National Environmental Research Institute
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Danish emission inventories for road transport and other mobile sources

Inventories until year 2002

Research Notes from NERI No. 201

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2004

Morten Winther

Data sheet

Title:	Danish emission inventories for road transport and other mobile sources
Subtitle:	Inventories until year 2002
Author:	Morten Winther
Department:	Department of Policy Analysis
Serial title and no.:	Research Notes from NERI No. 201
Publisher:	National Environmental Research Institute © Ministry of the Environment
URL:	http://www.dmu.dk
Date of publication:	December 2004
Editing complete:	November 2004
Referees:	Spencer Sorenson, Technical University of Denmark. Kaj Jørgensen, Risoe National Laboratory, Hanne Bach, National Environmental Research Institute, Jytte Illerup, National Environmental Research Institute.
Financial support:	No financial support
Please cite as:	Winther, M. 2004: Danish emission inventories for road transport and other mobile sources. Inventories until year 2002. National Environmental Research Institute, Denmark. 146 pp. – Research Notes from NERI no. 201 http://research-notes.dmu.dk

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Abstract: This report explains the parts of the Danish inventories related to road transport and other mobile sources. Emission results for CO_2, CH_4, N_2O, SO_2, NO_X, NMVOC, CO, particulate matter (PM), heavy metals, dioxins and PAH are shown from 1985 to 2002. In this period the fuel use and CO_2 emissions for road transport have increased by 38%. The emission decreases for PM (exhaust only), CO, NO_X and NMVOC are 30, 51, 25 and 57% respectively, due to the introduction of vehicles complying with gradually stricter emission standards. The N_2O emission increase of 274% is related to the high emissions from gasoline catalyst cars. For other mobile sources the fuel use, CO_2 and NO_X emissions have decreased with 15% from 1985 to 2002, and the PM emission decline is in the order of 13%. For SO_2 the emission drop is 74% from 1985 to 2002, due to gradually lower fuel sulphur contents. In the same period the emissions of NMVOC and CO has increased with 32 and 6%, mainly due to the increased use of small gasoline boats. Uncertainties for the emissions and trends have been estimated.

Keywords:	Road transport, military, railways, domestic navigation, domestic aviation, working equipment and machinery, SO_2, NO_X, NMVOC, CH_4, CO, CO_2, N_2O, PM, heavy metals, dioxin, PAH, greenhouse gases, acidifying components.
Layout:	Ann-Katrine Holme Christoffersen
ISSN (electronic):	1399-9346
Number of pages:	146
Internet version:	The report is only available in electronic format from NERI's homepage http://www2.dmu.dk/1_viden/2_Publikationer/3_arbrapporter/rapporter/AR201.pdf
For sale at:	Ministry of the Environment Frontlinien Rentemestervej 8 DK-2400 Copenhagen NV Tel. +45 70 12 02 11 frontlinien@frontlinien.dk

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Preface

The Danish National Environmental Research Institute prepares the Danish atmospheric emission inventories and reports the results on an annual basis to the UNFCCC (United Nations Framework Convention on Climate Change) and the UNECE LRTAP (United Nations Economic Commission for Europe Convention on Long Range Transboundary Pollutants) conventions. This report explains the parts of the Danish inventories related to road transport and other mobile sources. In the report emission results for CO_2, CH_4, N_2O, SO_2, NO_X, NMVOC, CO, particulate matter (PM), heavy metals, dioxins and PAH are shown from 1985 to 2002 grouped according to the IPCC (Intergovernmental Panel on Climate Changes) codes.

Summary

This report explains the road transport and other mobile sources part of the annual Danish emission inventories reported to the UNFCCC (United Nations Framework Convention on Climate Change) and the UNECE LRTAP (United Nations Economic Commission for Europe Long Range Transboundary Pollution) conventions. The sub-sectors for other mobile sources are Military, railways, navigation, fisheries, civil aviation and non-road machinery in agriculture, forestry, industry and household/gardening.

The emissions of CO_2, CH_4, N_2O, SO_2, NO_X, NMVOC, CO, particulate matter (PM), heavy metals, dioxins and PAH are shown in a 1985-2002 time series grouped according to the IPCC (Intergovernmental Panel on Climate Changes) CRF classification codes.

Mobile sources	CRF codes
Road transport	1A3b Transport-Road
Military	1A5 Other
Railways	1A3c Railways
Inland waterways	1A3d Transport-Navigation
National sea traffic	1A3d Transport-Navigation
National fishing	1A4c Agriculture/forestry/fisheries
International sea traffic	1A3d Transport-Navigation (international)
Dom. airport traffic (LTO < 1000 m)	1A3a Transport-Civil aviation
Int. airport traffic (LTO < 1000 m)	1A3a Transport-Civil aviation (international)
Dom. cruise traffic (> 1000 m)	1A3a Transport-Civil aviation
Int. cruise traffic (> 1000 m)	1A3a Transport-Civil aviation (international)
Agriculture	1A4c Agriculture/forestry/fisheries
Forestry	1A4c Agriculture/forestry/fisheries
Industry	1A2f Industry-Other
Household and gardening	1A4b Residential

Methodologies

The European COPERT III (COmputer Programme to calculate the Emissions from Road Transport) emission model is used to calculate the road transport emissions. In COPERT III 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 the Danish Road Directorate, and is grouped according to average fuel consumption and emission behaviour. The emissions are estimated by combining vehicle and annual mileage numbers with hot emission factors, cold:hot ratios and evaporation factors (detailed methodology).

For air traffic the 2001 and 2002 estimates are made on a city-pair level, using flight data from the Danish Civil Aviation Agency (CAA-DK) and LTO and distance related emission factors from the EMEP/CORINAIR (European Evaluation and Monitoring Programme/CORe INventory on AIR emissions) guidelines (detailed methodology). For previous years the background data consist of LTO/aircraft type statistics from Copenhagen Airport and total LTO numbers from CAA-DK. With appropriate assumptions a consistent

time series of emissions is produced back to 1985 using also the findings from a Danish city-pair emission inventory in 1998.

Non-road working machines and equipment, and small boats and pleasure crafts are grouped in the following sectors: small boats/pleasure crafts, agriculture, forestry, industry and household and gardening. 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 (detailed methodology).

Fuel use data are obtained from the Danish energy statistics provided by the Danish Energy Authority. For road transport and aviation the emission results are adjusted in a fuel balance to ensure that all statistical fuel sold is accounted for in the calculations. For military, railways and navigation the emissions are calculated as the product of fuel use and emission factors.

Emissions from road transport

Set in relation to the Danish national emission totals, the largest emission shares for road transport are noted for CO, NO_X, PM ($PM_{2.5}$), NMVOC and CO_2. In 2002 the emission percentages were 49, 33, 30, 28 and 21, respectively. The emissions of N_2O, NH_3, CH_4 and SO_2 only have marginal shares of 5, 2, 1 and 1% in 2002.

From 1985 to 2002 there has been an emission decrease of 30, 51, 25 and 57% for PM (exhaust only), CO, NO_X and NMVOC. In the same period the CO_2 (and fuel use), CH_4 and N_2O emissions have increased with 38, 21 and 274% (22% for CO_2, 15% for CH_4 and 233% for N_2O since 1990).

The most significant emission changes from 1985 to 2002 occur for SO_2 and NH_3. For SO_2 the emission drop is 97% (due to reduced sulphur content in the diesel fuel), whereas the NH_3 emissions increase with 3748% (due to the introduction of catalyst cars).

The highest $PM_{2.5}$, CO, NO_X and NMVOC emissions occur in 1991, after which the emissions drop with 40, 41, 34 and 57%, until 2002.

Emissions from road transport in 2002, changes from 1985 to 2002, and 2002 shares of national emission totals

CRF ID	CO_2 [ktons]	CH_4 [tons]	N_2O [tons]	SO_2 [tons]	NO_x [tons]	NMVOC [tons]	CO [tons]	NH_3 [tons]	TSP [tons]	PM_{10} [tons]	$PM_{2.5}$ [tons]
Road, 2002	11389	3010	1270	358	66749	34815	283912	2386	3508	3508	3508
Road non-exhaust, 2002									2333	1509	819
Total Road, 2002	11389	3010	1270	358	66749	34815	283912	2386	5841	5017	4327
Total national, 2002	54164	268320	25730	25275	200334	123763	576640	100916	33788	22112	14316
Road-% of national, 2002	21	1	5	1	33	28	49	2	17	23	30
Road-% change 1985-2002	38	21	274	-97	-25	-57	-51	3748	-30[1]	-30[1]	-30[1]

Road transport exhaust PM emissions almost solely come from diesel fuelled vehicles. The largest sources are light duty vehicles followed by heavy-duty vehicles and passenger cars in decreasing order. Since

[1] Exhaust only

the mid 1990s the emissions from light and heavy duty vehicles have decreased significantly due to gradually stricter EURO emission standards. For diesel passenger cars, the environmental benefit of introducing new engines with lower particulate emissions since 1990 is more or less compensated by an increase in vehicle new sales in the later years.

The trend in non-exhaust PM follows the traffic growth in general, and in 2002 the TSP, PM_{10} and $PM_{2.5}$ shares were 40, 30 and 19% of the respective road traffic totals. The non-exhaust PM are gaining more relative importance, in pace with the year by year reductions of exhaust PM.

Historically the emission totals of NO_X and especially NMVOC and CO have been dominated by the contributions coming from gasoline private cars. However, the emissions from this vehicle type have been reduced since the introduction of catalyst cars in 1990. A negative side effect of this technology though is the increase in N_2O and NH_3 emissions. The NO_X, NMVOC and CO emissions reductions are fortified by the introduction of new gradually stricter EURO emission standards for all other vehicle classes.

Emissions from other mobile sources

For other mobile sources the emissions of NO_X, $PM_{2.5}$, NMVOC, CO, PM_{10}, SO_2 and TSP have the largest shares of the national totals in 2002. The shares are 27, 26, 19, 18, 18, 13 and 12%, respectively. The 2002 CO_2 emission (and fuel use) share is 7%, whereas the emissions of N_2O, NH_3 and CH_4 have marginal shares of 1% or less in 2002.

The emissions of NO_X and PM have decreased with 15 and 13% from 1985 to 2002. For CO_2 (and fuel use) the decrease is 15% (and 12% from 1990). For N_2O the emission decrease is 16%, whereas the emissions of CH_4 increase with 6%. For SO_2 the emission drop is 74% from 1985 to 2002 (and 77% since 1980). In the same period the emissions of NMVOC and CO has increased with 32 and 6%.

Emissions from other mobile sources in 2002, changes from 1985 to 2002, and 2002 shares of national emission totals

CRF ID	CO_2 [ktons]	CH_4 [tons]	N_2O [tons]	SO_2 [tons]	NO_x [tons]	NMVOC [tons]	CO [tons]	NH_3 [tons]	TSP [tons]	PM_{10} [tons]	$PM_{2.5}$ [tons]
Military (1A5)	89	4	4	5	416	55	317	0	20	20	20
Railways (1A3c)	210	9	6	7	3385	247	635	1	125	125	125
Navigation (1A3d)	554	122	29	2017	8636	11374	20018	0	604	575	547
Ag./for./fish. (1A4c)	1836	121	89	1151	31005	5002	22285	3	2361	2244	2133
Civil Aviation (1A3a)	146	5	8	5	674	153	869	0	3	3	3
Industry-Other (1A2f)	742	148	32	201	10668	3052	10766	2	926	881	838
Residential (1A4b)	82	130	2	3	239	4162	47601	0	26	26	26
Total other mobile, 2002	3659	539	170	3388	55024	24046	102491	6	4065	3874	3693
Total national, 2002	54164	268320	25730	25275	200334	123763	576640	100916	33788	22112	14316
Other mobile-% of national, 2002	7	0	1	13	27	19	18	6	12	18	26
Other mobile -% change 1985-2002	-15	6	-16	-74	-15	32	6	-12	-13	-13	-13

The other mobile sources cover different modes of transport and non-road machinery. For NO_X and PM more than half of the emissions comes from agriculture/forestry/fisheries in 2002. The emission

trends are composed by fuel use (and hence emissions) fluctuations for fishery, and the constant emission decrease for diesel fuelled agricultural machines. The latter emission decline is the product of decreasing fuel use between 1990 and 2000 and an improved emission performance for new machinery since the late 1990's.

For NMVOC and CO almost half of the other mobile emissions come from the navigation and residential sectors, respectively. The major NMVOC increase is due to more gasoline fuelled private boats, while the high CO emissions for residential come from gasoline fuelled working machinery.

Heavy metals

For heavy metals the development in emissions follows the fuel use trends. The road transport shares for copper (Cu), zinc (Zn) and chromium (Cr) are 70, 15 and 11% of national totals in 2002, and for other mobile sources the lead (Pb), Cu and nickel (Ni) shares are 28, 16 and 12%. For the remaining components the emission shares are less than 5%.

The road transport emissions have increased by 22% from 1990 to 2002. For Pb though there has been a 99% emission decline, due to the phasing out of leaded gasoline fuels until 1994. For other mobile sources many of the components have emission increases of around 10-20% in the same time period. The arsenic (As) and Ni increase is around 40% due to a growth in residual oil fuel use, and for Pb the 71% increase is due to the use of aviation gasoline with a high content of lead.

PAH's

The PAH emission shares for road transport and other mobile sources are 5% or less of the national total in 2002.

Uncertainties

For mobile sources in 2002 the CO_2 emissions are determined with the most accuracy, followed by the CH_4, SO_2, NMVOC, NO_X, N_2O and TSP emissions with increasing levels of uncertainties. The uncertainties are 4, 32, 45, 46, 51, 53, 56 and 59%, respectively. The uncertainties for the 1990-2002 emission trends are 4, 4, 8, 6, 15, 7, 193 and 9% for the emissions in the same consecutive order. For NH_3, heavy metals and POPs the 2002 emissions have uncertainty levels of between 700 and 1000%. In this case the emission trend uncertainties are significantly lower, still large fluctuations exist between the calculated values for the different emission components. The smallest and largest uncertainties are 8 (Benzo(b) flouranthene) and 139% (Benzo(k) flouranthene).

Sammenfatning

Denne rapport dokumenterer de årlige danske emissionsopgørelser for vejtransport og andre mobile kilder. Opgørelserne laves som en del af de samlede danske opgørelser, og rapporteres til UNFCCC (United Nations Framework Convention on Climate Change) og UNECE LRTAP (United Nations Economic Commission for Europe Long Range Transboundary Pollution) konventionerne. Underkategorierne for andre mobile kilder er: Militær, jernbane, søfart, fiskeri, civil flyvning, og arbejdsredskaber- og maskiner i landbrug, skovbrug, industri samt have/hushold.

For CO_2, CH_4, N_2O, SO_2, NO_X, NMVOC, CO, partikler (PM), tungmetaller, dioxin og PAH er de beregnede emissioner grupperet iht. IPCCs (Intergovernmental Panel on Climate Changes) CRF koder og er vist i tidsserier fra 1985 til 2002.

Mobile kilder	CRF koder
Vejtrafik	1A3b Transport-Road
Militær	1A5 Other
Jernbane	1A3c Railways
Småbåde og fritidsfartøjer	1A3d Transport-Navigation
Indenrigs skibstrafik	1A3d Transport-Navigation
Indenrigs fiskeri	1A4c Agriculture/forestry/fisheries
Udenrigs skibstrafik	1A3d Transport-Navigation (international)
Indenrigs flytrafik (LTO < 1000 m)	1A3a Transport-Civil aviation
Udenrigs flytrafik (LTO < 1000 m)	1A3a Transport-Civil aviation (international)
Indenrigs cruise trafik (> 1000 m)	1A3a Transport-Civil aviation
Udenrigs cruise trafik (> 1000 m)	1A3a Transport-Civil aviation (international)
Landbrug	1A4c Agriculture/forestry/fisheries
Skovbrug	1A4c Agriculture/forestry/fisheries
Industri	1A2f Industry-Other
Have- og hushold	1A4b Residential

Metoder

Emissionerne for vejtrafik beregnes med den europæiske emissionsmodel COPERT III (COmputer Programme to calculate the Emissions from Road Transport). I modellen beregnes emissionerne for køretøjer med driftsvarme motorer, under koldstart og som følge af brændstoffordampning. Modellen tager også højde for de forøgede emissioner som følge af katalysatorslid. Input data for køretøjsbestand og årskørsler oplyses af Vejdirektoratet og køretøjerne grupperes iht. gennemsnitligt brændstofforbrug og emissioner. Emissionerne beregnes som produktet af antal køretøjer, årskørsler, varme emissionsfaktorer, kold/varm-forhold og fordampningsfaktorer (detaljeret metode).

For luftfart opgøres emissionerne for 2001 og 2002 på city-pair basis. Til beregningerne bruges flydata fra Statens Luftfartsvæsen (SLV) samt LTO og cruise emissionsfaktorer pr. fløjet distance fra EMEP/CORINAIR (European Evaluation and Monitoring Programme/ CORe INventory on AIR emissions). For årene før 2001 bruges som baggrundsdata en LTO/flytype statistik fra Københavns Lufthavn samt SLVs tal for antallet af starter og landinger. En konsistent emissionsopgørelse er beregnet tilbage til 1985 ved at gøre passende

antagelser og ved at bruge resultaterne fra en dansk city-pair emissionsopgørelse for 1998.

Arbejdsredskaber- og maskiner samt småbåde og lystfartøjer opgøres i sektorerne: Småbåde/fritidsfartøjer, landbrug, skovbrug, industri samt have/hushold. Emissionerne beregnes som produktet af antallet af maskiner, lastfaktorer, motorstørrelser, årlige driftstider og emissionsfaktorer (detaljeret metode).

Data for energiforbrug stammer fra Energistyrelsens energistatistik. For vejtransport og luftfart justeres emissionsresultaterne udfra en brændstofbalance. Dermed sikres at hele det oplyste brændstofsalg ligger til grund for emissionsopgørelserne. For militær, jernbane, søfart og fiskeri beregnes emissionerne som produktet af brændstofsalg og emissionsfaktorer.

Emissioner fra vejtrafik

Set i forhold til landets samlede emissionstotal beregnes vejtrafikkens største emissionsandele for CO, NO_X, PM ($PM_{2.5}$), NMVOC og CO_2. Procentandelene for disse stoffer ligger på hhv. 49, 33, 30, 28 og 21% i 2002. Emissionsandelene for N_2O, NH_3, CH_4 og SO_2 er marginale og i størrelsesordenen af hhv. 5, 2, 1 og 1% i 2002.

For partikler (udstødning), CO, NO_X og NMVOC er emissionerne steget med hhv. 30, 51, 25 og 57% fra 1985 til 2002. I den samme periode er CO_2 (og energiforbruget), CH_4 og N_2O emissionen steget med hhv. 38, 21 og 274% (siden 1990: 22% for CO_2 og 15% for CH_4 og 233% for N_2O).

De mest markante emissionsændringer fra 1985 til 2002 sker for SO_2 og NH_3. SO_2 emissionerne falder med 97% (pga. et lavere svovlindhold i diesel), hvorimod NH_3 emissionerne stiger med 3748% (pga. indførslen af katalysatorbiler).

De største $PM_{2.5}$-, CO-, NO_X- og NMVOC emissioner registreres i 1991. Herefter falder emissionerne med hhv. 40, 41, 34 og 57% frem til 2002.

Emissioner fra vejtrafik i 2002, ændringer fra 1985 til 2002, og 2002 andele af den samlede danske emissiontotal

CRF ID	CO_2 [ktons]	CH_4 [tons]	N_2O [tons]	SO_2 [tons]	NO_x [tons]	NMVOC [tons]	CO [tons]	NH_3 [tons]	TSP [tons]	PM_{10} [tons]	$PM_{2.5}$ [tons]
Vej, 2002	11389	3010	1270	358	66749	34815	283912	2386	3508	3508	3508
Vej, slidrelateret, 2002									2333	1509	819
Total Vej, 2002	11389	3010	1270	358	66749	34815	283912	2386	5841	5017	4327
Total national, 2002	54164	268320	25730	25275	200334	123763	576640	100916	33788	22112	14316
Vej-% af national, 2002	21	1	5	1	33	28	49	2	17	23	30
Vej-% ændring, 1985-2002	38	21	274	-97	-25	-57	-51	3748	-30[2]	-30[1]	-30[1]

Partikelemissionerne fra vejtrafikkens udstødning kommer næsten udelukkende fra dieselkøretøjer. De største emissionskilder er varebiler, fulgt af tunge køretøjer og personbiler. Emissionerne fra varebiler og tunge køretøjer er faldet markant siden midten af 1990'erne

[2] Kun udstødning

pga. gradvist skærpede emissionsnormer, mens den miljømæssige fordel ved at indføre dieselpersonbiler med lavere partikelemissioner siden 1990 mere eller mindre opvejes af de senere års stigende dieselpersonbilsalg.

Emissionsudviklingen for partikler fra dæk-, bremse-, og vejslid følger trafikkens generelle vækst. I forhold til vejtrafikkens samlede emissioner var TSP, PM_{10} og $PM_{2.5}$ emissionsandelene i 2002 på hhv. 40, 30 og 19%. De slidrelaterede partikelemissioner bliver mere og mere vigtige, i takt med at emissionerne fra udstødning falder år efter år.

Historisk set har benzinpersonbilernes emissionsbidrag domineret totalerne for NO_X, og specielt NMVOC og CO. Emissionerne for benzinpersonbiler er dog faldet en del i årene efter at katalysatorteknologien blev indført i 1990. En negativ sideeffekt af brugen af katalysatorer er at N_2O emissionerne er steget i samme periode. Faldet i NO-, NMVOC- og CO emissionerne forstærkes yderligere af de gradvist skærpede EURO emissionsnormer for alle andre køretøjskategorier.

Emissioner fra andre mobile kilder

Andre mobile kilders NO_X-, $PM_{2.5}$,- NMVOC-, CO-, PM_{10}-, SO_2- og TSP emissioner udgjorde i 2002 hhv. 27, 26, 19, 18, 18, 13 og 12% af landets total. I 2002 er emissionsandelen for CO_2 (og energiforbrug) på 7%, mens andelene for N_2O, NH_3 og CH_4 kun er på 1% eller mindre.

NO_X og partikelemissionerne er faldet med hhv. 15 og 13% fra´1985 til 2002. For CO_2 (og energiforbrug) er emissionsreduktionen i samme størrelsesorden, nemlig 15% (og 12% fra 1990). For N_2O falder emissionen med 16%, hvorimod CH_4 emissionen stiger med 6%. SO_2 emissionen er faldet med 74% fra 1985 til 2002 (og 77% siden 1980), mens NMVOC og CO emissionerne er steget med 32 og 6% i den samme periode.

Emissioner fra andre mobile kilder i 2002, ændringer fra 1985 til 2002, og 2002 andele af den samlede danske emissiontotal

CRF ID	CO_2 [ktons]	CH_4 [tons]	N_2O [tons]	SO_2 [tons]	NO_x [tons]	NMVOC [tons]	CO [tons]	NH_3 [tons]	TSP [tons]	PM_{10} [tons]	$PM_{2.5}$ [tons]
Militær (1A5)	89	4	4	5	416	55	317	0	20	20	20
Jernbane (1A3c)	210	9	6	7	3385	247	635	1	125	125	125
National søfart (1A3d)	554	122	29	2017	8636	11374	20018	0	604	575	547
landbrug/skovbrug/fiskeri (1A4c)	1836	121	89	1151	31005	5002	22285	3	2361	2244	2133
Civil luftfart (1A3a)	146	5	8	5	674	153	869	0	3	3	3
Industri, arbejdsredsaber (1A2f)	742	148	32	201	10668	3052	10766	2	926	881	838
Have-hushold (1A4b)	82	130	2	3	239	4162	47601	0	26	26	26
Total andre mobile, 2002	3659	539	170	3388	55024	24046	102491	6	4065	3874	3693
Total national, 2002	54164	268320	25730	25275	200334	123763	576640	100916	33788	22112	14316
Andre mobile-% af national, 2002	7	0	1	13	27	19	18	6	12	18	26
Andre mobile -% ændring 1985-2002	-15	6	-16	-74	-15	32	6	-12	-13	-13	-13

Andre mobile kilder omfatter forskellige transportformer samt arbejdsredskaber og –maskiner, de enkelte delkilders emissionsandele bliver derfor noget mindre end hele sektorens andel. Mest markant ses det at halvdelen af NO_X- og partikeludslippet i 2002 kommer fra

landbrug/skovbrug/fiskeri. Emissionsudviklingen skyldes udsving i energiforbruget (og emissioner) for fiskeri samt det konstante fald i emissionerne fra landbrugsmaskiner der bruger diesel. Den sidste kategoris emissionsfald skyldes et faldende energiforbrug fra 1990 til 2000 samt lavere emissioner fra nyt maskinel siden slutningen af 1990'erne.

Næsten halvdelen af NMVOC- og CO emissionerne kommer fra hhv. søfart og have- og hushold. For NMVOC skyldes den markante emissionsstigning en vækst i antallet af fritidsfartøjer fra 1990 til 2000, mens de store CO emissioner kommer fra benzinarbejdsredskaber.

