	92360	89143
NOx	National navigation (Shipping)	[tonnes]						13649	13180	12882	12753	12999	13679	14757	13544	11175	8720
NOx	Commercial/Institutional: Mobile	[tonnes]						70	75	80	85	89	93	95	98	101	102
NOx	Residential: Household and gardening (mobile)	[tonnes]						34	36	38	40	42	43	45	46	48	49
NOx	Agriculture/Forestry/Fishing: Off-road agriculture/forestry	[tonnes]						12679	12930	12627	12886	12461	13178	13139	13754	13273	13466
NOx	Agriculture/Forestry/Fishing: National fishing	[tonnes]						8387	8792	8198	7877	8063	8264	7999	6421	6846	8029
NOx	Other, Mobile (military)	[tonnes]						495	1864	1014	1296	1279	1760	958	1197	1386	1074

NMVOC	Manufacturing industries/Construction (mobile)	[tonnes]	2266	2231	2191	2147	2107	2088	2095	2083	2074	1997
NMVOC	Civil aviation (International, LTO)	[tonnes]	116	107	108	106	84	115	121	124	125	116
NMVOC	Civil aviation (International, Cruise)	[tonnes]	215	202	209	203	223	228	239	242	261	278
NMVOC	Civil aviation (Domestic, LTO)	[tonnes]	158	146	143	140	169	184	171	164	147	142
NMVOC	Civil aviation (Domestic, Cruise)	[tonnes]	28	23	21	21	22	22	22	23	22	20
NMVOC	Road transport: Passenger cars	[tonnes]	43024	44932	43766	42971	40189	37722	36282	32560	29786	25918
NMVOC	Road transport:Light duty vehicles	[tonnes]	1828	1964	2004	2143	2241	2187	2134	1957	1920	1822
NMVOC	Road transport:Heavy duty vehicles	[tonnes]	2370	2409	2318	2235	2339	2326	2275	2160	2018	1899
NMVOC	Road transport: Mopeds & motorcycles	[tonnes]	4121	4235	4293	4293	4265	4508	4765	5144	5523	5078
NMVOC	Road transport: Gasoline evaporation	[tonnes]	28590	28582	28175	25629	24298	21262	17889	16344	13516	11692
NMVOC	Railways	[tonnes]	321	326	345	358	324	327	325	316	267	276
NMVOC	International navigation (Shipping)	[tonnes]	2060	1839	1928	2933	3318	3501	3343	3082	3102	2929
NMVOC	National navigation (Shipping)	[tonnes]	1686	1719	1761	1786	1820	1879	1975	1969	1873	1776
NMVOC	Commercial/Institutional: Mobile	[tonnes]	2303	2314	2302	2265	2285	2367	2458	2547	2636	2741
NMVOC	Residential: Household and gardening (mobile)	[tonnes]	1801	1797	1792	1789	1785	1780	1774	1767	1759	1758
NMVOC	Agriculture/Forestry/Fishing: Off-road agriculture/forestry	[tonnes]	5744	5360	4914	4584	4272	4146	3847	3687	3399	3219
NMVOC	Agriculture/Forestry/Fishing: National fishing	[tonnes]	405	417	384	360	366	370	361	279	292	344
NMVOC	Other, Mobile (military)	[tonnes]	53	162	87	122	119	148	90	103	114	105
CH4	Manufacturing industries/Construction (mobile)	[tonnes]	60	58	57	56	54	53	53	53	53	51
CH4	Civil aviation (International, LTO)	[tonnes]	8	8	8	8	8	11	12	12	12	11
CH4	Civil aviation (International, Cruise)	[tonnes]	23	21	22	22	24	24	25	26	28	30
CH4	Civil aviation (Domestic, LTO)	[tonnes]	4	4	4	4	5	5	5	5	4	4
CH4	Civil aviation (Domestic, Cruise)	[tonnes]	3	2	2	2	2	2	2	2	2	2
CH4	Road transport: Passenger cars	[tonnes]	1931	2006	1989	1942	1849	1711	1588	1489	1391	1280
CH4	Road transport:Light duty vehicles	[tonnes]	142	148	151	156	167	160	150	141	135	125
CH4	Road transport:Heavy duty vehicles	[tonnes]	317	320	313	306	329	340	354	355	349	349
CH4	Road transport: Mopeds & motorcycles	[tonnes]	128	131	137	141	145	149	153	163	172	166
CH4	Railways	[tonnes]	12	13	13	14	12	13	12	12	10	11
CH4	International navigation (Shipping)	[tonnes]	64	57	60	91	103	108	103	95	96	91
CH4	National navigation (Shipping)	[tonnes]	32	33	34	34	35	36	38	38	35	34
CH4	Commercial/Institutional: Mobile	[tonnes]	99	97	95	92	90	89	89	89	89	90
CH4	Residential: Household and gardening (mobile)	[tonnes]	51	50	49	48	48	47	46	45	45	45
CH4	Agriculture/Forestry/Fishing: Off-road agriculture/forestry	[tonnes]	126	118	111	105	98	95	89	85	80	77
CH4	Agriculture/Forestry/Fishing: National fishing	[tonnes]	13	13	12	11	11	12	11	9	9	11
CH4	Other, Mobile (military)	[tonnes]	5	18	10	13	13	18	10	12	14	11
CO	Manufacturing industries/Construction (mobile)	[tonnes]	9379	9294	9188	9070	8956	8910	8963	8939	8907	8647

CO	Civil aviation (International, LTO)	[tonnes]	590	557	574	580	450	506	532	577	598	619
CO	Civil aviation (International, Cruise)	[tonnes]	853	800	825	808	892	915	970	987	1065	1123
CO	Civil aviation (Domestic, LTO)	[tonnes]	895	826	801	780	941	1024	958	923	824	802
CO	Civil aviation (Domestic, Cruise)	[tonnes]	203	162	154	150	157	156	159	162	149	130
CO	Road transport: Passenger cars	[tonnes]	416786	432028	414275	398195	365718	343506	331359	296092	273244	238468
CO	Road transport:Light duty vehicles	[tonnes]	17762	19031	19505	20837	21866	21049	19934	17792	17123	15810
CO	Road transport:Heavy duty vehicles	[tonnes]	9740	9903	9676	9468	10097	10312	10426	10149	9836	9600
CO	Road transport: Mopeds & motorcycles	[tonnes]	10759	11059	11602	12029	12471	12739	13062	13790	14495	14161
CO	Railways	[tonnes]	895	910	963	999	906	914	907	883	745	717
CO	International navigation (Shipping)	[tonnes]	6796	6065	6361	9677	10946	11548	11030	10168	10233	9662
CO	National navigation (Shipping)	[tonnes]	6126	6297	6491	6623	6805	7057	7246	7150	6983	6779
CO	Commercial/Institutional: Mobile	[tonnes]	30181	29610	28987	28319	27809	27575	27800	28012	28211	28817
CO	Residential: Household and gardening (mobile)	[tonnes]	17606	17238	16880	16708	16556	16422	16311	16217	16136	16286
CO	Agriculture/Forestry/Fishing: Off-road agriculture/forestry	[tonnes]	50431	47422	44184	41431	38543	36465	33697	31539	28859	26698
CO	Agriculture/Forestry/Fishing: National fishing	[tonnes]	1303	1348	1243	1177	1193	1208	1161	915	964	1121
CO	Other, Mobile (military)	[tonnes]	423	1001	507	841	865	876	613	590	669	675
CO2	Manufacturing industries/Construction (mobile)	[ktonnes]	839	841	841	839	839	846	851	858	865	871
CO2	Civil aviation (International, LTO)	[ktonnes]	156	151	163	167	173	184	199	212	217	230
CO2	Civil aviation (International, Cruise)	[ktonnes]	1580	1481	1530	1492	1645	1683	1772	1798	1942	2060
CO2	Civil aviation (Domestic, LTO)	[ktonnes]	75	62	62	62	64	66	69	72	63	55
CO2	Civil aviation (Domestic, Cruise)	[ktonnes]	168	137	132	128	133	132	136	140	131	119
CO2	Road transport: Passenger cars	[ktonnes]	5176	5505	5751	5898	6112	6165	6224	6380	6508	6549
CO2	Road transport:Light duty vehicles	[ktonnes]	1296	1344	1336	1374	1473	1478	1505	1525	1563	1597
CO2	Road transport:Heavy duty vehicles	[ktonnes]	2756	2792	2725	2663	2843	2881	2971	3004	3023	3095
CO2	Road transport: Mopeds & motorcycles	[ktonnes]	54	56	59	61	63	64	66	70	73	71
CO2	Railways	[ktonnes]	297	302	319	331	300	303	301	293	247	232
CO2	International navigation (Shipping)	[ktonnes]	3005	2673	2797	4214	4744	4976	4725	4326	4337	4053
CO2	National navigation (Shipping)	[ktonnes]	796	803	817	803	814	850	917	898	745	655
CO2	Commercial/Institutional: Mobile	[ktonnes]	74	74	75	75	77	78	80	81	83	85
CO2	Residential: Household and gardening (mobile)	[ktonnes]	39	39	39	39	39	40	40	41	41	42
CO2	Agriculture/Forestry/Fishing: Off-road agriculture/forestry	[ktonnes]	1308	1295	1238	1235	1168	1199	1141	1159	1097	1091
CO2	Agriculture/Forestry/Fishing: National fishing	[ktonnes]	591	607	556	525	527	529	502	395	412	473
CO2	Other, Mobile (military)	[ktonnes]	119	287	141	237	252	252	176	171	204	182
N2O	Manufacturing industries/Construction (mobile)	[tonnes]	34	34	35	35	35	35	36	36	36	37
N2O	Civil aviation (International, LTO)	[tonnes]	9	8	9	10	10	11	12	13	13	14
N2O	Civil aviation (International, Cruise)	[tonnes]	50	47	49	48	53	54	57	57	62	66

N2O	Civil aviation (Domestic, LTO)	[tonnes]						5	5	5	5	5	5	6	6	5	5
N2O	Civil aviation (Domestic, Cruise)	[tonnes]						5	4	4	4	4	4	4	4	4	4
N2O	Road transport: Passenger cars	[tonnes]						191	208	231	248	271	288	302	314	312	307
N2O	Road transport:Light duty vehicles	[tonnes]						6	6	7	7	7	9	13	17	22	27
N2O	Road transport:Heavy duty vehicles	[tonnes]						101	103	100	96	103	106	110	113	115	119
N2O	Road transport: Mopeds & motorcycles	[tonnes]						1	1	1	1	1	1	1	1	1	1
N2O	Railways	[tonnes]						8	8	9	9	8	8	8	8	7	6
N2O	International navigation (Shipping)	[tonnes]						189	168	176	265	298	313	297	272	273	255
N2O	National navigation (Shipping)	[tonnes]						48	49	50	49	49	51	55	54	44	39
N2O	Commercial/Institutional: Mobile	[tonnes]						1	1	1	1	1	1	1	1	1	1
N2O	Residential: Household and gardening (mobile)	[tonnes]						1	1	1	1	1	1	1	1	1	1
N2O	Agriculture/Forestry/Fishing: Off-road agricul-ture/forestry	[tonnes]						50	50	48	48	46	47	45	46	44	44
N2O	Agriculture/Forestry/Fishing: National fishing	[tonnes]						37	38	35	33	33	33	32	25	26	30
N2O	Other, Mobile (military)	[tonnes]						4	8	4	7	8	7	5	5	6	6
NH3	Manufacturing industries/Construction (mobile)	[tonnes]						2	2	2	2	2	2	2	2	2	2
NH3	Civil aviation (International, LTO)	[tonnes]						0	0	0	0	0	0	0	0	0	0
NH3	Civil aviation (International, Cruise)	[tonnes]															0
NH3	Civil aviation (Domestic, LTO)	[tonnes]						0	0	0	0	0	0	0	0	0	0
NH3	Civil aviation (Domestic, Cruise)	[tonnes]															0
NH3	Road transport: Passenger cars	[tonnes]						53	166	398	618	929	1220	1477	1842	2222	2506
NH3	Road transport:Light duty vehicles	[tonnes]						6	6	6	7	7	12	22	32	43	56
NH3	Road transport:Heavy duty vehicles	[tonnes]						10	10	10	10	10	11	11	11	12	12
NH3	Road transport: Mopeds & motorcycles	[tonnes]						1	1	1	1	1	1	1	1	1	1
NH3	Railways	[tonnes]						1	1	1	1	1	1	1	1	1	1
NH3	International navigation (Shipping)	[tonnes]								0	0						
NH3	National navigation (Shipping)	[tonnes]						0	0	0	0	0	0	0	0	0	0
NH3	Commercial/Institutional: Mobile	[tonnes]						0	0	0	0	0	0	0	0	0	0
NH3	Residential: Household and gardening (mobile)	[tonnes]						0	0	0	0	0	0	0	0	0	0
NH3	Agriculture/Forestry/Fishing: Off-road agricul-ture/forestry	[tonnes]						3	3	3	3	3	3	3	3	3	3
NH3	Agriculture/Forestry/Fishing: National fishing	[tonnes]						0	0	0	0	0	0		0	0	0
NH3	Other, Mobile (military)	[tonnes]						0	0	0	0	0	1	0	0	0	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]	1672	1695	1658	1605	1561	1622	1646	1540	1466	1374	1245	1140	1005	891	810
TSP	Road transport:Light duty vehicles	[tonnes]	1351	1552	1637	1627	1679	1797	1900	1845	1930	2046	1971	1857	1623	1471	1314
TSP	Road transport:Heavy duty vehicles	[tonnes]	1202	1336	1309	1290	1336	1382	1400	1362	1327	1397	1381	1376	1311	1214	1141
TSP	Road transport: Mopeds & motorcycles	[tonnes]	82	76	71	68	65	67	69	70	71	71	75	78	84	90	84
TSP	Road transport: Automobile tyre and brake wear	[tonnes]	891	951	954	966	982	1037	1080	1100	1113	1177	1195	1219	1256	1286	1313
TSP	Road transport: Automobile road abrasion	[tonnes]	667	709	710	717	728	766	800	816	823	868	883	899	926	948	967
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 agriculture/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]	100	100	49	18	26	11	112	66	62	54	114	44	70	73	44
PM10	Manufacturing industries/Construction (mobile)	[tonnes]						1577	1533	1484	1433	1383	1349	1317	1284	1249	1193
PM10	Civil aviation (International, LTO)	[tonnes]						3	3	3	3	3	3	3	4	4	4
PM10	Civil aviation (International, Cruise)	[tonnes]						25	24	25	24	27	27	29	29	31	33
PM10	Civil aviation (Domestic, LTO)	[tonnes]						2	2	2	2	2	2	2	2	2	2
PM10	Civil aviation (Domestic, Cruise)	[tonnes]						3	2	2	2	2	2	2	2	2	2
PM10	Road transport: Passenger cars	[tonnes]						1622	1646	1540	1466	1374	1245	1140	1005	891	810
PM10	Road transport:Light duty vehicles	[tonnes]						1797	1900	1845	1930	2046	1971	1857	1623	1471	1314
PM10	Road transport:Heavy duty vehicles	[tonnes]						1382	1400	1362	1327	1397	1381	1376	1311	1214	1141
PM10	Road transport: Mopeds & motorcycles	[tonnes]						67	69	70	71	71	75	78	84	90	84
PM10	Road transport: Automobile tyre and brake wear	[tonnes]						784	817	831	840	888	902	920	947	970	990
PM10	Road transport: Automobile road abrasion	[tonnes]						383	400	408	411	434	442	449	463	474	483
PM10	Railways	[tonnes]						202	205	217	225	204	206	204	199	168	146
PM10	International navigation (Shipping)	[tonnes]						5476	4327	3959	8561	8112	9975	9869	9139	7639	8095
PM10	National navigation (Shipping)	[tonnes]						890	704	515	655	756	911	717	664	448	414
PM10	Commercial/Institutional: Mobile	[tonnes]						24	24	23	22	23	24	25	27	28	29
PM10	Residential: Household and gardening (mobile)	[tonnes]						11	11	11	11	11	11	11	11	11	11
PM10	Agriculture/Forestry/Fishing: Off-road agriculture/forestry	[tonnes]						2444	2344	2188	2136	1954	1922	1736	1659	1504	1428
PM10	Agriculture/Forestry/Fishing: National fishing	[tonnes]						182	188	172	163	163	164	155	122	128	147
PM10	Other, Mobile (military)	[tonnes]						11	112	66	62	54	114	44	70	73	44
PM2.5	Manufacturing industries/Construction (mobile)	[tonnes]						1577	1533	1484	1433	1383	1349	1317	1284	1249	1193
PM2.5	Civil aviation (International, LTO)	[tonnes]						3	3	3	3	3	3	3	4	4	4
PM2.5	Civil aviation (International, Cruise)	[tonnes]						25	24	25	24	27	27	29	29	31	33

PM2.5	Civil aviation (Domestic, LTO)	[tonnes]	2	2	2	2	2	2	2	2	2	2
PM2.5	Civil aviation (Domestic, Cruise)	[tonnes]	3	2	2	2	2	2	2	2	2	2
PM2.5	Road transport: Passenger cars	[tonnes]	1622	1646	1540	1466	1374	1245	1140	1005	891	810
PM2.5	Road transport:Light duty vehicles	[tonnes]	1797	1900	1845	1930	2046	1971	1857	1623	1471	1314
PM2.5	Road transport:Heavy duty vehicles	[tonnes]	1382	1400	1362	1327	1397	1381	1376	1311	1214	1141
PM2.5	Road transport: Mopeds & motorcycles	[tonnes]	67	69	70	71	71	75	78	84	90	84
PM2.5	Road transport: Automobile tyre and brake wear	[tonnes]	423	440	449	454	480	487	497	512	525	535
PM2.5	Road transport: Automobile road abrasion	[tonnes]	207	216	220	222	234	239	243	250	256	261
PM2.5	Railways	[tonnes]	202	205	217	225	204	206	204	199	168	146
PM2.5	International navigation (Shipping)	[tonnes]	5448	4305	3939	8518	8071	9925	9819	9093	7601	8054
PM2.5	National navigation (Shipping)	[tonnes]	886	701	513	652	753	907	714	662	446	413
PM2.5	Commercial/Institutional: Mobile	[tonnes]	24	24	23	22	23	24	25	27	28	29
PM2.5	Residential: Household and gardening (mobile)	[tonnes]	11	11	11	11	11	11	11	11	11	11
PM2.5	Agriculture/Forestry/Fishing: Off-road agriculture/forestry	[tonnes]	2444	2344	2188	2136	1954	1922	1736	1659	1504	1428
PM2.5	Agriculture/Forestry/Fishing: National fishing	[tonnes]	181	187	171	162	162	163	154	122	127	146
PM2.5	Other, Mobile (military)	[tonnes]	11	112	66	62	54	114	44	70	73	44
Arsenic	Manufacturing industries/Construction (mobile)	[kg]	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
Arsenic	Civil aviation (International, Cruise)	[kg]										0
Arsenic	Civil aviation (Domestic, LTO)	[kg]	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	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
Arsenic	Road transport:Heavy duty vehicles	[kg]	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
Arsenic	Road transport: Automobile tyre and brake wear	[kg]	5	5	5	5	5	5	6	6	6	6
Arsenic	Road transport: Automobile road abrasion	[kg]	0	0	0	0	0	0	0	0	0	0
Arsenic	Railways	[kg]	0	0	0	0	0	0	0	0	0	0
Arsenic	International navigation (Shipping)	[kg]	353	292	267	465	496	505	325	417	357	369
Arsenic	National navigation (Shipping)	[kg]	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
Arsenic	Residential: Household and gardening (mobile)	[kg]	0	0	0	0	0	0	0	0	0	0
Arsenic	Agriculture/Forestry/Fishing: Off-road agriculture/forestry	[kg]	0	0	0	0	0	0	0	0	0	0
Arsenic	Agriculture/Forestry/Fishing: National fishing	[kg]	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
Cadmium	Manufacturing industries/Construction (mobile)	[kg]	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
Cadmium	Civil aviation (International, Cruise)	[kg]	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
Cadmium	Civil aviation (Domestic, Cruise)	[kg]	0	0	0	0	0	0	0	0	0	0
Cadmium	Road transport: Passenger cars	[kg]	18	19	20	20	21	21	21	22	22	22
Cadmium	Road transport:Light duty vehicles	[kg]	3	3	3	3	4	4	4	4	4	4
Cadmium	Road transport:Heavy duty vehicles	[kg]	5	5	5	5	5	5	5	6	6	6
Cadmium	Road transport: Mopeds & motorcycles	[kg]	0	0	0	0	0	0	0	0	0	0
Cadmium	Road transport: Automobile tyre and brake wear	[kg]	5	5	5	5	6	6	6	6	6	6
Cadmium	Road transport: Automobile road abrasion	[kg]	0	0	0	0	0	0	0	0	0	0
Cadmium	Railways	[kg]	1	1	1	1	1	1	1	1	1	1
Cadmium	International navigation (Shipping)	[kg]	23	20	19	31	34	35	20	29	26	26
Cadmium	National navigation (Shipping)	[kg]	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
Cadmium	Residential: Household and gardening (mobile)	[kg]	0	0	0	0	0	0	0	0	0	0
Cadmium	Agriculture/Forestry/Fishing: Off-road agriculture/forestry	[kg]	3	3	3	3	3	3	3	3	3	3
Cadmium	Agriculture/Forestry/Fishing: National fishing	[kg]	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
Chromium	Manufacturing industries/Construction (mobile)	[kg]	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
Chromium	Civil aviation (International, Cruise)	[kg]	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
Chromium	Civil aviation (Domestic, Cruise)	[kg]	0	0	0	0	0	0	0	0	0	0
Chromium	Road transport: Passenger cars	[kg]	30	32	33	34	35	35	35	36	37	37
Chromium	Road transport:Light duty vehicles	[kg]	11	11	11	11	12	12	12	13	13	13
Chromium	Road transport:Heavy duty vehicles	[kg]	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
Chromium	Road transport: Automobile tyre and brake wear	[kg]	51	53	54	54	57	58	59	61	62	64
Chromium	Road transport: Automobile road abrasion	[kg]	15	16	16	16	17	18	18	18	19	19
Chromium	Railways	[kg]	3	3	3	3	3	3	3	3	2	2
Chromium	International navigation (Shipping)	[kg]	147	123	115	195	210	214	131	178	157	160
Chromium	National navigation (Shipping)	[kg]	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
Chromium	Residential: Household and gardening (mobile)	[kg]	0	0	0	0	0	0	0	0	0	0
Chromium	Agriculture/Forestry/Fishing: Off-road agriculture/forestry	[kg]	11	11	11	11	10	10	10	10	10	10
Chromium	Agriculture/Forestry/Fishing: National fishing	[kg]	7	8	7	7	7	7	6	5	5	6

Chromium	Other, Mobile (military)	[kg]	0	1	1	1	1	1	0	1	1	1
Copper	Manufacturing industries/Construction (mobile)	[kg]	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
Copper	Civil aviation (International, Cruise)	[kg]	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
Copper	Civil aviation (Domestic, Cruise)	[kg]	0	0	0	0	0	0	0	0	0	0
Copper	Road transport: Passenger cars	[kg]	65	69	73	75	78	78	78	81	82	82
Copper	Road transport:Light duty vehicles	[kg]	9	9	9	9	10	10	10	10	11	11
Copper	Road transport:Heavy duty vehicles	[kg]	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
Copper	Road transport: Automobile tyre and brake wear	[kg]	32277	33986	35189	36059	37889	38236	38652	39859	40813	41395
Copper	Road transport: Automobile road abrasion	[kg]	8	8	8	8	9	9	9	9	9	10
Copper	Railways	[kg]	2	2	2	2	2	2	2	2	2	1
Copper	International navigation (Shipping)	[kg]	353	292	267	465	496	505	325	417	357	369
Copper	National navigation (Shipping)	[kg]	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
Copper	Residential: Household and gardening (mobile)	[kg]	1	1	1	1	1	1	1	1	1	1
Copper	Agriculture/Forestry/Fishing: Off-road agricul-ture/forestry	[kg]	9	9	8	8	8	8	8	8	7	7
Copper	Agriculture/Forestry/Fishing: National fishing	[kg]	9	10	9	8	8	8	9	6	7	7
Copper	Other, Mobile (military)	[kg]	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
Mercury	Civil aviation (International, LTO)	[kg]	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
Mercury	Civil aviation (Domestic, Cruise)	[kg]										0
Mercury	Road transport: Passenger cars	[kg]	13	14	15	15	16	16	16	17	17	17
Mercury	Road transport:Light duty vehicles	[kg]	2	2	2	3	3	3	3	3	3	3
Mercury	Road transport:Heavy duty vehicles	[kg]	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
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
Mercury	Railways	[kg]	0	1	1	1	1	1	1	0	0	0
Mercury	International navigation (Shipping)	[kg]	27	25	29	40	47	50	14	45	49	43
Mercury	National navigation (Shipping)	[kg]	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
Mercury	Residential: Household and gardening (mobile)	[kg]	0	0	0	0	0	0	0	0	0	0
Mercury	Agriculture/Forestry/Fishing: National fishing	[kg]	9	10	9	8	8	8	8	6	7	7

Mercury	Agriculture/Forestry/Fishing: Off-road agriculture/forestry	[kg]	2	2	2	2	2	2	2	2	2	2
Mercury	Other, Mobile (military)	[kg]	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
Nickel	Civil aviation (International, LTO)	[kg]	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
Nickel	Civil aviation (Domestic, LTO)	[kg]	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
Nickel	Road transport: Passenger cars	[kg]	21	22	23	24	25	25	25	26	26	26
Nickel	Road transport:Light duty vehicles	[kg]	3	3	3	4	4	4	4	4	4	4
Nickel	Road transport:Heavy duty vehicles	[kg]	5	5	5	5	5	5	6	6	6	6
Nickel	Road transport: Mopeds & motorcycles	[kg]	0	0	0	0	0	0	0	0	0	0
Nickel	Road transport: Automobile tyre and brake wear	[kg]	63	66	67	67	71	72	74	76	77	79
Nickel	Road transport: Automobile road abrasion	[kg]	12	13	13	13	14	14	14	15	15	15
Nickel	Railways	[kg]	1	1	1	1	1	1	1	1	1	1
Nickel	International navigation (Shipping)	[kg]	20420	16701	14894	26627	28129	28488	19451	23291	19285	20431
Nickel	National navigation (Shipping)	[kg]	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
Nickel	Residential: Household and gardening (mobile)	[kg]	0	0	0	0	0	0	0	0	0	0
Nickel	Agriculture/Forestry/Fishing: Off-road agriculture/forestry	[kg]	3	3	3	3	3	3	3	3	3	3
Nickel	Agriculture/Forestry/Fishing: National fishing	[kg]	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
Lead	Manufacturing industries/Construction (mobile)	[kg]	12	12	12	12	12	12	12	12	12	12
Lead	Civil aviation (International, LTO)	[kg]	490	465	452	456	153	175	126	145	145	124
Lead	Civil aviation (International, Cruise)	[kg]										0
Lead	Civil aviation (Domestic, LTO)	[kg]	1534	1423	1378	1328	1639	1788	1640	1559	1399	1387
Lead	Civil aviation (Domestic, Cruise)	[kg]										0
Lead	Road transport: Passenger cars	[kg]	92548	72074	65339	28337	71	72	72	74	75	76
Lead	Road transport:Light duty vehicles	[kg]	3639	2813	2578	1157	20	21	21	22	22	23
Lead	Road transport:Heavy duty vehicles	[kg]	332	257	229	114	31	32	33	33	34	35
Lead	Road transport: Mopeds & motorcycles	[kg]	1098	824	742	323	0	0	0	0	0	0
Lead	Road transport: Automobile tyre and brake wear	[kg]	4212	4438	4601	4719	4956	5000	5052	5211	5337	5412
Lead	Road transport: Automobile road abrasion	[kg]	36	38	38	39	41	42	42	44	45	45
Lead	Railways	[kg]	4	5	5	5	5	5	5	4	4	4
Lead	International navigation (Shipping)	[kg]	162	140	138	221	243	251	132	214	201	196
Lead	National navigation (Shipping)	[kg]	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

Lead	Residential: Household and gardening (mobile)	[kg]	0	0	0	0	0	0	0	0	0	0
Lead	Agriculture/Forestry/Fishing: Off-road agriculture/forestry	[kg]	19	19	18	18	17	18	17	17	16	16
Lead	Agriculture/Forestry/Fishing: National fishing	[kg]	19	19	18	17	17	17	16	12	13	15
Lead	Other, Mobile (military)	[kg]	63	81	62	121	86	104	99	125	118	79
Selenium	Manufacturing industries/Construction (mobile)	[kg]	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
Selenium	Civil aviation (International, Cruise)	[kg]	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
Selenium	Civil aviation (Domestic, Cruise)	[kg]	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
Selenium	Road transport:Light duty vehicles	[kg]	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
Selenium	Road transport: Mopeds & motorcycles	[kg]	0	0	0	0	0	0	0	0	0	0
Selenium	Road transport: Automobile tyre and brake wear	[kg]	21	22	22	22	24	24	24	25	26	26
Selenium	Road transport: Automobile road abrasion	[kg]	0	0	0	0	0	0	0	0	0	0
Selenium	Railways	[kg]	0	0	0	0	0	0	0	0	0	0
Selenium	International navigation (Shipping)	[kg]	325	279	275	442	486	503	264	427	402	391
Selenium	National navigation (Shipping)	[kg]	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
Selenium	Residential: Household and gardening (mobile)	[kg]	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
Selenium	Agriculture/Forestry/Fishing: National fishing	[kg]	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
Zinc	Manufacturing industries/Construction (mobile)	[kg]	419	420	420	419	419	422	425	428	432	435
Zinc	Civil aviation (International, LTO)	[kg]	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
Zinc	Civil aviation (Domestic, LTO)	[kg]	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
Zinc	Road transport: Passenger cars	[kg]	3527	3753	3955	4069	4217	4242	4250	4360	4423	4448
Zinc	Road transport:Light duty vehicles	[kg]	644	665	663	679	737	745	760	776	796	815
Zinc	Road transport:Heavy duty vehicles	[kg]	1014	1029	996	960	1032	1068	1095	1112	1132	1164
Zinc	Road transport: Mopeds & motorcycles	[kg]	11	12	14	15	16	17	18	19	21	22
Zinc	Road transport: Automobile tyre and brake wear	[kg]	13686	14307	14647	14875	15702	15920	16201	16700	17102	17426
Zinc	Road transport: Automobile road abrasion	[kg]	58	60	62	62	66	67	68	70	72	73
Zinc	Railways	[kg]	150	152	161	167	151	153	152	148	124	117
Zinc	International navigation (Shipping)	[kg]	744	643	638	1017	1121	1162	595	991	940	910

Zinc	National navigation (Shipping)	[kg]	191	187	184	183	188	195	202	193	165	151
Zinc	Commercial/Institutional: Mobile	[kg]	51	51	52	52	53	54	55	56	57	59
Zinc	Residential: Household and gardening (mobile)	[kg]	27	27	27	27	27	27	28	28	28	29
Zinc	Agriculture/Forestry/Fishing: Off-road agricul-ture/forestry	[kg]	674	666	636	634	600	614	584	593	561	558
Zinc	Agriculture/Forestry/Fishing: National fishing	[kg]	93	96	88	83	83	84	80	62	65	75
Zinc	Other, Mobile (military)	[kg]	6	62	37	34	30	67	27	49	57	39
Dioxins/furans	Manufacturing industries/Construction (mobile)	[g]	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
Dioxins/furans	Civil aviation (International, Cruise)	[g]	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
Dioxins/furans	Civil aviation (Domestic, Cruise)	[g]	0	0	0	0	0	0	0	0	0	0
Dioxins/furans	Road transport: Passenger cars	[g]	1	1	1	1	1	1	0	0	0	0
Dioxins/furans	Road transport:Light duty vehicles	[g]	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
Dioxins/furans	Road transport: Mopeds & motorcycles	[g]	0	0	0	0	0	0	0	0	0	0
Dioxins/furans	Railways	[g]	0	0	0	0	0	0	0	0	0	0
Dioxins/furans	International navigation (Shipping)	[g]	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
Dioxins/furans	Commercial/Institutional: Mobile	[g]	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
Dioxins/furans	Agriculture/Forestry/Fishing: Off-road agricul-ture/forestry	[g]	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
Dioxins/furans	Other, Mobile (military)	[g]	0	0	0	0	0	0	0	0	0	0
Flouranthene	Manufacturing industries/Construction (mobile)	[kg]	45	44	45	46	45	46	46	46	46	46
Flouranthene	Civil aviation (International, LTO)	[kg]	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
Flouranthene	Civil aviation (Domestic, LTO)	[kg]	0	0	0	0	1	1	1	0	0	0
Flouranthene	Civil aviation (Domestic, Cruise)	[kg]	0	0	0	0	0	0	0	0	0	0
Flouranthene	Road transport: Passenger cars	[kg]	593	606	589	563	531	479	432	402	368	342
Flouranthene	Road transport:Light duty vehicles	[kg]	138	143	142	145	155	156	157	160	163	165
Flouranthene	Road transport:Heavy duty vehicles	[kg]	75	76	75	73	78	79	82	81	82	83
Flouranthene	Road transport: Mopeds & motorcycles	[kg]	7	7	7	8	8	8	8	9	9	9
Flouranthene	Railways	[kg]	5	5	6	6	6	6	6	6	5	4
Flouranthene	International navigation (Shipping)	[kg]	198	184	205	288	334	355	344	316	338	304
Flouranthene	National navigation (Shipping)	[kg]	66	68	71	70	70	74	82	82	67	58
Flouranthene	Commercial/Institutional: Mobile	[kg]	4	4	4	4	5	5	5	5	5	5

Flouranthene	Residential: Household and gardening (mobile)	[kg]	2	2	2	2	2	2	2	2	2	2
Flouranthene	Agriculture/Forestry/Fishing: Off-road agriculture/forestry	[kg]	78	75	73	74	68	71	67	67	63	63
Flouranthene	Agriculture/Forestry/Fishing: National fishing	[kg]	59	61	56	52	53	53	50	40	41	47
Flouranthene	Other, Mobile (military)	[kg]	1	7	4	4	3	8	3	6	6	4
Benzo(b) flouranthene	Manufacturing industries/Construction (mobile)	[kg]	6	6	6	6	6	6	6	6	6	6
Benzo(b) flouranthene	Civil aviation (International, LTO)	[kg]	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
Benzo(b) flouranthene	Civil aviation (Domestic, LTO)	[kg]	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
Benzo(b) flouranthene	Road transport: Passenger cars	[kg]	38	39	39	38	37	34	32	31	30	29
Benzo(b) flouranthene	Road transport:Light duty vehicles	[kg]	9	9	9	9	10	10	10	10	10	10
Benzo(b) flouranthene	Road transport:Heavy duty vehicles	[kg]	19	19	19	18	20	20	21	21	21	21
Benzo(b) flouranthene	Road transport: Mopeds & motorcycles	[kg]	0	0	0	1	1	1	1	1	1	1
Benzo(b) flouranthene	Railways	[kg]	1	1	1	2	1	1	1	1	1	1
Benzo(b) flouranthene	International navigation (Shipping)	[kg]	13	12	15	19	23	25	24	22	25	22
Benzo(b) flouranthene	National navigation (Shipping)	[kg]	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
Benzo(b) flouranthene	Residential: Household and gardening (mobile)	[kg]	0	0	0	0	0	0	0	0	0	0
Benzo(b) flouranthene	Agriculture/Forestry/Fishing: Off-road agriculture/forestry	[kg]	10	9	9	9	9	9	8	8	8	8
Benzo(b) flouranthene	Agriculture/Forestry/Fishing: National fishing	[kg]	5	5	5	5	5	5	4	3	4	4
Benzo(b) flouranthene	Other, Mobile (military)	[kg]	0	1	1	1	0	1	0	1	1	1
Benzo(k) flouranthene	Manufacturing industries/Construction (mobile)	[kg]	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
Benzo(k) flouranthene	Civil aviation (International, Cruise)	[kg]	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
Benzo(k) flouranthene	Civil aviation (Domestic, Cruise)	[kg]	0	0	0	0	0	0	0	0	0	0
Benzo(k) flouranthene	Road transport: Passenger cars	[kg]	30	31	32	31	31	30	29	29	28	28
Benzo(k) flouranthene	Road transport:Light duty vehicles	[kg]	8	8	8	8	8	9	9	9	9	9
Benzo(k) flouranthene	Road transport:Heavy duty vehicles	[kg]	28	29	28	27	29	30	31	30	30	31
Benzo(k) flouranthene	Road transport: Mopeds & motorcycles	[kg]	0	0	0	0	0	0	0	0	0	0
Benzo(k) flouranthene	Railways	[kg]	2	2	2	2	2	2	2	2	1	1
Benzo(k) flouranthene	International navigation (Shipping)	[kg]	6	6	7	9	11	11	11	10	12	10
Benzo(k) flouranthene	National navigation (Shipping)	[kg]	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
Benzo(k) flouranthene	Residential: Household and gardening (mobile)	[kg]	0	0	0	0	0	0	0	0	0	0
Benzo(k) flouranthene	Agriculture/Forestry/Fishing: Off-road agriculture/forestry	[kg]	10	9	9	9	9	9	8	8	8	7

Benzo(k) flouranthene	Agriculture/Forestry/Fishing: National fishing	[kg]	2	2	2	2	2	2	2	2	2	2
Benzo(k) flouranthene	Other, Mobile (military)	[kg]	0	1	1	1	0	1	0	1	1	1
Benzo(a) pyrene	Manufacturing industries/Construction (mobile)	[kg]	3	3	3	3	3	3	3	3	3	3
Benzo(a) pyrene	Civil aviation (International, LTO)	[kg]	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
Benzo(a) pyrene	Civil aviation (Domestic, LTO)	[kg]	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
Benzo(a) pyrene	Road transport: Passenger cars	[kg]	34	35	35	34	33	32	30	29	28	28
Benzo(a) pyrene	Road transport:Light duty vehicles	[kg]	9	9	9	9	10	10	10	11	11	11
Benzo(a) pyrene	Road transport:Heavy duty vehicles	[kg]	4	4	3	3	4	4	4	4	4	4
Benzo(a) pyrene	Road transport: Mopeds & motorcycles	[kg]	0	0	0	0	0	0	0	0	1	1
Benzo(a) pyrene	Railways	[kg]	0	0	0	0	0	0	0	0	0	0
Benzo(a) pyrene	International navigation (Shipping)	[kg]	4	3	4	5	6	7	6	6	6	6
Benzo(a) pyrene	National navigation (Shipping)	[kg]	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
Benzo(a) pyrene	Residential: Household and gardening (mobile)	[kg]	0	0	0	0	0	0	0	0	0	0
Benzo(a) pyrene	Agriculture/Forestry/Fishing: Off-road agricul-ture/forestry	[kg]	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
Benzo(a) pyrene	Other, Mobile (military)	[kg]	0	0	0	0	0	1	0	0	0	0
Benzo(g,h,i) perylene	Manufacturing industries/Construction (mobile)	[kg]	6	6	6	6	5	6	5	5	5	5
Benzo(g,h,i) perylene	Civil aviation (International, LTO)	[kg]	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
Benzo(g,h,i) perylene	Civil aviation (Domestic, LTO)	[kg]	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
Benzo(g,h,i) perylene	Road transport: Passenger cars	[kg]	77	80	79	77	75	70	65	63	61	58
Benzo(g,h,i) perylene	Road transport:Light duty vehicles	[kg]	18	19	18	19	20	20	21	21	21	22
Benzo(g,h,i) perylene	Road transport:Heavy duty vehicles	[kg]	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
Benzo(g,h,i) perylene	Railways	[kg]	0	0	0	0	0	0	0	0	0	0
Benzo(g,h,i) perylene	International navigation (Shipping)	[kg]	23	23	29	36	44	48	48	44	51	44
Benzo(g,h,i) perylene	National navigation (Shipping)	[kg]	8	9	11	10	10	11	13	14	11	10
Benzo(g,h,i) perylene	Commercial/Institutional: Mobile	[kg]	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
Benzo(g,h,i) perylene	Agriculture/Forestry/Fishing: Off-road agricul-ture/forestry	[kg]	10	9	9	9	8	9	8	8	7	7
Benzo(g,h,i) perylene	Agriculture/Forestry/Fishing: National fishing	[kg]	11	12	11	10	10	10	10	8	8	9
Benzo(g,h,i) perylene	Other, Mobile (military)	[kg]	0	1	1	1	0	1	0	1	1	0

indeno(1,2,3-c,d) pyrene	Manufacturing industries/Construction (mobile)	[kg]	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	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
indeno(1,2,3-c,d) pyrene	Civil aviation (Domestic, LTO)	[kg]	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
indeno(1,2,3-c,d) pyrene	Road transport: Passenger cars	[kg]	31	32	33	33	33	32	31	31	31	31
indeno(1,2,3-c,d) pyrene	Road transport:Light duty vehicles	[kg]	9	9	9	9	10	10	10	10	10	11
indeno(1,2,3-c,d) pyrene	Road transport:Heavy duty vehicles	[kg]	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
indeno(1,2,3-c,d) pyrene	Railways	[kg]	0	0	0	0	0	0	0	0	0	0
indeno(1,2,3-c,d) pyrene	International navigation (Shipping)	[kg]	19	19	23	29	36	39	39	36	42	36
indeno(1,2,3-c,d) pyrene	National navigation (Shipping)	[kg]	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
indeno(1,2,3-c,d) pyrene	Residential: Household and gardening (mobile)	[kg]	0	0	0	0	0	0	0	0	0	0
indeno(1,2,3-c,d) pyrene	Agriculture/Forestry/Fishing: Off-road agriculture/forestry	[kg]	5	5	5	5	4	5	4	4	4	4
indeno(1,2,3-c,d) pyrene	Agriculture/Forestry/Fishing: National fishing	[kg]	9	10	9	8	8	8	8	6	7	8
indeno(1,2,3-c,d) pyrene	Other, Mobile (military)	[kg]	0	0	0	0	0	1	0	0	0	0