Tungmetaller

For tungmetaller følger emissionerne udviklingen i energiforbruget. I 2002 er vejtrafikkens emissionsandele af de nationale totaler for Cu, Zn og Cr på hhv. 70, 15 og 11%, og for andre mobile kilder er Pb, Cu and Ni emissionsandelene på 28, 16 og 12%. For de øvrige komponenter er emissionsandelene på mindre end 5%.

Vejtrafikkens tungmetalemissioner er steget med 22% fra 1990 til 2002. Dog har der været et fald på 99% for Pb, pga. udfasningen af bly i benzin frem til 1994. For andre mobile kilder stiger emissionerne i samme periode med mellem 10 og 20% for de fleste komponenters vedkommende. Emissionsstigningerne på 40% for As og Ni skyldes en stigning i forbruget af tung olie, og for Pb skyldes emissionsstigningen på 71% en stigning i forbruget af flybenzin med et højt blyindhold.

PAH

PAH emissionsandelene for vejtransport og andre mobile kilder udgør 5% eller mindre af de nationale totaler i 2002.

Usikkerheder

I 2002 er CO_2 emissionerne de mest præcise, fulgt af CH_4-, SO_2-, NMVOC-, NO_X-, N_2O- og TSP estimaterne med stigende usikkerheder. Usikkerhederne er på hhv. 4, 32, 45, 46, 51, 53, 56 og 59%. I samme emissionsrækkefølge er usikkerheden på emissionsudviklingen fra 1990 til 2002 på 4, 4, 8, 6, 15, 7, 193 and 9%. For NH_3, tungmetaller og POP er 2002 emissionerne bestemt med en usikkerhed på mellem 700 og 1000%. Her er usikkerheden på 1990-2002 emissionsudviklingen signifikant lavere, men varierer dog meget fra stof til stof. De mindste og største usikkerheder er hhv. 8% for Benzo(b) flouranthene og 139% for Benzo(k) flouranthene.

1 Introduction

The Danish atmospheric emission inventories are prepared on an annual basis and the results are reported to the *UN Framework Convention on Climate Change* (UNFCCC or Climate Convention) and to the UNECE LRTAP (United Nations Economic Commission for Europe Long Range Transboundary Pollution) conventions. Furthermore, the greenhouse gas emission inventory is reported to the EU, due to the EU – as well as the individual member states – being party to the Climate Convention. The Danish atmospheric emission inventories are calculated by the Danish National Environmental Research Institute (NERI).

This report explains the Danish 1985-2002 emission inventories for road transport and other mobile sources in the sectors military, railways, navigation, fisheries, civil aviation and non-road machinery in agriculture, forestry, industry and household/gardening.

In Chapter 2 an overview is given of the Danish emissions in 2002, the UNFCCC and UNECE conventions and the Danish reduction targets. The inventory methodologies and references for road transport and other mobile sources are given in Chapter 3, while fuel use data and emission results are provided in Chapter 4 and 5, respectively. Chapters 6 and 7 explain the QA/QC procedures behind the inventories and uncertainties/time-series consistencies. In Chapter 8 the recalculations/improvements since 2002 are listed, whereas future improvements are given in Chapter 9.

2 Total Danish emissions, international conventions and reduction targets

2.1 Total Danish emissions

An overview of the Danish emission inventories for 2002 including all sectors is shown in Table 1-Table 4. The emission inventories reported to the LRTAP Convention and to the Climate Convention are organised in 6 main source categories and a number of sub categories. The emission source *1 Energy* covers combustion in stationary and mobile sources as well as fugitive emissions from the energy sector.

Links to the latest emission inventories can be found on the NERI home page: http://www2.dmu.dk/1_Viden/2_Miljoe-tilstand /3_luft/4_adaei/default_en.asp or via www.dmu.dk. Surveys of the latest inventories and the updated emission factors are also available on the NERI homepage.

Note that according to convention decisions the emissions from international transport as well as CO_2 emissions from renewable fuels are not included in the inventory emission totals. These emissions are reported as memo items and are thus estimated, but not included in the reported emissions.

Further emission data for mobile sources are provided in Chapter 5.

Table 1 Greenhouse gas emission for the year 2002 (Illerup et al. 2004a)

Pollutant	CO_2 (Gg)	CO_2 (Gg)	CH_4 (Gg)	N_2O (Gg)
1. Energy	52457		35,21	2,68
2. Industrial Processes	1595		-	2,50
3. Solvent and Other Product Use	112		-	-
4. Agriculture	-		179,24	20,55
5. Land-Use Change and Forestry	-	-3813	-	-
6. Waste	-		53,87	-
National total	54164	-3813	268,32	25,73
International transport	5019		0,11	0,26
Biomass	8454			

Table 2 Emissions 2002 reported to the LRTAP Convention (Illerup et al. 2004b)

Pollutant	NO_x Gg	CO Gg	NMVOC Gg	SO_2 Gg	TSP Mg	PM_{10} Mg	$PM_{2.5}$ Mg
1. Energy	200	577	84	25	16633	14311	12447
2. Industrial Processes	0,4	-	1	-	501	306	204
3. Solvent and Other Product Use	-	-	38	-	-	-	-
4. Agriculture	-	-	1	-	16653	7495	1665
5. Land-Use Change and Forestry	-	-	-	-	-	-	-
6. Waste	-	-	-	-	-	-	-
National total	200	577	124	25	33788	22112	14316
International transport	90	9	3	40	4461	4239	4029

Table 3 Emissions 2002 reported to the LRTAP Convention (Illerup et al. 2004b)

Pollutant	Pb Mg	Cd Mg	Hg Mg	As Mg	Cr Mg	Cu Mg	Ni Mg	Se Mg	Zn Mg
1. Energy	5,186	0,659	1,186	0,767	1,638	8,637	13,378	1,881	22,908
2. Industrial Processes	0,068	0,005	-	-	-	0,045	-	-	0,634
3. Solvent and Other Product Use	-	-	-	-	-	-	-	-	-
4. Agriculture	-	-	-	-	-	-	-	-	-
5. Land-Use Change and Forestry	-	-	-	-	-	-	-	-	-
6. Waste	-	-	-	-	-	-	-	-	-
National total	5,254	0,664	1,186	0,767	1,638	8,682	13,378	1,881	23,542
International transport	0,249	0,024	0,034	0,240	0,139	1,346	12,951	0,279	1,290

Table 4 Emissions 2002 reported to the LRTAP Convention (Illerup et al. 2004b)

Pollutant	Benzo(a)-pyrene Mg	Benzo(b)-fluoranthene Mg	Benzo(k)-fluoranthene Mg	Indeno (1,2,3-c,d)pyrene Mg	Dioxin g I-teq
1. Energy	2,894	3,872	1,329	2,127	30,291
2. Industrial Processes	-	-	-	-	1,001
3. Solvent and Other Product Use	-	-	-	-	13,250
4. Agriculture	-	-	-	-	-
5. Land-Use Change and Forestry	-	-	-	-	-
6. Waste	-	-	-	-	22,852
7. Other	-	-	-	-	10,250
Total Danish emission	2,894	3,872	1,329	2,127	77,644
International transport	0,004	0,017	0,008	0,029	0,495

2.2 International conventions and reduction targets

Denmark is a party to two international conventions with regard to emissions from road transport and other mobile sources:

- The UNECE Convention on Long Range Transboundary Air Pollution (LRTAP Convention or the Geneva Convention)
- The UN Framework Convention on Climate Change (UNFCCC). The convention is also called the Climate Convention.

The LRTAP Convention is a framework convention and has expanded to cover 8 protocols:

1. EMEP Protocol, 1984 (Geneva).

2. Protocol on Reduction of Sulphur Emissions, 1985 (Helsinki).
3. Protocol concerning the Control of Emissions of Nitrogen Oxides, 1988 (Sofia).
4. Protocol concerning the Control of Emissions of Volatile Organic Compounds, 1991 (Geneva).
5. Protocol on Further Reduction of Sulphur Emissions, 1994 (Oslo).
6. Protocol on Heavy Metals, 1988 (Aarhus).
7. Protocol on Persistent Organic Pollutants (POPs), 1998 (Aarhus).
8. Protocol to Abate Acidification, Eutrophication and Ground-level Ozone, 1999 (Gothenburg).

The reduction targets/emission ceilings included in the Gothenburg protocol are stated in Table 5.

Table 5 Danish reduction targets / emission ceiling, Gothenburg protocol

Pollutant	Reduction/emission ceiling	Reference	Comment
SO_2	55 Gg in 2010	Gothenburg protocol	The ceiling equals 218% of the 2002 emission
NO_X	127 Gg in 2010	Gothenburg protocol	The ceiling equals 63% of the 2002 emission
NMVOC	85 Gg in 2010	Gothenburg protocol	The ceiling equals 69% of the 2002 emission

The Climate Convention is a framework convention from 1992. The Kyoto protocol is a protocol to the Climate Convention.

The Kyoto protocol sets legally binding emission targets and timetables for 6 greenhouse gases: CO_2, CH_4, N_2O, HFC, PFC and SF_6. The greenhouse gas emission of each of the 6 pollutants is combined to CO_2 equivalents, which can be totalled to produce total greenhouse gas (GHG) emissions in CO_2 equivalents. Denmark is obliged to reduce the average 2008-2010 GHG emissions by 21% compared to the 1990 emission level.

EU is a party to the Climate Convention and, thereby, EU countries are obliged to submit emission data to the EU Monitoring Mechanism for CO_2 and other Greenhouse Gases.

3 Methodology and references

The Danish emission inventory is based on the CORINAIR (CORe INventory on AIR emissions) system, which is a European programme 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, prepared by the UNECE/EMEP Task Force on Emissions Inventories and Projections (EMEP/CORINAIR, 2003). Emission data are stored in an Access database, from which data are transferred to the reporting formats.

The emission inventory basis for mobile sources is fuel use 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) 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 come from the EMEP/CORINAIR Emission Inventory Guidebook, however, for railways specific Danish measurements 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 CORINAIR 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 IPCC classification codes (CRF) shown in Table 3.1 (mobile sources only).

Table 3.1 SNAP – NFR correspondence table for transport

SNAP classification	CRF codes
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

Military transport activities (land and air) refer to the CRF sector Other (1A5), while the Transport-Navigation sector (1A3d) comprises national sea transport (ship movements between two Danish ports) and small boats and pleasure crafts. The working machinery and materiel in industry is grouped in Industry-Other (1A2f), while agricultural and forestry machinery is accounted for in the Agriculture/forestry/fisheries (1A4c) sector together with fishing activities.

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

3.1 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/CORINAIR Emission Inventory Guidebook (EMEP/CORINAIR, 2003). The actual calculations are made with the European COPERT III model (Ntziachristos et al. 2000). In COPERT III fuel use 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.

3.1.1 Vehicle fleet and mileage data

Corresponding to the COPERT fleet classification all present and future vehicles in the Danish traffic 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 use and emission behaviour according to EU emission legislation levels. Table 3.2 gives an overview of the different model classes and sub-classes, whereas the layer level with implementation years are shown in Annex 1.

Table 3.2 Model vehicle classes and sub-classes, trip speeds and mileage split.

			Trip speed [km/h]			Mileage split [%]		
Vehicle classes	Fuel type	Engine size/weight	Urban	Rural	Highway	Urban	Rural	Highway
PC	Gasoline	< 1.4 l.	40	70	100	35	46	19
PC	Gasoline	1.4 – 2 l.	40	70	100	35	46	19
PC	Gasoline	> 2 l.	40	70	100	35	46	19
PC	Diesel	< 2 l.	40	70	100	35	46	19
PC	Diesel	> 2 l.	40	70	100	35	46	19
PC	LPG		40	70	100	35	46	19
PC	2-stroke		40	70	100	35	46	19
LDV	Gasoline		40	65	80	35	50	15
LDV	Diesel		40	65	80	35	50	15
Trucks	Gasoline		35	60	80	32	47	21
Trucks	Diesel	3.5 – 7.5 tonnes	35	60	80	32	47	21
Trucks	Diesel	7.5 – 16 tonnes	35	60	80	32	47	21
Trucks	Diesel	16 – 32 tonnes	35	60	80	19	45	36
Trucks	Diesel	> 32 tonnes	35	60	80	19	45	36
Urban buses	Diesel		30	50	70	51	41	8
Coaches	Diesel		35	60	80	32	47	21
Mopeds	Gasoline		30	30	-	81	19	0
Motorcycles	Gasoline	2 stroke	40	70	100	47	39	14
Motorcycles	Gasoline	< 250 cc.	40	70	100	47	39	14
Motorcycles	Gasoline	250 – 750 cc.	40	70	100	47	39	14
Motorcycles	Gasoline	> 750 cc.	40	70	100	47	39	14

Information of the vehicle stock and annual mileage is obtained from the Danish Road Directorate (Ekman, 2003). This covers data for the number of vehicles and annual mileage per first registration year for all vehicle sub-classes, and mileage split between urban, rural and highway driving and the respective average speeds.

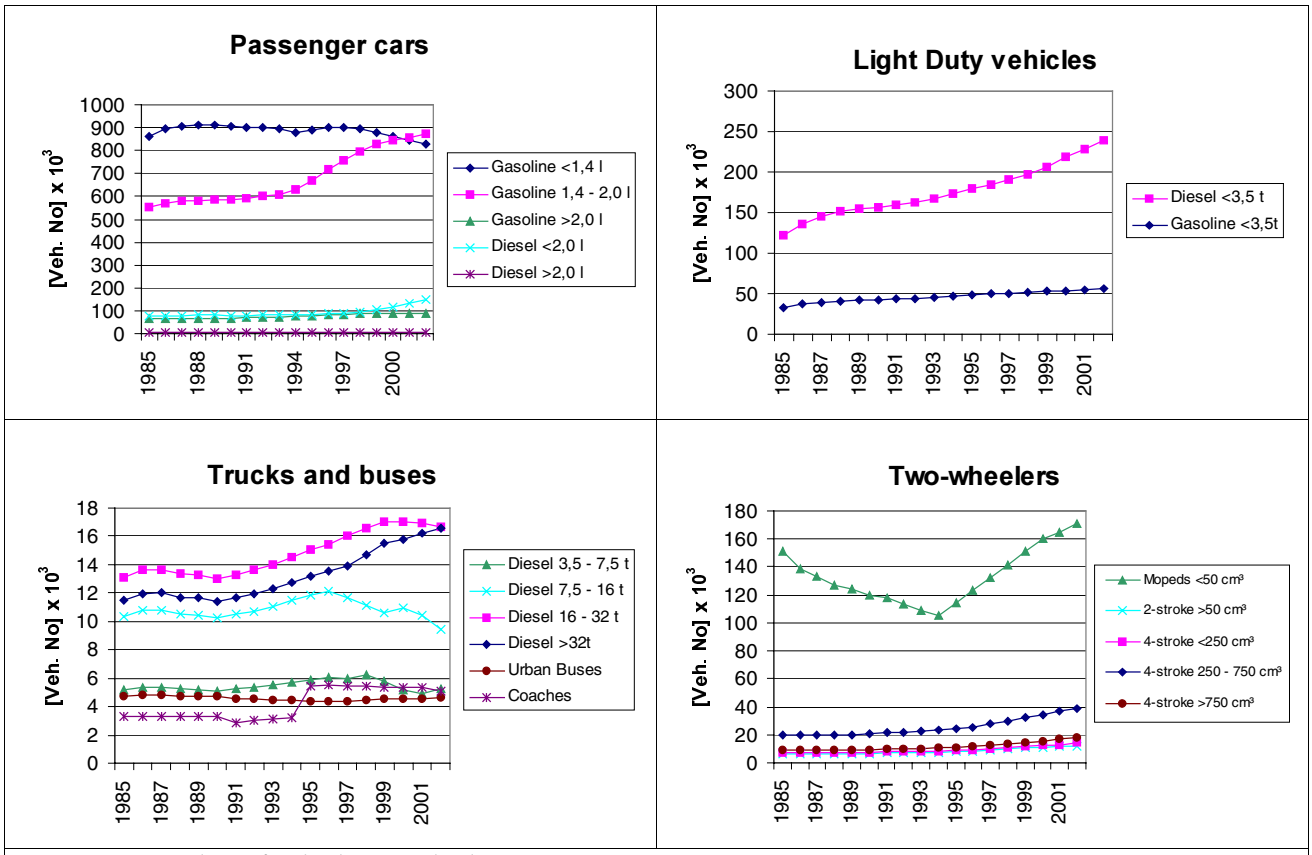

Figure 3.1 Number of vehicles in sub-classes in 1985-2002

The vehicle numbers per sub-class are shown in Figure 3.1. 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. In the later years there has been a decrease in the number of cars with engine sizes larger than 2 litres, and on the same time the number of diesel passenger cars has increased.

There has been a considerable growth in the number of diesel light duty vehicles from 1985 to 2002. The two largest truck sizes have also increased in numbers during the 1990's. From 2000 onwards this growth has continued for trucks larger than 32 tons, whereas the number of trucks with gross vehicle weights between 16 and 32 tons has decreased slightly.

The number of urban buses has been very constant from 1985 to 2002. 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 onwards is the introduction of the so-called Moped 45 vehicle type. For motorcycles the number of vehicles has grown in general throughout the entire 1985-2002 period. The increase is however most visible from the mid-1990's and onwards.

The vehicle numbers are summed up in layers for each year (Figure 3.2) by using the correspondence between layers and first registration year:

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

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

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

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

Vehicle numbers and weighted annual mileages per layer are shown in Annex 1 and 2 for 1985-2002. The trends in vehicle numbers per layer are also shown in Figure 3.2. The latter figure show how vehicles complying with the gradually stricter EU emission levels (EURO I, II, III etc.) have been introduced in the Danish motor fleet.

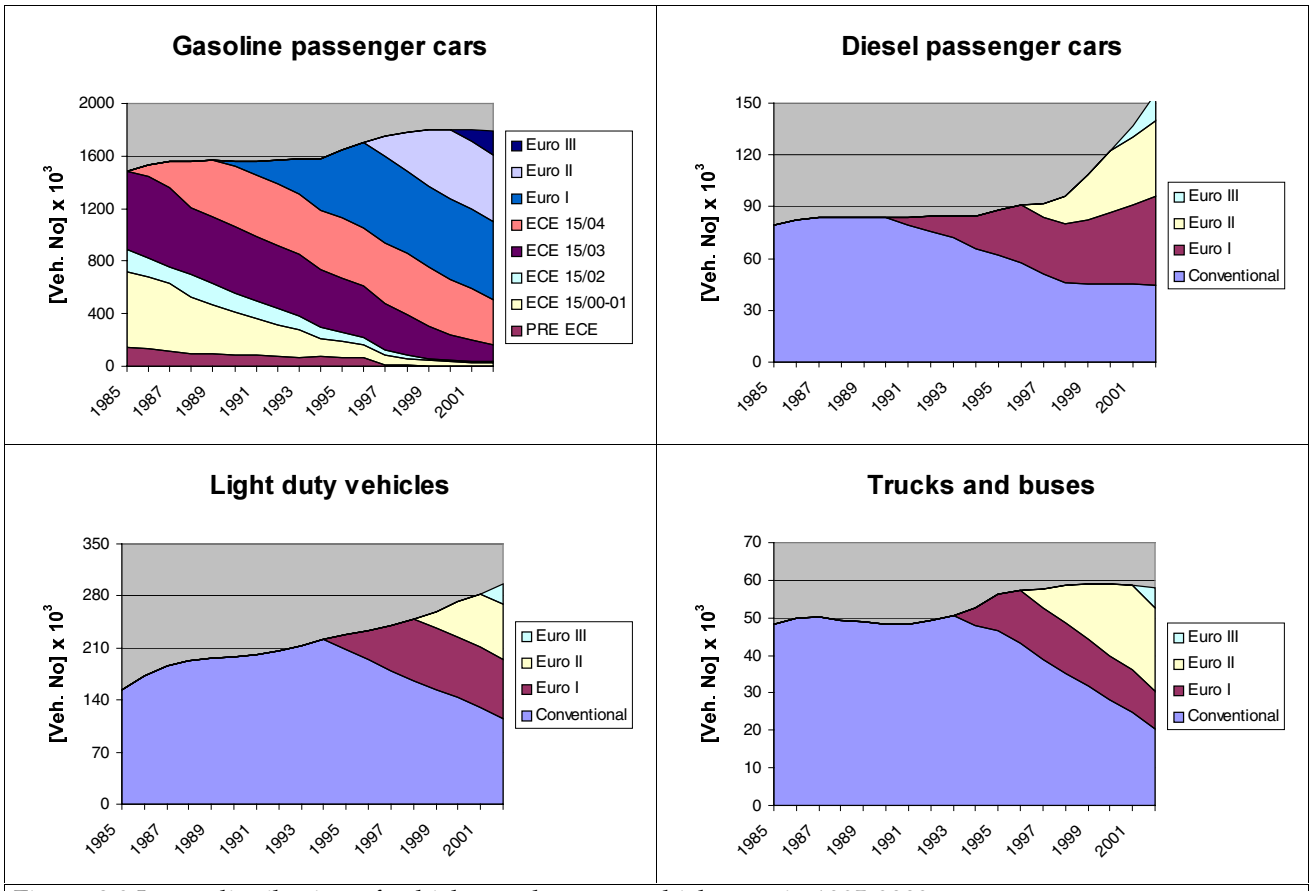

Figure 3.2 Layer distribution of vehicle numbers per vehicle type in 1985-2002

Trip speed dependent fuel use and emission factors are taken from the COPERT model using trip speeds as shown in Table 3.2. The factors are listed in Annex 3. For EU emission levels not represented by

actual data, the emission factors are scaled according to reduction factors, see Ntziachristos et al. (2000) or Illerup et al. (2003).

3.1.2 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 forecast year the deterioration factors are calculated per first registration year by using deterioration coefficients and cut-off mileages, as given in Ntziachristos et al. (2000) or Illerup et al. (2002) 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/h, respectively.

Firstly, the deterioration factors are calculated for the corresponding trip speeds of 19 and 63 km/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, U_{MAX} urban cut-off mileage.

In the case of trip speeds below 19 km/h the deterioration factor, DF, equals UDF, whereas for trip speeds exceeding 63 km/h DF=EUDF. For trip speeds between 19 and 63 km/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 the vehicle numbers and annual mileages per 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.

3.1.3 Emissions and fuel use for hot engines

Emissions and fuel use results for operationally hot engines are calculated for each year and layer and road type. The procedure is to combine fuel use and emission factors (and deterioration factors for

catalyst vehicles), number of vehicles, annual mileage numbers and their road type shares given in Table 3.2. 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 use/emission, EF = fuel use/emission factor, S = road type share, k = road type.

For catalyst vehicles the calculation becomes:

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

3.1.4 Extra emissions and fuel use for cold engines

Extra emissions of SO_2, NO_x, NMVOC, CH_4, CO, CO_2 PM and fuel consumption from cold start are simulated separately. In the COPERT III model each trip is associated with an amount of cold start emission and is assumed to take place under urban driving conditions. The number of trips is distributed evenly in months. Firstly 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. Lastly 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 and are equivalent for gasoline fuelled conventional passenger cars and vans and for diesel passenger cars and vans, respectively, see Ntziachristos et al. (2000). 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 time periods for future EURO standards. Correspondingly the β-factor for gasoline vehicles is step-wise reduced for EURO II vehicles onwards.

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.

3.1.5 Evaporative emissions from gasoline vehicles

For each year evaporative emissions of hydrocarbons are simulated in the forecast model as hot and warm running loss, hot and warm soak, and diurnal emissions. All emission types are influenced by 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 during operation. The distinction between hot and warm running loss emissions depends on the engine temperature. In the model hot and warm running loss occur for hot and cold engines, respectively. The emissions are calculated as the annual mileage – broken down on cold and hot mileage totals using the β-factor - times respective emission factors. For vehicles equipped with evaporation control (catalyst cars) the emission factors are only one tenth of the uncontrolled factors used by 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 the running loss emissions and HR and WR the hot and warm running loss emission factors, respectively.

In the model hot and warm soak emissions for carburettor vehicles also occurs 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 is the hot and warm soak emission factors, respectively. Since all catalyst vehicles are assumed to be carbon canister controlled no soak emissions are estimated for this vehicle type. Average maximum and minimum temperatures per month are used in combination with diurnal emission factors to estimate the diurnal emissions from uncontrolled vehicles $E^d(U)$:

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

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

3.1.6 Fuel use balance

The calculated fuel use in COPERT III must equal the statistical fuel sale totals from the Danish Energy Authority (DEA, 2003) according to the UNFCCC and UNECE emissions reporting format. 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.

Table 3.3 COPERT III:DEA statistics fuel use ratios and mileage adjustment factors for the Danish 1985-2002 road transport inventories.