Emissions 2000-2010

pol_name	NFR category	Unit	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
SO2	Manufacturing industries/Construction (mobile)	[tonnes]	253	256	258	261	263	28	30	32	33	24	31
SO2	Civil aviation (International, LTO)	[tonnes]	76	76	70	65	71	71	68	70	74	63	66
SO2	Civil aviation (International, Cruise)	[tonnes]	674	686	587	618	711	751	756	776	771	676	707
SO2	Civil aviation (Domestic, LTO)	[tonnes]	15	16	13	12	10	10	11	13	13	13	14
SO2	Civil aviation (Domestic, Cruise)	[tonnes]	34	36	32	32	31	33	34	38	38	36	35
SO2	Road transport: Passenger cars	[tonnes]	204	203	206	211	213	42	42	44	45	44	43
SO2	Road transport:Light duty vehicles	[tonnes]	51	51	52	57	61	13	14	15	14	13	13
SO2	Road transport:Heavy duty vehicles	[tonnes]	94	97	97	102	105	21	22	23	22	19	20
SO2	Road transport: Mopeds & motorcycles	[tonnes]	2	2	2	2	2	0	0	0	0	0	0
SO2	Railways	[tonnes]	7	7	7	7	7	1	1	1	1	1	2
SO2	International navigation (Shipping)	[tonnes]	55367	43830	30036	30982	26540	34283	50417	25652	19326	7383	8262
SO2	National navigation (Shipping)	[tonnes]	1844	1733	1582	1984	2319	2339	2431	1686	1510	1593	1440
SO2	Commercial/Institutional: Mobile	[tonnes]	3	3	4	4	5	1	1	1	1	1	1
SO2	Residential: Household and gardening (mobile)	[tonnes]	1	1	2	2	2	0	0	0	0	0	0
SO2	Agriculture/Forestry/Fishing: Off-road agriculture/forestry	[tonnes]	326	330	331	333	339	34	35	37	39	39	40
SO2	Agriculture/Forestry/Fishing: National fishing	[tonnes]	695	879	905	871	683	817	765	653	380	352	364
SO2	Other, Mobile (military)	[tonnes]	27	12	19	17	46	57	26	40	19	25	20
NOx	Manufacturing industries/Construction (mobile)	[tonnes]	12096	11869	11617	11214	10744	10664	10807	10667	9978	7137	8540
NOx	Civil aviation (International, LTO)	[tonnes]	1070	1059	1002	936	1027	1026	1000	1025	1078	923	951
NOx	Civil aviation (International, Cruise)	[tonnes]	8376	8542	7722	8149	9445	9998	10158	10376	10214	8920	9159
NOx	Civil aviation (Domestic, LTO)	[tonnes]	264	269	230	203	165	178	188	223	224	210	215
NOx	Civil aviation (Domestic, Cruise)	[tonnes]	459	483	412	393	386	405	414	470	473	425	408
NOx	Road transport: Passenger cars	[tonnes]	32784	30416	28568	26870	24891	22323	20147	19083	17761	16233	15372
NOx	Road transport:Light duty vehicles	[tonnes]	8525	8260	8151	8313	8386	8367	8468	8184	7007	6187	5753
NOx	Road transport:Heavy duty vehicles	[tonnes]	34446	34808	33633	34169	34191	33397	33973	33375	28926	23523	22873
NOx	Road transport: Mopeds & motorcycles	[tonnes]	114	116	120	122	128	136	149	159	164	160	162
NOx	Railways	[tonnes]	3727	3396	3396	3540	3478	3724	3542	3555	2920	2603	2818
NOx	International navigation (Shipping)	[tonnes]	94441	75429	60383	65339	53439	56540	78012	83555	70401	35658	51332
NOx	National navigation (Shipping)	[tonnes]	8087	8197	8315	8443	8469	8634	8979	9057	9316	9534	9582
NOx	Commercial/Institutional: Mobile	[tonnes]	104	112	124	138	155	177	199	215	222	220	217
NOx	Residential: Household and gardening (mobile)	[tonnes]	50	54	59	64	69	72	76	79	82	84	87
NOx	Agriculture/Forestry/Fishing: Off-road agriculture/forestry	[tonnes]	13324	13630	13359	12961	12690	12233	11739	11379	10939	10494	10104
NOx	Agriculture/Forestry/Fishing: National fishing	[tonnes]	9483	12157	12677	12325	9757	11776	11093	9509	11088	10296	10666
NOx	Other, Mobile (military)	[tonnes]	544	670	465	511	1252	1287	597	752	477	696	438
NMVOC	Manufacturing industries/Construction (mobile)	[tonnes]	1926	1873	1815	1754	1676	1620	1583	1498	1357	976	1173

NMVOC	Civil aviation (International, LTO)	[tonnes]	122	114	116	108	121	120	114	111	122	99	90
NMVOC	Civil aviation (International, Cruise)	[tonnes]	285	290	272	289	327	340	355	361	334	285	278
NMVOC	Civil aviation (Domestic, LTO)	[tonnes]	138	137	133	124	131	133	127	135	120	102	93
NMVOC	Civil aviation (Domestic, Cruise)	[tonnes]	18	18	18	19	27	32	29	29	26	24	16
NMVOC	Road transport: Passenger cars	[tonnes]	23251	21859	19417	17967	15241	13879	11767	10182	9143	7836	7218
NMVOC	Road transport:Light duty vehicles	[tonnes]	1754	1699	1600	1599	1499	1488	1440	1353	1154	1010	971
NMVOC	Road transport:Heavy duty vehicles	[tonnes]	1706	1639	1522	1493	1456	1381	1364	1263	1002	757	679
NMVOC	Road transport: Mopeds & motorcycles	[tonnes]	4622	3695	3641	3500	3280	3086	2942	2815	2670	2438	2253
NMVOC	Road transport: Gasoline evaporation	[tonnes]	7746	6585	5843	4933	4165	3530	2996	2433	1982	1710	1392
NMVOC	Railways	[tonnes]	253	248	243	223	217	235	230	231	205	174	189
NMVOC	International navigation (Shipping)	[tonnes]	3045	2433	1989	2130	1731	1792	2418	2563	2195	1160	1636
NMVOC	National navigation (Shipping)	[tonnes]	1731	1702	1661	1602	1534	1423	1305	1190	1096	1013	937
NMVOC	Commercial/Institutional: Mobile	[tonnes]	2845	3504	4188	4897	5631	5775	5922	6022	5844	5159	4423
NMVOC	Residential: Household and gardening (mobile)	[tonnes]	1757	1824	1894	1972	2053	2084	2115	2134	2109	2071	2032
NMVOC	Agriculture/Forestry/Fishing: Off-road agriculture/forestry	[tonnes]	3011	2863	2663	2467	2286	2216	2194	2196	2164	2070	1928
NMVOC	Agriculture/Forestry/Fishing: National fishing	[tonnes]	402	515	536	520	412	496	468	402	467	435	446
NMVOC	Other, Mobile (military)	[tonnes]	55	53	45	45	100	106	51	68	40	56	41
CH4	Manufacturing industries/Construction (mobile)	[tonnes]	50	49	48	47	46	45	44	43	40	30	37
CH4	Civil aviation (International, LTO)	[tonnes]	12	11	11	11	12	12	12	12	12	10	9
CH4	Civil aviation (International, Cruise)	[tonnes]	30	31	29	31	35	36	38	38	35	30	30
CH4	Civil aviation (Domestic, LTO)	[tonnes]	4	4	3	3	3	4	3	4	3	3	2
CH4	Civil aviation (Domestic, Cruise)	[tonnes]	2	2	2	2	3	3	3	3	3	3	2
CH4	Road transport: Passenger cars	[tonnes]	1182	1091	996	914	818	714	619	538	465	398	344
CH4	Road transport:Light duty vehicles	[tonnes]	114	101	92	84	76	65	56	49	38	32	28
CH4	Road transport:Heavy duty vehicles	[tonnes]	327	327	316	325	328	324	330	305	235	171	152
CH4	Road transport: Mopeds & motorcycles	[tonnes]	160	145	145	143	138	134	134	133	131	123	120
CH4	Railways	[tonnes]	10	10	9	9	8	9	9	9	8	7	7
CH4	International navigation (Shipping)	[tonnes]	94	75	62	66	54	55	75	79	68	36	51
CH4	National navigation (Shipping)	[tonnes]	33	33	34	34	35	35	35	35	35	35	35
CH4	Commercial/Institutional: Mobile	[tonnes]	92	101	113	127	144	157	169	175	174	167	160
CH4	Residential: Household and gardening (mobile)	[tonnes]	45	48	51	55	60	62	64	65	66	66	65
CH4	Agriculture/Forestry/Fishing: Off-road agriculture/forestry	[tonnes]	75	74	73	72	72	75	83	91	96	101	99
CH4	Agriculture/Forestry/Fishing: National fishing	[tonnes]	13	16	17	16	13	16	15	13	15	14	14
CH4	Other, Mobile (military)	[tonnes]	6	6	5	5	12	12	6	7	4	5	4
CO	Manufacturing industries/Construction (mobile)	[tonnes]	8395	8227	8030	7842	7600	7497	7515	7383	7010	5123	6446
CO	Civil aviation (International, LTO)	[tonnes]	640	626	635	638	705	701	650	669	789	663	668
CO	Civil aviation (International, Cruise)	[tonnes]	1150	1169	973	1030	1143	1206	1201	1237	1190	1027	1048

CO	Civil aviation (Domestic, LTO)	[tonnes]	783	778	757	716	733	733	711	763	689	593	569
CO	Civil aviation (Domestic, Cruise)	[tonnes]	112	113	106	119	126	128	131	138	134	124	120
CO	Road transport: Passenger cars	[tonnes]	215843	206787	187506	177974	154698	147170	128092	112065	101924	88048	81554
CO	Road transport:Light duty vehicles	[tonnes]	15003	14198	13273	13133	12131	11831	11101	10164	8663	7728	7362
CO	Road transport:Heavy duty vehicles	[tonnes]	8998	8943	8765	8945	9021	8910	9154	9075	7958	6635	6607
CO	Road transport: Mopeds & motorcycles	[tonnes]	13894	12930	13015	12834	12285	11850	11682	11534	11344	10635	10449
CO	Railways	[tonnes]	694	637	627	611	599	648	626	629	526	450	481
CO	International navigation (Shipping)	[tonnes]	10044	8025	6562	7025	5709	5912	7977	8454	7243	3826	5397
CO	National navigation (Shipping)	[tonnes]	6832	7034	7217	7408	7601	7631	7281	6915	6565	6213	5841
CO	Commercial/Institutional: Mobile	[tonnes]	29423	32889	37681	43798	51239	58128	64197	67870	70290	72227	72338
CO	Residential: Household and gardening (mobile)	[tonnes]	16451	17390	18463	19890	21444	22482	23547	24366	25092	25341	25616
CO	Agriculture/Forestry/Fishing: Off-road agriculture/forestry	[tonnes]	24524	22761	20821	18971	17231	16035	15887	16837	17463	18020	17909
CO	Agriculture/Forestry/Fishing: National fishing	[tonnes]	1317	1683	1750	1698	1344	1620	1527	1311	1529	1424	1471
CO	Other, Mobile (military)	[tonnes]	396	304	309	297	697	790	376	534	302	410	309
CO2	Manufacturing industries/Construction (mobile)	[ktonnes]	877	886	895	905	910	948	1019	1087	1108	821	1037
CO2	Civil aviation (International, LTO)	[ktonnes]	239	237	218	205	221	221	213	218	231	198	206
CO2	Civil aviation (International, Cruise)	[ktonnes]	2110	2147	1840	1936	2226	2353	2368	2429	2416	2118	2215
CO2	Civil aviation (Domestic, LTO)	[ktonnes]	48	50	42	38	30	33	35	41	42	41	45
CO2	Civil aviation (Domestic, Cruise)	[ktonnes]	106	113	99	100	98	102	108	120	120	111	111
CO2	Road transport: Passenger cars	[ktonnes]	6519	6479	6567	6721	6783	6718	6748	7091	7172	6970	6879
CO2	Road transport:Light duty vehicles	[ktonnes]	1626	1609	1661	1801	1945	2078	2241	2340	2220	2087	2038
CO2	Road transport:Heavy duty vehicles	[ktonnes]	2986	3068	3055	3215	3318	3349	3528	3682	3471	3025	3121
CO2	Road transport: Mopeds & motorcycles	[ktonnes]	72	67	69	69	68	68	70	73	74	71	69
CO2	Railways	[ktonnes]	228	211	210	218	216	232	227	228	237	230	242
CO2	International navigation (Shipping)	[ktonnes]	4168	3304	2691	2853	2299	2352	3136	3292	2809	1487	2073
CO2	National navigation (Shipping)	[ktonnes]	588	587	578	576	588	585	588	586	593	598	593
CO2	Commercial/Institutional: Mobile	[ktonnes]	87	98	112	129	149	162	172	175	176	174	173
CO2	Residential: Household and gardening (mobile)	[ktonnes]	43	46	49	53	57	59	61	62	63	63	63
CO2	Agriculture/Forestry/Fishing: Off-road agriculture/forestry	[ktonnes]	1063	1074	1076	1079	1099	1112	1144	1210	1262	1280	1290
CO2	Agriculture/Forestry/Fishing: National fishing	[ktonnes]	552	696	716	689	540	647	606	517	601	557	575
CO2	Other, Mobile (military)	[ktonnes]	111	97	89	92	239	271	126	175	108	160	107
N2O	Manufacturing industries/Construction (mobile)	[tonnes]	37	38	38	38	39	40	43	46	47	35	44
N2O	Civil aviation (International, LTO)	[tonnes]	15	14	13	13	14	14	13	13	14	12	12
N2O	Civil aviation (International, Cruise)	[tonnes]	67	69	59	62	71	75	76	78	77	68	71
N2O	Civil aviation (Domestic, LTO)	[tonnes]	4	4	5	5	5	5	5	5	5	4	5
N2O	Civil aviation (Domestic, Cruise)	[tonnes]	3	4	3	3	3	3	3	4	4	4	4
N2O	Road transport: Passenger cars	[tonnes]	300	287	278	269	259	239	225	223	217	206	202

N2O	Road transport:Light duty vehicles	[tonnes]	33	37	42	48	54	60	67	72	69	65	64
N2O	Road transport:Heavy duty vehicles	[tonnes]	115	119	118	123	127	127	133	138	130	114	118
N2O	Road transport: Mopeds & motorcycles	[tonnes]	1	1	1	1	1	1	1	1	1	1	1
N2O	Railways	[tonnes]	6	6	6	6	6	6	6	6	7	6	7
N2O	International navigation (Shipping)	[tonnes]	262	208	170	180	145	148	197	207	177	94	130
N2O	National navigation (Shipping)	[tonnes]	34	34	34	33	34	34	34	34	35	35	35
N2O	Commercial/Institutional: Mobile	[tonnes]	1	1	2	2	2	2	3	3	3	3	3
N2O	Residential: Household and gardening (mobile)	[tonnes]	1	1	1	1	1	1	1	1	1	1	1
N2O	Agriculture/Forestry/Fishing: Off-road agriculture/forestry	[tonnes]	43	44	44	45	46	46	48	51	53	54	54
N2O	Agriculture/Forestry/Fishing: National fishing	[tonnes]	35	44	45	44	34	41	38	33	38	35	36
N2O	Other, Mobile (military)	[tonnes]	3	3	3	3	8	9	4	6	4	6	4
NH3	Manufacturing industries/Construction (mobile)	[tonnes]	2	2	2	2	2	2	2	3	3	2	3
NH3	Civil aviation (International, LTO)	[tonnes]	0	0	0	0	0	0	0	0	0	0	0
NH3	Civil aviation (International, Cruise)	[tonnes]	0	0	0	0	0	0	0	0	0	0	0
NH3	Civil aviation (Domestic, LTO)	[tonnes]	0	0	0	0	0	0	0	0	0	0	0
NH3	Civil aviation (Domestic, Cruise)	[tonnes]	0	0	0	0	0	0	0	0	0	0	0
NH3	Road transport: Passenger cars	[tonnes]	2682	2659	2601	2519	2424	2211	2045	1900	1726	1548	1376
NH3	Road transport:Light duty vehicles	[tonnes]	69	77	82	81	79	74	70	63	53	49	45
NH3	Road transport:Heavy duty vehicles	[tonnes]	12	12	12	12	13	13	13	14	13	11	12
NH3	Road transport: Mopeds & motorcycles	[tonnes]	1	1	1	1	1	1	1	1	1	1	1
NH3	Railways	[tonnes]	1	1	1	1	1	1	1	1	1	1	1
NH3	International navigation (Shipping)	[tonnes]											
NH3	National navigation (Shipping)	[tonnes]	0	0	0	0	0	0	0	0	0	0	0
NH3	Commercial/Institutional: Mobile	[tonnes]	0	0	0	0	0	0	0	0	0	0	0
NH3	Residential: Household and gardening (mobile)	[tonnes]	0	0	0	0	0	0	0	0	0	0	0
NH3	Agriculture/Forestry/Fishing: Off-road agriculture/forestry	[tonnes]	3	3	3	3	3	3	3	3	4	4	4
NH3	Agriculture/Forestry/Fishing: National fishing	[tonnes]	0	0	0	0	0	0	0	0	0	0	0
NH3	Other, Mobile (military)	[tonnes]	0	0	0	0	1	1	0	0	1	1	0
TSP	Manufacturing industries/Construction (mobile)	[tonnes]	1135	1121	1098	1075	1037	1002	991	938	854	587	686
TSP	Civil aviation (International, LTO)	[tonnes]	4	4	4	3	4	4	3	4	4	3	3
TSP	Civil aviation (International, Cruise)	[tonnes]	34	35	30	31	36	38	38	39	39	34	36
TSP	Civil aviation (Domestic, LTO)	[tonnes]	2	2	2	1	1	1	1	2	1	1	1
TSP	Civil aviation (Domestic, Cruise)	[tonnes]	2	2	2	2	2	2	2	2	2	2	2
TSP	Road transport: Passenger cars	[tonnes]	742	707	656	659	634	625	604	608	614	571	574
TSP	Road transport:Light duty vehicles	[tonnes]	1171	1054	942	914	843	817	785	741	635	549	523
TSP	Road transport:Heavy duty vehicles	[tonnes]	1023	961	892	865	836	789	779	723	567	426	372
TSP	Road transport: Mopeds & motorcycles	[tonnes]	79	66	66	64	61	57	55	54	52	48	45

TSP	Road transport: Automobile tyre and brake wear	[tonnes]	1305	1307	1323	1378	1423	1433	1484	1556	1523	1433	1438
TSP	Road transport: Automobile road abrasion	[tonnes]	958	962	972	1008	1037	1038	1071	1122	1102	1038	1044
TSP	Railways	[tonnes]	141	125	124	119	115	124	120	120	101	84	95
TSP	International navigation (Shipping)	[tonnes]	8791	7143	4988	4501	3978	5761	7888	2365	1873	820	940
TSP	National navigation (Shipping)	[tonnes]	383	373	357	387	430	425	421	336	327	327	307
TSP	Commercial/Institutional: Mobile	[tonnes]	30	38	46	55	63	65	66	66	67	67	67
TSP	Residential: Household and gardening (mobile)	[tonnes]	11	11	12	13	13	13	14	14	14	14	14
TSP	Agriculture/Forestry/Fishing: Off-road agriculture/forestry	[tonnes]	1334	1280	1204	1135	1075	1011	955	914	870	830	789
TSP	Agriculture/Forestry/Fishing: National fishing	[tonnes]	172	218	224	216	169	203	190	162	175	162	167
TSP	Other, Mobile (military)	[tonnes]	15	31	15	18	38	33	15	15	12	18	9
PM10	Manufacturing industries/Construction (mobile)	[tonnes]	1135	1121	1098	1075	1037	1002	991	938	854	587	686
PM10	Civil aviation (International, LTO)	[tonnes]	4	4	4	3	4	4	3	4	4	3	3
PM10	Civil aviation (International, Cruise)	[tonnes]	34	35	30	31	36	38	38	39	39	34	36
PM10	Civil aviation (Domestic, LTO)	[tonnes]	2	2	2	1	1	1	1	2	1	1	1
PM10	Civil aviation (Domestic, Cruise)	[tonnes]	2	2	2	2	2	2	2	2	2	2	2
PM10	Road transport: Passenger cars	[tonnes]	742	707	656	659	634	625	604	608	614	571	574
PM10	Road transport:Light duty vehicles	[tonnes]	1171	1054	942	914	843	817	785	741	635	549	523
PM10	Road transport:Heavy duty vehicles	[tonnes]	1023	961	892	865	836	789	779	723	567	426	372
PM10	Road transport: Mopeds & motorcycles	[tonnes]	79	66	66	64	61	57	55	54	52	48	45
PM10	Road transport: Automobile tyre and brake wear	[tonnes]	983	985	997	1038	1072	1079	1118	1171	1146	1079	1082
PM10	Road transport: Automobile road abrasion	[tonnes]	479	481	486	504	519	519	535	561	551	519	522
PM10	Railways	[tonnes]	141	125	124	119	115	124	120	120	101	84	95
PM10	International navigation (Shipping)	[tonnes]	8703	7072	4938	4456	3938	5703	7809	2341	1854	812	931
PM10	National navigation (Shipping)	[tonnes]	381	371	355	384	427	422	418	334	325	324	305
PM10	Commercial/Institutional: Mobile	[tonnes]	30	38	46	55	63	65	66	66	67	67	67
PM10	Residential: Household and gardening (mobile)	[tonnes]	11	11	12	13	13	13	14	14	14	14	14
PM10	Agriculture/Forestry/Fishing: Off-road agriculture/forestry	[tonnes]	1334	1280	1204	1135	1075	1011	955	914	870	830	789
PM10	Agriculture/Forestry/Fishing: National fishing	[tonnes]	171	216	222	214	167	201	188	160	173	160	166
PM10	Other, Mobile (military)	[tonnes]	15	31	15	18	38	33	15	15	12	18	9
PM2.5	Manufacturing industries/Construction (mobile)	[tonnes]	1135	1121	1098	1075	1037	1002	991	938	854	587	686
PM2.5	Civil aviation (International, LTO)	[tonnes]	4	4	4	3	4	4	3	4	4	3	3
PM2.5	Civil aviation (International, Cruise)	[tonnes]	34	35	30	31	36	38	38	39	39	34	36
PM2.5	Civil aviation (Domestic, LTO)	[tonnes]	2	2	2	1	1	1	1	2	1	1	1
PM2.5	Civil aviation (Domestic, Cruise)	[tonnes]	2	2	2	2	2	2	2	2	2	2	2
PM2.5	Road transport: Passenger cars	[tonnes]	742	707	656	659	634	625	604	608	614	571	574
PM2.5	Road transport:Light duty vehicles	[tonnes]	1171	1054	942	914	843	817	785	741	635	549	523
PM2.5	Road transport:Heavy duty vehicles	[tonnes]	1023	961	892	865	836	789	779	723	567	426	372

PM2.5	Road transport: Mopeds & motorcycles	[tonnes]	79	66	66	64	61	57	55	54	52	48	45
PM2.5	Road transport: Automobile tyre and brake wear	[tonnes]	532	533	540	562	581	585	606	635	621	585	587
PM2.5	Road transport: Automobile road abrasion	[tonnes]	259	260	262	272	280	280	289	303	298	280	282
PM2.5	Railways	[tonnes]	141	125	124	119	115	124	120	120	101	84	95
PM2.5	International navigation (Shipping)	[tonnes]	8659	7036	4913	4434	3918	5675	7770	2330	1845	808	926
PM2.5	National navigation (Shipping)	[tonnes]	379	370	354	383	425	421	417	333	324	323	304
PM2.5	Commercial/Institutional: Mobile	[tonnes]	30	38	46	55	63	65	66	66	67	67	67
PM2.5	Residential: Household and gardening (mobile)	[tonnes]	11	11	12	13	13	13	14	14	14	14	14
PM2.5	Agriculture/Forestry/Fishing: Off-road agriculture/forestry	[tonnes]	1334	1280	1204	1135	1075	1011	955	914	870	830	789
PM2.5	Agriculture/Forestry/Fishing: National fishing	[tonnes]	170	215	221	213	167	199	187	159	172	160	165
PM2.5	Other, Mobile (military)	[tonnes]	15	31	15	18	38	33	15	15	12	18	9
Arsenic	Manufacturing industries/Construction (mobile)	[kg]	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
Arsenic	Civil aviation (International, Cruise)	[kg]	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
Arsenic	Civil aviation (Domestic, Cruise)	[kg]	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
Arsenic	Road transport:Light duty vehicles	[kg]	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
Arsenic	Road transport: Mopeds & motorcycles	[kg]	0	0	0	0	0	0	0	0	0	0	0
Arsenic	Road transport: Automobile tyre and brake wear	[kg]	6	6	6	6	6	6	7	7	7	6	6
Arsenic	Road transport: Automobile road abrasion	[kg]	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
Arsenic	International navigation (Shipping)	[kg]	422	329	227	257	213	250	381	424	326	127	206
Arsenic	National navigation (Shipping)	[kg]	24	23	23	28	28	28	30	30	31	33	35
Arsenic	Commercial/Institutional: Mobile	[kg]	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
Arsenic	Agriculture/Forestry/Fishing: Off-road agriculture/forestry	[kg]	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
Arsenic	Other, Mobile (military)	[kg]	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
Cadmium	Civil aviation (International, LTO)	[kg]	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
Cadmium	Civil aviation (Domestic, LTO)	[kg]	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
Cadmium	Road transport: Passenger cars	[kg]	22	22	23	23	24	24	24	25	25	24	24
Cadmium	Road transport:Light duty vehicles	[kg]	4	4	4	5	5	5	6	6	6	6	6

Cadmium	Road transport:Heavy duty vehicles	[kg]	6	6	6	6	6	6	6	7	6	5	6
Cadmium	Road transport: Mopeds & motorcycles	[kg]	0	0	0	0	0	0	0	0	0	0	0
Cadmium	Road transport: Automobile tyre and brake wear	[kg]	6	6	6	7	7	7	7	7	7	7	7
Cadmium	Road transport: Automobile road abrasion	[kg]	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
Cadmium	International navigation (Shipping)	[kg]	29	23	17	18	15	17	24	27	21	9	14
Cadmium	National navigation (Shipping)	[kg]	3	2	2	3	3	3	3	3	3	3	3
Cadmium	Commercial/Institutional: Mobile	[kg]	0	0	0	0	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
Cadmium	Agriculture/Forestry/Fishing: Off-road agriculture/forestry	[kg]	3	3	3	3	3	3	3	3	3	3	3
Cadmium	Agriculture/Forestry/Fishing: National fishing	[kg]	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
Chromium	Manufacturing industries/Construction (mobile)	[kg]	7	7	7	8	8	8	9	9	9	7	9
Chromium	Civil aviation (International, LTO)	[kg]	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
Chromium	Civil aviation (Domestic, LTO)	[kg]	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
Chromium	Road transport: Passenger cars	[kg]	37	38	39	41	42	43	44	47	49	50	51
Chromium	Road transport:Light duty vehicles	[kg]	14	13	14	15	17	18	19	20	19	19	18
Chromium	Road transport:Heavy duty vehicles	[kg]	22	22	22	23	24	24	25	26	25	21	22
Chromium	Road transport: Mopeds & motorcycles	[kg]	0	0	0	0	0	0	0	0	0	0	0
Chromium	Road transport: Automobile tyre and brake wear	[kg]	63	63	64	67	69	69	72	75	73	68	69
Chromium	Road transport: Automobile road abrasion	[kg]	19	19	19	20	21	21	21	22	22	21	21
Chromium	Railways	[kg]	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	88
Chromium	National navigation (Shipping)	[kg]	13	12	12	14	14	14	15	15	15	16	17
Chromium	Commercial/Institutional: Mobile	[kg]	0	0	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
Chromium	Agriculture/Forestry/Fishing: Off-road agriculture/forestry	[kg]	9	9	9	9	10	10	10	11	11	11	11
Chromium	Agriculture/Forestry/Fishing: National fishing	[kg]	7	9	9	9	7	8	8	7	8	7	7
Chromium	Other, Mobile (military)	[kg]	0	1	0	0	1	1	0	0	0	1	0
Copper	Manufacturing industries/Construction (mobile)	[kg]	6	6	6	6	6	6	7	7	7	5	7
Copper	Civil aviation (International, LTO)	[kg]	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
Copper	Civil aviation (Domestic, LTO)	[kg]	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
Copper	Road transport: Passenger cars	[kg]	82	81	83	85	85	83	83	85	84	82	80

Copper	Road transport:Light duty vehicles	[kg]	11	11	11	12	13	14	15	16	15	14	14
Copper	Road transport:Heavy duty vehicles	[kg]	15	16	16	17	17	17	18	19	17	15	16
Copper	Road transport: Mopeds & motorcycles	[kg]	0	0	1	1	1	1	1	1	1	1	1
Copper	Road transport: Automobile tyre and brake wear	[kg]	41526	41095	41907	43538	45076	45453	46864	49217	48741	47039	46617
Copper	Road transport: Automobile road abrasion	[kg]	10	10	10	10	10	10	11	11	11	10	10
Copper	Railways	[kg]	1	1	1	1	1	1	1	1	1	1	2
Copper	International navigation (Shipping)	[kg]	422	329	227	257	213	250	381	424	326	127	206
Copper	National navigation (Shipping)	[kg]	25	24	24	29	29	29	31	31	32	34	36
Copper	Commercial/Institutional: Mobile	[kg]	1	1	1	2	2	2	2	2	2	2	2
Copper	Residential: Household and gardening (mobile)	[kg]	1	1	1	1	1	1	1	1	1	1	1
Copper	Agriculture/Forestry/Fishing: Off-road agriculture/forestry	[kg]	7	7	7	7	7	7	7	8	8	8	8
Copper	Agriculture/Forestry/Fishing: National fishing	[kg]	9	11	11	11	9	10	10	8	9	9	9
Copper	Other, Mobile (military)	[kg]	0	0	0	0	1	1	0	0	0	1	0
Mercury	Manufacturing industries/Construction (mobile)	[kg]	1	1	1	1	1	1	2	2	2	1	2
Mercury	Civil aviation (International, LTO)	[kg]	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
Mercury	Civil aviation (Domestic, LTO)	[kg]	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
Mercury	Road transport: Passenger cars	[kg]	17	17	17	17	17	17	17	17	17	17	16
Mercury	Road transport:Light duty vehicles	[kg]	3	3	3	3	4	4	4	4	4	4	4
Mercury	Road transport:Heavy duty vehicles	[kg]	5	5	5	5	6	6	6	6	6	5	5
Mercury	Road transport: Mopeds & motorcycles	[kg]	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
Mercury	Railways	[kg]	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
Mercury	National navigation (Shipping)	[kg]	7	7	7	6	6	6	6	6	6	6	6
Mercury	Commercial/Institutional: Mobile	[kg]	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
Mercury	Agriculture/Forestry/Fishing: Off-road agriculture/forestry	[kg]	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
Mercury	Other, Mobile (military)	[kg]	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
Nickel	Civil aviation (International, LTO)	[kg]	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
Nickel	Civil aviation (Domestic, LTO)	[kg]	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

Nickel	Road transport: Passenger cars	[kg]	26	26	27	27	28	27	27	28	28	28	27
Nickel	Road transport:Light duty vehicles	[kg]	4	4	5	5	5	6	6	6	6	6	6
Nickel	Road transport:Heavy duty vehicles	[kg]	6	6	6	6	6	6	7	7	6	6	6
Nickel	Road transport: Mopeds & motorcycles	[kg]	0	0	0	0	0	0	0	0	0	0	0
Nickel	Road transport: Automobile tyre and brake wear	[kg]	78	78	79	83	85	86	89	93	91	85	86
Nickel	Road transport: Automobile road abrasion	[kg]	15	15	15	16	16	16	17	18	17	16	17
Nickel	Railways	[kg]	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	11614
Nickel	National navigation (Shipping)	[kg]	1068	1036	1026	1374	1367	1371	1494	1479	1578	1687	1811
Nickel	Commercial/Institutional: Mobile	[kg]	0	0	0	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
Nickel	Agriculture/Forestry/Fishing: Off-road agriculture/forestry	[kg]	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
Nickel	Other, Mobile (military)	[kg]	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
Lead	Civil aviation (International, LTO)	[kg]	118	114	113	106	111	117	22	10	113	52	10
Lead	Civil aviation (International, Cruise)	[kg]	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
Lead	Civil aviation (Domestic, Cruise)	[kg]	0	0	0	0	0	0	0	0	0	0	0
Lead	Road transport: Passenger cars	[kg]	76	77	79	83	86	86	88	94	98	98	101
Lead	Road transport:Light duty vehicles	[kg]	23	23	24	26	29	30	33	35	33	32	32
Lead	Road transport:Heavy duty vehicles	[kg]	33	35	34	36	37	37	39	40	37	33	34
Lead	Road transport: Mopeds & motorcycles	[kg]	0	0	0	0	0	0	0	0	0	0	0
Lead	Road transport: Automobile tyre and brake wear	[kg]	5433	5374	5483	5695	5897	5948	6133	6443	6385	6169	6110
Lead	Road transport: Automobile road abrasion	[kg]	45	45	46	47	49	49	50	53	52	49	49
Lead	Railways	[kg]	3	3	3	3	3	4	3	3	4	3	4
Lead	International navigation (Shipping)	[kg]	210	166	126	137	112	121	172	186	151	70	104
Lead	National navigation (Shipping)	[kg]	21	20	20	21	21	21	22	22	22	23	23
Lead	Commercial/Institutional: Mobile	[kg]	1	1	1	1	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
Lead	Agriculture/Forestry/Fishing: Off-road agriculture/forestry	[kg]	16	16	16	16	16	17	17	18	19	19	19
Lead	Agriculture/Forestry/Fishing: National fishing	[kg]	17	22	23	22	17	20	19	16	19	18	18
Lead	Other, Mobile (military)	[kg]	114	89	106	79	84	60	47	81	40	66	80
Selenium	Manufacturing industries/Construction (mobile)	[kg]	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
Selenium	Civil aviation (International, Cruise)	[kg]	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

Selenium	Civil aviation (Domestic, Cruise)	[kg]	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
Selenium	Road transport:Light duty vehicles	[kg]	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
Selenium	Road transport: Mopeds & motorcycles	[kg]	0	0	0	0	0	0	0	0	0	0	0
Selenium	Road transport: Automobile tyre and brake wear	[kg]	26	26	26	28	28	29	30	31	30	29	29
Selenium	Road transport: Automobile road abrasion	[kg]	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
Selenium	International navigation (Shipping)	[kg]	421	331	252	274	224	243	345	372	302	140	208
Selenium	National navigation (Shipping)	[kg]	39	38	37	39	40	40	41	40	42	43	43
Selenium	Commercial/Institutional: Mobile	[kg]	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
Selenium	Agriculture/Forestry/Fishing: Off-road agriculture/forestry	[kg]	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
Selenium	Other, Mobile (military)	[kg]	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
Zinc	Civil aviation (International, LTO)	[kg]	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
Zinc	Civil aviation (Domestic, LTO)	[kg]	5	5	5	5	5	5	5	5	4	4	3
Zinc	Civil aviation (Domestic, Cruise)	[kg]	0	0	0	0	0	0	0	0	0	0	0
Zinc	Road transport: Passenger cars	[kg]	4453	4452	4561	4688	4779	4704	4721	4913	4967	4889	4892
Zinc	Road transport:Light duty vehicles	[kg]	833	823	856	932	1014	1074	1154	1217	1165	1120	1113
Zinc	Road transport:Heavy duty vehicles	[kg]	1122	1164	1151	1208	1247	1241	1293	1335	1250	1091	1141
Zinc	Road transport: Mopeds & motorcycles	[kg]	23	23	24	25	25	25	24	25	26	25	25
Zinc	Road transport: Automobile tyre and brake wear	[kg]	17367	17335	17597	18309	18926	19065	19722	20689	20327	19276	19266
Zinc	Road transport: Automobile road abrasion	[kg]	72	73	73	76	78	78	81	85	83	78	79
Zinc	Railways	[kg]	115	106	106	110	109	117	114	115	119	116	122
Zinc	International navigation (Shipping)	[kg]	973	766	588	637	519	560	788	848	692	326	481
Zinc	National navigation (Shipping)	[kg]	142	143	143	149	152	152	153	152	154	156	157
Zinc	Commercial/Institutional: Mobile	[kg]	60	68	77	89	103	112	119	121	122	121	119
Zinc	Residential: Household and gardening (mobile)	[kg]	29	32	34	36	39	41	42	43	44	44	43
Zinc	Agriculture/Forestry/Fishing: Off-road agriculture/forestry	[kg]	543	548	549	550	559	566	583	617	643	653	658
Zinc	Agriculture/Forestry/Fishing: National fishing	[kg]	87	110	113	109	85	102	96	82	95	88	91
Zinc	Other, Mobile (military)	[kg]	14	31	15	21	51	46	23	25	24	42	24
Dioxins/furans	Manufacturing industries/Construction (mobile)	[g]	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
Dioxins/furans	Civil aviation (International, Cruise)	[g]	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
Dioxins/furans	Civil aviation (Domestic, Cruise)	[g]	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
Dioxins/furans	Road transport:Light duty vehicles	[g]	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
Dioxins/furans	Road transport: Mopeds & motorcycles	[g]	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
Dioxins/furans	International navigation (Shipping)	[g]	1	1	0	0	0	0	1	1	0	0	0
Dioxins/furans	National navigation (Shipping)	[g]	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
Dioxins/furans	Residential: Household and gardening (mobile)	[g]	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
Dioxins/furans	Agriculture/Forestry/Fishing: National fishing	[g]	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
Flouranthene	Manufacturing industries/Construction (mobile)	[kg]	48	48	49	49	50	52	56	60	61	45	57
Flouranthene	Civil aviation (International, LTO)	[kg]	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
Flouranthene	Civil aviation (Domestic, LTO)	[kg]	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
Flouranthene	Road transport: Passenger cars	[kg]	324	312	310	320	329	334	347	400	435	446	479
Flouranthene	Road transport:Light duty vehicles	[kg]	167	165	171	187	203	217	236	251	240	226	222
Flouranthene	Road transport:Heavy duty vehicles	[kg]	80	80	80	84	86	87	92	96	91	79	81
Flouranthene	Road transport: Mopeds & motorcycles	[kg]	10	10	10	10	10	11	11	12	12	12	12
Flouranthene	Railways	[kg]	4	4	4	4	4	4	4	4	5	4	5
Flouranthene	International navigation (Shipping)	[kg]	298	238	208	215	171	164	203	205	187	114	149
Flouranthene	National navigation (Shipping)	[kg]	52	51	50	49	50	50	49	49	50	50	49
Flouranthene	Commercial/Institutional: Mobile	[kg]	5	6	7	8	9	10	10	10	10	10	10
Flouranthene	Residential: Household and gardening (mobile)	[kg]	3	3	3	3	3	3	4	4	4	4	4
Flouranthene	Agriculture/Forestry/Fishing: Off-road agriculture/forestry	[kg]	63	63	63	63	65	65	67	71	74	75	76
Flouranthene	Agriculture/Forestry/Fishing: National fishing	[kg]	55	70	72	69	54	65	61	52	60	56	58
Flouranthene	Other, Mobile (military)	[kg]	2	4	2	3	6	6	3	3	3	5	3
Benzo(b) flouranthene	Manufacturing industries/Construction (mobile)	[kg]	6	6	6	6	6	6	7	7	7	5	7
Benzo(b) flouranthene	Civil aviation (International, LTO)	[kg]	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
Benzo(b) flouranthene	Civil aviation (Domestic, LTO)	[kg]	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
Benzo(b) flouranthene	Road transport: Passenger cars	[kg]	28	27	27	28	29	29	30	33	35	35	37

Benzo(b) flouranthene	Road transport:Light duty vehicles	[kg]	10	10	11	12	13	14	15	16	15	14	14
Benzo(b) flouranthene	Road transport:Heavy duty vehicles	[kg]	20	20	20	21	22	22	23	24	23	20	21
Benzo(b) flouranthene	Road transport: Mopeds & motorcycles	[kg]	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
Benzo(b) flouranthene	International navigation (Shipping)	[kg]	21	17	15	16	12	11	13	12	12	8	10
Benzo(b) flouranthene	National navigation (Shipping)	[kg]	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
Benzo(b) flouranthene	Residential: Household and gardening (mobile)	[kg]	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
Benzo(b) flouranthene	Agriculture/Forestry/Fishing: National fishing	[kg]	5	6	6	6	5	6	5	4	5	5	5
Benzo(b) flouranthene	Other, Mobile (military)	[kg]	0	0	0	0	1	1	0	0	0	1	0
Benzo(k) flouranthene	Manufacturing industries/Construction (mobile)	[kg]	6	5	5	6	6	6	6	7	7	5	6
Benzo(k) flouranthene	Civil aviation (International, LTO)	[kg]	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
Benzo(k) flouranthene	Civil aviation (Domestic, LTO)	[kg]	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
Benzo(k) flouranthene	Road transport: Passenger cars	[kg]	28	27	28	29	29	30	30	34	35	35	37
Benzo(k) flouranthene	Road transport:Light duty vehicles	[kg]	9	9	10	11	12	12	13	14	14	13	13
Benzo(k) flouranthene	Road transport:Heavy duty vehicles	[kg]	30	30	30	31	32	33	34	36	34	30	30
Benzo(k) flouranthene	Road transport: Mopeds & motorcycles	[kg]	0	0	1	1	1	1	1	1	1	1	1
Benzo(k) flouranthene	Railways	[kg]	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
Benzo(k) flouranthene	National navigation (Shipping)	[kg]	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
Benzo(k) flouranthene	Residential: Household and gardening (mobile)	[kg]	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
Benzo(k) flouranthene	Agriculture/Forestry/Fishing: National fishing	[kg]	2	3	3	3	2	3	2	2	2	2	2
Benzo(k) flouranthene	Other, Mobile (military)	[kg]	0	0	0	0	1	1	0	0	0	1	0
Benzo(a) pyrene	Manufacturing industries/Construction (mobile)	[kg]	3	3	3	3	3	3	3	4	4	3	3
Benzo(a) pyrene	Civil aviation (International, LTO)	[kg]	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
Benzo(a) pyrene	Civil aviation (Domestic, LTO)	[kg]	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
Benzo(a) pyrene	Road transport: Passenger cars	[kg]	27	27	27	28	29	30	31	35	37	37	39
Benzo(a) pyrene	Road transport:Light duty vehicles	[kg]	11	11	12	13	14	15	16	17	16	15	15
Benzo(a) pyrene	Road transport:Heavy duty vehicles	[kg]	4	4	4	4	4	4	4	4	4	4	4
Benzo(a) pyrene	Road transport: Mopeds & motorcycles	[kg]	1	1	1	1	1	1	1	1	1	1	1

Benzo(a) pyrene	Railways	[kg]	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
Benzo(a) pyrene	National navigation (Shipping)	[kg]	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
Benzo(a) pyrene	Residential: Household and gardening (mobile)	[kg]	0	0	0	0	0	0	0	0	0	0	0
Benzo(a) pyrene	Agriculture/Forestry/Fishing: Off-road agriculture/forestry	[kg]	4	4	4	4	4	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
Benzo(a) pyrene	Other, Mobile (military)	[kg]	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
Benzo(g,h,i) perylene	Civil aviation (International, LTO)	[kg]	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
Benzo(g,h,i) perylene	Civil aviation (Domestic, LTO)	[kg]	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
Benzo(g,h,i) perylene	Road transport: Passenger cars	[kg]	57	55	56	58	59	60	61	68	72	73	77
Benzo(g,h,i) perylene	Road transport:Light duty vehicles	[kg]	22	22	23	25	27	29	31	33	32	30	29
Benzo(g,h,i) perylene	Road transport:Heavy duty vehicles	[kg]	3	3	3	3	3	3	3	4	3	3	3
Benzo(g,h,i) perylene	Road transport: Mopeds & motorcycles	[kg]	1	1	1	1	1	1	1	2	2	2	2
Benzo(g,h,i) perylene	Railways	[kg]	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
Benzo(g,h,i) perylene	National navigation (Shipping)	[kg]	8	8	8	7	7	7	7	7	7	7	7
Benzo(g,h,i) perylene	Commercial/Institutional: Mobile	[kg]	1	1	1	1	1	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
Benzo(g,h,i) perylene	Agriculture/Forestry/Fishing: Off-road agriculture/forestry	[kg]	7	7	7	7	7	7	7	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
Benzo(g,h,i) perylene	Other, Mobile (military)	[kg]	0	0	0	0	1	1	0	0	0	1	0
indeno(1,2,3-c,d) pyrene	Manufacturing industries/Construction (mobile)	[kg]	3	3	3	3	3	3	3	4	4	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
indeno(1,2,3-c,d) pyrene	Civil aviation (International, Cruise)	[kg]	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
indeno(1,2,3-c,d) pyrene	Civil aviation (Domestic, Cruise)	[kg]	0	0	0	0	0	0	0	0	0	0	0
indeno(1,2,3-c,d) pyrene	Road transport: Passenger cars	[kg]	31	31	32	33	34	34	35	39	41	41	42
indeno(1,2,3-c,d) pyrene	Road transport:Light duty vehicles	[kg]	11	11	11	12	13	14	15	16	15	15	14
indeno(1,2,3-c,d) pyrene	Road transport:Heavy duty vehicles	[kg]	5	5	5	5	6	6	6	6	6	5	5
indeno(1,2,3-c,d) pyrene	Road transport: Mopeds & motorcycles	[kg]	0	0	1	1	1	1	1	1	1	1	1
indeno(1,2,3-c,d) pyrene	Railways	[kg]	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
indeno(1,2,3-c,d) pyrene	National navigation (Shipping)	[kg]	7	7	6	6	6	6	6	6	6	6	5

indeno(1,2,3-c,d) pyrene	Commercial/Institutional: Mobile	[kg]	0	0	0	0	0	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
indeno(1,2,3-c,d) pyrene	Agriculture/Forestry/Fishing: Off-road agriculture/forestry	[kg]	4	4	4	4	4	4	4	4	4	5	5
indeno(1,2,3-c,d) pyrene	Agriculture/Forestry/Fishing: National fishing	[kg]	9	11	11	11	9	10	10	8	10	9	9
indeno(1,2,3-c,d) pyrene	Other, Mobile (military)	[kg]	0	0	0	0	0	0	0	0	0	0	0

Annex 2B-16: Uncertainty estimates

Uncertainty estimation, SO_2.