Description	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
COPERT III:DEA Gasoline (sales)	0,89	0,88	0,87	0,88	0,86	0,91	0,95	0,99	1,02	1,03	0,98	0,97	0,95	0,95	0,92	0,92	0,84	0,94
COPERT III:DEA Diesel (sales)	0,67	0,63	0,65	0,65	0,63	0,60	0,58	0,60	0,60	0,57	0,60	0,60	0,60	0,61	0,63	0,65	0,67	0,68
COPERT III:DEA Gasoline (cons.)	1,07	1,07	1,05	1,01	1,00	0,99	1,01	1,00	0,99	1,00	1,02	1,02	1,04	1,04	1,06	1,07	1,15	1,04
COPERT III:DEA Diesel (cons.)	0,67	0,65	0,67	0,67	0,65	0,61	0,60	0,61	0,61	0,59	0,62	0,62	0,62	0,63	0,64	0,66	0,72	0,75
Gasoline mileage factor (sales)	1,12	1,14	1,15	1,13	1,16	1,10	1,06	1,01	0,98	0,97	1,02	1,03	1,05	1,05	1,09	1,09	1,19	1,07
Diesel mileage factor (sales)	1,58	1,70	1,64	1,64	1,71	1,81	1,87	1,81	1,80	1,89	1,80	1,81	1,80	1,78	1,74	1,67	1,63	1,63
Gasoline mileage factor (cons.)	0,93	0,94	0,95	0,99	1,00	1,01	0,99	1,00	1,01	1,00	0,98	0,98	0,96	0,96	0,95	0,94	0,87	0,96
Diesel mileage factor (cons.)	1,58	1,63	1,58	1,58	1,65	1,75	1,81	1,76	1,76	1,84	1,74	1,75	1,74	1,73	1,69	1,65	1,50	1,44

In Table 3.3 the COPERT III:DEA gasoline and diesel fuel use ratios are shown for fuel sales and fuel consumption. The latter figures are related to the traffic on Danish roads. As previously mentioned the fuel sale figures underpin the national emission estimates, due to convention definitions.

For gasoline vehicles all mileage numbers are equally scaled in order to obtain gasoline fuel equilibrium, and hence the gasoline mileage factor used is the reciprocal value of the COPERT III:DEA gasoline fuel use ratio.

For diesel the fuel balance is made by adjusting the mileage for light and heavy-duty vehicles and buses, given that the mileage and fuel consumption factors for these vehicles are regarded as the most uncertain parameters in the diesel engine emission simulations. Consequently, the diesel mileage factor used is slightly higher than the reciprocal value of the COPERT III:DEA diesel fuel use ratio.

From Table 3.3 it appears that the inventory fuel balances for gasoline and diesel would be improved, if the DEA statistical figures for fuel consumption were used instead of fuel sale numbers. The fuel difference for diesel is however still significant. The reason for this inaccuracy must be a combination of COPERT III fuel use factors, allocation of vehicle numbers in sub-categories, annual mileage, trip speeds and mileage splits for urban, rural and highway driving conditions.

For future inventories it is intended to use improved fleet and mileage data from the Danish vehicle inspection programme (performed by the Danish motor vehicle inspection office). The update of road traffic fleet and mileage data will be made as soon as this information is provided from the Danish Ministry of Transport in a COPERT model input format. In addition, a new version of the COPERT model – COPERT IV - will be available in 2005. The scientific basis for the new model version is the work on emission models and measurements performed in the EU 5th framework programme.

The final fuel use and emission factors are shown in Annex 4 for 1990-2002. The total fuel use and emissions are shown in Annex 5 per vehicle category and as grand totals for 1990-2002, for other components than non-exhaust particles, heavy metals and PAH. In Annex 7 fuel use and emission factors and total emissions are given in CollectER format for 1990 and 2002, while the emission factors and total

emissions for heavy-metals and PAH are shown in Annex 9 and 10, respectively.

3.1.7 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 2000-2002 as prescribed by the UNECE convention reporting format. The emissions are calculated by multiplying the total annual mileage per vehicle category with the correspondent average emission factors for each source type. The calculation procedure is consistent with the COPERT III model approach used to estimate the Danish national emissions coming from exhaust. A more thorough explanation of the calculations is given by Winther (2004), and emission factors are taken from EMEP/CORINAIR (2003). The emission factors and total emissions for 2002 are shown in Annex 8.

3.2 Methodologies and references for other mobile sources

The other mobile sources are divided into several sub-sectors; sea transport, fishery, air traffic, railways, military and the 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/CORINAIR Emission Inventory Guidebook (EMEP/CORINAIR, 2003) for air traffic and off road working machinery and equipment, while for the remaining sectors the simple method is used.

3.2.1 Activity data

Air traffic

The activity data for air traffic consist of air traffic statistics provided by the Danish Civil Aviation Agency (CAA-DK) and Copenhagen Airport. For 2001 onwards records are given per flight by CAA-DK as data for aircraft type and origin and destination airports. Prior to 2001 detailed LTO/aircraft type statistics are provided by Copenhagen Airport (for this airport only), while CAA-DK has given information of total take off numbers for other Danish airports. Fuel statistics for jet fuel use and aviation gasoline are obtained from the Danish energy statistics (DEA, 2003).

Prior to emission calculations the aircraft types are grouped into a smaller number of representative aircraft for which fuel use and emission data exist in the EMEP/CORINAIR databank. In this procedure the actual aircraft types are classified according to their overall aircraft type (jets, turbo props, helicopters and piston engine). Secondly, information on the aircraft MTOM (Maximum Take Off Mass) and number of engines are used to append a representative aircraft to the aircraft type in question.

The list of representative aircraft types behind the present inventory can be seen in Winther (2001). In next year's inventory a number of new turbo prop types will be included in the list and a more thor-

ough documentation of the emission calculations for aviation will be given in the sector report for 2003.

Non-road working machinery and equipment

For non-road working machinery and equipment used in agriculture, forestry, industry, household/gardening and inland waterways (small boats and pleasure crafts), the number of different types of machines, their load factors, engine sizes and annual working hours are taken from a national 1990 survey reported by Dansk Teknologisk Institut (1992 and 1993). All activity data can be seen in Annex 7.

The amount of fuel sold for non-road machinery and small boats/pleasure crafts cannot be derived explicitly from national fuel sale statistics and hence it is necessary to make a bottom-up estimate of the fuel used. In this way the fuel use for diesel, gasoline and LPG is calculated for 1990 using the 1990 activity data and EMEP/CORINAIR fuel use factors. The latter factors are shown in Annex 6. Equation 13 explains the calculation procedure:

$$F = N \cdot HRS \cdot HP \cdot LF \cdot FC \quad (13)$$

Where F = fuel use, N = number of engines, HRS = annual working hours, HP = average rated engine size in kW, LF = load factor and FC = fuel use factor in g kWh-1.

The total fuel use per fuel type is calculated as the sum of fuel use for all engines.

The results from a national 2000 survey funded by the Danish EPA is used to make a fuel use estimate per fuel type for non-road machinery in this year (Bak et al., 2003). The assumptions have been set in agreement with experts from the Danish Energy Authority and the Technological Institute of Denmark, see Winther (2004). For the years prior to 1990 and after 2000, respectively, the fuel use estimates for 1990 and 2000 are used. By interpolation the two latter figures are also used to make estimates for the years in between.

Table 3.3 Fuel use estimates for non-road in 1990 and 2000

	1990 (TJ)	2000 (TJ)
Diesel, non-road	26575	24580
Gasoline, non-road	1911	1797
LPG, non-road	1251	1499
Inland waterways, diesel	371	1002
Inland waterways, gasoline	545	902

In order to ensure that the same total fuel amount is behind the Danish emission inventories and the reported fuel sale figures by DEA some decisions have to be made as regards fuel allocation on subsectoral levels (Winther, 2004).

For diesel and LPG, the non-road fuel use is partly covered by the fuel use amounts in the 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 use total. In addition a small fuel amount 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 small boats and pleasure crafts the calculated fuel use totals are subsequently subtracted from the DEA fishery (diesel) and road transport (gasoline) sectors.

Other sectors

The activity data for military, railways, sea transport and fishery consist of fuel use information from DEA (2003). For sea transport the basis is fuel sold in Danish ports and depending on the destination of the vessels in question the traffic is defined as either national or international as prescribed by the IPCC guidelines.

For all sectors fuel use figures are given in Annex 7 for the years 1990 and 2002 in CollectER format.

3.2.2 Emission factors

For military ground material aggregated emission factors for gasoline and diesel are derived from the road traffic emission simulations made with the COPERT model. For railways specific Danish measurements from the Danish State Railways (Næraa, 2004) are used. The emission factors for the remaining sectors come from the EMEP/CORINAIR guidebook, see CORINAIR (2003). For all sectors emission factors are given in CollectER format in Annex 7 for the years 1990 and 2002, for other components than heavy metals and PAH, while the emission factors for heavy metals and PAH's are shown in annex 9 and 10, respectively.

3.2.3 Calculation method

Air traffic

For aviation the estimates are made separately for Landing and Take Offs (LTOs < 3000 ft) and cruise (> 3000 ft). From 2001 the estimates are made on a city-pair level by combining activity data and emission factors and subsequently group the emission results into domestic and international totals. 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 the cruise fuel use and emissions in the model according to the domestic and international cruise fuel shares.

Prior to 2001 the calculation scheme is firstly to estimate each year's fuel use and emissions for LTO. Secondly, the total cruise fuel use is found year by year as the statistical fuel use total minus the calculated fuel use for LTO. Lastly, the cruise fuel use is split into domestic and international parts 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).

A more thorough documentation of the emission calculations for civil aviation will be given in next year's sector report for the 2003 inventory.

Non-road working machinery and equipment

The emissions from non-road working machinery and equipment are calculated by combining information from the number of different machine types and their respective load factors, engine sizes, annual working hours and emission factors. For gasoline and LPG no emission directives have currently come into force and the emission calculations are carried out using formula 14:

$$E = N \cdot HRS \cdot HP \cdot LF \cdot EF \quad (14)$$

Where F = fuel use, N = number of engines, HRS = annual working hours, HP = average rated engine size in kW, LF = load factor and FC = emission factor in g kWh-1.

For diesel the simulations take into account the implementation of a two stage emission legislation directive for NO_X, VOC, CO and TSP depending on engine size. Stage I and II of the directive becomes effective for new machinery in use in 1999-2001 and 1999-2003 respectively.

In a specific year the weighted emission factors for each equipment type rely on the fractions of conventional, Stage I and Stage II engine technologies in use. Due to lack of data it is assumed that all engines in a specific group have the same lifetime period.

If for a certain inventory year the lifetime period predicates the existence of conventional, Stage I and Stage II engine technologies in the machinery stock, new sales of Stage II technology in a $X_{\text{Stage II}}$ year period forms the newest part of the stock. Before that, in a period of $X_{\text{Stage I}}$ years, new sales of Stage I technology took place, and the remaining conventional types was sold in a X_{Conv} year period. The sum of the three periods gives the lifetime period, and the aggregated emission factor then becomes:

$$EF = \frac{(X_{Conv} \cdot EF_{Conv} + X_{StageI} \cdot EF_{StageI} + X_{StageII} \cdot EF_{StageII})}{LT} \quad (15)$$

Where EF = emission factor in g kWh-1, X = number of years with new sales of one technology and LT = lifetime.

In specific cases where inventory years are before Stage I or Stage II implementation years, no contributions from the latter technologies goes into equation 15. The emissions are calculated by inserting (15) into (14).

Other sectors

For military, railways, national sea traffic and fishing the emissions are estimated with the simple method using fuel-related emission factors and fuel use from the DEA:

$$E = FC \cdot EF \quad (16)$$

Where E = emission, FC = fuel consumption, EF = emission factor.

The calculated emissions for other mobile sources are shown per sector in Annex 8 for the years 1990 and 2002.

3.3 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 in the Faroe Islands the jet fuel sold is treated as domestic. This decision becomes sensible since in the real world almost no fuel is bunkered in Greenland/Faroe Islands by other flights 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 Greenland all marine fuel sales are treated as domestic. In the Faroe Islands the 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).

To comply with the IPCC classification rules the fuel used by vessels sailing to Greenland and the Faroe Islands should be a part of the domestic total. To improve the fuel data quality for Greenland and the Faroe Islands the fuel sales should be examined by vessel destination and IPCC classifications made, subsequently.

Conclusively the domestic/international fuel split (and associated emissions) for navigation is not determined with the same precision as for aviation. It is, however, considered that the potential of incorrectly allocated fuel quantities is only a small part of the total fuel sold for navigation purposes in the Kingdom of Denmark.

4 Fuel consumption

Table 4.1 Fuel use (PJ) for domestic transport in 2002 in CRF sectors

CRF ID	Fuel use (PJ)
Agriculture/forestry/fisheries (1A4c)	25
Civil Aviation (1A3a)	2
Industry-Other (1A2f)	10
Navigation (1A3d)	7
Other (1A5)	1
Railways (1A3c)	3
Residential (1A4b)	1
Road (1A3b)	155
Total	205

In Table 4.1 the fuel use for domestic transport based on DEA statistics is shown for 2002 in CRF sectors. The fuel use figures in time-series 1990-2002 are given in Annex 11 (CRF format) and are shown for 1990 and 2002 in Annex 7 (CollectER format). Road transport has a major share of the fuel consumption for domestic transport. In 2002 this sector's fuel use share is 76%, while the fuel use shares for agriculture/forestry/fisheries and Industry-Other are 12 and 5%, respectively. For the remaining sectors the total fuel use share is 7%.

From 1985 to 2002 the diesel and gasoline fuel uses have increased with 20 and 29%, respectively, and in 2002 the fuel use shares for diesel and gasoline were 55 and 42% (figures 4.1 and 4.2). Other fuels only have a 3% share of the domestic transport total, composed of 1% for each of the fuel types: jet fuel, LPG and residual oil. Gasoline is almost solely used by road transportation vehicles. Gardening machinery and private boats and pleasure crafts are merely small consumers. As regards diesel, there is a considerable fuel use in most of the domestic transport categories, whereas a more limited use of residual oil and jet fuel, respectively is taking place in the fisheries/navigation sectors and by aviation (civil and military flights).

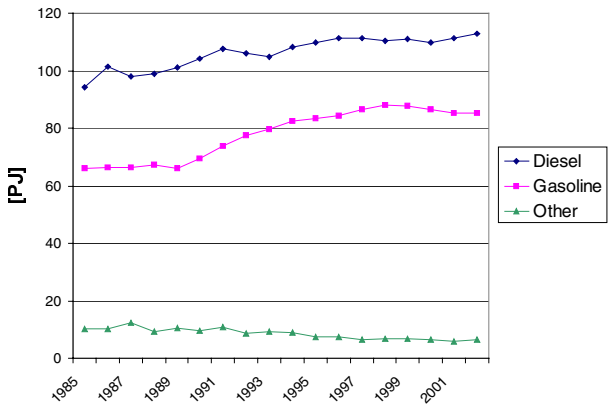

Figure 4.1 Fuel consumption per fuel type for domestic transport 1985-2000

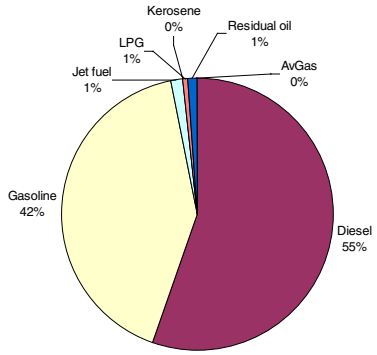

Figure 4.2 Fuel use share per fuel type for domestic transport in 2002

4.1 Road transport

In total the energy use for road transport has increased until 2000. After that stagnation in the total energy use is seen. As shown in the figures 4.3-4.5, the overall fuel use development in the recent years is characterised by an increasing fuel use for diesel passenger cars and light duty vehicles, and a fuel use decrease for gasoline passenger cars and diesel trucks and buses (heavy-duty vehicles). Passenger cars is the most fuel consuming vehicle category followed by heavy-duty vehicles, light duty vehicles and 2-wheelers in decreasing order. In 2002 the fuel use shares for gasoline passenger cars, heavy-duty vehicles, diesel light duty vehicles, diesel passenger cars and gasoline light duty vehicles were 50, 24, 15, 8 and 2%, respectively (Figure 4.6).

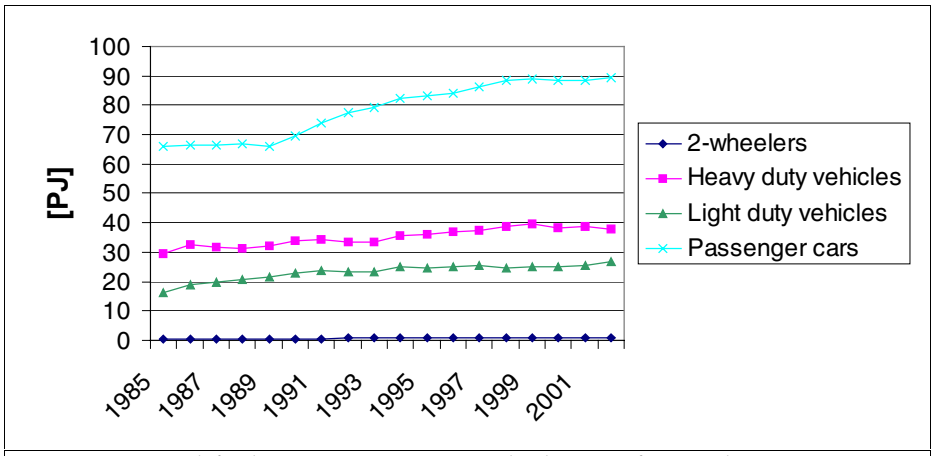

Figure 4.3 Total fuel consumption per vehicle type for road transport 1985-2002

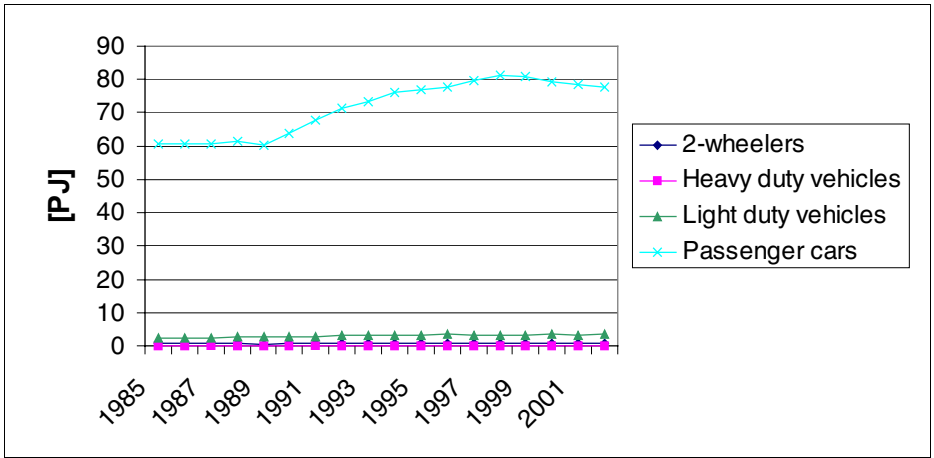

Figure 4.4 Gasoline fuel consumption per vehicle type for road transport 1985-2002

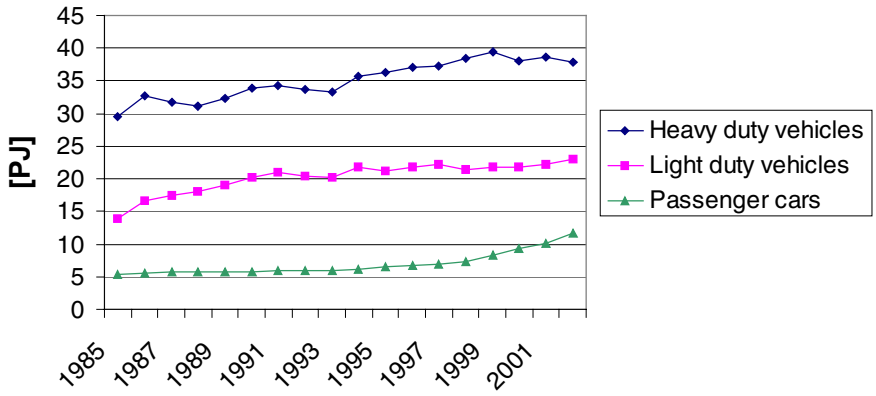

Figure 4.5 Diesel fuel consumption per vehicle type for road transport 1985-2002

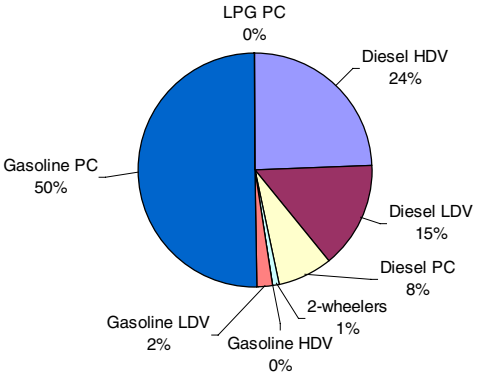

Figure 4.6 Fuel use share (PJ) per vehicle type for road transport in 2002

4.2 Other mobile sources

As explained in paragraph 3.2.1 it must be noted that the fuel use 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, since DEA statistical figures do not directly provide fuel use information for working equipment and machinery.

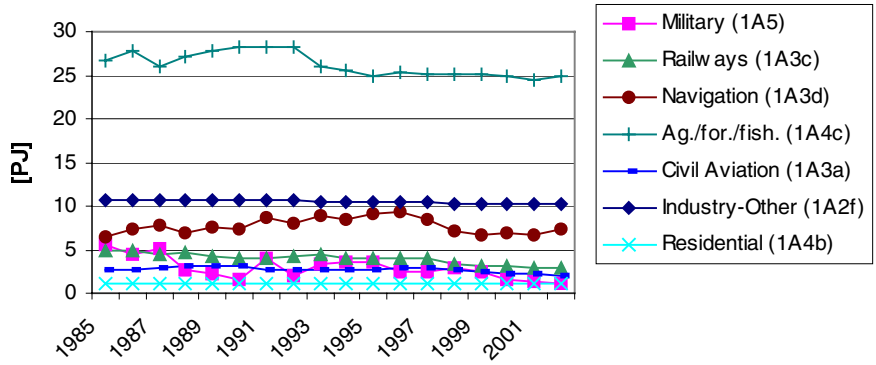

Figure 4.7 Total fuel use in CRF sectors for other mobile sources 1985-2002

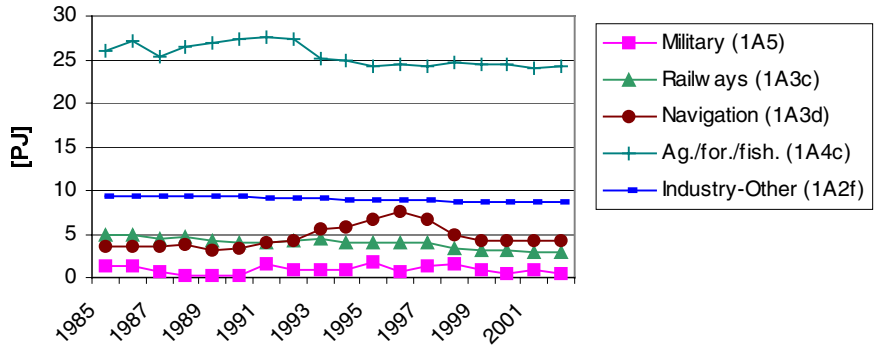

Figure 4.8 Diesel fuel use in CRF sectors for other mobile sources 1985-2002

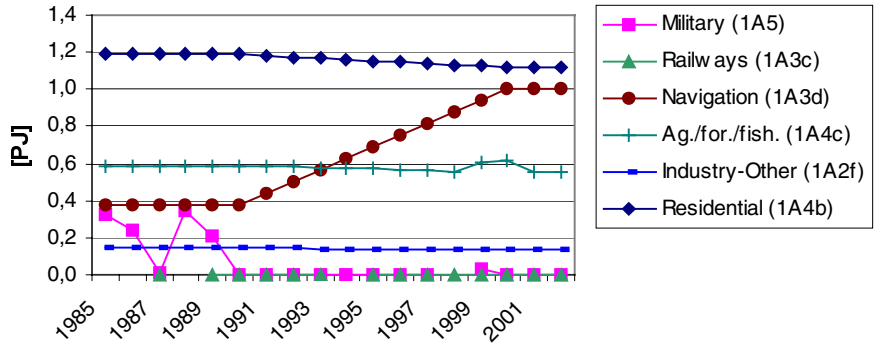

Figure 4.9 Gasoline fuel use in CRF sectors for other mobile sources 1985-2002

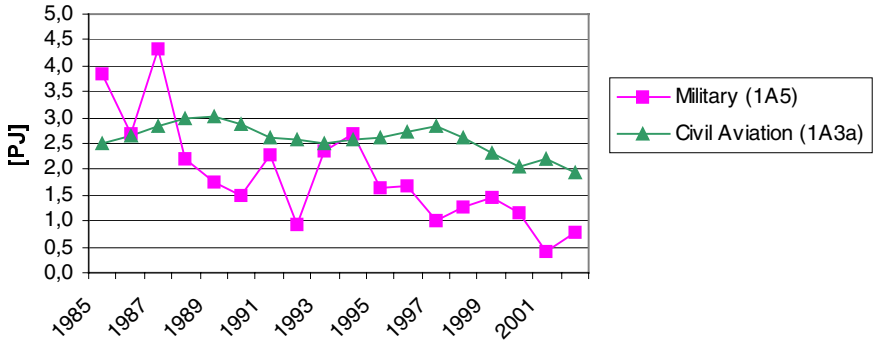

Figure 4.10 Jet fuel use in CRF sectors for other mobile sources 1985-2002

Except for small boats and pleasure crafts (inland waterways) the fuel use has made a slight decrease from 1990 to 2000 in the above mentioned sectors. Classified according to CRF the most important sectors are agriculture/forestry/fisheries (1A4c), industry-other (mobile machinery part of 1A2f) and navigation (1A3d), as seen in Figure 4.7. Minor fuel consuming sectors are civil aviation (1A3a), railways (1A3c), Other (military mobile fuel use: 1A5) and residential (1A4b). The 1985-2002 time series are shown per fuel type in the figures 4.8-4.10 for diesel, gasoline and jet fuel, respectively.

In the agriculture/forestry/fisheries sector the diesel fuel use by agricultural machines accounts for two thirds of the total fuel use. The fuel use decrease is the result of fluctuations in the diesel fuel use for fishery and the steady fuel use decrease for agricultural machines between 1990 and 2000.

The navigation sector comprises national sea transport (fuel use between two Danish ports) and small boats and pleasure crafts. For the latter categories the fuel use has increased significantly from 1990 to 2000 due to more gasoline and diesel fuelled private boats. For national sea transport the diesel fuel use has shown some fluctuations in the same time period and the amount of fuel used is actually lower in 2002 than in 1990. The most important explanation for this fuel use decrease is the shut down of ferry service connections in connection with the opening of the Great Belt link in 1997.

The considerable year by year variations in military jet fuel use is due to planning and budget-wise reasons and the passing demand for flying activities. Consequently, for some years a certain degree of jet fuel stock building might disturb the real picture of aircraft fuel use. Civil aviation has decreased since the building of the Great Belt Bridge, both in terms of number of flights and total jet fuel use. For railways the gradual shift towards electrification explains the lowering trend in diesel fuel use and emissions for this transport sector. The fuel used (and associated emissions) to produce electricity is accounted for in the stationary source part of the Danish inventories.

4.3 Bunkers

The residual oil and diesel oil fuel use 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 use 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.

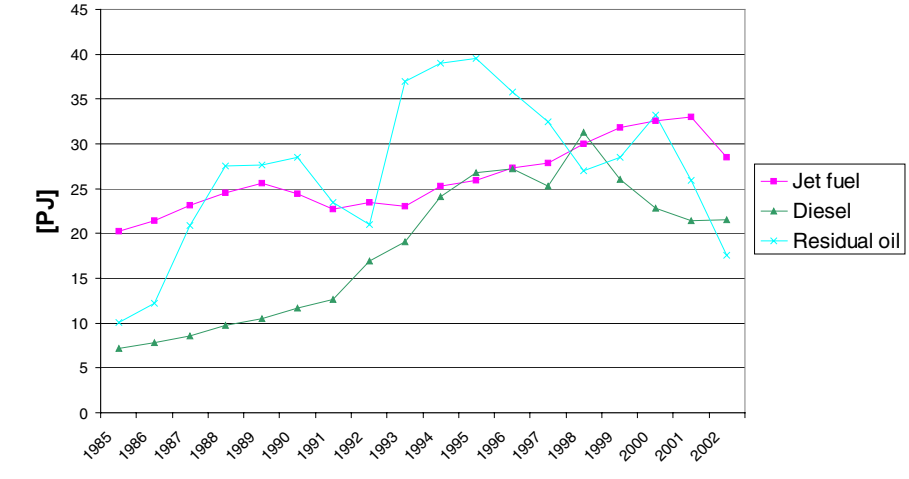

Figure 4.11 Bunker fuel use 1985-2002

5 Emissions

5.1 CO_2, CH_4 and N_2O

In Table 5.1 the CO_2, CH_4 and N_2O emissions for road transport and other mobile sources is shown for 2002 in CRF sectors. The emission figures in time-series 1985-2002 are given in Annex 11 (CRF format) and are shown for 1990 and 2002 in Annex 7 (CollectER format).

The road transport shares of national totals for CO_2, CH_4 and N_2O are 21, 1 and 5%, respectively in 2002. From 1985 to 2002 the CO_2, CH_4 and N_2O emissions have increased with 38, 21 and 274%, respectively, whereas the 1990-2002 emission increases are 22, 15 and 233%, respectively (from Figures 5.1-5.3). For other mobile sources the 2002 emission shares are 7% for CO_2 and less than 1% for CH_4 and N_2O. The other mobile CO_2 emissions have decreased with 15 and 12% from 1985 and 1990, respectively, to 2002 (from Figures 5.5-5.7).

Table 5.1 Emissions of CO_2, CH_4 and N_2O in 2002 for road transport and other mobile sources, and shares of national emission totals

CRF Sector	CH_4 [tons]	N_2O [tons]	CO_2 [ktons]	CH_4 % of national total	CO_2	N_2O
Military (1A5)	4	4	89	0	0	0
Railways (1A3c)	9	6	210	0	0	0
Navigation (1A3d)	122	29	554	0	1	0
Ag./for./fish. (1A4c)	121	89	1836	0	3	0
Civil Aviation (1A3a)	5	8	146	0	0	0
Industry-Other (1A2f)	148	32	742	0	1	0
Residential (1A4b)	130	2	82	0	0	0
Total other mobile	539	170	3659	0	7	1
Road (1A3b)	3010	1270	11389	1	21	5
Total mobile	3549	1440	15048	1	28	6
Total national	268320	25730	54164	100	100	100

Road transport

The CO_2 emissions are directly fuel use dependent and in this way the emission development reflects the trend in fuel use. As shown in Figure 5.1, the most important emission source for road transport is passenger cars followed by heavy-duty vehicles, light duty vehicles and 2-wheelers in decreasing order. In 2002 the respective emission shares were 57, 25, 17 and 1% (Figure 5.4).

The majority of the CH_4 emissions from road transport come from gasoline passenger cars (Figure 5.2.). The emission increase from 1990 to 1996 for this vehicle category is a result of the somewhat higher emission factors for EURO I gasoline cars (introduced in 1990) than the ones for conventional gasoline cars. The emission drop from 1997 onwards is explained by the penetration of EURO II and III catalyst cars (1997 and 2001) into the Danish traffic. The newer technology stages have lower CH_4 emission factors than conventional gasoline vehicles. The 2002 emission shares for CH_4 was 83, 8, 5 and 4% for

passenger cars, heavy-duty vehicles, 2-wheelers and light duty vehicles, respectively (Figure 5.4).

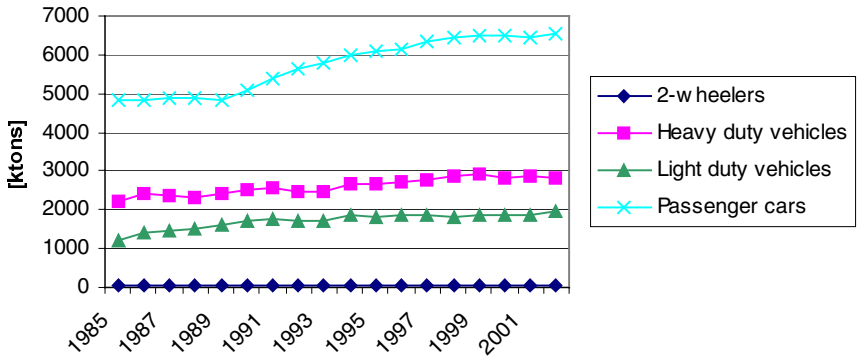

Figure 5.1 CO_2 emissions (ktons) per vehicle type for road transport 1985-2002

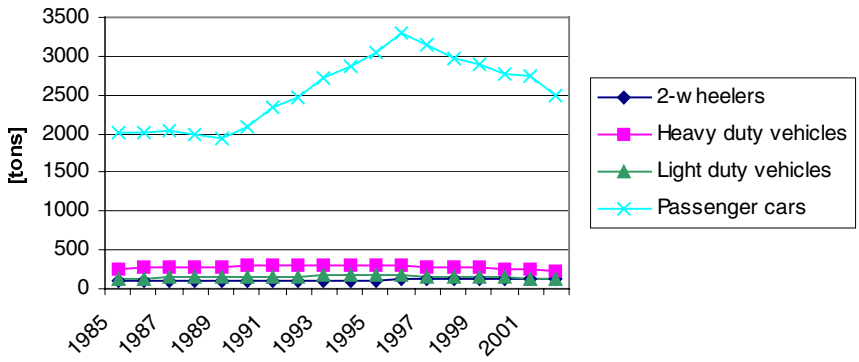

Figure 5.2 CH_4 emissions (tons) per vehicle type for road transport 1985-2002

An undesirable environmental side effect of the introduction of catalyst cars is the increase in the emissions of N_2O from 1990 onwards (Figure 5.3.). However, the total road transport N_2O and CH_4 emission contributions are still small compared to the emissions from the agricultural sector. In 2002 the emission shares for passenger cars, light and heavy-duty vehicles were 80, 12, 8%, respectively, of total road transport N_2O (Figure 5.4).

Referring to the second IPCC assessment report (IPCC, 1995) 1 g CH_4 and 1 g N_2O has the greenhouse effect of 21 and 310 g CO_2, respectively. In spite of the relatively large CH_4 and N_2O global warming potentials, the largest contribution to the total CO_2 emission equivalents for road transport comes from CO_2, and the CO_2 emission equivalent shares per vehicle category are almost the same as for CO_2.

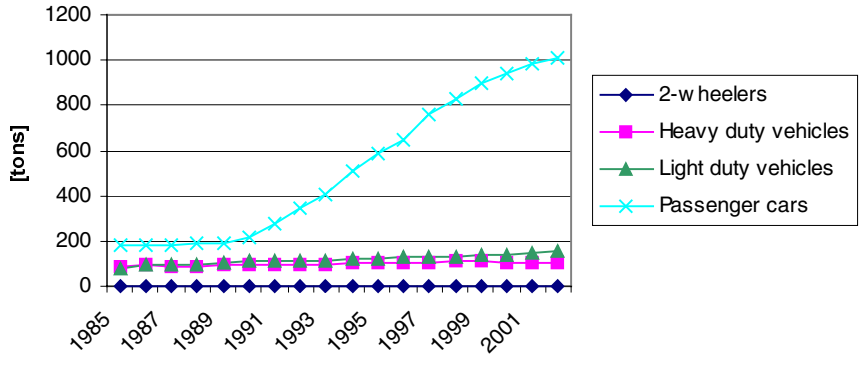

Figure 5.3 N_2O emissions (tons) per vehicle type for road transport 1985-2002

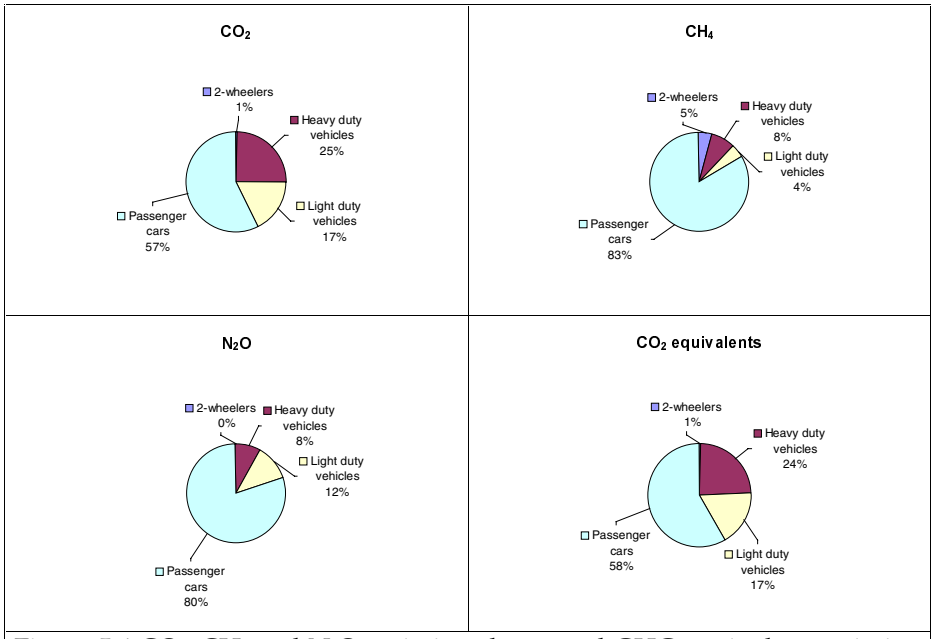

Figure 5.4 CO_2, CH_4 and N_2O emission shares and GHG equivalent emission distribution for road transport in 2002

Other mobile sources

For other mobile sources the biggest CO_2 emissions come from agriculture/forestry/fisheries (1A4c), industry-other (1A2f), navigation (1A3d), with shares of 51, 20 and 15%, respectively in 2002 (Figure 5.8). The 1985-2002 emission trend is directly related to the fuel use development in the same time period (Figure 5.5). Minor CO_2 emission contributors are sectors such as civil aviation (1A3a), railways (1A3c), military (1A5) and residential (1A4b). In 2002 their CO_2 emission shares were 6, 4, 2 and 2%, respectively (Figure 5.8).

For CH_4 the most important sectors are industry (1A2f), residential (1A4b), agriculture/forestry/fisheries (1A4c) and navigation (1A3d), with almost equal shares of 27, 24, 23 and 22% in 2002 (Figure 5.8). The remaining emissions come from the minor sources railways (1A3c), civil aviation (1A3a) and military (1A5).

The reasons for high CH_4 emissions in the two most emitting sectors are the use of LPG trucks in industry and the relatively large amount

of gasoline used in the residential sector. Also the appearance of more gasoline fuelled private boats in navigation has caused a significant increase in the emissions from this sector from 1990 to 2000 (Figure 5.6).

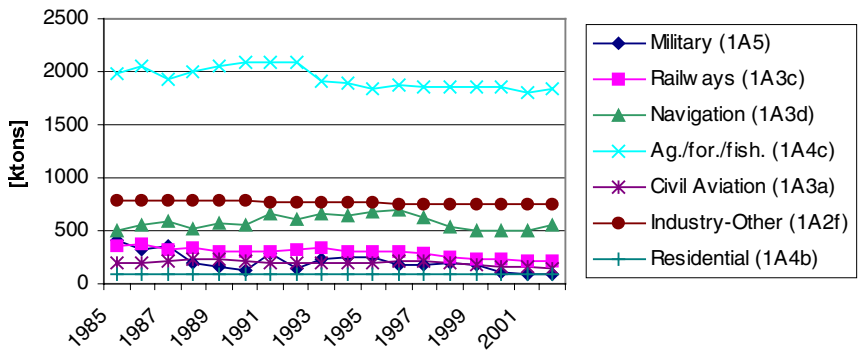

Figure 5.5 CO_2 emissions (ktons) in CRF sectors for other mobile sources 1985-2002

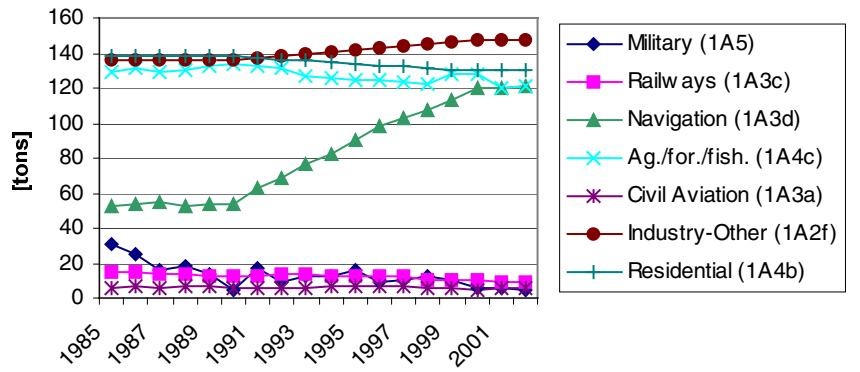

Figure 5.6 CH_4 emissions (tons) in CRF sectors for other mobile sources 1985-2002

For N_2O the emission trend in sub-sectors is the same as for fuel use and CO_2 emissions (Figure 5.7).

As for road transport, CO_2 alone brings far the most of the CO_2 emission equivalents for other mobile sources and the sectoral CO_2 emission equivalent shares are almost the same as for CO_2 (Figure 5.8).

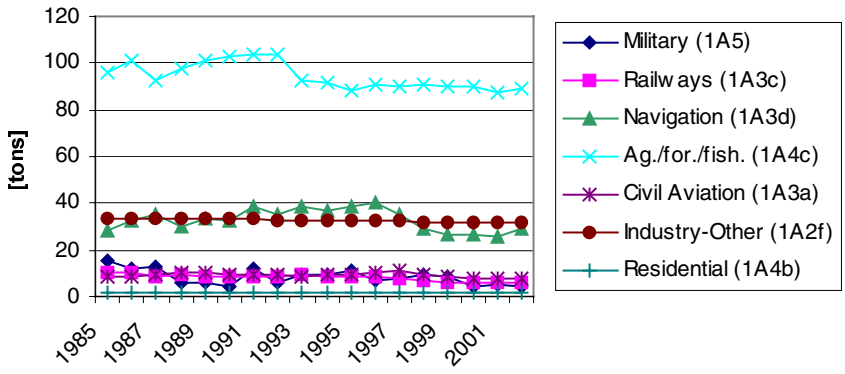

Figure 5.7 N_2O emissions (tons) in CRF sectors for other mobile sources 1985-2002

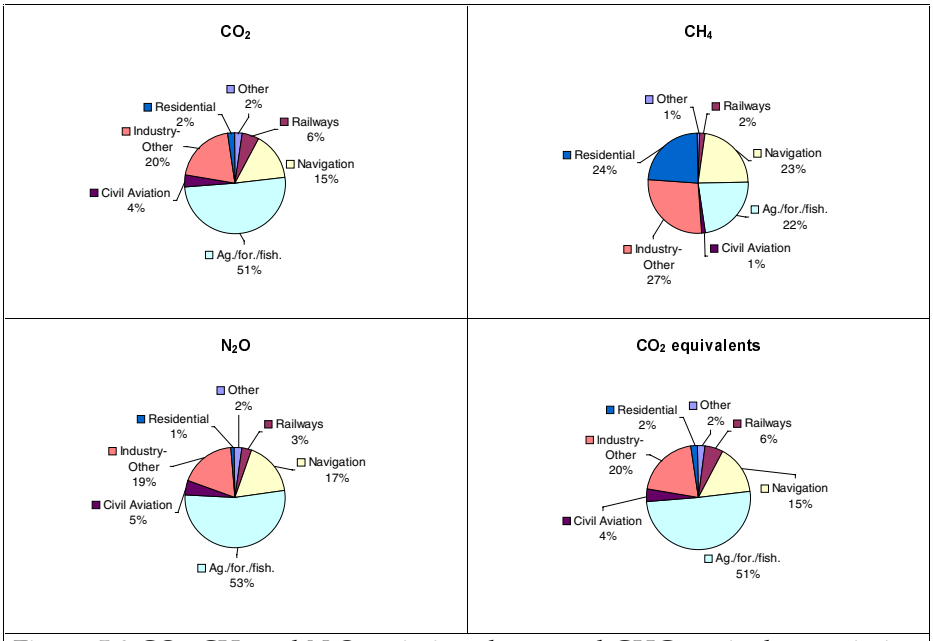

Figure 5.8 CO_2, CH_4 and N_2O emission shares and GHG equivalent emission distribution for other mobile sources in 2002

5.2 SO_2, NO_X, NMVOC, CO and NH_3

In Table 5.2 the SO_2, NO_X, NMVOC, CO and NH_3 emissions for road transport and other mobile sources are shown for 2002 in CRF sectors. The emission figures in time-series 1985-2002 are given in Annex 11 (CRF format) and are shown for 1990 and 2002 in Annex 7 (CollectER format).

The road transport emission shares of national totals for CO, NO_X and NMVOC are 49, 33 and 28%, respectively, in 2002, and for NH_3 and SO_2 the shares are 2 and 1%, respectively. From 1985 to 2002 the NMVOC, CO and NO_X emissions have decreased by 57, 51, 25%, respectively (from Figures 5.10-5.12). The highest CO, NO_X and NMVOC emissions occur in 1991, after which the emissions drop by 41, 34 and 57%, respectively, until 2002.

The other mobile emission shares for NO_x, NMVOC, CO, SO_2 and NH_3 are 27, 19, 18, 13 and 0%, respectively in 2002. From 1985 to 2002 the emissions of NO_x has decreased by 15% and for SO_2 the emission drop is as much as 74%. (77% since 1980). In the same period the emissions of NMVOC and CO has increased by 32 and 6% (from Figures 5.14-5.17).

Table 5.2 Emissions of SO_2, NO_x, NMVOC, CO and NH_3 in 2002 for road transport and other mobile sources, and shares of national emission totals

CRF ID	SO_2	NO_x	NMVOC	CO	NH_3	SO_2	NO_x	NMVOC	CO	NH_3
	[tons]	[tons]	[tons]	[tons]	[tons]	% of national total				
Military (1A5)	5	416	55	317	0	0	0	0	0	0
Railways (1A3c)	7	3385	247	635	1	0	2	0	0	0
Navigation (1A3d)	2017	8636	11374	20018	0	8	4	9	3	0
Ag./for./fish. (1A4c)	1151	31005	5002	22285	3	5	15	4	4	0
Civil Aviation (1A3a)	5	674	153	869	0	0	0	0	0	0
Industry-Other (1A2f)	201	10668	3052	10766	2	1	5	2	2	0
Residential (1A4b)	3	239	4162	47601	0	0	0	3	8	0
Total other mobile	3388	55024	24046	102491	6	13	27	19	18	0
Road (1A3b)	358	66749	34815	283912	2386	1	33	28	49	2
Total mobile	3746	121774	58860	386402	2392	15	61	48	67	2
Total national	25275	200334	123763	576640	100916	100	100	100	100	100

Road transport

The step-wise lowering of the sulphur content in diesel fuel has brought along a substantial decrease in the road transport emissions of SO_2 (Figure 5.9) In 1999 the sulphur content was reduced from 500 ppm to the present level of 50 ppm (the same as for gasoline). Since Danish diesel and gasoline fuels have the same sulphur-percentages at present, the 2002 shares for SO_2 emissions and fuel use for passenger cars, heavy-duty vehicles, light-duty vehicles and 2-wheelers are the same in each case; 57, 25, 17 and 1%, respectively (Figure 5.13).

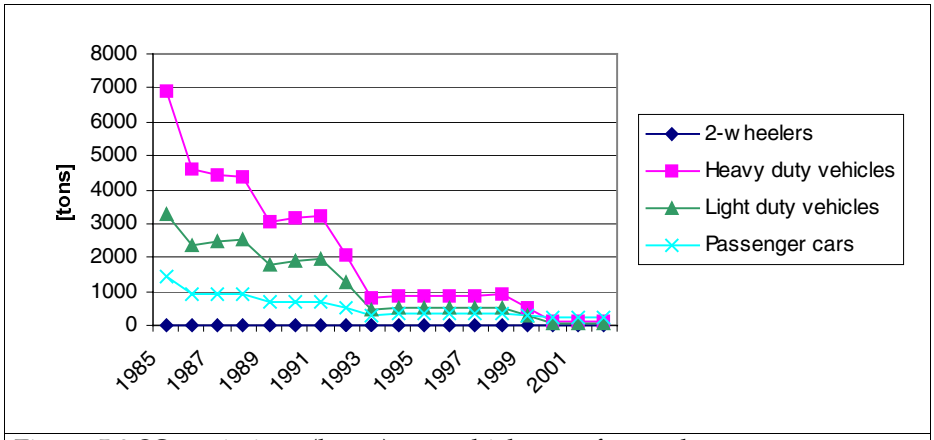

Figure 5.9 SO_2 emissions (ktons) per vehicle type for road transport 1985-2002

Historically the emission totals of NO_x and especially NMVOC and CO have been very dominated by the contributions coming from private cars, as shown in the Figures 5.10-5.12. However, the emissions from this vehicle type have shown a steady decreasing tendency

since the introduction of catalyst private cars in 1990 (EURO I), and the introduction of even more emission efficient EURO II and III private cars (introduced in 1997 and 2001, respectively). The total emission reductions of NO_X, NMVOC and CO are fortified by the introduction of new gradually stricter EURO emission standards for all other vehicle classes.

In 2002 the emission shares for passenger cars, heavy-duty vehicles, light-duty vehicles and 2-wheelers were 49, 36, 15 and 0% for NO_X, 77, 8, 6 and 9% for NMVOC and 87, 2, 6 and 5% for CO (Figure 5.13).