	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 SO_2	Gg SO_2	%	%	%	%	%	%	%	%	%
Road Transportation	SO_2	5767	76	2	50	50,040	1,851	-0,041620218	0,0048	-2,0810109	0,013470813	2,08105448
Other mobile sources	SO_2	10186	1977	10	50	50,990	49,104	0,041505666	0,1240	2,07528329	1,753033839	2,71660236
Total		15952,627	2053,4359				2414,588					11,7107161
Total uncertainties					**Year (%):**		**49,138**			**Trend (%):**		**3,422**

Uncertainty estimation, NO_X.

	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 NO_X	Gg NO_X	%	%	%	%	%	%	%	%	%
Road Transportation	NO_X	105699	44159	2	50	50,040	25,174	-0,091254746	0,2793	-4,5627373	0,790007314	4,63062448
Other mobile sources	NO_X	52403	43618	10	100	100,499	49,939	0,091561345	0,2759	9,15613454	3,901609297	9,95275615
Total	NO_X	158101,66	87777,281				3127,695					120,500038
Total uncertainties					**Year (%):**		**55,926**			**Trend (%):**		**10,977**

Uncertainty estimation, NMVOC.

	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 Gg NMVOC	Input data Gg NMVOC	Input data %	Input data %	%	%	%	%	%	%	%
Road Transportation	NMVOC	79934	12514	2	50	50,040	26,237	-0,079645792	0,1320	-3,9822896	0,373408286	3,99975804
Other mobile sources	NMVOC	14853	11353	10	100	100,499	47,805	0,080191789	0,1198	8,01917887	1,693842002	8,19611679
Total	NMVOC	94786,56	23866,543				2973,722					83,1743949
Total uncertainties					**Year (%):**		**54,532**			**Trend (%):**		**9,120**

Uncertainty estimation, CO.

	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 Gg CO	Input data Gg CO	Input data %	Input data %	%	%	%	%	%	%	%
Road Transportation	CO	455048	105972	2	50	50,040	22,316	-0,143350118	0,1850	-7,1675059	0,523208576	7,18657693
Other mobile sources	CO	117830	131648	10	100	100,499	55,679	0,144192201	0,2298	14,4192201	3,24988753	14,7809227
Total	CO	572877,23	237620,26				3598,185					270,122564
Total uncertainties					**Year (%):**		**59,985**			**Trend (%):**		**16,435**

Uncertainty estimation, NH_3.

	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 Gg NH_3	Input data Gg NH_3	Input data %	Input data %	%	%	%	%	%	%	%
Road Transportation	NH_3	70	1433	2	1000	1000,002	994,482	1,410350764	18,8033	1410,35076	53,18370968	1411,35317
Other mobile sources	NH_3	6	8	10	1000	1000,050	5,521	-1,422165666	0,1044	-1422,1657	1,476143592	1422,16643
Total	NH_3	76,235271	1441,4306				989023,976					4014475,14
Total uncertainties					**Year (%):**		**994,497**			**Trend (%):**		**2004**

Uncertainty estimation, TSP.

	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 Gg TSP	Input data Gg TSP	Input data %	Input data %	%	%	%	%	%	%	%
Road Transportation	TSP	6669	3995	2	50	50,040	32,586	0,049021232	0,3322	2,45106161	0,939595579	2,62498436
Other mobile sources	TSP	5357	2140	10	100	100,499	35,053	-0,049074505	0,1779	-4,9074505	2,516273054	5,51495245
Total	TSP	12025,777	6134,6444				2290,600					37,3052434
Total uncertainties					**Year (%):**		**47,860**			**Trend (%):**		**6,108**

Uncertainty estimation, Arsenic.

	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	139,390	0,046536591	0,0928	46,536591	0,262597388	46,5373319
Other mobile sources	Arsenic	71	44	10	1000	1000,050	860,653	-0,04613958	0,5732	-46,13958	8,106532833	46,8463097
Total	Arsenic	76,775782	51,137326				760153,275					4360,3
Total uncertainties					**Year (%):**		**871,868**			**Trend (%):**		**66,033**

Uncertainty estimation, Cadmium.

	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	31	43	2	1000	1000,002	778,137	0,096055936	0,9696	96,0559365	2,742408251	96,0950766
Other mobile sources	Cadmium	13	12	10	1000	1000,050	221,876	-0,096439982	0,2765	-96,439982	3,909631254	96,5191971
Total	Cadmium	44,16223	55,027923				654725,571					18550,2191
Total uncertainties					**Year (%):**		**809,151**			**Trend (%):**		**136,199**

Uncertainty estimation, Chromium.

	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	127	182	2	1000	1000,002	791,726	0,125587331	0,9914	125,587331	2,804156915	125,618633
Other mobile sources	Chromium	57	48	10	1000	1000,050	208,286	-0,126064946	0,2608	-126,06495	3,688381535	126,118892
Total	Chromium	183,33713	229,57974				670213,469					31686,0158
Total uncertainties					**Year (%):**		**818,666**			**Trend (%):**		**178,006**

Uncertainty estimation, Copper.

	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	32373	46738	2	1000	1000,002	998,618	0,001963829	1,4398	1,9638294	4,072268317	4,52106129
Other mobile sources	Copper	90	65	10	1000	1000,050	1,384	-0,001983359	0,0020	-1,9833588	0,028223721	1,98355956
Total	Copper	32462,239	46802,758				997239,374					24,3745037
Total uncertainties					**Year (%):**		**998,619**			**Trend (%):**		**4,937**

Uncertainty estimation, Mercury.

	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	25	2	1000	1000,002	554,197	0,076299349	0,5868	76,2993488	1,659803956	76,3174002
Other mobile sources	Mercury	22	20	10	1000	1000,050	445,827	-0,076271707	0,4721	-76,271707	6,67586829	76,5633107
Total	Mercury	42,859538	45,3833				505895,468					11686,2861
Total uncertainties					**Year (%):**		**711,263**			**Trend (%):**		**108,103**

Uncertainty estimation, Nickel.

	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	104	141	2	1000	1000,002	71,699	0,023601062	0,0406	23,601062	0,114734977	23,6013409
Other mobile sources	Nickel	3382	1831	10	1000	1000,050	928,348	-0,02338133	0,5252	-23,38133	7,42754162	24,5327325
Total	Nickel	3486,2029	1972,3941				866970,617					1158,87826
Total uncertainties					**Year (%):**		**931,113**			**Trend (%):**		**34,042**

Uncertainty estimation, Lead.

	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	101864	6327	2	1000	1000,002	851,822	-0,008995644	0,0608	-8,9956444	0,171992755	8,99728842
Other mobile sources	Lead	2178	1101	10	1000	1000,050	148,187	0,009081817	0,0106	9,08181669	0,149596004	9,08304868
Total	Lead	104042,34	7427,2348				747560,509					163,452972
Total uncertainties					**Year (%):**		**864,616**			**Trend (%):**		**12,785**

Uncertainty estimation, Selenium.

	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	269,025	0,087849574	0,2291	87,8495736	0,647865753	87,8519624
Other mobile sources	Selenium	107	80	10	1000	1000,050	731,012	-0,087267027	0,6224	-87,267027	8,801683563	87,7097693
Total	Selenium	127,82368	108,83268				606752,974					15410,9709
Total uncertainties					**Year (%):**		**778,943**			**Trend (%):**		**124,141**

Uncertainty estimation, Zinc.

	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	18940	26516	2	1000	1000,002	938,530	0,023388611	1,2899	23,388611	3,648322606	23,6714466
Other mobile sources	Zinc	1617	1737	10	1000	1000,050	61,475	-0,023585554	0,0845	-23,585554	1,194787195	23,6157968
Total	Zinc	20556,641	28252,246				884618,165					1118,04324
Total uncertainties					**Year (%):**		**940,541**			**Trend (%):**		**33,437**

Uncertainty estimation, Dioxins.

	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	328,109	-0,128682003	0,0960	-128,682	0,271500794	128,682289
Other mobile sources	Dioxins	0	0	10	1000	1000,050	671,925	0,129378781	0,1966	129,378781	2,779861006	129,408642
Total	Dioxins	1,1310127	0,3308844				559139,057					33305,7282
Total uncertainties					**Year (%):**		**747,756**			**Trend (%):**		**182,499**

Uncertainty estimation, Flouranthene.

	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	813	794	2	1000	1000,002	752,614	-0,004317785	0,7394	-4,317785	2,091409389	4,79763073
Other mobile sources	Flouranthene	261	261	10	1000	1000,050	247,400	0,004339928	0,2431	4,3399281	3,437290057	5,53623869
Total	Flouranthene	1074,3659	1055,5408				627634,190					53,6671994
Total uncertainties					**Year (%):**		**792,234**			**Trend (%):**		**7,326**

Uncertainty estimation, Benzo(b) flouranthene.

	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	66	72	2	1000	1000,002	730,923	0,024306763	0,7674	24,3067633	2,170412062	24,4034717
Other mobile sources	Benzo(b) flouranthene	27	26	10	1000	1000,050	269,092	-0,024407393	0,2825	-24,407393	3,995041377	24,7321894
Total	Benzo(b) flouranthene	93,468557	98,127837				606658,512					1207,21062
Total uncertainties					**Year (%):**		**778,883**			**Trend (%):**		**34,745**

Uncertainty estimation, Benzo(k) flouranthene.

	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	66	80	2	1000	1000,002	793,186	0,043634199	0,9143	43,6341989	2,586138048	43,7107701
Other mobile sources	Benzo(k) flouranthene	21	21	10	1000	1000,050	206,826	-0,04385623	0,2384	-43,85623	3,371561141	43,9856375
Total	Benzo(k) flouranthene	87,725326	101,12478				671920,889					3845,36773
Total uncertainties					**Year (%):**		**819,708**			**Trend (%):**		**62,011**

Uncertainty estimation, Benzo(a) pyrene.

	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	47	58	2	1000	1000,002	846,839	0,037908225	1,0212	37,9082246	2,888366225	38,018103
Other mobile sources	Benzo(a) pyrene	11	11	10	1000	1000,050	153,171	-0,038146715	0,1847	-38,146715	2,61201926	38,2360372
Total	Benzo(a) pyrene	57,226763	69,009143				740596,993					2907,37069
Total uncertainties					**Year (%):**		**860,579**			**Trend (%):**		**53,920**

Uncertainty estimation, Benzo(g,h,i) perylene.

	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	99	110	2	1000	1000,002	759,630	0,032369112	0,8152	32,3691122	2,305801714	32,4511347
Other mobile sources	Benzo(g,h,i) perylene	37	35	10	1000	1000,050	240,383	-0,032517122	0,2580	-32,517122	3,648155151	32,7211286
Total	Benzo(g,h,i) perylene	135,32256	145,22648				634822,170					2123,7484
Total uncertainties					**Year (%):**		**796,757**			**Trend (%):**		**46,084**

Uncertainty estimation, indeno(1,2,3-c,d) pyrene.

	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) pyr.	45	63	2	1000	1000,002	725,078	0,101607319	0,9020	101,607319	2,551359636	101,639347
Other mobile sources	indeno(1,2,3-c,d) pyr.	25	24	10	1000	1000,050	274,937	-0,101896635	0,3420	-101,89663	4,836929779	102,011372
Total	indeno(1,2,3-c,d) pyr.	69,407503	86,347406				601328,497					20736,8768
Total uncertainties					**Year (%):**		**775,454**			**Trend (%):**		**144,003**

Annex 2C - Agriculture

Annex 2C.1 Background information - NH_3 from Manure Management

1 N-excretion

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 measurements 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, which has been done to the extent possible. From 2007 the calculation of NH_3 emission from liquid manure is based on TAN. For solid manure and deep litter an emission factor for total N is still used.

The normative figures for both total nitrogen excretion and the content of TAN are provided by Department of Animal Science, Aarhus University.

In Table 2C.1 is given the average N-excretion (TAN) for each NFR livestock category from 1985 to 2010. These values includes N excretion from grassing animals. Notice that each livestock category is an aggregated average of different subcategories (see Table 6.3 in Chapter 6).

Table 2C.1a Nitrogen excretion rates in average, 1985 – 2010, kg N pr head pr year.

Livestock categories:	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
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
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
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
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
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
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
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
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
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
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
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
N-excretion, total (M kg N/year)	257	260	262	264	266	265	263	262	259	258	256	252	249

Continued

Livestock categories:	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Dairy Cattle	124.82	124.60	125.31	125.31	127.16	129.79	131.56	133.30	134.66	137.58	137.98	138.12	138.63
Non-Dairy Cattle	35.95	36.43	36.39	35.86	37.45	37.29	38.86	40.88	43.33	44.79	45.53	44.81	43.15
Sheep	16.53	14.75	16.95	16.95	16.95	16.95	16.95	16.95	16.95	16.95	16.95	16.95	16.95
Goats	16.53	14.75	16.95	16.95	16.36	16.36	16.36	15.83	15.74	15.64	16.32	16.37	16.40
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	9.63	9.98	9.61	9.53	9.91	9.51	9.69	9.19	8.52	8.54	8.63	8.33	7.65
Laying hens	0.77	0.77	0.75	0.77	0.79	0.90	0.91	0.95	1.13	0.97	0.89	0.90	0.80
Broilers	0.50	0.48	0.45	0.48	0.49	0.58	0.68	0.58	0.47	0.53	0.63	0.40	0.47
Turkeys	2.00	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	0.34	0.35	0.32	0.36	0.36	0.31	0.28	0.25	0.26	0.14	0.15	0.15	0.13
Other	4.69	4.69	4.68	4.67	4.66	4.66	5.14	5.42	5.22	5.22	5.32	5.55	5.85
N-excretion, total (M kg N/year)	244	241	246	245	249	251	255	257	260	265	266	265	264

Table 2C.1b Nitrogen excretion based on TAN, 2007-2010, kg pr head pr year.

	2007	2008	2009	2010
Cattle, Large breed				
Dairy cows	66.67	67.00	65.70	65.69
Bulls[a, c]	16.11	16.11	16.11	16.11
Heifers[b]	35.86	35.86	35.86	33.49
Pigs				
Sows	19.77	19.21	19.34	18.67
Fattening pigs[c]	2.04	2.03	1.96	1.87
Weaners[c]	0.31	0.33	0.31	0.29
Fur animals				
Mink	3.85	3.93	4.11	4.34

[a] 6 mth to slaughter. Pr produced animal.
[b] 6 mth to calving.
[c] per produced animal.

2 Housing system

A systematic statement of the housing of husbandry for all farms does not exist from 1985 to 2004 and the housing is therefore based on estimate from the Danish Agricultural Advisory Services (Rasmussen, J.B. and Lundgaard, N.H., pers. comm.). From 2005 the distribution of housing system is based

on information from the Danish Plant Directorate, which is provided on information from the farmers. Is has to be mentioned that data regarding 2010 is the same as 2009 and have to be considered as preliminary estimtate. 2010 data will be implemented when data is available.

The structural development in the agricultural sector has an influence in change of housing types. 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 2010 the part is reduced to 12%. 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 table 2C.2 the distribution of housing type for dairy cattle and fattening pigs from 1985-2010 is listed.

Table 2C.2 The percentage distribution of housing type – Dairy cattle and Fattening pigs 1985 – 2010.

	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Dairy cattle													
Tied-up stables	85	84	83	82	80	79	78	77	76	74	73	72	66
Loose-holdings with beds	14	15	15	16	17	18	18	19	20	21	21	22	26
Deep litter	1	2	2	2	3	3	4	4	5	5	6	6	8
Fattening pigs													
Full slatted floor	29	33	38	42	47	51	56	60	60	60	60	60	60
Partly slatted floor	30	29	27	26	24	23	21	20	21	23	24	25	26
Solid floor	40	36	33	29	26	22	19	15	14	12	11	9	8
Deep litter	1	2	2	3	3	4	4	5	5	5	5	6	6

Continued

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Dairy cattle													
Tied-up stables	60	60	46	40	35	26	22	20	18	17	14	12	12
Loose-holdings with beds	30	30	43	49	54	63	67	70	73	76	79	82	82
Deep litter	10	10	11	11	11	11	11	10	9	7	7	6	6
Fattening pigs													
Full slatted floor	60	60	58	57	56	55	53	53	53	53	53	54	54
Partly slatted floor	28	29	31	33	34	35	38	38	38	39	41	42	42
Solid floor	6	5	5	4	4	4	3	3	4	4	3	2	2
Deep litter	6	6	6	6	6	6	6	6	5	5	4	3	3

3 Emission of NH_3

3.1 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, 2011). In table 2C.3 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 2C.3 NH_3 emission factors in different housing systems 2010 – dairy cattle and fattening pigs.

Manure system	Manure type	NH_3 emission pct NH_3-N of N ex Animal	NH_3 emission 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

3.2 Storage

Livestock manure is collected either as solid manure or as slurry depending on housing type. In Table 2C.4 is shown the emission factor 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% sows, 15% from poultry and 5% from hens (Poulsen et al., 2011). 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 result in a higher NH_3 emission. In 2010 it is assumed that 5% of the tanks with pig slurry and 2% of tanks with cattle slurry are incompletely covered. This information has been incorporated in the emission inventory.

Table 2C.4 NH_3 emission factors for storage 2010.

		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.

3.3 Spreading in fields

There is no statistical information on how the farmer handling the manure in practice. In calculation of emission from application of manure on the fields is used to different weighted emission factors, which distinguish between solid manure and liquid manure. In 2010 the emission factor for solid manure is estimated to 6 % and liquid manure is estimated to 15 % for cattle and 11% for swine of TAN ex storage.

The weighted emission factor will vary from year to year depending on changes in the practice of spreading. The weighted emission factor is based on background estimates of time of spreading, application methods, spreading in growing crops or on bare soil and the time from spreading to ploughing in soil. In table 2C.5 background information for 2010 are given.

Table 2C.5 Estimate for application method, time of spreading and time before the manure is incorporated in the soil.

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	49	24	49	24	-	-	-	-	-	-
Incorporated	summer-autumn	14	4	14	4	-	-	-	-	-	-
Trailing horses	winter-spring	26	64	-	-	2	3	2	2	22	59
Trailing horses	spring-summer	2	2	-	-	-	-	-	-	2	2
Trailing horses	late summer-autumn	9	6	-	-	3	2	2	1	4	3
Total		100	100	63	28	5	5	4	3	28	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	81	81	-	-	60	60	12	12	9	9
Broad spreading	spring-summer	0	0	-	-	-	-	-	-	-	-
Broad spreading	late summer-autumn	19	19	-	-	8	8	9	9	2	2
Total		100	100	-	-	68	68	21	21	11	11

Annex 2C.2 Background information - NH_3 from Agricultural Soils

1 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 for example in the Action Plan on the Aquatic Environment. Further, the use of different fertiliser types has changed. At present, urea constitutes less than 1% of the total nitrogen used as fertiliser (table 2C.6). It is estimated that 1.5 % of the total nitrogen used in synthetic fertiliser is emitted as NH_3 in 2010. It means the implied emission factor for 2010 is 1.5 % compared to 10 % in the EMEP/EEA guidebook.

Data on the use of synthetic fertiliser is based on the sale estimations collected by the Danish Plant Directorate (2011). 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 1-2 percent of the synthetic fertiliser can be related to use out side the agriculture area.

Table 2C.6 Synthetic fertiliser consumption 2010 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	0.5
Ammonium sulphate	0.01	6.1
Calcium ammonium nitrate and other nitrate types	0.01	94.1
Ammonium nitrate	0.01	8.4
Liquid ammonia	0.02	5.8
Urea	0.13	0.5
Other nitrogen fertiliser	0.06	18.9
Magnesium fertiliser	0.01	0.0
NPK-fertiliser	0.01	48.1
Diammonphosphate	0.01	0.9
Other NP fertiliser types	0.01	4.5
NK fertiliser	0.01	2.2
Total consumption of N in synthetic fertiliser		190.0
Total emission of NH_3-N, Gg	2.86	
Average NH_3-N emission, FracGASF	0.02	

[1] EMEP/EEA (2009).
[2] The Danish Plant Directorate.

2 Grazing

It is assumed that 5% of the manure from dairy cattle is deposited in the field, which corresponding to 18 days per year. For heifers 36% of the nitrogen in the manure is estimated deposited during grazing, 61% for suckling cows, 50% for horses and 73% for sheep and goats.

An emission factor of 7% of the total nitrogen content is assumed to evaporate as NH_3 (Jarvis *et al*. 1998a, Jarvis *et al*. 1989b and Bussink 1994). The emission factor is used on all animal categories.

Annex 2C.3 Background information - NH_3 from Agriculture Other

1 Crops

In the Danish emission inventory it is chosen to include NH_3 emission from crops, despite the uncertainties related to this emission source. Literature research shows that the volatilisation from crop types differs considerably. The emission factors 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 2C.7 Emission factor 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

2 NH_3 treated straw

NH_3 is used for conservation of straw for feeding. Investigations show that 80-90% of the supplied NH_3 (given in NH_3-N) will emit (Andersen *et al.* 1999). However, the emissions can be reduced particularly if the right dose is used. Therefore it is estimated 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 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.

Annex 2C.4 Background information - Field burning of Agricultural Wastes

Table 2C.8 Emissions of pollutants from field burning of agricultural wastes, 1985-2010.

	Unit	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
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
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
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
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
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
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
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
$PM_{2,5}$	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
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
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
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
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
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
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	0.11	0.10	0.09	0.07	0.07	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
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
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
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
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
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
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
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
Continued	Unit	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
NO_X	Gg	0.12	0.12	0.11	0.12	0.10	0.12	0.13	0.13	0.13	0.11	0.10	0.12	0.09
CO	Gg	2.98	2.83	2.79	2.93	2.44	2.93	3.07	3.12	3.16	2.73	2.53	2.98	2.17
NMVOC	Gg	0.32	0.30	0.30	0.31	0.26	0.31	0.33	0.33	0.34	0.29	0.27	0.32	0.23
SO_2	Gg	0.02	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.01	0.01	0.02	0.01
NH_3	Gg	0.12	0.12	0.11	0.12	0.10	0.12	0.13	0.13	0.13	0.11	0.10	0.12	0.09
TSP	Mg	0.29	0.28	0.27	0.29	0.24	0.29	0.30	0.31	0.31	0.27	0.25	0.29	0.21
PM_{10}	Mg	0.29	0.28	0.27	0.29	0.24	0.29	0.30	0.31	0.31	0.27	0.25	0.29	0.21
$PM_{2,5}$	Mg	0.28	0.26	0.26	0.27	0.23	0.27	0.29	0.29	0.30	0.26	0.24	0.28	0.20
Pb	Mg	0.04	0.04	0.04	0.04	0.04	0.04	0.05	0.05	0.05	0.04	0.04	0.04	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	0.03	0.02	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.02
Benzo(a)pyrene	Mg	0.14	0.13	0.13	0.14	0.12	0.14	0.15	0.15	0.15	0.13	0.12	0.14	0.10
Benzo(b)fluoranthene	Mg	0.14	0.13	0.13	0.14	0.11	0.14	0.14	0.14	0.15	0.13	0.12	0.14	0.10
Benzo(k)fluoranthene	Mg	0.05	0.05	0.05	0.05	0.04	0.05	0.06	0.06	0.06	0.05	0.05	0.05	0.04
Indeno(1,2,3-cd)pyrene	Mg	0.05	0.05	0.05	0.05	0.04	0.05	0.05	0.05	0.05	0.05	0.04	0.05	0.04

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Annex 2D - Waste

Annex 2D-1:	Human cremation activity data, 1980-2010
Annex 2D-2:	Animal cremation activity data, 1980-2010
Annex 2D-3:	Emissions from human cremation, 1980-2010
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Annex 2D-7:	Occurrence of all fires, building and vehicle fires, 1980-2010
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Annex 2D-15:	Average vehicle weight, 1980-2010
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Annex 2D-17:	Emissions from accidental vehicle fires, 1980-2010

Annex 2D-1 Human cremation activity data, 1980-2010

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, 2011. The data describing the number of cremations and the cremation fraction in the period 1984-2010 are gathered from the Association of Danish Crematoria (DKL, 2011). 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 2011, Statistics Denmark 2011).

	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									
Nationally deceased	54368									
Cremations	42050									
Cremation fraction, %	77.3									

Annex 2D-2 Animal cremation activity data, 1980-2010

Table 2D-2 Activity data. Source: direct contact with all Danish crematoria.

	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
	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
	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
	2010									
Crematorium A, Mg	475									
Crematorium B, Mg	934									
Crematorium C, Mg	40									
Total, Mg	1449									

Annex 2D-3 Emissions from human cremation, 1980-2010

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	1.85	1.88	1.86	1.94	1.89	2.00	2.00	2.05	2.11	2.14
NO_X	Mg	10.48	10.66	10.57	11.01	10.74	11.32	11.35	11.62	11.94	12.10
NMVOC	Mg	0.442	0.449	0.445	0.464	0.453	0.477	0.478	0.489	0.503	0.510
CO	Mg	0.366	0.372	0.369	0.384	0.375	0.395	0.396	0.406	0.417	0.423
TSP	Mg	1.48	1.50	1.49	1.55	1.51	1.60	1.60	1.64	1.68	1.71
PM_{10}	Mg	1.33	1.35	1.34	1.40	1.36	1.44	1.44	1.47	1.52	1.54
$PM_{2.5}$	Mg	1.33	1.35	1.34	1.40	1.36	1.44	1.44	1.47	1.52	1.54
As	g	0.373	0.379	0.376	0.392	0.382	0.403	0.404	0.413	0.425	0.431
Cd	g	0.106	0.107	0.106	0.111	0.108	0.114	0.114	0.117	0.120	0.122
Cr	g	0.287	0.292	0.289	0.301	0.294	0.310	0.311	0.318	0.327	0.331
Cu	g	0.262	0.266	0.264	0.275	0.268	0.283	0.284	0.290	0.299	0.303
Hg	kg	38.0	38.7	38.3	39.9	39.0	41.1	41.2	42.1	43.3	43.9
Ni	g	0.365	0.371	0.368	0.384	0.374	0.395	0.396	0.405	0.416	0.422
Pb	g	0.632	0.643	0.637	0.664	0.647	0.683	0.685	0.700	0.720	0.730
Se	g	758	771	765	796	777	819	821	840	864	876
Zn	kg	6.14	6.28	6.22	6.48	6.32	6.67	6.69	6.84	7.03	7.13
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	32.3	32.8	32.5	33.9	33.1	34.9	35.0	35.8	36.8	37.3
flouranthene	mg	2.0	2.0	2.0	2.1	2.1	2.2	2.2	2.2	2.3	2.3
benzo(b)flouranthene	mg	277	281	279	290	283	299	300	306	315	319
benzo(k)flouranthene	mg	247	251	249	259	253	267	268	274	281	285
benzo(a)pyrene	mg	0.351	0.357	0.354	0.369	0.360	0.380	0.381	0.389	0.400	0.406
benzo(g,h,i)perylene	mg	506	515	510	531	519	547	548	561	577	584
indeno(1,2,3-c-d)pyrene	mg	268	272	270	281	274	289	290	297	305	309
PCB	g	14.1	14.3	14.2	14.8	14.4	15.2	15.2	15.6	16.0	16.2

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	2.23	2.21	2.26	2.35	2.33	2.39	2.35	2.33	2.27	2.30
NO_X	Mg	12.65	12.55	12.79	13.33	13.19	13.53	13.35	13.23	12.85	13.05
NMVOC	Mg	0.533	0.529	0.539	0.562	0.556	0.570	0.562	0.558	0.542	0.550
CO	Mg	0.441	0.438	0.446	0.465	0.461	0.472	0.466	0.462	0.449	0.456
TSP	Mg	1.78	1.77	1.80	1.88	1.86	1.91	1.88	1.87	1.81	1.84
PM_{10}	Mg	1.61	1.59	1.62	1.69	1.67	1.72	1.69	1.68	1.63	1.66
$PM_{2.5}$	Mg	1.61	1.59	1.62	1.69	1.67	1.72	1.69	1.68	1.63	1.66
As	g	0.450	0.446	0.455	0.474	0.469	0.481	0.475	0.471	0.457	0.464
Cd	g	0.127	0.126	0.129	0.134	0.133	0.136	0.134	0.133	0.129	0.131
Cr	g	0.346	0.343	0.350	0.364	0.361	0.370	0.365	0.362	0.351	0.357
Cu	g	0.316	0.314	0.320	0.333	0.330	0.338	0.334	0.331	0.321	0.326
Hg	kg	45.9	45.5	46.4	48.3	47.9	49.1	48.4	48.0	46.6	47.3
Ni	g	0.441	0.437	0.446	0.464	0.460	0.471	0.465	0.461	0.448	0.455
Pb	g	0.762	0.756	0.771	0.803	0.795	0.816	0.805	0.798	0.775	0.787
Se	g	915	908	925	964	954	979	965	957	930	944
Zn	kg	7.45	7.39	7.53	7.85	7.77	7.97	7.86	7.79	7.57	7.69
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	38.9	38.6	39.4	41.0	40.6	41.7	41.1	40.7	39.6	40.2
flouranthene	mg	2.4	2.4	2.4	2.5	2.5	2.6	2.6	2.5	2.5	2.5
benzo(b)flouranthene	mg	334	331	337	352	348	357	352	349	339	344
benzo(k)flouranthene	mg	298	296	301	314	311	319	314	312	303	307
benzo(a)pyrene	mg	0.424	0.420	0.429	0.447	0.442	0.453	0.447	0.443	0.431	0.437
benzo(g,h,i)perylene	mg	611	606	617	643	637	653	644	639	621	630
indeno(1,2,3-c-d)pyrene	mg	323	321	327	340	337	346	341	338	328	333
PCB	g	17.0	16.8	17.1	17.9	17.7	18.1	17.9	17.7	17.2	17.5

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	2.27	2.27	2.32	2.29	2.26	2.22	2.24	2.27	2.27	2.31
NO_X	Mg	12.85	12.87	13.12	12.96	12.82	12.57	12.72	12.88	12.89	13.08
NMVOC	Mg	0.541	0.542	0.553	0.546	0.540	0.530	0.536	0.543	0.543	0.551
CO	Mg	0.449	0.449	0.458	0.452	0.448	0.439	0.444	0.450	0.450	0.457
TSP	Mg	1.81	1.81	1.85	1.83	1.81	1.77	1.79	1.82	1.82	1.85
PM_{10}	Mg	1.63	1.63	1.67	1.64	1.63	1.60	1.61	1.64	1.64	1.66
$PM_{2.5}$	Mg	1.63	1.63	1.67	1.64	1.63	1.60	1.61	1.64	1.64	1.66
As	g	0.457	0.458	0.467	0.461	0.456	0.447	0.453	0.458	0.459	0.466
Cd	g	0.129	0.130	0.132	0.130	0.129	0.127	0.128	0.130	0.130	0.132
Cr	g	0.351	0.352	0.359	0.354	0.351	0.344	0.348	0.352	0.353	0.358
Cu	g	0.321	0.322	0.328	0.324	0.320	0.314	0.318	0.322	0.322	0.327
Hg	kg	46.6	46.7	47.6	47.0	46.5	45.6	46.1	46.7	46.8	47.5
Ni	g	0.448	0.448	0.457	0.451	0.447	0.438	0.443	0.449	0.449	0.456
Pb	g	0.775	0.776	0.791	0.781	0.773	0.758	0.767	0.777	0.777	0.789
Se	g	930	931	949	937	927	910	920	932	933	946
Zn	kg	7.57	7.58	7.73	7.63	7.55	7.41	7.49	7.59	7.59	7.71
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	39.6	39.6	40.4	39.9	39.5	38.7	39.2	39.7	39.7	40.3
flouranthene	mg	2.5	2.5	2.5	2.5	2.5	2.4	2.4	2.5	2.5	2.5
benzo(b)flouranthene	mg	339	339	346	342	338	332	336	340	340	345
benzo(k)flouranthene	mg	303	303	309	305	302	296	300	304	304	308
benzo(a)pyrene	mg	0.431	0.431	0.440	0.434	0.430	0.421	0.426	0.432	0.432	0.438
benzo(g,h,i)perylene	mg	620	621	634	626	619	607	614	622	622	632
indeno(1,2,3-c-d)pyrene	mg	328	329	335	331	328	321	325	329	329	334
PCB	g	17.2	17.2	17.6	17.4	17.2	16.9	17.1	17.3	17.3	17.5

Table 2D-3d Total national emissions from incineration of corpses - 2010.

	Unit	2010
SO_2	Mg	2.29
NO_X	Mg	12.97
NMVOC	Mg	0.547
CO	Mg	0.453
TSP	Mg	1.83
PM_{10}	Mg	1.65
$PM_{2.5}$	Mg	1.65
As	g	0.462
Cd	g	0.131
Cr	g	0.355
Cu	g	0.324
Hg	kg	47.1
Ni	g	0.452
Pb	g	0.782
Se	g	938
Zn	kg	7.64
HCB	g	6.37
PCDD/F	mg	39.9
flouranthene	mg	2.5
benzo(b)flouranthene	mg	342
benzo(k)flouranthene	mg	306
benzo(a)pyrene	mg	0.435
benzo(g,h,i)perylene	mg	626
indeno(1,2,3-c-d)pyrene	mg	331
PCB	g	17.4

Annex 2D-4 Emissions from animal cremation, 1980-2010

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	0.04	0.05	0.06	0.07	0.08	0.08	0.09	0.10	0.11	0.12
NO_X	Mg	0.24	0.28	0.33	0.38	0.43	0.47	0.52	0.57	0.62	0.66
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	g	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.02
Cd	g	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20	1.30	1.40
Cr	g	3.50	4.20	4.90	5.60	6.30	7.00	7.70	8.40	9.10	9.80
Cu	g	1.00	1.20	1.40	1.60	1.80	2.00	2.20	2.40	2.60	2.80
Ni	g	3.00	3.60	4.20	4.80	5.40	6.00	6.60	7.20	7.80	8.40
Pb	g	9.00	10.80	12.60	14.40	16.20	18.00	19.80	21.60	23.40	25.20
Se	g	17.15	20.58	24.01	27.44	30.87	34.30	37.73	41.16	44.59	48.02
Zn	g	9.50	11.40	13.30	15.20	17.10	19.00	20.90	22.80	24.70	26.60
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
flouranthene	mg	0.05	0.05	0.06	0.07	0.08	0.09	0.10	0.11	0.12	0.13
benzo(b)flouranthene	mg	6.26	7.51	8.77	10.02	11.27	12.52	13.78	15.03	16.28	17.53
benzo(k)flouranthene	mg	5.59	6.71	7.83	8.95	10.06	11.18	12.30	13.42	14.54	15.66
benzo(a)pyrene	mg	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.02
benzo(g,h,i)perylene	mg	11.46	13.75	16.05	18.34	20.63	22.92	25.22	27.51	29.80	32.09
indeno(1,2,3-c-d)pyrene	mg	6.06	7.28	8.49	9.70	10.92	12.13	13.34	14.55	15.77	16.98
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	0.13	0.13	0.14	0.15	0.16	0.17	0.18	0.18	0.20	0.31
NO_X	Mg	0.71	0.76	0.81	0.85	0.90	0.95	1.00	1.04	1.11	1.75
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	0.03	0.03	0.03	0.03	0.03	0.03	0.04	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	g	0.03	0.03	0.03	0.03	0.03	0.03	0.04	0.04	0.04	0.06
Cd	g	1.50	1.60	1.70	1.80	1.90	2.00	2.10	2.20	2.35	3.68
Cr	g	10.50	11.20	11.90	12.60	13.30	14.00	14.70	15.40	16.43	25.78
Cu	g	3.00	3.20	3.40	3.60	3.80	4.00	4.20	4.40	4.69	7.37
Ni	g	9.00	9.60	10.20	10.80	11.40	12.00	12.60	13.20	14.08	22.10
Pb	g	27.00	28.80	30.60	32.40	34.20	36.00	37.80	39.60	42.24	66.30
Se	g	51.45	54.88	58.31	61.74	65.17	68.60	72.03	75.46	80.49	126.33
Zn	g	28.50	30.40	32.30	34.20	36.10	38.00	39.90	41.80	44.59	69.98
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
flouranthene	mg	0.14	0.15	0.15	0.16	0.17	0.18	0.19	0.20	0.21	0.33
benzo(b)flouranthene	mg	18.78	20.04	21.29	22.54	23.79	25.05	26.30	27.55	29.39	46.12
benzo(k)flouranthene	mg	16.77	17.89	19.01	20.13	21.25	22.37	23.48	24.60	26.24	41.19
benzo(a)pyrene	mg	0.02	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.04	0.06
benzo(g,h,i)perylene	mg	34.38	36.68	38.97	41.26	43.55	45.85	48.14	50.43	53.79	84.43
indeno(1,2,3-c-d)pyrene	mg	18.19	19.40	20.62	21.83	23.04	24.26	25.47	26.68	28.46	44.67
PCB	g	0.96	1.02	1.08	1.15	1.21	1.27	1.34	1.40	1.49	2.35

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	0.37	0.38	0.38	0.39	0.48	0.64	0.93	1.07	1.12	1.12
NO_X	Mg	2.10	2.15	2.14	2.19	2.71	3.62	5.30	6.09	6.35	6.35
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	0.08	0.07	0.08	0.09	0.13	0.19	0.21	0.22	0.22
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	g	0.08	0.08	0.08	0.08	0.10	0.13	0.19	0.22	0.23	0.23
Cd	g	4.43	4.52	4.51	4.62	5.71	7.62	11.16	12.84	13.38	13.39
Cr	g	31.04	31.66	31.59	32.31	39.98	53.36	78.14	89.89	93.68	93.72
Cu	g	8.87	9.05	9.02	9.23	11.42	15.25	22.33	25.68	26.77	26.78
Ni	g	26.61	27.14	27.07	27.70	34.27	45.74	66.98	77.05	80.30	80.33
Pb	g	79.82	81.41	81.22	83.09	102.80	137.22	200.94	231.16	240.89	241.00
Se	g	152.09	155.14	154.77	158.33	195.89	261.49	382.91	440.48	459.04	459.23
Zn	g	84.25	85.94	85.73	87.71	108.51	144.85	212.11	244.00	254.28	254.39
HCB	g	1.04	1.06	1.06	1.08	1.34	1.78	2.61	3.01	3.13	3.13
PCDD/F	mg	4.43	4.52	4.51	4.62	5.71	7.62	11.16	12.84	13.38	13.39
flouranthene	mg	0.40	0.41	0.41	0.42	0.52	0.69	1.01	1.17	1.22	1.22
benzo(b)flouranthene	mg	55.53	56.64	56.51	57.81	71.52	95.47	139.80	160.82	167.59	167.67
benzo(k)flouranthene	mg	49.59	50.58	50.46	51.62	63.87	85.25	124.84	143.61	149.66	149.73
benzo(a)pyrene	mg	0.07	0.07	0.07	0.07	0.09	0.12	0.18	0.20	0.21	0.21
benzo(g,h,i)perylene	mg	101.64	103.68	103.43	105.82	130.92	174.75	255.90	294.38	306.78	306.91
indeno(1,2,3-c-d)pyrene	mg	53.78	54.86	54.72	55.98	69.27	92.46	135.39	155.75	162.31	162.38
PCB	g	2.82	2.88	2.87	2.94	3.64	4.86	7.11	8.18	8.52	8.53

Table 2D-4d Total national emissions from incineration of carcasses - 2010.

	unit	2010
SO_2	Mg	1.21
NO_X	Mg	6.88
NMVOC	Mg	2.90
CO	Mg	0.24
NH_3	Mg	2.75
TSP	Mg	3.16
PM_{10}	Mg	2.22
$PM_{2.5}$	Mg	1.90
As	g	0.25
Cd	g	14.49
Cr	g	101.41
Cu	g	28.97
Ni	g	86.92
Pb	g	260.77
Se	g	496.91
Zn	g	275.26
HCB	g	3.39
PCDD/F	mg	14.49
flouranthene	mg	1.32
benzo(b)flouranthene	mg	181.42
benzo(k)flouranthene	mg	162.01
benzo(a)pyrene	mg	0.23
benzo(g,h,i)perylene	mg	332.09
indeno(1,2,3-c-d)pyrene	mg	175.70
PCB	g	9.23

Annex 2D-5 Compost production activity data, 1985-2010

Table 2D-5 Activity data composting, Gg.