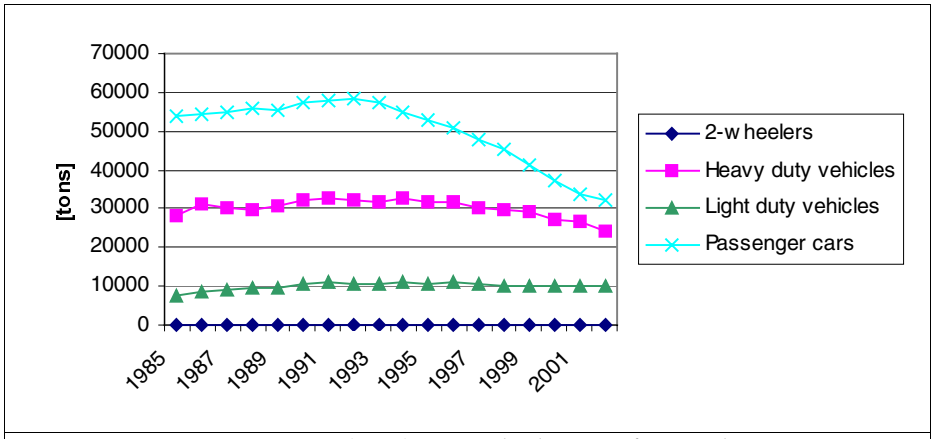

Figure 5.10 NO_x emissions (tons) per vehicle type for road transport 1985-2002

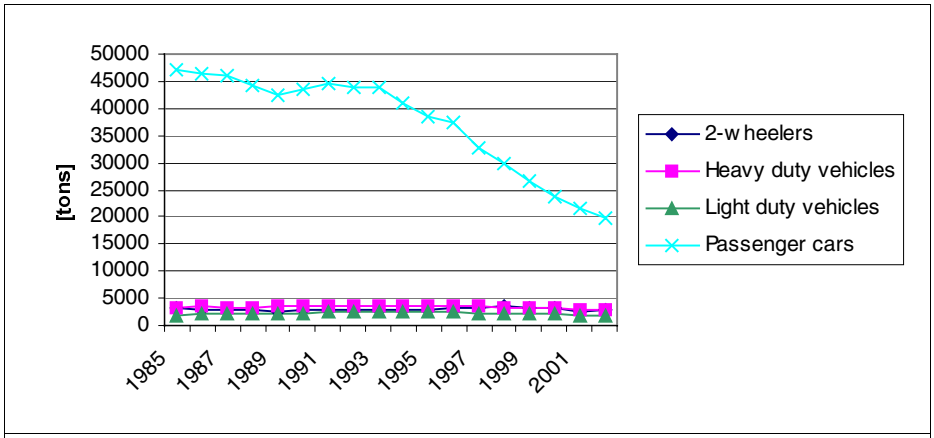

Figure 5.11 NMVOC emissions (tons) per vehicle type for road transport 1985-2002

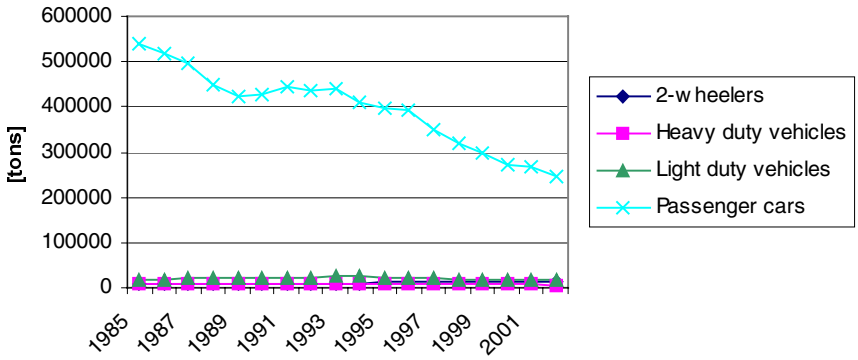

Figure 5.12 CO emissions (tons) per vehicle type for road transport 1985-2002

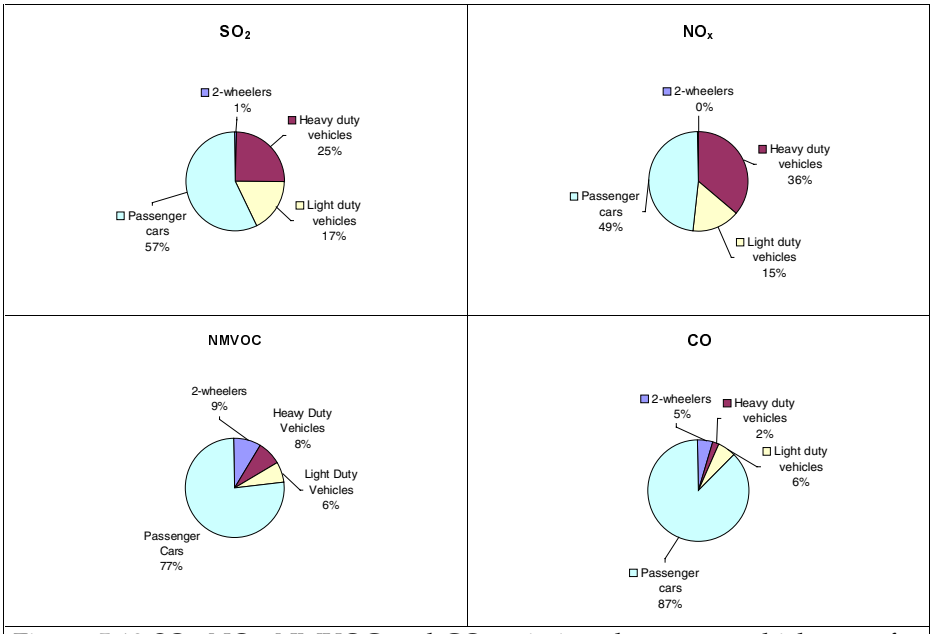

Figure 5.13 SO_2, NO_X, NMVOC and CO emission shares per vehicle type for road transport in 2002

Other mobile sources

The SO_2 emissions decrease significantly from 1985 to 1996, as shown in Figure 5.14. The lowering is due to the reduction of the sulphur content for marine diesel fuel in navigation (1A3d) and diesel fuel used by, among others, railways (1A3c) and non-road machinery in agriculture/forestry/fisheries (1A4c) and industry (1A2f).

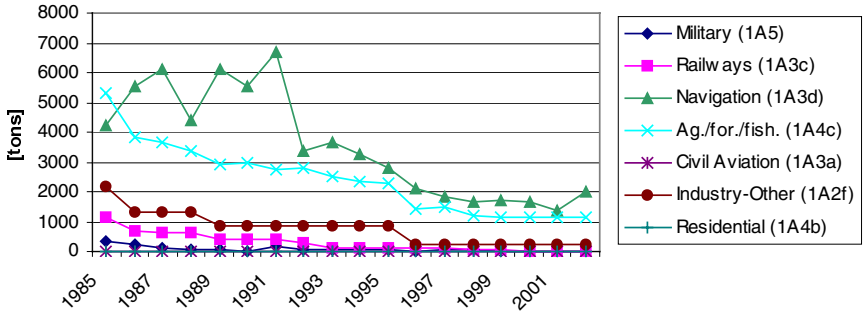

Figure 5.14 SO_2 emissions (ktons) in CRF sectors for other mobile sources 1985-2002

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 the implementation of a two-stage EU emission directive.

NO_X emissions mainly come from diesel machinery and the most important sources are agriculture/forestry/fisheries (1A4c), industry (1A2f), navigation (1A3d) and railways (1A3c), as shown in Figure 5.15. The 2002 emission shares are 52, 19, 16 and 6%, respectively (Figure 5.18). Minor emissions come from civil aviation (1A3a), military (1A5) and residential (1A4b).

The NO_X emission trend for agriculture/forestry/fisheries is determined by fuel use (and hence emissions) fluctuations for fishery and the constant emission decrease for diesel fuelled agricultural machines. The latter emission decline is the product of decreasing fuel use between 1990 and 2000 and an improved emission performance for new machinery since the late 1990's.

The emission explanation for agricultural NO_X also applies for industry NO_X emissions. The development in fuel use for national sea transport explains the emission trend for navigation. The most influential parameter is the shut down of ferry service connections in connection with the opening of the Great Belt link in 1997. For railways the gradual shift towards electrification explains the lowering trend in diesel fuel use and NO_X emissions for this transport sector.

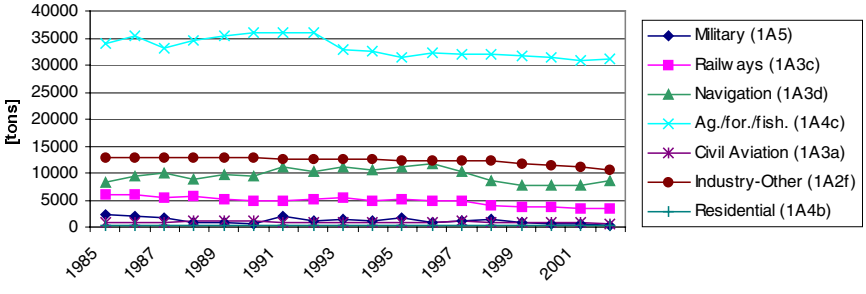

Figure 5.15 NO_X emissions (tons) in CRF sectors for other mobile sources 1985-2002

The 1985-2002 time series of NMVOC and CO emissions are shown in the Figures 5.16 and 5.17 for other mobile sources. The 2002 sectoral emission shares are shown in Figure 5.18. For NMVOC the most important sectors are navigation (1A3d), agriculture/forestry/fisheries (1A4c), residential (1A4b) and industry (1A2f), with 2002 emission shares of 47, 21, 17 and 13%, respectively. The same four sectors also contribute with most of the CO emissions. However, in this case the largest emission source is residential (1A4b), followed by agriculture/forestry/fisheries (1A4c), navigation (1A3d) and industry (1A2f), with 2002 emission shares of 45, 22, 20 and 11%, respectively. Minor NMVOC and CO emissions come from railways (1A3c), civil aviation (1A3a) and military (1A5).

The reason for high NMVOC and relatively large CO emissions in navigation is the appearance of more gasoline fuelled private boats in navigation, whereas the high CO and relatively large NMVOC emissions from the residential sector solely come from gasoline fuelled working machinery (characterised by high emission factors).

In agriculture/forestry/fisheries the large amount of diesel used by agricultural tractors causes most of the NMVOC, whereas the use of diesel and LPG (and to a smaller extent gasoline) causes the NMVOC emissions from industry. The majority of the CO emissions from the same two sectors is emitted by gasoline engines.

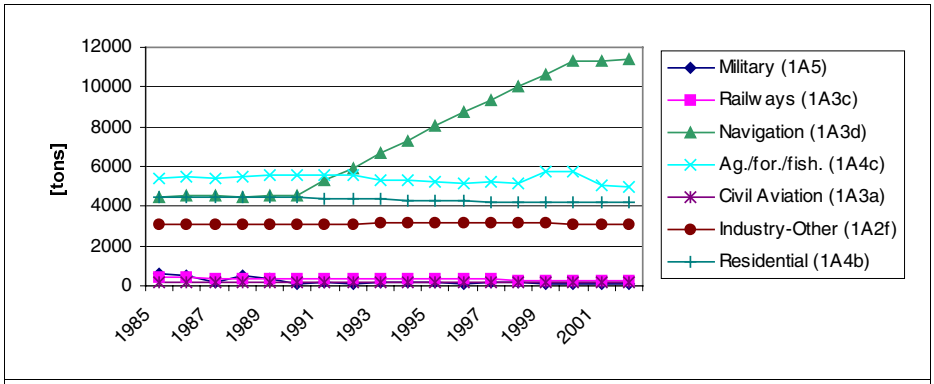

Figure 5.16 NMVOC emissions (tons) in CRF sectors for other mobile sources 1985-2002

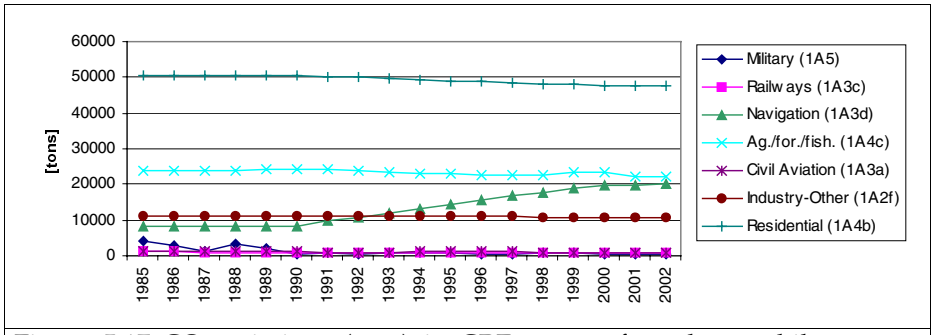

Figure 5.17 CO emissions (tons) in CRF sectors for other mobile sources 1985-2002

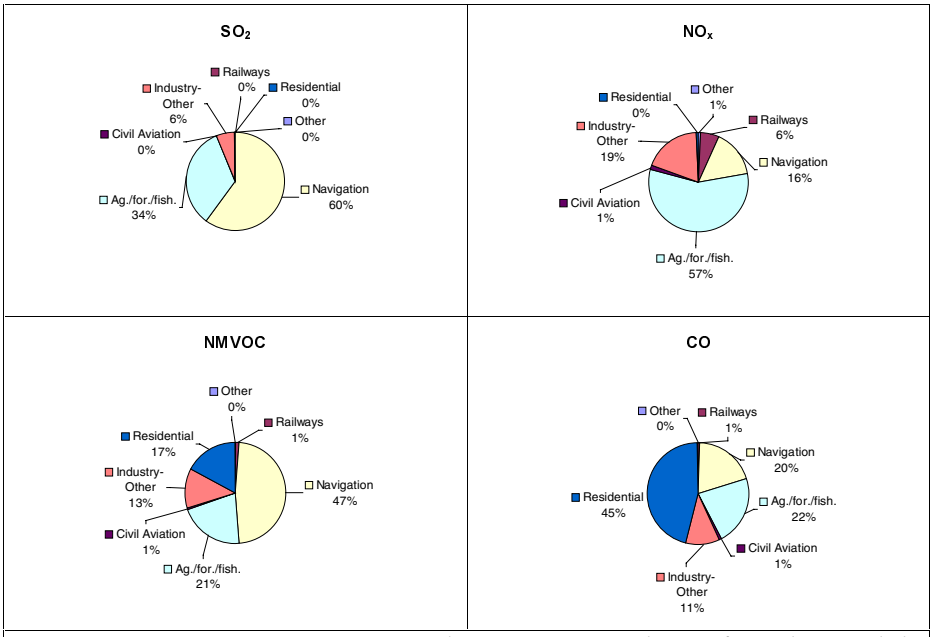

Figure 5.18 SO_2, NO_X, NMVOC and CO emission shares for other mobile sources in 2002

5.3 Particulate matter (PM)

Road transport and other mobile sources have exhaust emissions of particulate matter (PM). In addition, the first sector contributes with non-exhaust PM emissions coming from brake and tyre wear and road abrasion.

In Table 5.3 the TSP, PM_{10} and $PM_{2.5}$ emissions for road transport and other mobile sources are shown for 2002 in CRF sectors. The emission figures (exhaust only) in time-series 1985-2002 are given in Annex 11 (CRF format). Exhaust PM emissions are also shown for 1990 and 2002 in Annex 7 (CollectER format), while 2002 non-exhaust emission figures are shown in Annex 8.

The road transport shares of national totals for TSP, PM_{10} and $PM_{2.5}$ are 17, 23 and 30%, respectively in 2002. The totals include both exhaust and non-exhaust emissions. From 1985 to 2002 the PM emissions (exhaust only) have decreased by 30% (from Figure 5.19). The highest emissions occur in 1991, after which the emissions drop by 40%, until 2002.

For other mobile sources the 2002 shares are 12, 18 and 26% for TSP, PM_{10} and $PM_{2.5}$, respectively. The TSP emissions have decreased by 13% from 1985 to 2002 (from Figure 5.21).

Table 5.3 Emissions of TSP, PM_{10} and $PM_{2.5}$ in 2002 from road transport and other mobile sources

CRF Sector	TSP [tons]	PM_{10} [tons]	$PM_{2.5}$ [tons]	TSP % of national total	PM_{10}	$PM_{2.5}$
Military (1A5)	20	20	20	0	0	0
Railways (1A3c)	125	125	125	0	1	1
Navigation (1A3d)	604	575	547	2	3	4
Ag./for./fish. (1A4c)	2361	2244	2133	7	10	15
Civil Aviation (1A3a)	3	3	3	0	0	0
Industry-Other (1A2f)	926	881	838	3	4	6
Residential (1A4b)	26	26	26	0	0	0
Total other mobile	4065	3874	3693	12	18	26
Road exhaust (1A3b)	3508	3508	3508	10	16	25
Road Brake wear	540	529	210	2	2	1
Road Tyre wear	832	499	349	2	2	2
Road abrasion	962	481	260	3	2	2
Total Road non-exhaust	2333	1509	819	7	7	6
Total Road	5841	5017	4327	17	23	30
Total mobile	9906	8890	8020	29	40	56
Total national	33788	22112	14316	100	100	100

5.3.1 PM emissions from exhaust

Exhaust particulate emissions from road transportation vehicles are well below $PM_{2.5}$. The largest emission contributor in 2002 was light duty vehicles (44%) followed by heavy-duty vehicles (33%), passenger cars (21%) and 2-wheelers (2%), as shown in Figure 5.20.

The emissions from light and heavy-duty vehicles have significantly decreased since the mid-1990s due to gradually stricter EURO emission standards, whereas the environmental benefit of introducing diesel private cars with lower particulate emissions since 1990 is more or less outbalanced by an increase in vehicle new sales in recent years. (Figure 5.19).

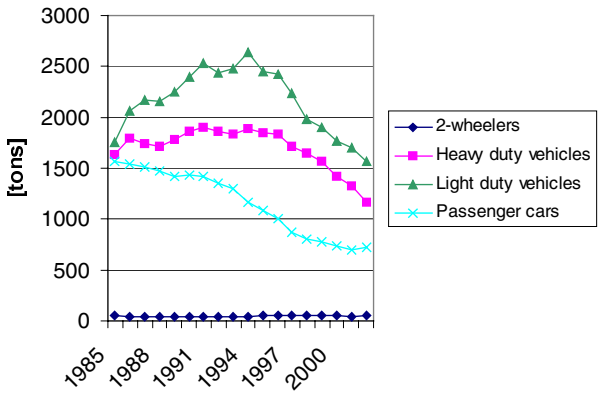

Figure 5.19 Exhaust particulate emissions ($PM_{2.5}$) in tons from 1985-2002 for road transport

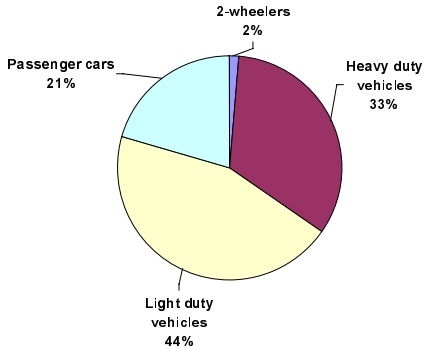

Figure 5.20 Exhaust particulate emission ($PM_{2.5}$) shares for road transport in 2002

As shown in Figure 5.22 for other mobile sources the largest TSP contributors in 2002 are agriculture/forestry/fisheries (1A4c), industry (1A2f) and navigation (1A3d), with emission shares of 57, 23 and

15%, respectively. The remaining sectors: Railways (1A3c), civil aviation (1A3a), military (1A5) and residential (1A4b) are only minor emission sources.

For civil aviation, residential and gasoline fuel use in the agriculture/forestry/fisheries (1A4c), industry (1A2f) and navigation (1A3d) sectors no TSP emission estimates are made from 1998 and backwards. For military jet fuel use the first estimate dates to 1999. However, these emission contributions are small compared to the emissions from diesel fuel use.

As for NO_x the TSP emission trend for agriculture/forestry/fisheries is determined by fuel use fluctuations for fishery and the slight emission decrease for diesel fuelled agricultural machines. The latter emission decline is the product of decreasing fuel use between 1990 and 2000 and an improved emission performance for new machinery since the late 1990's (Figure 5.21).

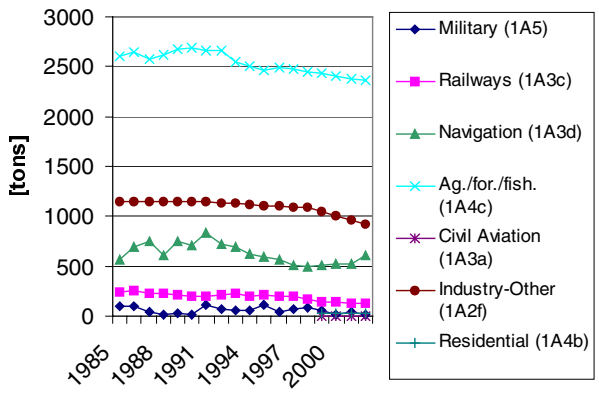

Figure 5.21 Exhaust particulate emissions (TSP) in tons from 1985-2002 for other mobile sources

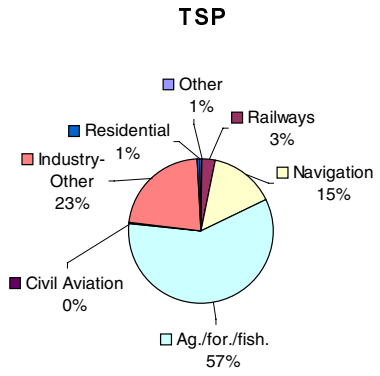

Figure 5.22 Exhaust particulate emissions (TSP) shares for other mobile sources in 2002

5.3.2 Non-exhaust PM

The respective source category distributions for TSP, PM_{10} and $PM_{2.5}$ emissions are identical for each of the non-exhaust emission types brake and tyre wear and road abrasion, and hence only the PM_{10} distributions are shown in Figure 5.23. For brake and tyre wear passenger cars cause the highest emissions in 2002, followed by light duty vehicles, trucks, buses and 2-wheelers. Trucks cause more road abrasion emissions than light duty vehicles, but apart from that the size order of emission sources is the same as for brake and tyre wear.

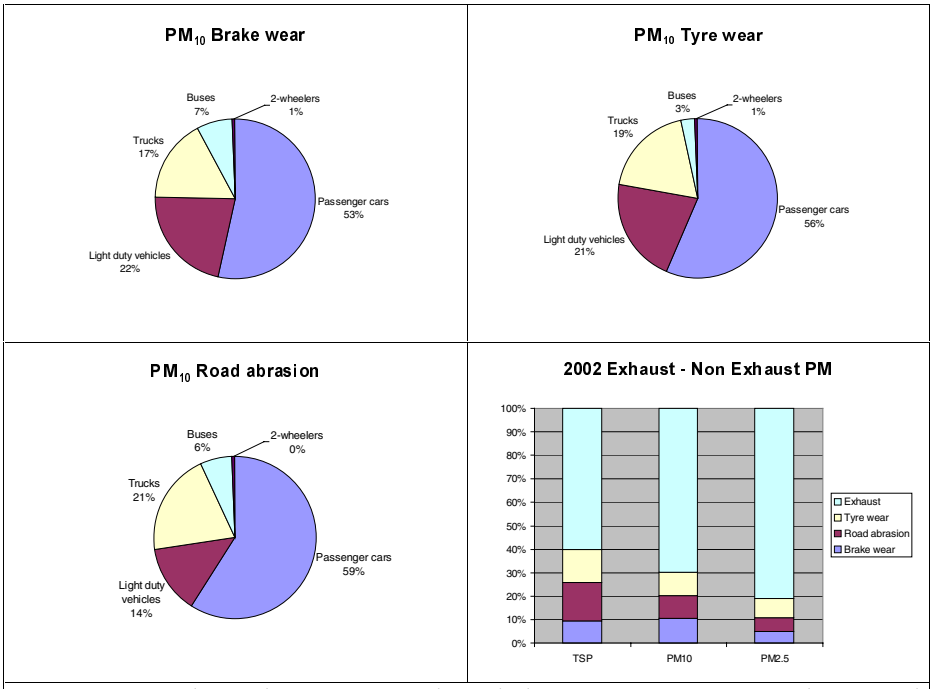

Figure 5.23 Brake and tyre wear and road abrasion PM_{10} emission shares and PM exhaust-non exhaust distributions for road traffic in 2002

The exhaust emission shares of total road transport TSP, PM_{10} and $PM_{2.5}$ are 60, 70 and 81%, respectively in 2002. For brake and tyre and road abrasion the TSP shares are 9, 14 and 16%, respectively. The same three sources have PM_{10} shares of 11, 10 and 10%, respectively, and $PM_{2.5}$ shares of 5, 8 and 6%, 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.

5.4 Heavy metals

In Table 5.4 the heavy-metal emissions for road transport and other mobile sources is shown for 2002 in CRF sectors. The emission figures in time-series 1990-2002 are given in Annex 11 (CRF format) and are shown for 1990 and 2002 in Annex 9 (CollectER format).

The heavy metal emission factors (except Pb) are taken from the EMEP/CORINAIR guidebook and are constant throughout the 1990-2002 period. Consequently the emission development follows the trends in fuel use. Road transport shares for copper (Cu), zinc (Zn) and chromium (Cr) are 70, 15 and 11%, respectively, of national totals in 2002, and for other mobile sources the lead (Pb), Cu and nickel (Ni) shares are 28, 16 and 12%, respectively. For the remaining components the emission shares are less than 5% (Table 5.5).

The road transport emissions have increased with 22% from 1990 to 2002. For Pb, though, there has been a 99% emission decline, due to the phasing out of leaded gasoline fuels until 1994 (Figure 5.25). For other mobile sources the components have emission increases of

around 10-20% between 1990 and 2002, except in the case of arsenic (As) and Ni where the emission increase is around 40%.

Table 5.4 Heavy metal emissions in 2002 for road transport and other mobile sources

CRF Sector	As [kg]	Cd [kg]	Cr [kg]	Cu [kg]	Hg [kg]	Ni [kg]	Pb [kg]	Se [kg]	Zn [kg]
Military (1A5)	0	0	1	48	0	2	106	0	28
Railways (1A3c)		1	3	113		5	0	1	67
Navigation (1A3d)	29	3	16	104	5	1523	19	37	129
Ag./for./fish. (1A4c)	10	6	27	668	10	43	20	42	484
Civil Aviation (1A3a)	0	0	2	79	0	3	1328	0	46
Industry-Other (1A2f)		2	10	347		14	0	2	204
Residential (1A4b)		0	1	43		2	1	0	26
Total other mobile	39	12	61	1402	15	1592	1473	83	984
Road (1A3b)		36	179	6090		251	56	36	3582
Total mobile	39	48	240	7491	15	1843	1529	119	4566
Total national	767	664	1638	8682	1186	13378	5254	1881	23542

Table 5.5 Heavy metal emission shares in 2002 for road transport and other mobile sources

CRF Sector	As	Cd	Cr	Cu	Hg	Ni	Pb	Se	Zn
	% of national total								
Military (1A5)	0	0	0	1	0	0	2	0	0
Railways (1A3c)	0	0	0	1	0	0	0	0	0
Navigation (1A3d)	4	0	1	1	0	11	0	2	1
Ag./for./fish. (1A4c)	1	1	2	8	1	0	0	2	2
Civil Aviation (1A3a)	0	0	0	1	0	0	25	0	0
Industry-Other (1A2f)	0	0	1	4	0	0	0	0	1
Residential (1A4b)	0	0	0	0	0	0	0	0	0
Total other mobile	5	2	4	16	1	12	28	4	4
Road (1A3b)	0	5	11	70	0	2	1	2	15
Total mobile	5	7	15	86	1	14	29	6	19
Total national	100	100	100	100	100	100	100	100	100

As shown in Figure 5.24, the road transport emissions of cadmium (Cd), Cr, Cu and Zn accounts for around two thirds of the total for all mobile sources in 2002. No road transport emissions occur for As and mercury (Hg). Instead the emissions of these species come from the use of marine diesel oil and residual oil in fisheries and navigation. The latter sector also has large emissions of Ni (from residual oil), whereas the selenium (Se) emissions in almost equal shares come from agriculture/forestry/fisheries, navigation and road transport.

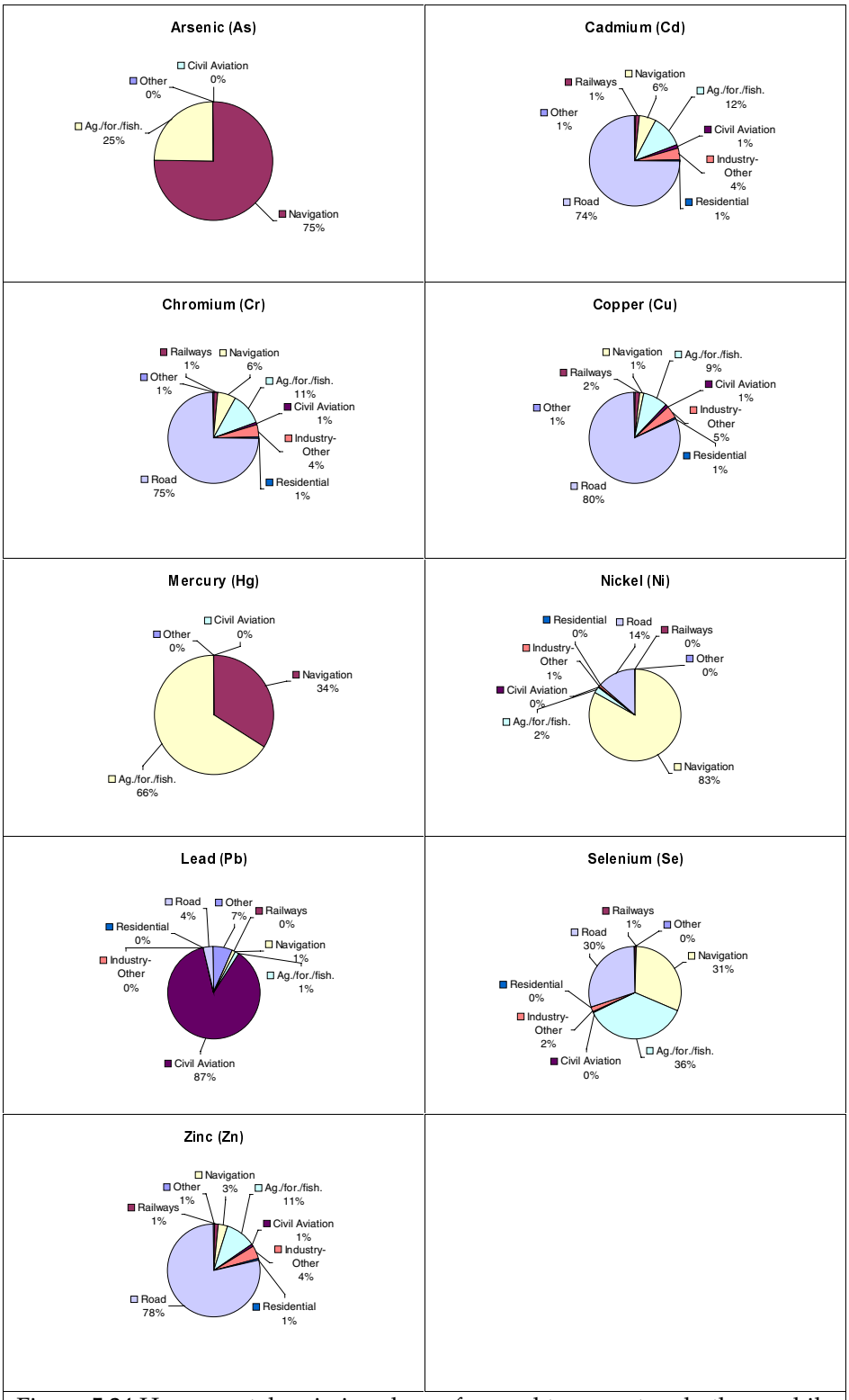

Figure 5.24 Heavy metal emission shares for road transport and other mobile sources in 2002

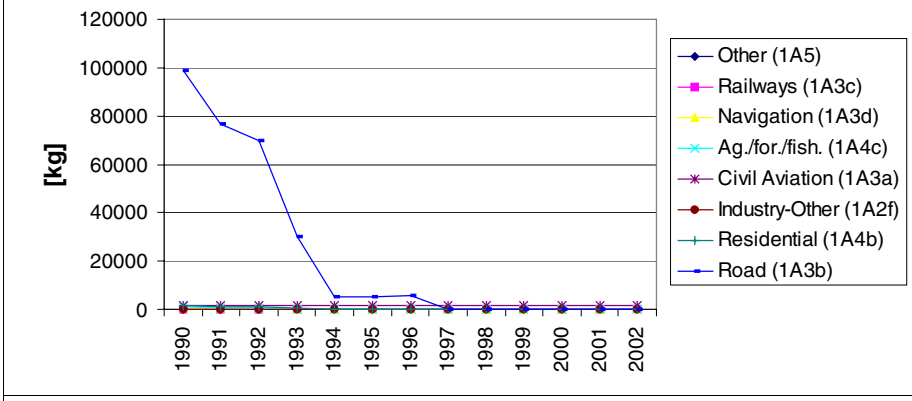

Figure 5.25 Pb emissions (kg) in CRF sectors for road transport and other mobile sources 1990-2002

5.5 Dioxin and PAH

In Table 5.6 the dioxin and PAH emissions for road transport and other mobile sources are shown for 2002 in CRF sectors. The emission figures in time-series 1990-2002 are given in Annex 11 (CRF format) and are shown for 1990 and 2002 in Annex 9 (CollectER format).

The PAH emission shares for road transport and other mobile sources are 5% or less of the national total in 2002.

Table 5.6 Dioxin and PAH emissions in 2002 for road transport and other mobile sources

CRF ID	Dioxins/ Furans [g]	Flouranthene [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]
Other (1A5)	0	2	0	0	0	0	0
Railways (1A3c)	0	4	1	1	0	0	0
Navigation (1A3d)	0	44	3	2	1	6	5
Ag./for./fish. (1A4c)	0	133	14	10	5	20	14
Civil Aviation (1A3a)	0	0	0	0	0	0	0
Industry-Other (1A2f)	0	38	4	4	2	4	2
Residential (1A4b)	0	5	0	0	0	1	0
Total other mobile	0	227	23	18	9	31	22
Road (1A3b)	0	616	60	67	45	88	50
Total mobile	1	843	83	85	54	119	71
Total national	78	0	3872	1329	2894	0	2127

For mobile sources road transport has the largest emissions of dioxins and PAH (Figure 5.26). The dioxin emission share for road transport is 60% of all mobile emissions in 2002, whereas agriculture/forestry/fisheries and navigation have smaller shares of 23 and 15%. For the different PAH components the road transport shares are around two thirds of the 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.

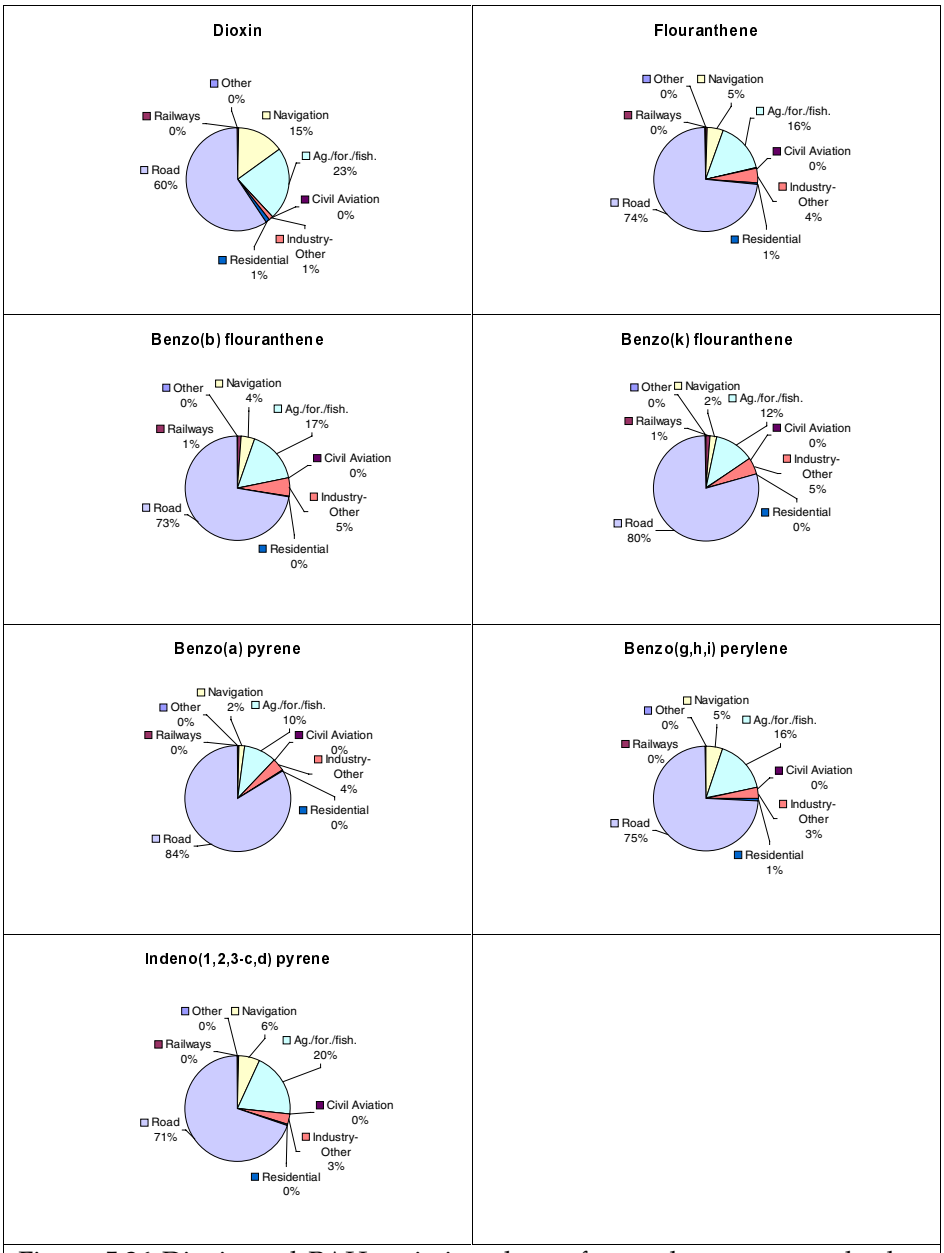

Figure 5.26 Dioxin and PAH emission shares for road transport and other mobile sources in 2002

5.6 Bunkers

The most important emissions from bunker fuel use (fuel use for international transport) are SO_2, NO_X, CO_2 and TSP. The total figures are shown in Table 5.7 for 2002, split into sea transport and civil aviation. All emission figures in time-series 1985-2002 are given in Annex 11 (CRF format). In Annex 7 the emissions are also given in CollectER format for the years 1990 and 2002, for other components than heavy metals and PAH, while the emissions for heavy metals and PAH's are shown in Annex 9 and 10, respectively.

Table 5.7 Emissions in 2002 for international transport and national totals

CRF sector	SO_2	NO_X	CO_2	TSP
Navigation int. (1A3d)	39610	81292	2966	4428
Civil Aviation int. (1A3a)	66	8712	2053	33
International total	39676	90003	5019	4461
National total	25275	200334	54164	33788

The differences in emissions between navigation and civil aviation are much larger than differences in fuel use (and derived CO_2 emissions) and display a poor emission performance for international sea transport. In broad terms the emission trends shown in Figure 5.27 are similar to the fuel use development. Minor differences occur for navigation (SO_2, NO_X, CO_2 and TSP) due to shifting amounts of marine diesel and residual oil, and for civil aviation (NO_X) due to yearly variations in LTO/aircraft type (earlier than 2001) and city-pair (2001 onwards) statistics.

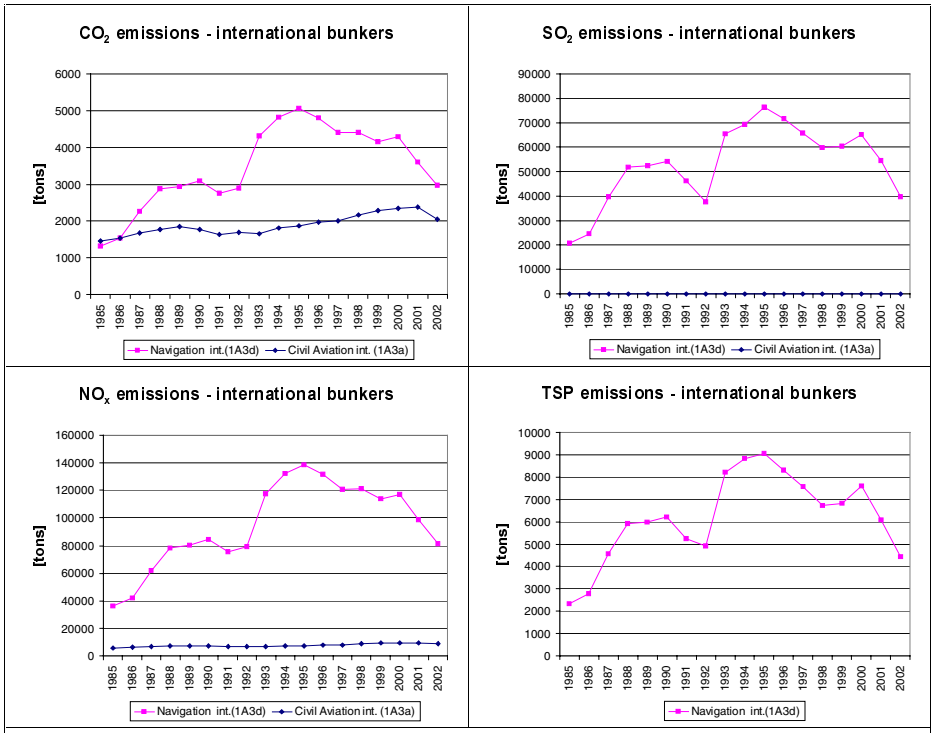

Figure 5.27 CO_2, SO_2, NO_X and TSP emissions for international transport 1985-2002

Compared to the Danish national emission total (all sources) the CO_2 emissions from bunkers are small (Figure 5.28). Most remarkably are the large SO_2 emissions coming from the residual fuel used by international sea transport. The international:domestic emission ratio has shown a major increase in the later years as most fuels (other than maritime types) have become more clean. The same trend is also visible for NO_X, though, with a relatively smaller emission importance.

The emissions from TSP are expected to become increasingly more important in the future. At present impact on local air quality can be measured in the vicinity of ports coming from shipping activities. In relative terms this impact from emissions will gain more importance when the emissions from other sources are gradually reduced.

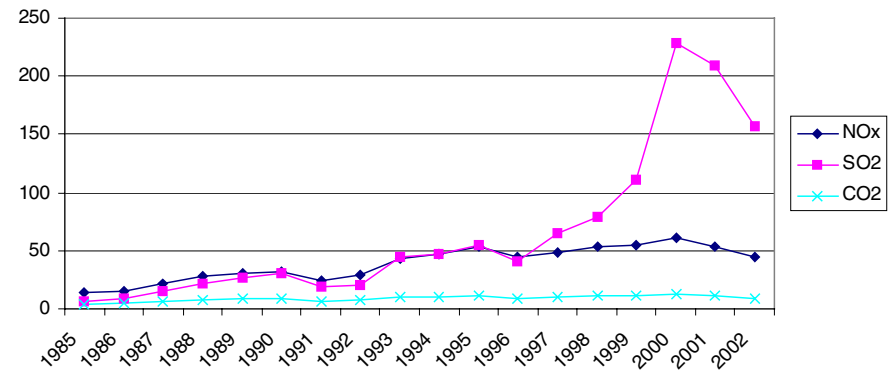

Figure 5.28 Domestic (all sources)/international transport total emission ratio for CO_2, SO_2, NO_x and TSP 1985-2002

6 Quality assurance/quality control (QA/QC)

For road transport and air traffic the detailed methodology and fuel balance approach are used independently to provide a quality control of the emission estimations. Firstly, the bottom up approach (detailed methodology) is used as described in the sections 3.1 and 3.2. Secondly, the estimates are modified according to a fuel balance using the statistical sale figures respectively for road transportation and civil aviation fuel in Denmark (fuel balance approach), as described in the same sections. The usage of the fuel balance approach ensures that all fuel for road transport and civil aviation is accounted for in the estimations.

For non-road machinery and working equipment the detailed methodology determines the amount of fuel used. The subsequent adjustment of fuel totals to be used in the estimates for other sectors (see section 3.2.1) ensures that no double counting of emissions is made.

For the remaining transport sectors the simple method ensure that all fuel is accounted for in the emission estimations.

As a part of the general QA/QC work all time-series of emissions in the NFR and SNAP source categories are examined and significant changes are checked and explained. Moreover a comparison is made to the previous year's estimate and any major changes are verified. As a last point, a data transfer control is made from SNAP source categories to aggregated NFR source categories.

Presently the level of QA/QC of the Danish emission inventories for transport is incomplete in comparison to the prescriptions given in the IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories (IPCC). It will however, continuously be aspired to make the QA/QC according to the IPCC Good Practice Guidelines (IPCC, 2000), and work will be undertaken to improve next year's inventory in this part.

7 Uncertainties and time-series consistency

Uncertainty estimates for greenhouse gases are made for road transport and other mobile sources using the guidelines and emission factor uncertainties formulated in the Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories (IPCC, 2000).

For the emission components reported to the UNECE convention the uncertainty estimates are made according to the Good Practice Guidance for CLRTAP Emission Inventories by Pulles et al. (2001). However, the latter source indicates no uncertainty factor for TSP. Instead this value is based on own judgement. Also relevant for UNECE uncertainty estimates the uncertainty factors for activity data are assumed to be 2 and 10% for road transport and other mobile sources based on own judgement.

No uncertainty estimates are made for exhaust PM_{10} and $PM_{2.5}$ as well as for the non-exhaust particulate emissions arising from tyre, brake and asphalt wear.

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 12 for all emission components.

Table 7.2 Uncertainties for emission factors and total emissions in 2002 and as a trend

	Emission factor uncertainties [%]		Emission uncertainties [%]	
	Road	Other	Overall 2002	Trend
CO_2	5	5	4	4
CH_4	40	10	32	4
N_2O	50	1000	56	195
SO_2	50	50	46	6
NO_X	50	100	53	7
NMVOC	50	100	51	15
CO	50	100	45	8
NH_3	1000	1000	997	1123
TSP	50	100	59	9
Arsenic	1000	1000	1000	9
Cadmium	1000	1000	789	123
Chromium	1000	1000	788	128
Copper	1000	1000	834	84
Mercury	1000	1000	1000	12
Nickel	1000	1000	875	59
Lead	1000	1000	964	19
Selenium	1000	1000	761	106
Zinc	1000	1000	814	96
Dioxins	1000	1000	718	109
Flouranthene	1000	1000	779	47
Benzo(b) flouranthene	1000	1000	774	8
Benzo(k) flouranthene	1000	1000	818	139
Benzo(a) pyrene	1000	1000	851	61
Benzo(g,h,i) perylene	1000	1000	784	46
indeno(1,2,3-c,d) pyrene	1000	1000	760	13

As regards time-series consistency background flight data cannot be made available on a city-pair level from 2000 and backward. However, aided by LTO/aircraft statistics for these years and the use of proper assumptions a sound level of consistency is obtained anyhow 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 use information for working equipment and machinery.

For 1990 and 2000 background activity data (stock and operation) exist, but for the years in between 1990 and 2000 and for the years beyond 2000 data is presently missing. For consistency purposes for the years prior to 1990 and after 2000, the fuel use estimates for 1990 and 2000 are used. By interpolation the two latter figures are also used to make fuel use estimates for the years in between.

The strengthening of emission standards for diesel machinery is taken into account by using specific lifetime periods and emission directive implementation years. From this the share of different emission levels per machinery type can be found in a given year.

8 Recalculations/Improvements since reporting in 2002

The following recalculations and improvements of the emission inventories have been made since the emission reporting in 2002:

- Road transport: An updated COPERT III run was made for the year 1999 to include the deterioration effect for catalyst vehicles and more accurate Danish cold start parameters. The Danish inventory for non-exhaust particulate emissions (tyre and brake wear and road abrasion) has been revised according to the new EMEP/CORINAIR guidebook methodology chapter.
- Railways: Updated NO_x, NMVOC, CH_4, CO and PM emission factors for diesel are used in a time-series from 1985 to 2002 based on real emission measurements carried out by the Danish Railways. For gasoline the minor amount of fuel used by railways is transferred to road transport in the years 1987, 1989-1993 and 1995-2002.
- Inland waterways: A change is made for diesel fuel use in relation to Danish energy statistics based on consultations with the Danish Energy Authority and the Technological Institute of Denmark. Now the estimated amount of diesel fuel use from 1985-2002 is taken directly from the fishery sector in the statistics.
- Fishery: A part of this sector's diesel fuel use is transferred to "Inland waterways" for the years 1985-2002 (see description "Inland waterways").
- International navigation: The Danish Energy Authority has estimated a fuel use for the year 1985, which has been included in the Danish inventory.
- Air traffic: Small changes in emission factors are made for the years 2001 and 2002. Helicopters are now included in background flight data and in addition minor changes are made to the real aircraft type - representative aircraft type relation.
- Agriculture/Forestry/Industry/Household and gardening: A change is made for diesel fuel use in relation to Danish energy statistics based on consultations with the Danish Energy Authority and the Technological Institute of Denmark. Consequently a correction is made to the sectors "0203: Plants in agriculture, forestry and aquaculture" and "0301: Combustion in boilers, gas turbines and stationary" in order to account for all fuel sold.

9 Future improvements

It will continuously be aspired to fulfil the requirements from UNECE and UNFCCC of good practice in inventory making for transport. This year a note will be made for transport going through the different issues of choices relating to methods (methods used, emission factors, activity data, completeness, time-series consistency, uncertainty assessment) reporting and documentation, and inventory quality assurance/quality control. The outcome of this description might result in some changes to the inventory in the future.

Navigation

For navigation an error occurs in the emission estimates for the sub-sector fisheries. A small amount of gasoline that should be transferred to the road transport sector is still included in fuel use for fisheries and thus causes some emissions, most visible for VOC and CO. This will be corrected in next year's national emission report.

Aviation

The inclusion of several new turboprops in the list of representative aircraft will improve the emission calculations for civil aviation. A more in-dept description of the calculation methodology, flight data and emission factors used will be given in next year's inventory report.

Military

Military use of marine diesel oil is envisaged to be subtracted from fuel sale statistics in next year's inventory. This will enable more precise allocation of the emissions in question.

10 Conclusion

The annual Danish emission inventories are prepared and reported by NERI. For mobile sources the inventory basis is fuel use data from the Danish energy statistics and additional background data for road transport (fleet, mileage), air traffic (aircraft type, flight numbers, origin and destination airports) and non-road machinery (engine no. and size, load factor, annual working hours). Emission data mainly come from the EMEP/CORINAIR Emission Inventory Guidebook – however - for railways specific Danish measurements are used.