	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Composting of garden and park waste	124	154	184	214	244	274	304	335	365	395
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
Continued	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Composting of garden and park waste	358	431	496	517	614	653	669	653	682	650
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
Continued	2005	2006	2007	2008	2009	2010				
Composting of garden and park waste	702	745	835	757	807	877				
Composting of organic waste from households and other sources	45	48	44	46	70	58				
Composting of sludge	50	67	91	94	107	120				
Home composting of garden and vegetable food waste	22	22	22	22	23	23				

NAV = Not available.

Annex 2D-6 Emissions from composting, 1985-2010

Table 2D-6 National emissions from composting. Mg.

	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
CO	71.0	88.0	104.9	121.9	138.8	155.8	172.7	189.7	206.6	223.6
NH_3	95.1	115.8	136.4	157.1	177.7	198.7	219.7	240.7	261.7	282.6
Continued	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
CO	203.0	243.8	280.6	292.4	347.1	368.7	377.7	368.7	385.3	367.1
NH_3	262.2	309.4	355.4	369.2	437.1	463.7	475.7	471.7	491.9	460.4
Continued	2005	2006	2007	2008	2009	2010				
CO	396.6	420.7	471.1	427.7	455.6	494.8				
NH_3	492.5	522.2	580.7	530.5	571.1	613.6				

Annex 2D-7 Occurrence of all fires, building and vehicle fires, 1980-2010

Table 2D-7 Occurrence of all fires and building fires.

Year	All fires	Building fires	Vehicle fires
1980	17751	10621	3497
1981	17751	10621	3497
1982	17751	10621	3497
1983	17751	10621	3497
1984	17751	10621	3497
1985	17751	10621	3497
1986	17751	10621	3497
1987	17751	10621	3497
1988	17751	10621	3497
1989	18784	11239	3700
1990	17025	10187	3354
1991	17589	10524	3465
1992	19124	11443	3767
1993	16803	10054	3310
1994	16918	10123	3333
1995	19543	11694	3850
1996	19756	11821	3892
1997	18236	10911	3592
1998	16320	9765	3215
1999	17538	10494	3455
2000	17174	10276	3383
2001	16894	10108	3328
2002	16362	9790	3223
2003	18443	11035	3633
2004	15927	9530	3137
2005	16551	9903	3260
2006	16965	10151	3342
2007	18263	12527	3223
2008	20643	12124	4068
2009	18930	10652	3930
2010	16728	9325	3459

Annex 2D-8 Accidental building fires full scale equivalent activity data, 1980-2010

Table 2D-8 Accidental building fires full scale equivalent activity data, 1980-2010

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Container fires	782	814	814	814	814	814	814	814	814	862
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	781	807	878	771	776	897	907	837	749	805
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	788	775	751	846	731	759	778	979	1004	841
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									
Container fires	623									
Detached house fires	833									
Undetached house fires	194									
Apartment building fires	348									
Industry building fire	281									
Additional building fires	429									

Annex 2D-9 Emission factors for accidental detached house fires, 1980-2009

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	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
PM_{10}	kg	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
$PM_{2.5}$	kg	0.140	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
As	mg	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Cd	mg	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Cr	mg	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3
Cu	mg	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Hg	mg	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Pb	mg	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
Flouranthene	g	17.2	17.2	17.2	17.2	17.2	17.3	17.4	17.5	17.5	17.5
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
Benzo[ghi]perylene	g	8.0	8.0	8.0	8.0	8.0	8.0	8.1	8.1	8.1	8.1
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
PAHs	g	56.4	56.4	56.5	56.5	56.5	56.6	56.9	57.2	57.3	57.3

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	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
PM_{10}	kg	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
$PM_{2.5}$	kg	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
As	mg	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Cd	mg	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Cr	mg	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3
Cu	mg	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Hg	mg	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Pb	mg	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
Flouranthene	g	17.5	17.4	17.4	17.4	17.4	17.3	17.3	17.4	17.3	17.3
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
Benzo[ghi]perylene	g	8.1	8.1	8.1	8.1	8.1	8.0	8.0	8.1	8.0	8.1
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
PAHs	g	57.2	57.1	56.9	57.0	56.9	56.8	56.7	56.9	56.7	56.8

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	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
PM_{10}	kg	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
$PM_{2.5}$	kg	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
As	mg	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Cd	mg	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Cr	mg	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3
Cu	mg	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Hg	mg	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Pb	mg	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
Flouranthene	g	17.5	17.9	18.0	18.1	18.2	18.2	18.3	17.9	18.0	18.1
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
Benzo[ghi]perylene	g	8.1	8.3	8.4	8.4	8.5	8.4	8.5	8.3	8.4	8.4
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
PAHs	g	57.3	58.5	59.0	59.4	59.6	59.4	59.8	58.7	59.0	59.3

Annex 2D-10 Emission factors for accidental undetached house fires, 1980-2009

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	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
PM_{10}	kg	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
$PM_{2.5}$	kg	0.060	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
As	mg	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Cd	mg	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Cr	mg	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Cu	mg	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3
Hg	mg	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Pb	mg	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
Flouranthene	g	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.4
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
Benzo[ghi]perylene	g	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7
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
PAH	g	47.6	47.6	47.6	47.5	47.5	47.5	47.5	47.4	47.4	47.3

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	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
PM_{10}	kg	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
$PM_{2.5}$	kg	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
As	mg	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Cd	mg	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Cr	mg	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Cu	mg	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3
Hg	mg	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Pb	mg	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
Flouranthene	g	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.5	14.5	14.6
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
Benzo[ghi]perylene	g	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.8
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
PAH	g	47.2	47.1	47.1	47.1	47.1	47.2	47.2	47.4	47.6	47.8

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	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
PM_{10}	kg	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
$PM_{2.5}$	kg	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
As	mg	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Cd	mg	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Cr	mg	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Cu	mg	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3
Hg	mg	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Pb	mg	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
Flouranthene	g	14.6	14.7	14.7	14.7	14.7	14.7	14.7	14.8	14.8	14.9
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
Benzo[ghi]perylene	g	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.9	6.9	6.9
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
PAH	g	47.9	48.0	48.1	48.2	48.2	48.1	48.2	48.4	48.6	48.8

Annex 2D-11 Emission factors for accidental apartment building fires, 1980-2009

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	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
PM_{10}	kg	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
$PM_{2.5}$	kg	0.040	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
As	mg	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Cd	mg	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Cr	mg	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Cu	mg	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Hg	mg	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Pb	mg	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
Flouranthene	g	8.3	8.3	8.3	8.3	8.4	8.4	8.4	8.4	8.4	8.4
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
Benzo[ghi]perylene	g	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9
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
PAH	g	27.3	27.3	27.3	27.3	27.4	27.4	27.5	27.5	27.5	27.5

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	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
PM_{10}	kg	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
$PM_{2.5}$	kg	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
As	mg	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Cd	mg	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Cr	mg	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Cu	mg	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Hg	mg	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Pb	mg	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
Flouranthene	g	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4
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
Benzo[ghi]perylene	g	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9
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
PAH	g	27.5	27.5	27.5	27.5	27.5	27.5	27.5	27.5	27.5	27.5

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	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
PM_{10}	kg	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
$PM_{2.5}$	kg	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
As	mg	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Cd	mg	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Cr	mg	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Cu	mg	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Hg	mg	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Pb	mg	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
Flouranthene	g	8.4	8.4	8.4	8.4	8.4	8.5	8.5	8.5	8.6	8.6
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
Benzo[ghi]perylene	g	3.9	3.9	3.9	3.9	3.9	3.9	3.9	4.0	4.0	4.0
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
PAH	g	27.5	27.5	27.6	27.6	27.7	27.7	27.8	28.0	28.1	28.2

Annex 2D-12 Average building floor space, 1980-2010

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

Annex 2D-13 Emissions from building fires, 1980-2010

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	580.54	580.63	580.73	580.77	581.39	582.40	583.25	583.74	617.65
NO_x	Mg	32.91	33.01	33.01	33.02	33.02	33.07	33.15	33.21	33.25	35.18
NMVOC	Mg	153.34	153.38	153.42	153.45	153.47	153.70	154.08	154.40	154.58	163.55
CO	Mg	460.67	462.10	462.19	462.29	462.33	462.98	464.04	464.93	465.44	492.46
TSP	Mg	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.28
PM_{10}	Mg	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.28
$PM_{2.5}$	Mg	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.28
As	kg	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
Cd	kg	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Cr	kg	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
Cu	kg	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004
Hg	kg	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Pb	kg	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
PCDD/F	g I-TEQ	6.21	6.24	6.25	6.25	6.25	6.26	6.27	6.28	6.29	6.65
Flouranthene	kg	30.71	30.81	30.81	30.82	30.82	30.87	30.94	31.00	31.03	32.83
Benzo(b)fluoranthene	kg	20.84	20.90	20.91	20.91	20.91	20.94	20.99	21.03	21.06	22.28
Benzo(k)fluoranthene	kg	7.35	7.37	7.37	7.37	7.38	7.39	7.40	7.42	7.42	7.86
Benzo(a)pyrene	kg	13.16	13.20	13.21	13.21	13.21	13.23	13.26	13.28	13.30	14.07
Benzo(g,h,i)perylene	kg	14.26	14.30	14.31	14.31	14.31	14.33	14.36	14.39	14.41	15.24
Indeno(1,2,3-cd)pyrene	kg	14.26	14.30	14.31	14.31	14.31	14.33	14.36	14.39	14.41	15.24

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	577.2	627.0	551.3	554.6	640.3	647.0	598.1	535.0	575.4
NO_x	Mg	31.8	32.9	35.7	31.4	31.6	36.4	36.8	34.0	30.4	32.7
NMVOC	Mg	148.1	152.7	165.8	145.9	146.7	169.3	171.1	158.2	141.5	152.2
CO	Mg	445.8	459.9	499.4	439.3	441.8	509.9	515.3	476.5	426.2	458.4
TSP	Mg	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.3
PM_{10}	Mg	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.3
$PM_{2.5}$	Mg	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.3
As	kg	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
Cd	kg	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Cr	kg	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.001	0.002
Cu	kg	0.004	0.004	0.004	0.003	0.004	0.004	0.004	0.004	0.003	0.004
Hg	kg	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Pb	kg	0.000	0.001	0.001	0.000	0.000	0.001	0.001	0.001	0.000	0.001
PCDD/F	g I-TEQ	6.0	6.2	6.7	5.9	6.0	6.9	7.0	6.4	5.8	6.2
Flouranthene	kg	29.7	30.7	33.3	29.3	29.5	34.0	34.4	31.8	28.4	30.6
Benzo(b)fluoranthene	kg	20.2	20.8	22.6	19.9	20.0	23.1	23.3	21.6	19.3	20.7
Benzo(k)fluoranthene	kg	7.1	7.3	8.0	7.0	7.0	8.1	8.2	7.6	6.8	7.3
Benzo(a)pyrene	kg	12.7	13.1	14.3	12.6	12.6	14.6	14.7	13.6	12.2	13.1
Benzo(g,h,i)perylene	kg	13.8	14.2	15.5	13.6	13.7	15.8	15.9	14.7	13.2	14.2
Indeno(1,2,3-cd)pyrene	kg	13.8	14.2	15.5	13.6	13.7	15.8	15.9	14.7	13.2	14.2

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	560.3	544.4	615.2	532.2	552.4	567.8	683.6	638.4	616.0
NO_x	Mg	32.2	32.0	31.1	35.2	30.5	31.6	32.5	37.5	37.3	35.3
NMVOC	Mg	149.7	148.9	144.9	163.9	141.9	147.2	151.4	173.5	172.3	164.7
CO	Mg	450.8	447.9	435.7	492.7	426.5	442.5	455.2	525.0	522.5	494.7
TSP	Mg	0.3	0.3	0.2	0.3	0.2	0.2	0.3	0.3	0.3	0.3
PM_{10}	Mg	0.3	0.3	0.2	0.3	0.2	0.2	0.3	0.3	0.3	0.3
$PM_{2.5}$	Mg	0.3	0.3	0.2	0.3	0.2	0.2	0.3	0.3	0.3	0.3
As	kg	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
Cd	kg	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Cr	kg	0.002	0.002	0.001	0.002	0.001	0.001	0.002	0.002	0.002	0.002
Cu	kg	0.004	0.004	0.003	0.004	0.003	0.003	0.004	0.004	0.004	0.004
Hg	kg	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Pb	kg	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.001	0.001	0.001
PCDD/F	g I-TEQ	6.1	6.0	5.9	6.6	5.8	6.0	6.1	7.1	7.1	6.7
Flouranthene	kg	30.1	29.9	29.0	32.8	28.4	29.5	30.3	35.0	34.8	33.0
Benzo(b)fluoranthene	kg	20.4	20.3	19.7	22.3	19.3	20.0	20.6	23.8	23.6	22.4
Benzo(k)fluoranthene	kg	7.2	7.1	7.0	7.9	6.8	7.1	7.3	8.4	8.3	7.9
Benzo(a)pyrene	kg	12.9	12.8	12.4	14.1	12.2	12.6	13.0	15.0	14.9	14.1
Benzo(g,h,i)perylene	kg	14.0	13.9	13.5	15.3	13.2	13.7	14.1	16.3	16.2	15.3
Indeno(1,2,3-cd)pyrene	kg	14.0	13.9	13.5	15.3	13.2	13.7	14.1	16.3	16.2	15.3

Table 2D-13d National emissions from building fires, 2010.

	unit	2010
SO_2	Mg	543.1
NO_x	Mg	31.6
NMVOC	Mg	149.1
CO	Mg	442.5
TSP	Mg	0.2
PM_{10}	Mg	0.2
$PM_{2.5}$	Mg	0.2
As	kg	0.002
Cd	kg	0.001
Cr	kg	0.002
Cu	kg	0.004
Hg	kg	0.001
Pb	kg	0.000
PCDD/F	g I-TEQ	5.9
Flouranthene	kg	29.5
Benzo(b)fluoranthene	kg	20.0
Benzo(k)fluoranthene	kg	7.1
Benzo(a)pyrene	kg	12.6
Benzo(g,h,i)perylene	kg	13.7
Indeno(1,2,3-cd)pyrene	kg	13.7

Annex 2D-14 Full scale vehicle fires, 1980-2010

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 fires	Registered	FSE fires	Registered	FSE fires	Registered	FSE fires
1980	1475109	430	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	449	8070	12	131285	13	47428	60
1984	1562072	455	8070	12	141991	14	47428	60
1985	1564449	456	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	482	8093	12	187221	18	46980	60
1989	1655005	482	8031	12	190569	18	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	20	46228	59
1994	1672177	487	14261	21	219642	21	47329	60
1995	1733405	505	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	547	14894	21	249463	24	49697	63
1999	1906153	555	14953	21	259215	25	50443	64
2000	1916686	558	15051	22	272387	26	50227	64
2001	1932741	563	15005	22	283031	27	49885	63
2002	1946353	567	14971	22	295581	29	49208	62
2003	1948967	568	14989	22	309614	30	48653	62
2004	1967643	573	14997	22	336038	32	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	2182235	666	14830	24	398552	44	50528	71
2009	2199453	729	14752	23	383148	48	46510	67
2010	2247021	646	14577	23	362389	38	44812	60

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	192395	68			7284	9	2222	25
1986	180868	64			7284	9	2222	25
1987	175456	62			7284	9	2222	25
1988	169450	60			7284	9	2222	25
1989	167255	59			7284	9	2222	25
1990	164111	58	86257	24	7156	9	2324	26
1991	163362	58	88278	24	7212	9	2312	26
1992	159024	56	90299	25	7438	9	2307	26
1993	156405	55	93150	26	7496	9	2140	24
1994	154376	55	94551	26	7117	8	2027	22
1995	165313	58	95831	26	6854	8	1911	21
1996	178096	63	97592	27	6631	8	1841	20
1997	192364	68	99931	27	6428	8	1761	19
1998	205654	73	102302	28	5861	7	1696	19
1999	220064	78	104852	29	5525	7	1695	19
2000	233695	83	106935	29	4907	6	1759	19
2001	243390	86	108924	30	4561	5	1797	20
2002	253731	90	110995	30	4169	5	1878	21
2003	256779	91	113338	31	4048	5	1838	20
2004	263815	93	116930	32	3273	4	1783	20
2005	274264	97	121350	33	3195	4	1792	20
2006	287672	102	126011	35	3002	4	1789	20
2007	302914	99	131708	36	2617	2	1755	20
2008	308546	122	136905	45	2588	3	1728	20
2009	307373	128	140366	34	2489	5	1742	22
2010	301766	83	142354	37	2740	2	1773	16

Table 2D-14c Number of nationally registered vehicles and full scale equivalent vehicle fires

	Airplane		Tractor		Combined Harvester		Bicycle	Other Transport	Machine
	Registered	FSE fires	Registered	FSE fires	Registered	FSE fires	FSE fires	FSE fires	FSE fires
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

Annex 2D-15 Average vehicle weight, 1980-2010

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	107
1994	908	10512	2382	14674	108
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

Annex 2D-16 Accidental vehicle fires activity data, 1980-2010

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	371	376	381	387	387	401	407	409	410
Buses	116	116	116	116	116	115	117	117	116	115
Light duty vehicles	19	21	23	25	27	29	32	35	36	37
Heavy duty vehicles	903	903	903	903	903	894	922	921	895	883
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	2956	2946	2922	2906	2890	2889	2916	2900	2905	2843

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	441	442	466	488	509	527	545
Buses	117	144	162	196	215	223	229	231	235	239
Light duty vehicles	37	38	39	47	51	55	60	64	69	74
Heavy duty vehicles	870	866	867	865	882	903	916	928	953	975
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	2867	2867	2861	2923	2909	2940	2991	2960	2993	2992

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	570	581	590	603	626	653	572	748	827
Buses	242	244	245	247	249	251	255	182	283	264
Light duty vehicles	82	89	95	103	116	137	165	86	207	223
Heavy duty vehicles	970	943	905	866	834	830	848	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	-	-	-	-	-	-	-	0.02	0.05	0.03
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	3016	2991	2952	2899	2856	2884	2965	2339	3371	3512

Table 2D-16d Burnt mass of different vehicle categories, Mg, 2010.