Road transport

Seen in relation to the Danish national totals, the largest emission shares for road transport are noted for PM ($PM_{2.5}$), CO, NO_X, NMVOC and CO_2. In 2002 the emission percentages were 56, 49, 33, 28 and 21, respectively. The emissions of N_2O, NH_3, CH_4 and SO_2 only have marginal shares of 5, 2, 1 and 1%, respectively, in 2002.

From 1985 to 2002 there has been an emission decrease of 30, 51, 25 and 57% for PM (exhaust only), CO, NO_X and NMVOC, respectively. In the same period the CO_2 (and fuel use) and N_2O emissions have increased by 38% and 274% (22% for CO_2 and 233% for N_2O since 1990). The highest $PM_{2.5}$, CO, NO_X and NMVOC emissions occur in 1991, after which the emissions drop by 40, 41, 34 and 57%, respectively, until 2002.

Road transport exhaust PM emissions almost solely come from diesel fuelled vehicles. The largest sources are light duty vehicles followed by heavy-duty vehicles and passenger cars in decreasing order. Since the mid-1990s the emissions from light and heavy-duty vehicles have decreased significantly due to gradually stricter EURO emission standards, whereas the environmental benefit of introducing diesel private cars with lower particulate emissions since 1990 is more or less outbalanced by an increase in vehicle new sales in the later years.

The trend in non-exhaust PM follows the traffic growth in general, and in 2002 the TSP, PM_{10} and $PM_{2.5}$ shares were 40, 30 and 19%, respectively, of the respective road traffic totals. The non-exhaust PM are gaining relative more importance, in pace with the year by year reductions of exhaust PM.

Historically the emission totals of NO_X and especially NMVOC and CO have been dominated by the contributions coming from gasoline private cars. However, the emissions from this vehicle type have been reduced since the introduction of catalyst cars in 1990. A negative side effect of this technology, though, is the increase in N_2O emissions. The NO_X, NMVOC and CO emissions reductions are fortified by the introduction of new gradually stricter EURO emission standards for all other vehicle classes.

Other mobile sources

For other mobile sources the emissions of NO_X, $PM_{2.5}$, NMVOC, CO, PM_{10}, SO_2 and TSP have the largest shares of the national totals in

2002. The shares are 27, 26, 19, 18, 13 and 12%, respectively. The 2002 CO_2 emission (and fuel use) share is 7%, whereas the emissions of N_2O, NH_3 and CH_4 have marginal shares of 1% or less in 2002.

The emissions of NO_X and PM have decreased by 15 and 13%, respectively, from 1985 to 2002, and for CO_2 (and fuel use) the decrease is 15% (and 12% from 1990). For SO_2 the emission drop is 74% from 1985 to 2002 (and 77% since 1980). In the same period the emissions of NMVOC and CO have increased by 32 and 6%, respectively.

The other mobile sources cover different modes of transport and non-road machinery, and regarded as single sources the emission shares become somewhat smaller. However, for NO_X and PM more than half of the emissions comes from agriculture/forestry/fisheries in 2002. The emission trends are determined by fuel use fluctuations for fishery, and the steady emission decrease for diesel fuelled agricultural machines. The latter emission decline is the result of decreasing fuel use between 1990 and 2000 and improved emission performance for new machinery since the late 1990's.

For NMVOC and CO almost half of the emissions come from the navigation and residential sectors, respectively. The major NMVOC increase is due to more gasoline fuelled private boats, while the high CO emissions for residential come from gasoline fuelled working machinery.

Heavy metals

For heavy metals the development in emissions follows the fuel use trends. Road transport shares for Cu, Zn and Cr are 70, 15 and 11%, respectively, of national totals in 2002, and for other mobile sources the Pb, Cu and Ni shares are 28, 16 and 12%, respectively. For the remaining components the emission shares are less than 5%.

The road transport emissions have increased by 22% from 1990 to 2002. For Pb, though, there has been a 99% emission decline, due to the phasing out of leaded gasoline fuels until 1994. For other mobile sources many of the components have emission increases of around 10-20% in the same time-period. The As and Ni emission increase is around 40% due to an increase in residual oil fuel use, and for Pb the 71% increase is due to the use of aviation gasoline with a high content of lead.

Except for lead (Pb) the emission factors are likely to be revised in the 2003 inventory on the basis of new fuel measurements.

PAH

The PAH emission shares for road transport and other mobile sources are 5% or less of the national total in 2002.

Uncertainties

For mobile sources in 2002 the CO_2 emissions are determined with the most accuracy, followed by the CH_4, SO_2, NMVOC, NO_X, N_2O and TSP emissions with increasing levels of uncertainties. The uncertainties are 4, 32, 45, 46, 51, 53, 56 and 59%, respectively. The uncertainties for the 1990-2002 emission trends are 4, 4, 8, 6, 15, 7, 193 and 9%

for the emissions in the same consecutive order. For NH_3, heavy metals and POPs the 2002 emissions have uncertainty levels of between 700 and 1000%. In this case the emission trend uncertainties are significantly lower, still large fluctuations exist between the calculated values for the different emission components. The smallest and largest uncertainties are 8 (Benzo(b) flouranthene) and 139% (Benzo(k) flouranthene).

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Annex 1 - 11

Annex 1: Fleet data 1990-2002 for road transport (No. vehicles)

Sector	Subsector	Tech	Reg. year	1985	1986	1987	1988	1989
Passenger Cars	Gasoline <1,4 l	PRE ECE	-1969	80570	70965	61916	53661	49471
Passenger Cars	Gasoline <1,4 l	ECE 15/00-01	1970-1978	333715	319741	297372	247513	217970
Passenger Cars	Gasoline <1,4 l	ECE 15/02	1979-1980	105027	82699	76343	98297	93397
Passenger Cars	Gasoline <1,4 l	ECE 15/03	1981-1985	345142	373558	358057	307504	306014
Passenger Cars	Gasoline <1,4 l	ECE 15/04	1986-1990		46574	114381	206105	245261
Passenger Cars	Gasoline <1,4 l	Euro I	1991-1996		1	1	1	1
Passenger Cars	Gasoline <1,4 l	Euro II	1997-2000					
Passenger Cars	Gasoline <1,4 l	Euro III	2001-2005					
Passenger Cars	Gasoline 1,4 - 2,0 l	PRE ECE	-1969	61592	54869	48157	41737	38477
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/00-01	1970-1978	218180	211819	199591	168672	148281
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/02	1979-1980	60836	50077	46439	62263	59148
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/03	1981-1985	210574	222174	211066	178826	177842
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/04	1986-1990		31049	74328	131279	159911
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro I	1991-1996					
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro II	1997-2000					
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro III	2001-2005					
Passenger Cars	Gasoline >2,0 l	PRE ECE	-1969	5923	5243	4586	3975	3665
Passenger Cars	Gasoline >2,0 l	ECE 15/00-01	1970-1978	18532	17532	16673	14345	12566
Passenger Cars	Gasoline >2,0 l	ECE 15/02	1979-1980	8730	6326	4456	4966	4718
Passenger Cars	Gasoline >2,0 l	ECE 15/03	1981-1985	31066	33256	31914	25237	25111
Passenger Cars	Gasoline >2,0 l	ECE 15/04	1986-1990		4085	9932	19410	22964
Passenger Cars	Gasoline >2,0 l	Euro I	1991-1996					
Passenger Cars	Gasoline >2,0 l	Euro II	1997-2000					
Passenger Cars	Gasoline >2,0 l	Euro III	2001-2005					
Passenger Cars	Diesel <2,0 l	Euro I	1991-1996					
Passenger Cars	Diesel <2,0 l	Euro II	1997-2000					
Passenger Cars	Diesel <2,0 l	Euro III	2001-2005					
Passenger Cars	Diesel <2,0 l	Conventional	-1990	75828	78431	79759	80201	80187
Passenger Cars	Diesel >2,0 l	Euro I	1991-1996					
Passenger Cars	Diesel >2,0 l	Euro II	1997-2000					
Passenger Cars	Diesel >2,0 l	Euro III	2001-2005					
Passenger Cars	Diesel >2,0 l	Conventional	-1990	3451	3568	3629	3649	3707
Passenger Cars	LPG	Conventional		287	287	287	287	287
Passenger Cars	2-Stroke	Conventional		4823	5402	5997	6026	5853

Sector	Subsector	Tech	Reg. year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Passenger Cars	Gasoline <1,4 l	PRE ECE	-1969	46209	44014	42804	36466	39959	37597	37130	3434	2761	2103	1744	1614	1475
Passenger Cars	Gasoline <1,4 l	ECE 15/00-01	1970-1978	187912	161642	139010	119424	80742	67991	53302	44338	31104	22511	17980	15837	14155
Passenger Cars	Gasoline <1,4 l	ECE 15/02	1979-1980	86959	80041	73306	66422	50119	43384	35052	26097	17585	10873	7348	5544	4203
Passenger Cars	Gasoline <1,4 l	ECE 15/03	1981-1985	300791	294878	288227	280146	261998	250043	235177	215301	183113	147111	118929	97930	79016
Passenger Cars	Gasoline <1,4 l	ECE 15/04	1986-1990	272012	270182	268686	268154	265860	262990	259954	265188	264791	254032	235890	219216	194543
Passenger Cars	Gasoline <1,4 l	Euro I	1991-1996	10000	49608	87121	122067	177991	230063	282488	289374	275572	273582	270268	267260	261791
Passenger Cars	Gasoline <1,4 l	Euro II	1997-2000								58502	119142	170981	209279	205833	201734
Passenger Cars	Gasoline <1,4 l	Euro III	2001-2005												34695	73385
Passenger Cars	Gasoline 1,4 - 2,0 l	PRE ECE	-1969	35940	34233	33292	28362	31079	29242	28879	2671	2148	1635	1356	1255	1147
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/00-01	1970-1978	127631	109641	94188	80844	54600	45991	36079	30465	21520	15647	12537	11077	9923
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/02	1979-1980	55063	50674	46402	42040	31712	27445	22173	16509	11141	6870	4642	3500	2659
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/03	1981-1985	174545	170750	166596	161592	150612	143386	133413	122642	103931	83270	67222	55300	44572
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/04	1986-1990	180298	178950	177873	177525	176045	174195	172298	176155	179510	172582	160800	149915	133745
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro I	1991-1996	10000	45647	82427	119744	184854	250826	322960	330407	315731	313279	309587	306414	300335
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro II	1997-2000								80440	163821	235099	287758	283021	277385
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro III	2001-2005												47705	100904
Passenger Cars	Gasoline >2,0 l	PRE ECE	-1969	3423	3260	3171	2701	2960	2785	2750	254	205	156	129	120	109
Passenger Cars	Gasoline >2,0 l	ECE 15/00-01	1970-1978	10781	9234	7914	6781	4567	3849	3022	2619	1881	1366	1110	986	885
Passenger Cars	Gasoline >2,0 l	ECE 15/02	1979-1980	4392	4043	3702	3355	2531	2191	1770	1318	888	549	371	280	212
Passenger Cars	Gasoline >2,0 l	ECE 15/03	1981-1985	24667	24157	23595	22912	21429	20432	19053	17571	14934	12016	9722	8009	6459
Passenger Cars	Gasoline >2,0 l	ECE 15/04	1986-1990	15679	15524	15390	15339	15120	14844	14546	14977	23975	22975	21251	19699	17377
Passenger Cars	Gasoline >2,0 l	Euro I	1991-1996	10000	13961	17871	21674	28044	34257	40813	41567	31121	30887	30519	30193	29586
Passenger Cars	Gasoline >2,0 l	Euro II	1997-2000								7313	14893	21373	26160	25729	25217
Passenger Cars	Gasoline >2,0 l	Euro III	2001-2005												4337	9173
Passenger Cars	Diesel <2,0 l	Euro I	1991-1996		4041	8031	11912	18412	24751	31440	31580	31998	35415	39518	43826	48984
Passenger Cars	Diesel <2,0 l	Euro II	1997-2000								7316	15312	24505	33856	37328	41736
Passenger Cars	Diesel <2,0 l	Euro III	2001-2005												6313	15219
Passenger Cars	Diesel <2,0 l	Conventional	-1990	79709	75788	72288	68529	62139	58843	55000	48153	43893	43004	42861	42885	42300
Passenger Cars	Diesel >2,0 l	Euro I	1991-1996		213	423	627	969	1303	1655	1662	1684	1864	2087	2313	2583
Passenger Cars	Diesel >2,0 l	Euro II	1997-2000								385	806	1290	1789	1971	2202
Passenger Cars	Diesel >2,0 l	Euro III	2001-2005												332	801
Passenger Cars	Diesel >2,0 l	Conventional	-1990	3702	3556	3425	3281	3040	2905	2746	2461	2266	2237	2228	2229	2187
Passenger Cars	LPG	Conventional		286	286	288	289	289	301	311	172	97	44	32	63	21
Passenger Cars	2-Stroke	Conventional		5417	4804	4308	3747	3029	2443	1665	1248	761	400	300	200	150

Sector	Subsector	Tech	Reg. year	1985	1986	1987	1988	1989
Light Duty Vehicles	Gasoline <3,5t	Conventional	-2004	33049	36810	39724	41321	41967
Light Duty Vehicles	Gasoline <3,5t	Euro I	2005-2008					
Light Duty Vehicles	Gasoline <3,5t	Euro II	2009-2001					
Light Duty Vehicles	Gasoline <3,5t	Euro III	2002-2006					
Light Duty Vehicles	Diesel <3,5 t	Conventional	-2004	121431	135248	145954	151822	154198
Light Duty Vehicles	Diesel <3,5 t	Euro I	2005-2008					
Light Duty Vehicles	Diesel <3,5 t	Euro II	2009-2001					
Light Duty Vehicles	Diesel <3,5 t	Euro III	2002-2006					
Heavy Duty Vehicles	Gasoline >3,5 t	Conventional		251	261	262	255	254
Heavy Duty Vehicles	Diesel 3,5 - 7,5 t	Conventional	-1993	5140	5338	5353	5228	5194
Heavy Duty Vehicles	Diesel 3,5 - 7,5 t	Euro I	1994-1996					
Heavy Duty Vehicles	Diesel 3,5 - 7,5 t	Euro II	1997-2001					
Heavy Duty Vehicles	Diesel 3,5 - 7,5 t	Euro III	2002-2005					
Heavy Duty Vehicles	Diesel 7,5 - 16 t	Conventional	-1993	10350	10750	10779	10528	10460
Heavy Duty Vehicles	Diesel 7,5 - 16 t	Euro I	1994-1996					
Heavy Duty Vehicles	Diesel 7,5 - 16 t	Euro II	1997-2001					
Heavy Duty Vehicles	Diesel 7,5 - 16 t	Euro III	2002-2005					
Heavy Duty Vehicles	Diesel 16 - 32 t	Conventional	-1993	13115	13623	13659	13342	13255
Heavy Duty Vehicles	Diesel 16 - 32 t	Euro I	1994-1996					
Heavy Duty Vehicles	Diesel 16 - 32 t	Euro II	1997-2001					
Heavy Duty Vehicles	Diesel 16 - 32 t	Euro III	2002-2005					
Heavy Duty Vehicles	Diesel >32t	Conventional	-1993	11517	11962	11994	11715	11640
Heavy Duty Vehicles	Diesel >32t	Euro I	1994-1996					
Heavy Duty Vehicles	Diesel >32t	Euro II	1997-2001					
Heavy Duty Vehicles	Diesel >32t	Euro III	2002-2005					
Buses	Urban Buses	Conventional	-1993	4712	4768	4771	4761	4724
Buses	Urban Buses	Euro I	1994-1996					
Buses	Urban Buses	Euro II	1997-2001					
Buses	Urban Buses	Euro III	2002-2005					
Buses	Coaches	Conventional	-1993	3298	3337	3339	3332	3307
Buses	Coaches	Euro I	1994-1996					
Buses	Coaches	Euro II	1997-2001					
Buses	Coaches	Euro III	2002-2005					
Mopeds	<50 cm³	Conventional	-1999	151000	139000	133000	127000	124000
Mopeds	<50 cm³	97/24/EC I	2000-2002					
Motorcycles	2-stroke >50 cm³	Conventional		6209	6280	6368	6368	6488
Motorcycles	4-stroke <250 cm³	Conventional	-1999	7037	7118	7218	7217	7353
Motorcycles	4-stroke <250 cm³	97/24/EC	2000-2003					
Motorcycles	4-stroke 250 - 750 cm³	Conventional	-1999	19352	19573	19848	19845	20222
Motorcycles	4-stroke 250 - 750 cm³	97/24/EC	2000-2003					

Motorcycles	4-stroke >750 cm³	Conventional	-1999	8796	8897	9022	9021	9192
Motorcycles	4-stroke >750 cm³	97/24/EC	2000-2003					

Sector	Subsector	Tech	Reg. year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Light Duty Vehicles	Gasoline <3,5t	Conventional	-2004	42333	43215	44179	45486	47261	44601	41519	37209	34454	31489	28488	25423	21615
Light Duty Vehicles	Gasoline <3,5t	Euro I	2005-2008						4259	8524	12645	17212	16632	15979	15527	15049
Light Duty Vehicles	Gasoline <3,5t	Euro II	2009-2001										4705	9299	14017	13917
Light Duty Vehicles	Gasoline <3,5t	Euro III	2002-2006													5140
Light Duty Vehicles	Diesel <3,5 t	Conventional	-2004	155543	158781	162324	167129	173650	163877	152553	142109	131572	122992	115695	105397	92990
Light Duty Vehicles	Diesel <3,5 t	Euro I	2005-2008						15648	31318	48292	65727	64964	64894	64370	64743
Light Duty Vehicles	Diesel <3,5 t	Euro II	2009-2001										18376	37766	58112	59870
Light Duty Vehicles	Diesel <3,5 t	Euro III	2002-2006													22112
Heavy Duty Vehicles	Gasoline >3,5 t	Conventional		250	255	260	268	279	288	295	261	274	253	257	249	249
Heavy Duty Vehicles	Diesel 3,5 - 7,5 t	Conventional	-1993	5108	5214	5330	5488	5205	4891	4532	3999	3692	3079	2406	1979	1739
Heavy Duty Vehicles	Diesel 3,5 - 7,5 t	Euro I	1994-1996					497	1004	1506	1440	1435	1269	1057	951	956
Heavy Duty Vehicles	Diesel 3,5 - 7,5 t	Euro II	1997-2001								529	1087	1487	1703	1990	2064
Heavy Duty Vehicles	Diesel 3,5 - 7,5 t	Euro III	2002-2005													484
Heavy Duty Vehicles	Diesel 7,5 - 16 t	Conventional	-1993	10286	10500	10734	11052	10482	9850	9126	7800	6603	5613	5085	4210	3136
Heavy Duty Vehicles	Diesel 7,5 - 16 t	Euro I	1994-1996					1001	2022	3033	2808	2566	2314	2235	2024	1724
Heavy Duty Vehicles	Diesel 7,5 - 16 t	Euro II	1997-2001								1032	1945	2710	3600	4234	3724
Heavy Duty Vehicles	Diesel 7,5 - 16 t	Euro III	2002-2005													872
Heavy Duty Vehicles	Diesel 16 - 32 t	Conventional	-1993	13034	13306	13602	14005	13283	12481	11564	10720	9832	8982	7933	6814	5525
Heavy Duty Vehicles	Diesel 16 - 32 t	Euro I	1994-1996					1268	2562	3844	3859	3821	3702	3486	3276	3037
Heavy Duty Vehicles	Diesel 16 - 32 t	Euro II	1997-2001								1419	2896	4336	5616	6853	6560
Heavy Duty Vehicles	Diesel 16 - 32 t	Euro III	2002-2005													1537
Heavy Duty Vehicles	Diesel >32t	Conventional	-1993	11446	11684	11944	12298	11664	10960	10154	9337	8720	8180	7361	6527	5486
Heavy Duty Vehicles	Diesel >32t	Euro I	1994-1996					1114	2250	3376	3362	3389	3371	3234	3138	3016
Heavy Duty Vehicles	Diesel >32t	Euro II	1997-2001								1236	2568	3949	5211	6564	6514
Heavy Duty Vehicles	Diesel >32t	Euro III	2002-2005													1526
Buses	Urban Buses	Conventional	-1993	4753	4561	4522	4490	4083	3635	3261	2946	2792	2542	2319	2319	1977
Buses	Urban Buses	Euro I	1994-1996					390	746	1084	1060	972	913	852	852	752
Buses	Urban Buses	Euro II	1997-2001								390	729	1053	1345	1345	1525
Buses	Urban Buses	Euro III	2002-2005													346
Buses	Coaches	Conventional	-1993	3327	2868	3007	3086	2927	4507	4156	3662	3369	3007	2724	2724	2165
Buses	Coaches	Euro I	1994-1996					280	925	1381	1318	1173	1080	1001	1001	823
Buses	Coaches	Euro II	1997-2001								485	879	1246	1579	1579	1670
Buses	Coaches	Euro III	2002-2005													379
Mopeds	<50 cm³	Conventional	-1999	120000	118000	113000	109000	105000	114167	123333	132500	141667	150833	150522	149460	146077
Mopeds	<50 cm³	97/24/EC I	2000-2002											9478	15540	24923
Motorcycles	2-stroke >50 cm³	Conventional		6617	6804	6904	7111	7406	7672	8214	8980	9598	10385	11054	11367	11582
Motorcycles	4-stroke <250 cm³	Conventional	-1999	7499	7712	7824	8059	8394	8695	9310	10177	10878	11769	11916	11367	12882

Motorcycles	4-stroke <250 cm³	97/24/EC	2000-2003											613	1074	1348
Motorcycles	4-stroke 250 - 750 cm³	Conventional	-1999	20622	21207	21516	22162	23083	23911	25602	27986	29914	32365	32768	33910	35424
Motorcycles	4-stroke 250 - 750 cm³	97/24/EC	2000-2003											1685	2953	3707
Motorcycles	4-stroke >750 cm³	Conventional	-1999	9374	9639	9780	10074	10492	10869	11637	12721	13597	14712	14894	15414	16102
Motorcycles	4-stroke >750 cm³	97/24/EC	2000-2003											766	1342	1685

Annex 2: Mileage data 1990-2002 for road transport (km)

Sector	Subsector	Tech	Reg. year	1985	1986	1987	1988	1989
Passenger Cars	Gasoline <1,4 l	PRE ECE	-1969	9654	9441	9348	9515	9557
Passenger Cars	Gasoline <1,4 l	ECE 15/00-01	1970-1978	12879	12266	11854	11652	11251
Passenger Cars	Gasoline <1,4 l	ECE 15/02	1979-1980	16201	15060	13954	13614	13193
Passenger Cars	Gasoline <1,4 l	ECE 15/03	1981-1985	19010	17912	17078	16606	15707
Passenger Cars	Gasoline <1,4 l	ECE 15/04	1986-1990		20553	19951	19628	19313
Passenger Cars	Gasoline <1,4 l	Euro I	1991-1996		1	1	1	1
Passenger Cars	Gasoline <1,4 l	Euro II	1997-2000					
Passenger Cars	Gasoline <1,4 l	Euro III	2001-2005					
Passenger Cars	Gasoline 1,4 - 2,0 l	PRE ECE	-1969	9654	9441	9348	9515	9557
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/00-01	1970-1978	12879	12266	11854	11652	11251
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/02	1979-1980	16201	15060	13954	13614	13193
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/03	1981-1985	19010	17912	17078	16606	15707
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/04	1986-1990		20553	19951	19628	19313
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro I	1991-1996					
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro II	1997-2000					
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro III	2001-2005					
Passenger Cars	Gasoline >2,0 l	PRE ECE	-1969	9654	9441	9348	9515	9557
Passenger Cars	Gasoline >2,0 l	ECE 15/00-01	1970-1978	12879	12266	11854	11652	11251
Passenger Cars	Gasoline >2,0 l	ECE 15/02	1979-1980	16201	15060	13954	13614	13193
Passenger Cars	Gasoline >2,0 l	ECE 15/03	1981-1985	19010	17912	17078	16606	15707
Passenger Cars	Gasoline >2,0 l	ECE 15/04	1986-1990		20553	19951	19628	19313
Passenger Cars	Gasoline >2,0 l	Euro I	1991-1996					
Passenger Cars	Gasoline >2,0 l	Euro II	1997-2000					
Passenger Cars	Gasoline >2,0 l	Euro III	2001-2005					
Passenger Cars	Diesel <2,0 l	Euro I	1991-1996					
Passenger Cars	Diesel <2,0 l	Euro II	1997-2000					
Passenger Cars	Diesel <2,0 l	Euro III	2001-2005					
Passenger Cars	Diesel <2,0 l	Conventional	-1990	30188	30188	30188	30188	30484
Passenger Cars	Diesel >2,0 l	Euro I	1991-1996					
Passenger Cars	Diesel >2,0 l	Euro II	1997-2000					
Passenger Cars	Diesel >2,0 l	Euro III	2001-2005					
Passenger Cars	Diesel >2,0 l	Conventional	-1990	30188	30188	30188	30188	30484
Passenger Cars	LPG	Conventional		19010	17912	17078	16606	15707
Passenger Cars	2-Stroke	Conventional		19010	17912	17078	16606	15707