	2010
Passenger cars	739
Buses	266
Light duty vehicles	171
Heavy duty vehicles	715
Motorcycle, moped	10
Other transport	33
Caravan	38
Train	24
Ship	189
Airplane	7
Bicycle	0.05
Tractor	347
Combine harvester	378
Machine	43
Total	2960

Annex 2D-17 Emissions from accidental vehicle fires, 1980-2010

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	14.73	14.61	14.53	14.45	14.45	14.58	14.50	14.53	14.22
NO_X	Mg	5.91	5.89	5.84	5.81	5.78	5.78	5.83	5.80	5.81	5.69
NMVOC	Mg	25.13	25.04	24.84	24.70	24.56	24.56	24.79	24.65	24.69	24.17
CO	Mg	186.25	185.60	184.08	183.06	182.05	182.04	183.73	182.68	183.02	179.13
TSP	Mg	6.06	6.04	5.99	5.96	5.92	5.92	5.98	5.94	5.96	5.83
PM_{10}	Mg	6.06	6.04	5.99	5.96	5.92	5.92	5.98	5.94	5.96	5.83
$PM_{2.5}$	Mg	6.06	6.04	5.99	5.96	5.92	5.92	5.98	5.94	5.96	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	4.27
Ni	kg	0.44	0.44	0.44	0.44	0.43	0.43	0.44	0.43	0.44	0.43
Pb	kg	130.08	129.62	128.56	127.85	127.14	127.14	128.32	127.59	127.82	125.11
Zn	kg	511.44	509.65	505.48	502.69	499.90	499.88	504.53	501.66	502.57	491.90
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	47.74	47.58	47.19	46.93	46.67	46.67	47.10	46.83	46.92	45.92
Benzo(k)fluoranthene	kg	47.74	47.58	47.19	46.93	46.67	46.67	47.10	46.83	46.92	45.92
Benzo(a)pyrene	kg	43.46	43.31	42.95	42.71	42.48	42.48	42.87	42.63	42.70	41.80
Benzo(ghi)perylene	kg	18.62	18.56	18.41	18.31	18.20	18.20	18.37	18.27	18.30	17.91
Indeno(1.2.3-cd)pyrene	kg	68.88	68.64	68.08	67.70	67.33	67.33	67.95	67.56	67.69	66.25

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	14.34	14.34	14.31	14.62	14.55	14.70	14.95	14.80	14.96	14.96
NO_X	Mg	5.73	5.73	5.72	5.85	5.82	5.88	5.98	5.92	5.99	5.98
NMVOC	Mg	24.37	24.37	24.32	24.85	24.73	24.99	25.42	25.16	25.44	25.43
CO	Mg	180.63	180.64	180.25	184.16	183.30	185.25	188.41	186.49	188.55	188.47
TSP	Mg	5.88	5.88	5.87	5.99	5.96	6.03	6.13	6.07	6.14	6.13
PM_{10}	Mg	5.88	5.88	5.87	5.99	5.96	6.03	6.13	6.07	6.14	6.13
$PM_{2.5}$	Mg	5.88	5.88	5.87	5.99	5.96	6.03	6.13	6.07	6.14	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	4.49	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	126.15	126.16	125.89	128.62	128.02	129.38	131.59	130.24	131.69	131.63
Zn	kg	496.02	496.04	494.97	505.71	503.34	508.70	517.38	512.10	517.78	517.55
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	46.30	46.31	46.21	47.21	46.99	47.49	48.30	47.81	48.34	48.31
Benzo(k)fluoranthene	kg	46.30	46.31	46.21	47.21	46.99	47.49	48.30	47.81	48.34	48.31
Benzo(a)pyrene	kg	42.15	42.15	42.06	42.97	42.77	43.22	43.96	43.51	44.00	43.98
Benzo(ghi)perylene	kg	18.06	18.06	18.02	18.42	18.33	18.52	18.84	18.65	18.86	18.85
Indeno(1.2.3-cd)pyrene	kg	66.80	66.81	66.66	68.11	67.79	68.51	69.68	68.97	69.74	69.70

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	14.96	14.76	14.50	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	25.64	25.42	25.09	24.64	24.27	24.51	25.20	19.88	28.65	29.85
CO	Mg	190.02	188.43	185.95	182.66	179.91	181.67	186.79	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	4.33	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	132.71	131.60	129.87	127.57	125.65	126.88	130.46	102.93	148.32	154.52
Zn	kg	521.79	517.45	510.63	501.58	494.05	498.88	512.94	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	48.71	48.30	47.67	46.82	46.12	46.57	47.88	37.78	54.44	56.72
Benzo(k)fluoranthene	kg	48.71	48.30	47.67	46.82	46.12	46.57	47.88	37.78	54.44	56.72
Benzo(a)pyrene	kg	44.34	43.97	43.39	42.62	41.98	42.39	43.59	34.39	49.55	51.62
Benzo(ghi)perylene	kg	19.00	18.84	18.60	18.27	17.99	18.17	18.68	14.74	21.24	22.12
Indeno(1.2.3-cd)pyrene	kg	70.28	69.69	68.77	67.55	66.54	67.19	69.08	54.51	78.54	81.83

Table 2D-17d National emissions from vehicle fires - 2010.

	unit	2010
SO_2	Mg	14.80
NO_X	Mg	5.92
NMVOC	Mg	25.16
CO	Mg	186.51
TSP	Mg	6.07
PM_{10}	Mg	6.07
$PM_{2.5}$	Mg	6.07
As	kg	0.04
Cd	kg	0.27
Cr	kg	0.59
Cu	kg	4.44
Ni	kg	0.44
Pb	kg	130.26
Zn	kg	512.16
PCDD/F	g I-TEQ	0.12
Benzo(b)fluoranthene	kg	47.81
Benzo(k)fluoranthene	kg	47.81
Benzo(a)pyrene	kg	43.52
Benzo(ghi)perylene	kg	18.65
Indeno(1.2.3-cd)pyrene	kg	68.98

Annex 2E - Solvents and Other Product Use

Annex 2E-1:	NMVOC emissions, 1990-2010
Annex 2E-2:	Activity data for NMVOC use, 1990-2010
Annex 2E-3:	Emissions from use of fireworks, 1990-2010
Annex 2E-4:	Emissions from tobacco smoking, 1990-2010
Annex 2E-5:	Emissions from barbequing, 1990-2010
Annex 2E-6:	Activity data for other product use, 1990-2010

Annex 2E-1 NMVOC emissions, 1990-2010

Table 2E-1a NMVOC emissions (Gg per year), 1990-1999.

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Paint application (3A)	6.02	6.90	7.56	6.89	7.56	6.89	8.46	7.16	7.00	7.55
Degreasing and dry cleaning (3B)	7.05E-05	6.56E-05	6.26E-05	7.27E-05	9.38E-05	7.67E-05	7.38E-05	4.46E-05	5.48E-05	3.45E-05
Chemical products, manufacturing and processing (3C)	7.96	9.12	8.89	6.92	9.00	9.11	9.20	7.82	7.45	7.07
Other (3D)	23.7	26.41	28.50	25.17	30.0	28.8	31.2	29.3	26.6	25.6
Total NMVOC	37.6	42.4	44.9	39.0.	46.5	44.8	48.8	44.2	41.0	40.2

Table 2E-1b NMVOC emissions (Gg per year), 2000-2009.

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Paint application (3A)	7.44	6.08	6.08	5.95	5.40	4.89	4.07	3.39	3.66	3.32
Degreasing and dry cleaning (3B)	2.93E-05	1.25E-05	2.98E-05	2.89E-05	2.4E-05	1.83E-05	1.46E-05	2.17E-05	1.5E-05	1.31E-05
Chemical products, manufacturing and processing (3C)	6.74	6.10	6.39	4.76	5.90	6.12	5.94	6.07	5.84	4.90
Other (3D)	26.6	23.8	23.4	21.4	20.6	20.0	20.3	17.7	18.0	19.2
Total NMVOC	40.7	36.0	35.8	32.1	31.9	31.0	30.3	27.1	27.5	27.4

Table 2E-1c NMVOC emissions (Gg per year), 2010

	2010
Paint application (3A)	3.11
Degreasing and dry cleaning (3B)	1.24E-05
Chemical products, manufacturing and processing (3C)	4.96
Other (3D)	18.7
Total NMVOC	26.8

Annex 2E-2 Activity data for NMVOC use, 1990-2010

Table 2E-2a Activity data for NMVOC use (Gg per year), 1990-2010

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Paint application (3A)	92.6	107	115	102	108	102	123	107	108	112
Degreasing and dry cleaning (3B)	1.41	1.31	1.25	1.45	1.88	1.53	1.48	0.892	1.10	0.689
Chemical products, manufacturing and processing (3C)	407	455	569	389	467	505	524	519	528	488
Other (3D)	210	215	224	193	229	260	250	240	225	217
Total NMVOC	710	779	910	685	805	869	898	867	863	818

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)	115	94.7	95.4	89.5	85.2	80.9	67.7	58.4	60.6	53.6
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)	568	552	541	514	635	742	751	817	773	683
Other (3D)	250	224	242	214	211	227	210	185	189	203
Total NMVOC	934	870	879	818	931	1050	1030	1060	1022	940

Table 2E-2c Activity data for NMVOC use (Gg per year), 2010

	2010
Paint application (3A)	49.8
Degreasing and dry cleaning (3B)	0.247
Chemical products, manufacturing and processing (3C)	641
Other (3D)	187
Total NMVOC	878

Annex 2E-3 Emissions from use of fireworks, 1990-2010

Table 2E-3a Emissions from use of fireworks, 1990-1999

	Unit	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
SO_2	Mg	2.5	3.3	3.5	3.1	3.8	5.8	5.3	4.2	6.8	12.9
CO	Mg	8.8	11.7	12.6	11.2	13.5	20.7	19.0	14.9	24.3	46.0
TSP	Mg	50.7	67.1	72.6	64.1	77.8	118.9	109.1	85.8	139.7	264.6
PM_{10}	Mg	25.4	33.6	36.3	32.1	38.9	59.4	54.5	42.9	69.9	132.3
$PM_{2.5}$	Mg	17.8	23.5	25.4	22.4	27.2	41.6	38.2	30.0	48.9	92.6
As	kg	1.7	2.3	2.4	2.2	2.6	4.0	3.7	2.9	4.7	8.9
Cd	kg	0.9	1.1	1.2	1.1	1.3	2.0	1.8	1.4	2.3	4.4
Cr	kg	19.9	26.3	28.5	25.2	30.5	46.6	42.8	33.7	54.8	103.8
Cu	kg	568	752	813	718	872	1332	1222	962	1566	2966
Hg	kg	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.1	0.2	0.4
Ni	kg	38.4	50.8	54.9	48.5	58.9	89.9	82.5	64.9	105.7	200.2
Pb	kg	2814	3724	4025	3557	4318	6595	6050	4762	7753	14681
Zn	kg	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	213.3
PM_{10}	Mg	96.3	76.0	93.9	120.0	171.4	73.0	83.5	88.7	86.6	106.6
$PM_{2.5}$	Mg	67.4	53.2	65.8	84.0	119.9	51.1	58.4	62.1	60.6	74.6
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	2390
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	161.3
Pb	kg	3237	2554	3159	4035	5762	2456	2807	NO	NO	NO
Zn	kg	1262	996	1232	1574	2247	958	1095	1163	1136	1398

Table 2E-3c Emissions from use of fireworks,

	Unit	2010
SO_2	Mg	10.5
CO	Mg	37.4
TSP	Mg	214.9
PM_{10}	Mg	107.5
$PM_{2.5}$	Mg	75.2
As	kg	7.2
Cd	kg	3.6
Cr	kg	84.3
Cu	kg	2409
Hg	kg	NO
Ni	kg	162.6
Pb	kg	NO
Zn	kg	1409

Annex 2E-4Emissions from tobacco smoking, 1990-2010

Table 2E-4a Emission from tobacco smoking, 1990-1999

	Unit	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
SO_2	Mg	4.64	4.35	4.39	4.19	4.14	4.14	4.00	4.05	4.03	4.07
NO_X	Mg	20.74	19.45	19.63	18.73	18.52	18.52	17.88	18.11	17.99	18.18
CO	Mg	634.49	594.98	600.60	573.16	566.71	566.55	546.99	553.93	550.51	556.08
NH_3	Mg	47.76	44.79	45.21	43.15	42.66	42.65	41.18	41.70	41.44	41.86
TSP	Mg	157.46	147.65	149.05	142.24	140.64	140.60	135.74	137.46	136.62	138.00
PM_{10}	Mg	157.46	147.65	149.05	142.24	140.64	140.60	135.74	137.46	136.62	138.00
$PM_{2.5}$	Mg	157.46	147.65	149.05	142.24	140.64	140.60	135.74	137.46	136.62	138.00
As	kg	1.83	1.72	1.73	1.65	1.64	1.63	1.58	1.60	1.59	1.60
Cd	kg	0.18	0.17	0.17	0.17	0.16	0.16	0.16	0.16	0.16	0.16
Cr	kg	4.08	3.82	3.86	3.68	3.64	3.64	3.51	3.56	3.54	3.57
Cu	kg	1.75	1.64	1.66	1.58	1.56	1.56	1.51	1.53	1.52	1.53
Hg	kg	0.07	0.06	0.07	0.06	0.06	0.06	0.06	0.06	0.06	0.06
Ni	kg	0.37	0.35	0.35	0.33	0.33	0.33	0.32	0.32	0.32	0.32
Pb	kg	7.42	6.95	7.02	6.70	6.62	6.62	6.39	6.47	6.43	6.50
Se	kg	0.09	0.09	0.09	0.08	0.08	0.08	0.08	0.08	0.08	0.08
Zn	kg	18.54	17.38	17.55	16.75	16.56	16.55	15.98	16.19	16.09	16.25
PCDD/Fs	mg	1.15	1.08	1.09	1.04	1.03	1.03	0.99	1.01	1.00	1.01
Flouranthene	kg	10.94	10.26	10.36	9.88	9.77	9.77	9.43	9.55	9.49	9.59
Benzo[b]fluoranthene	kg	0.52	0.49	0.49	0.47	0.46	0.46	0.45	0.45	0.45	0.45
Benzo[k]fluoranthene	kg	0.52	0.49	0.49	0.47	0.46	0.46	0.45	0.45	0.45	0.45
Benzo[a]pyrene	kg	1.28	1.20	1.21	1.15	1.14	1.14	1.10	1.12	1.11	1.12
Benzo[ghi]perylene	kg	0.71	0.67	0.68	0.64	0.64	0.64	0.62	0.62	0.62	0.63
Indeno[1,2,3-cd]pyrene	kg	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	4.06	3.86	3.84	4.06	4.06	3.87	3.93	3.74	3.69	3.63
NO_X	Mg	18.13	17.27	17.18	18.15	18.14	17.30	17.55	16.72	16.50	16.21
CO	Mg	554.59	528.42	525.61	555.20	555.03	529.13	536.85	511.67	504.84	496.02
NH_3	Mg	41.75	39.78	39.57	41.80	41.78	39.83	40.41	38.52	38.00	37.34
TSP	Mg	137.63	131.13	130.44	137.78	137.74	131.31	133.23	126.98	125.28	123.09
PM_{10}	Mg	137.63	131.13	130.44	137.78	137.74	131.31	133.23	126.98	125.28	123.09
$PM_{2.5}$	Mg	137.63	131.13	130.44	137.78	137.74	131.31	133.23	126.98	125.28	123.09
As	kg	1.60	1.52	1.52	1.60	1.60	1.53	1.55	1.48	1.46	1.43
Cd	kg	0.16	0.15	0.15	0.16	0.16	0.15	0.16	0.15	0.15	0.14
Cr	kg	3.56	3.39	3.38	3.57	3.57	3.40	3.45	3.29	3.24	3.19
Cu	kg	1.53	1.46	1.45	1.53	1.53	1.46	1.48	1.41	1.39	1.37
Hg	kg	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.05	0.05
Ni	kg	0.32	0.31	0.31	0.32	0.32	0.31	0.31	0.30	0.29	0.29
Pb	kg	6.48	6.18	6.14	6.49	6.49	6.18	6.27	5.98	5.90	5.80
Se	kg	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.07	0.07	0.07
Zn	kg	16.20	15.44	15.36	16.22	16.22	15.46	15.69	14.95	14.75	14.49
PCDD/Fs	mg	1.01	0.96	0.95	1.01	1.01	0.96	0.97	0.93	0.92	0.90
Flouranthene	kg	9.56	9.11	9.06	9.57	9.57	9.12	9.26	8.82	8.70	8.55
Benzo[b]fluoranthene	kg	0.45	0.43	0.43	0.45	0.45	0.43	0.44	0.42	0.41	0.41
Benzo[k]fluoranthene	kg	0.45	0.43	0.43	0.45	0.45	0.43	0.44	0.42	0.41	0.41
Benzo[a]pyrene	kg	1.12	1.06	1.06	1.12	1.12	1.07	1.08	1.03	1.02	1.00
Benzo[ghi]perylene	kg	0.62	0.59	0.59	0.62	0.62	0.60	0.60	0.58	0.57	0.56
Indeno[1,2,3-cd]pyrene	kg	0.45	0.43	0.43	0.45	0.45	0.43	0.44	0.42	0.41	0.41

Table 2E-4c Emission from tobacco smoking, 2010

	Unit	2010
SO_2	Mg	3.53
NO_X	Mg	15.76
CO	Mg	482.24
NH_3	Mg	36.30
TSP	Mg	119.67
PM_{10}	Mg	119.67
$PM_{2.5}$	Mg	119.67
As	kg	1.39
Cd	kg	0.14
Cr	kg	3.10
Cu	kg	1.33
Hg	kg	0.05
Ni	kg	0.28
Pb	kg	5.64
Se	kg	0.07
Zn	kg	14.09
PCDD/Fs	mg	0.88
Flouranthene	kg	8.31
Benzo[b]fluoranthene	kg	0.39
Benzo[k]fluoranthene	kg	0.39
Benzo[a]pyrene	kg	0.97
Benzo[ghi]perylene	kg	0.54
Indeno[1,2,3-cd]pyrene	kg	0.39

Annex 2E-5Emissions from barbequing 1990-2010

Table 2E-5a Emissions from barbequing, 1990-1999

	Unit	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
SO_2	Mg	22.23	19.22	29.58	21.89	18.59	24.47	31.48	41.81	31.72	33.98
NO_X	Mg	21.52	18.60	28.63	21.18	17.99	23.69	30.46	40.47	30.70	32.88
CO	Mg	1506.2	1301.8	2003.9	1482.9	1259.4	1658.0	2132.3	2832.6	2149.0	2301.9
TSP	Mg	17.21	14.88	22.90	16.95	14.39	18.95	24.37	32.37	24.56	26.31
PM_{10}	Mg	17.21	14.88	22.90	16.95	14.39	18.95	24.37	32.37	24.56	26.31
$PM_{2.5}$	Mg	17.21	14.88	22.90	16.95	14.39	18.95	24.37	32.37	24.56	26.31
As	kg	0.68	0.59	0.91	0.67	0.57	0.75	0.96	1.28	0.97	1.04
Cd	kg	0.25	0.22	0.34	0.25	0.21	0.28	0.36	0.48	0.36	0.39
Cr	kg	100.41	86.79	133.59	98.86	83.96	110.53	142.15	188.84	143.27	153.46
Hg	kg	0.47	0.40	0.62	0.46	0.39	0.51	0.66	0.88	0.67	0.71
Ni	kg	0.93	0.81	1.24	0.92	0.78	1.03	1.32	1.75	1.33	1.42
Pb	kg	31.92	27.59	42.46	31.42	26.69	35.13	45.18	60.02	45.54	48.78
Se	kg	4.66	4.03	6.20	4.59	3.90	5.13	6.60	8.77	6.65	7.12
Zn	kg	99.70	86.17	132.64	98.16	83.36	109.74	141.14	187.49	142.24	152.36
PCDD/Fs	g	0.08	0.07	0.10	0.07	0.06	0.08	0.11	0.14	0.11	0.12
PAHs	kg	8.03	6.94	10.69	7.91	6.72	8.84	11.37	15.11	11.46	12.28

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	63.85	37.67	32.19	42.47
NO_X	Mg	40.07	32.69	49.19	60.11	48.63	44.77	61.79	36.45	31.15	41.10
CO	Mg	2805.1	2288.4	3443.4	4207.8	3404.3	3134.2	4325.4	2551.8	2180.5	2877.0
TSP	Mg	32.06	26.15	39.35	48.09	38.91	35.82	49.43	29.16	24.92	32.88
PM_{10}	Mg	32.06	26.15	39.35	48.09	38.91	35.82	49.43	29.16	24.92	32.88
$PM_{2.5}$	Mg	32.06	26.15	39.35	48.09	38.91	35.82	49.43	29.16	24.92	32.88
As	kg	1.27	1.04	1.56	1.90	1.54	1.42	1.96	1.15	0.99	1.30
Cd	kg	0.47	0.39	0.58	0.71	0.58	0.53	0.73	0.43	0.37	0.49
Cr	kg	187.01	152.56	229.56	280.52	226.95	208.95	288.36	170.12	145.37	191.80
Hg	kg	0.87	0.71	1.07	1.30	1.05	0.97	1.34	0.79	0.67	0.89
Ni	kg	1.74	1.42	2.13	2.60	2.11	1.94	2.68	1.58	1.35	1.78
Pb	kg	59.44	48.49	72.97	89.17	72.14	66.42	91.66	54.07	46.21	60.97
Se	kg	8.68	7.08	10.66	13.02	10.54	9.70	13.39	7.90	6.75	8.91
Zn	kg	185.67	151.47	227.92	278.52	225.33	207.45	286.30	168.90	144.33	190.43
PCDD/Fs	g	0.14	0.11	0.17	0.21	0.17	0.16	0.22	0.13	0.11	0.14
PAHs	kg	14.96	12.20	18.36	22.44	18.16	16.72	23.07	13.61	11.63	15.34

Table 2E-5c Emissions from barbequing, 2010

	Unit	2010
SO_2	Mg	25.97
NO_X	Mg	25.13
CO	Mg	1759.
TSP	Mg	20.11
PM_{10}	Mg	20.11
$PM_{2.5}$	Mg	20.11
As	kg	0.80
Cd	kg	0.30
Cr	kg	117.2
Hg	kg	0.54
Ni	kg	1.09
Pb	kg	37.28
Se	kg	5.45
Zn	kg	116.45
PCDD/Fs	g	0.09
PAHs	kg	9.38

Annex 2E-6Activity data for other product use, 1990-2010

Table 2E-6 Activity data for the national use of fireworks, tobacco and charcoal for BBQs.

		1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Fireworks	Gg	1.3	1.7	1.8	1.6	2.0	3.0	2.8	2.2	3.5	6.7
Tobacco	Gg	11.5	10.8	10.9	10.4	10.3	10.3	9.9	10.1	10.0	10.1
BBQ	Gg	7.2	6.2	9.5	7.1	6.0	7.9	10.2	13.5	10.2	11.0
Continued		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Fireworks	Gg	4.9	3.8	4.7	6.1	8.6	3.7	4.2	4.5	4.4	5.4
Tobacco	Gg	10.1	9.6	9.5	10.1	10.1	9.6	9.7	9.3	9.2	9.0
BBQ	Gg	13.4	10.9	16.4	20.0	16.2	14.9	20.6	12.2	10.4	13.7
Continued		2010									
Fireworks	Gg	5.4									
Tobacco	Gg	8.8									
BBQ	Gg	8.4									

Annex 3 – Completeness and use of notation keys

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 waste-water 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.

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. NERI 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 NERI 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 2010

This report is a documentation report on the emission inventories for Denmark as reported to the UNECE Secre tariat under the Convention on Long Range Transboundary Air Pollution due by 15 February 2012. The report contains information on Denmark's emission inventories regarding emissions of (1) SO_X for the years 1980-2010, (2) NO_X, CO, NMVOC and NH_3 for the years 1985-2010, (3) Particulate matter: TSP, PM_{10}, $PM_{2.5}$ for the years 2000-2010, (4) Heavy Metals: Pb, Cd, Hg, As, Cr, Cu, Ni, Se and Zn for the years 1990-2010, (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 1990-2010. Further, the report contains information on background data for emissions inventory.

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