Sector	Subsector	Tech	Reg. year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Passenger Cars	Gasoline <1,4 l	PRE ECE	-1969	10352	11120	11847	12282	12679	12387	12152	11935	11988	11691	11507	11922	11743
Passenger Cars	Gasoline <1,4 l	ECE 15/00-01	1970-1978	12073	12735	13119	13036	12679	12387	12152	11935	11988	11691	11507	11922	11743
Passenger Cars	Gasoline <1,4 l	ECE 15/02	1979-1980	13225	13605	14495	15028	15513	13532	12152	11935	11988	11691	11507	11922	11743
Passenger Cars	Gasoline <1,4 l	ECE 15/03	1981-1985	16370	16830	16920	16820	16701	15701	14867	14403	14225	13461	12591	11922	11743
Passenger Cars	Gasoline <1,4 l	ECE 15/04	1986-1990	19941	20341	20763	20356	19947	18688	17564	16233	15648	14929	14356	12416	13780
Passenger Cars	Gasoline <1,4 l	Euro I	1991-1996	22535	23984	25041	25397	25885	24768	23130	22344	21207	19843	18497	18409	17226
Passenger Cars	Gasoline <1,4 l	Euro II	1997-2000								25981	25671	24357	24054	22954	21396
Passenger Cars	Gasoline <1,4 l	Euro III	2001-2005												25954	25172
Passenger Cars	Gasoline 1,4 - 2,0 l	PRE ECE	-1969	10352	11120	11847	12282	12679	12387	12152	11935	11988	11691	11507	11922	11743
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/00-01	1970-1978	12073	12735	13119	13036	12679	12387	12152	11935	11988	11691	11507	11922	11743
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/02	1979-1980	13225	13605	14495	15028	15513	13532	12152	11935	11988	11691	11507	11922	11743
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/03	1981-1985	16370	16830	16920	16820	16701	15701	14867	14403	14225	13461	12591	11922	11743
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/04	1986-1990	19941	20341	20763	20356	19947	18688	17564	16233	15648	14929	14356	12416	13780
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro I	1991-1996	22535	23984	25041	25397	25885	24768	23130	22344	21207	19843	18497	18409	17226
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro II	1997-2000								25981	25671	24357	24054	22954	21396
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro III	2001-2005												25954	25172
Passenger Cars	Gasoline >2,0 l	PRE ECE	-1969	10352	11120	11847	12282	12679	12387	12152	11935	11988	11691	11507	11922	11743
Passenger Cars	Gasoline >2,0 l	ECE 15/00-01	1970-1978	12073	12735	13119	13036	12679	12387	12152	11935	11988	11691	11507	11922	11743
Passenger Cars	Gasoline >2,0 l	ECE 15/02	1979-1980	13225	13605	14495	15028	15513	13532	12152	11935	11988	11691	11507	11922	11743
Passenger Cars	Gasoline >2,0 l	ECE 15/03	1981-1985	16370	16830	16920	16820	16701	15701	14867	14403	14225	13461	12591	11922	11743
Passenger Cars	Gasoline >2,0 l	ECE 15/04	1986-1990	19941	20341	20763	20356	19947	18688	17564	16233	15648	14929	14356	12416	13780
Passenger Cars	Gasoline >2,0 l	Euro I	1991-1996	22535	23984	25041	25397	25885	24768	23130	22344	21207	19843	18497	18409	17226
Passenger Cars	Gasoline >2,0 l	Euro II	1997-2000								25981	25671	24357	24054	22954	21396
Passenger Cars	Gasoline >2,0 l	Euro III	2001-2005												25954	25172
Passenger Cars	Diesel <2,0 l	Euro I	1991-1996		44822	44911	43972	44800	44746	43410	41641	39363	38090	35677	34320	33095
Passenger Cars	Diesel <2,0 l	Euro II	1997-2000								47992	47256	46753	45221	42794	41107
Passenger Cars	Diesel <2,0 l	Euro III	2001-2005												48385	48362
Passenger Cars	Diesel <2,0 l	Conventional	-1990	30874	30888	30400	29591	29501	29228	28169	27809	27304	27242	26288	22832	25212
Passenger Cars	Diesel >2,0 l	Euro I	1991-1996		44822	44911	43972	44800	44746	43410	41641	39363	38090	35677	34320	33095
Passenger Cars	Diesel >2,0 l	Euro II	1997-2000								47992	47256	46753	45221	42794	41107
Passenger Cars	Diesel >2,0 l	Euro III	2001-2005												48385	48362
Passenger Cars	Diesel >2,0 l	Conventional	-1990	30874	30888	30400	29591	29501	29228	28169	27809	27304	27242	26288	22832	25212
Passenger Cars	LPG	Conventional		16370	16830	16920	16820	16701	15701	14867	12868	14225	13461	12591	11922	11743
Passenger Cars	2-Stroke	Conventional		16370	16830	16920	16820	16701	15701	14867	12868	14225	13461	12591	11922	11743

Sector	Subsector	Tech	Reg. year	1985	1986	1987	1988	1989
Light Duty Vehicles	Gasoline <3,5t	Conventional	-2004	19882	19445	19252	19597	19195
Light Duty Vehicles	Gasoline <3,5t	Euro I	2005-2008					
Light Duty Vehicles	Gasoline <3,5t	Euro II	2009-2001					
Light Duty Vehicles	Gasoline <3,5t	Euro III	2002-2006					
Light Duty Vehicles	Diesel <3,5 t	Conventional	-2004	35193	37676	36474	36501	38052
Light Duty Vehicles	Diesel <3,5 t	Euro I	2005-2008					
Light Duty Vehicles	Diesel <3,5 t	Euro II	2009-2001					
Light Duty Vehicles	Diesel <3,5 t	Euro III	2002-2006					
Heavy Duty Vehicles	Gasoline >3,5 t	Conventional		22460	21965	21747	22137	21683
Heavy Duty Vehicles	Diesel 3,5 - 7,5 t	Conventional	-1993	31160	33359	32294	32318	33691
Heavy Duty Vehicles	Diesel 3,5 - 7,5 t	Euro I	1994-1996					
Heavy Duty Vehicles	Diesel 3,5 - 7,5 t	Euro II	1997-2001					
Heavy Duty Vehicles	Diesel 3,5 - 7,5 t	Euro III	2002-2005					
Heavy Duty Vehicles	Diesel 7,5 - 16 t	Conventional	-1993	43415	46479	44996	45029	46942
Heavy Duty Vehicles	Diesel 7,5 - 16 t	Euro I	1994-1996					
Heavy Duty Vehicles	Diesel 7,5 - 16 t	Euro II	1997-2001					
Heavy Duty Vehicles	Diesel 7,5 - 16 t	Euro III	2002-2005					
Heavy Duty Vehicles	Diesel 16 - 32 t	Conventional	-1993	60351	64610	62549	62594	65254
Heavy Duty Vehicles	Diesel 16 - 32 t	Euro I	1994-1996					
Heavy Duty Vehicles	Diesel 16 - 32 t	Euro II	1997-2001					
Heavy Duty Vehicles	Diesel 16 - 32 t	Euro III	2002-2005					
Heavy Duty Vehicles	Diesel >32t	Conventional	-1993	60351	64610	62549	62594	65254
Heavy Duty Vehicles	Diesel >32t	Euro I	1994-1996					
Heavy Duty Vehicles	Diesel >32t	Euro II	1997-2001					
Heavy Duty Vehicles	Diesel >32t	Euro III	2002-2005					
Buses	Urban Buses	Conventional	-1993	91053	97478	94369	94437	98450
Buses	Urban Buses	Euro I	1994-1996					
Buses	Urban Buses	Euro II	1997-2001					
Buses	Urban Buses	Euro III	2002-2005					
Buses	Coaches	Conventional	-1993	81623	87383	84595	84656	88254
Buses	Coaches	Euro I	1994-1996					
Buses	Coaches	Euro II	1997-2001					
Buses	Coaches	Euro III	2002-2005					
Mopeds	<50 cm³	Conventional	-1999	2018	1973	1954	1989	1948
Mopeds	<50 cm³	97/24/EC I	2000-2002					
Motorcycles	2-stroke >50 cm³	Conventional		5708	5582	5527	5626	5511
Motorcycles	4-stroke <250 cm³	Conventional	-1999	5708	5582	5527	5626	5511
Motorcycles	4-stroke <250 cm³	97/24/EC	2000-2003					
Motorcycles	4-stroke 250 - 750 cm³	Conventional	-1999	5708	5582	5527	5626	5511
Motorcycles	4-stroke 250 - 750 cm³	97/24/EC	2000-2003					
Motorcycles	4-stroke >750 cm³	Conventional	-1999	5708	5582	5527	5626	5511

Motorcycles	4-stroke >750 cm³	97/24/EC	2000-2003

Sector	Subsector	Tech	Reg. year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Light Duty Vehicles	Gasoline <3,5t	Conventional	-2004	20255	20573	21208	21167	21003	20157	20005	19559	18762	18082	18101	16619	18399
Light Duty Vehicles	Gasoline <3,5t	Euro I	2005-2008						20157	20005	19559	18762	18082	18101	16619	18399
Light Duty Vehicles	Gasoline <3,5t	Euro II	2009-2001										18082	18101	16619	18399
Light Duty Vehicles	Gasoline <3,5t	Euro III	2002-2006													18399
Light Duty Vehicles	Diesel <3,5 t	Conventional	-2004	40234	40672	38721	37230	38732	36909	37282	37023	35010	34193	32789	32130	32060
Light Duty Vehicles	Diesel <3,5 t	Euro I	2005-2008						36909	37282	37023	35010	34193	32789	32130	32060
Light Duty Vehicles	Diesel <3,5 t	Euro II	2009-2001										34193	32789	32130	32060
Light Duty Vehicles	Diesel <3,5 t	Euro III	2002-2006													32060
Heavy Duty Vehicles	Gasoline >3,5 t	Conventional		24464	24848	25614	25565	25367	24346	24162	21140	21559	21272	22009	23191	25362
Heavy Duty Vehicles	Diesel 3,5 - 7,5 t	Conventional	-1993	41061	41509	39516	37996	39528	37666	38048	30803	31809	33583	34246	44099	43711
Heavy Duty Vehicles	Diesel 3,5 - 7,5 t	Euro I	1994-1996					39528	37666	38048	30803	31809	33583	34246	44099	43711
Heavy Duty Vehicles	Diesel 3,5 - 7,5 t	Euro II	1997-2001								30803	31809	33583	34246	44099	43711
Heavy Duty Vehicles	Diesel 3,5 - 7,5 t	Euro III	2002-2005													43711
Heavy Duty Vehicles	Diesel 7,5 - 16 t	Conventional	-1993	49634	50175	47767	45929	47781	45532	45991	43199	42348	39158	37550	20945	17878
Heavy Duty Vehicles	Diesel 7,5 - 16 t	Euro I	1994-1996					47781	45532	45991	43199	42348	39158	37550	20945	17878
Heavy Duty Vehicles	Diesel 7,5 - 16 t	Euro II	1997-2001								43199	42348	39158	37550	20945	17878
Heavy Duty Vehicles	Diesel 7,5 - 16 t	Euro III	2002-2005													17878
Heavy Duty Vehicles	Diesel 16 - 32 t	Conventional	-1993	68996	69748	66402	63845	66422	63294	63934	64717	65653	66838	64092	68254	66841
Heavy Duty Vehicles	Diesel 16 - 32 t	Euro I	1994-1996					66422	63294	63934	64717	65653	66838	64092	68254	66841
Heavy Duty Vehicles	Diesel 16 - 32 t	Euro II	1997-2001								64717	65653	66838	64092	68254	66841
Heavy Duty Vehicles	Diesel 16 - 32 t	Euro III	2002-2005													66841
Heavy Duty Vehicles	Diesel >32t	Conventional	-1993	68996	69748	66402	63845	66422	63294	63934	64717	65653	66838	64092	68254	66841
Heavy Duty Vehicles	Diesel >32t	Euro I	1994-1996					66422	63294	63934	64717	65653	66838	64092	68254	66841
Heavy Duty Vehicles	Diesel >32t	Euro II	1997-2001								64717	65653	66838	64092	68254	66841
Heavy Duty Vehicles	Diesel >32t	Euro III	2002-2005													66841
Buses	Urban Buses	Conventional	-1993	104096	107730	104029	103324	108850	103224	103953	103313	102311	99871	95765	93590	93770
Buses	Urban Buses	Euro I	1994-1996					108850	103224	103953	103313	102311	99871	95765	93590	93770
Buses	Urban Buses	Euro II	1997-2001								103313	102311	99871	95765	93590	93770
Buses	Urban Buses	Euro III	2002-2005													93770
Buses	Coaches	Conventional	-1993	93315	98696	98846	98624	108850	90022	85021	83545	82509	81021	77850	76121	76267
Buses	Coaches	Euro I	1994-1996					108850	90022	85021	83545	82509	81021	77850	76121	76267
Buses	Coaches	Euro II	1997-2001								83545	82509	81021	77850	76121	76267
Buses	Coaches	Euro III	2002-2005													76267
Mopeds	<50 cm³	Conventional	-1999	2056	2137	2235	2304	2315	2211	2188	2141	2151	1794	1614	1175	1306
Mopeds	<50 cm³	97/24/EC I	2000-2002											1614	1175	1306
Motorcycles	2-stroke >50 cm³	Conventional		5815	6072	6372	6557	6584	6279	6220	6106	6168	5971	6029	5563	6228
Motorcycles	4-stroke <250 cm³	Conventional	-1999	5815	6072	6372	6557	6584	6279	6220	6106	6168	5971	6029	5563	6228
Motorcycles	4-stroke <250 cm³	97/24/EC	2000-2003											6029	5563	6228
Motorcycles	4-stroke 250 - 750 cm³	Conventional	-1999	5815	6072	6372	6557	6584	6279	6220	6106	6168	5971	6029	5563	6228
Motorcycles	4-stroke 250 - 750 cm³	97/24/EC	2000-2003											6029	5563	6228

Motorcycles	4-stroke >750 cm³	Conventional	-1999	5815	6072	6372	6557	6584	6279	6220	6106	6168	5971	6029	5563	6228
Motorcycles	4-stroke >750 cm³	97/24/EC	2000-2003											6029	5563	6228

Annex 3: Basis emission factors (g/km)

Sector	Subsector	Tech	FCu	FCr	FCh	CO2u	CO2r	CO2h	CH4u	CH4r	CH4h	N2Ou	N2Or	N2Oh
Passenger Cars	Gasoline <1,4 l	PRE ECE	67,5	55,0	62,7	216	176	201	0,092	0,029	0,026	0,005	0,005	0,005
Passenger Cars	Gasoline <1,4 l	ECE 15/00-01	58,2	44,5	48,6	186	142	155	0,092	0,029	0,026	0,005	0,005	0,005
Passenger Cars	Gasoline <1,4 l	ECE 15/02	53,2	45,2	51,2	170	144	164	0,092	0,029	0,026	0,005	0,005	0,005
Passenger Cars	Gasoline <1,4 l	ECE 15/03	53,2	45,2	51,2	170	144	164	0,092	0,029	0,026	0,005	0,005	0,005
Passenger Cars	Gasoline <1,4 l	ECE 15/04	51,4	43,4	47,7	164	139	153	0,092	0,029	0,026	0,005	0,005	0,005
Passenger Cars	Gasoline <1,4 l	Euro I	51,1	38,0	43,9	164	121	140	0,038	0,018	0,021	0,053	0,016	0,035
Passenger Cars	Gasoline <1,4 l	Euro II	51,1	38,0	43,9	164	121	140	0,038	0,018	0,021	0,053	0,016	0,035
Passenger Cars	Gasoline <1,4 l	Euro III	51,1	38,0	43,9	164	121	140	0,038	0,018	0,021	0,053	0,016	0,035
Passenger Cars	Gasoline 1,4 - 2,0 l	PRE ECE	79,3	67,0	76,4	253	214	244	0,092	0,029	0,026	0,005	0,005	0,005
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/00-01	67,8	51,1	60,3	217	163	193	0,092	0,029	0,026	0,005	0,005	0,005
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/02	61,7	50,7	59,7	197	162	191	0,092	0,029	0,026	0,005	0,005	0,005
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/03	61,7	50,7	59,7	197	162	191	0,092	0,029	0,026	0,005	0,005	0,005
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/04	61,7	49,1	52,1	197	157	166	0,092	0,029	0,026	0,005	0,005	0,005
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro I	65,9	44,0	48,0	211	141	154	0,039	0,017	0,016	0,053	0,016	0,035
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro II	65,9	44,0	48,0	211	141	154	0,039	0,017	0,016	0,053	0,016	0,035
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro III	65,9	44,0	48,0	211	141	154	0,039	0,017	0,016	0,053	0,016	0,035
Passenger Cars	Gasoline >2,0 l	PRE ECE	96,5	80,0	88,3	309	256	282	0,092	0,029	0,026	0,005	0,005	0,005
Passenger Cars	Gasoline >2,0 l	ECE 15/00-01	73,8	57,1	66,3	236	183	212	0,092	0,029	0,026	0,005	0,005	0,005
Passenger Cars	Gasoline >2,0 l	ECE 15/02	75,3	63,3	70,7	241	202	226	0,092	0,029	0,026	0,005	0,005	0,005
Passenger Cars	Gasoline >2,0 l	ECE 15/03	75,3	63,3	70,7	241	202	226	0,092	0,029	0,026	0,005	0,005	0,005
Passenger Cars	Gasoline >2,0 l	ECE 15/04	71,1	58,1	69,9	227	186	223	0,092	0,029	0,026	0,005	0,005	0,005
Passenger Cars	Gasoline >2,0 l	Euro I	79,4	46,4	51,1	254	148	163	0,040	0,017	0,010	0,053	0,016	0,035
Passenger Cars	Gasoline >2,0 l	Euro II	79,4	46,4	51,1	254	148	163	0,040	0,017	0,010	0,053	0,016	0,035
Passenger Cars	Gasoline >2,0 l	Euro III	79,4	46,4	51,1	254	148	163	0,040	0,017	0,010	0,053	0,016	0,035
Passenger Cars	Diesel <2,0 l	Euro I	52,7	42,2	47,4	167	133	150	0,004	0,005	0,009	0,027	0,027	0,027
Passenger Cars	Diesel <2,0 l	Euro II	52,7	42,2	47,4	167	133	150	0,004	0,005	0,009	0,027	0,027	0,027
Passenger Cars	Diesel <2,0 l	Euro III	52,7	42,2	47,4	167	133	150	0,004	0,005	0,009	0,027	0,027	0,027
Passenger Cars	Diesel <2,0 l	Conventional	57,5	41,2	50,1	182	130	158	0,004	0,005	0,009	0,027	0,027	0,027
Passenger Cars	Diesel >2,0 l	Euro I	52,7	42,2	47,4	167	133	150	0,004	0,005	0,009	0,027	0,027	0,027
Passenger Cars	Diesel >2,0 l	Euro II	52,7	42,2	47,4	167	133	150	0,004	0,005	0,009	0,027	0,027	0,027
Passenger Cars	Diesel >2,0 l	Euro III	52,7	42,2	47,4	167	133	150	0,004	0,005	0,009	0,027	0,027	0,027
Passenger Cars	Diesel >2,0 l	Conventional	57,5	41,2	50,1	182	130	158	0,004	0,005	0,009	0,027	0,027	0,027
Passenger Cars	LPG	Conventional	59,0	45,0	54,0	176	135	161	0,080	0,035	0,025	0,015	0,015	0,015
Passenger Cars	2-Stroke	Conventional	111,5	66,0	56,9	357	211	182	0,150	0,040	0,025	0,005	0,005	0,005

Sector	Subsector	Tech	FCu	FCr	FCh	CO2u	CO2r	CO2h	CH4u	CH4r	CH4h	N2Ou	N2Or	N2Oh
Light Duty Vehicles	Gasoline <3,5t	Conventional	82,3	59,9	56,5	263	191	181	0,150	0,040	0,025	0,006	0,006	0,006
Light Duty Vehicles	Gasoline <3,5t	Euro I	96,5	70,4	66,5	308	225	212	0,038	0,020	0,016	0,053	0,016	0,035
Light Duty Vehicles	Gasoline <3,5t	Euro II	96,5	70,4	66,5	308	225	212	0,038	0,020	0,016	0,053	0,016	0,035
Light Duty Vehicles	Gasoline <3,5t	Euro III	96,5	70,4	66,5	308	225	212	0,038	0,020	0,016	0,053	0,016	0,035
Light Duty Vehicles	Diesel <3,5 t	Conventional	76,7	65,9	72,1	242	208	228	0,005	0,005	0,005	0,017	0,017	0,017
Light Duty Vehicles	Diesel <3,5 t	Euro I	68,9	58,2	63,7	218	184	201	0,005	0,005	0,005	0,017	0,017	0,017
Light Duty Vehicles	Diesel <3,5 t	Euro II	68,9	58,2	63,7	218	184	201	0,005	0,005	0,005	0,017	0,017	0,017
Light Duty Vehicles	Diesel <3,5 t	Euro III	68,9	58,2	63,7	218	184	201	0,005	0,005	0,005	0,017	0,017	0,017
Heavy Duty Vehicles	Gasoline >3,5 t	Conventional	225,0	150,0	165,0	719	480	528	0,140	0,110	0,070	0,006	0,006	0,006
Heavy Duty Vehicles	Diesel 3,5 - 7,5 t	Conventional	95,8	87,1	109,2	303	275	345	0,085	0,023	0,020	0,030	0,030	0,030
Heavy Duty Vehicles	Diesel 3,5 - 7,5 t	Euro I	95,8	87,1	109,2	303	275	345	0,085	0,023	0,020	0,030	0,030	0,030
Heavy Duty Vehicles	Diesel 3,5 - 7,5 t	Euro II	95,8	87,1	109,2	303	275	345	0,085	0,023	0,020	0,030	0,030	0,030
Heavy Duty Vehicles	Diesel 3,5 - 7,5 t	Euro III	95,8	87,1	109,2	303	275	345	0,085	0,023	0,020	0,030	0,030	0,030
Heavy Duty Vehicles	Diesel 7,5 - 16 t	Conventional	186,8	147,0	169,1	590	465	534	0,085	0,023	0,020	0,030	0,030	0,030
Heavy Duty Vehicles	Diesel 7,5 - 16 t	Euro I	186,8	147,0	169,1	590	465	534	0,085	0,023	0,020	0,030	0,030	0,030
Heavy Duty Vehicles	Diesel 7,5 - 16 t	Euro II	186,8	147,0	169,1	590	465	534	0,085	0,023	0,020	0,030	0,030	0,030
Heavy Duty Vehicles	Diesel 7,5 - 16 t	Euro III	186,8	147,0	169,1	590	465	534	0,085	0,023	0,020	0,030	0,030	0,030
Heavy Duty Vehicles	Diesel 16 - 32 t	Conventional	295,3	227,0	230,7	933	717	729	0,175	0,080	0,070	0,030	0,030	0,030
Heavy Duty Vehicles	Diesel 16 - 32 t	Euro I	295,3	227,0	230,7	933	717	729	0,175	0,080	0,070	0,030	0,030	0,030
Heavy Duty Vehicles	Diesel 16 - 32 t	Euro II	295,3	227,0	230,7	933	717	729	0,175	0,080	0,070	0,030	0,030	0,030
Heavy Duty Vehicles	Diesel 16 - 32 t	Euro III	295,3	227,0	230,7	933	717	729	0,175	0,080	0,070	0,030	0,030	0,030
Heavy Duty Vehicles	Diesel >32t	Conventional	392,8	311,5	297,4	1241	984	940	0,175	0,080	0,070	0,030	0,030	0,030
Heavy Duty Vehicles	Diesel >32t	Euro I	392,8	311,5	297,4	1241	984	940	0,175	0,080	0,070	0,030	0,030	0,030
Heavy Duty Vehicles	Diesel >32t	Euro II	392,8	311,5	297,4	1241	984	940	0,175	0,080	0,070	0,030	0,030	0,030
Heavy Duty Vehicles	Diesel >32t	Euro III	392,8	311,5	297,4	1241	984	940	0,175	0,080	0,070	0,030	0,030	0,030
Buses	Urban Buses	Conventional	315,8	253,3	219,0	998	800	692	0,175	0,080	0,070	0,030	0,030	0,030
Buses	Urban Buses	Euro I	315,8	253,3	219,0	998	800	692	0,175	0,080	0,070	0,030	0,030	0,030
Buses	Urban Buses	Euro II	315,8	253,3	219,0	998	800	692	0,175	0,080	0,070	0,030	0,030	0,030
Buses	Urban Buses	Euro III	315,8	253,3	219,0	998	800	692	0,175	0,080	0,070	0,030	0,030	0,030
Buses	Coaches	Conventional	281,8	214,6	198,3	890	678	627	0,175	0,080	0,070	0,030	0,030	0,030
Buses	Coaches	Euro I	281,8	214,6	198,3	890	678	627	0,175	0,080	0,070	0,030	0,030	0,030
Buses	Coaches	Euro II	281,8	214,6	198,3	890	678	627	0,175	0,080	0,070	0,030	0,030	0,030
Buses	Coaches	Euro III	281,8	214,6	198,3	890	678	627	0,175	0,080	0,070	0,030	0,030	0,030
Mopeds	<50 cm³	Conventional	25,0	25,0	0,0	80	80	0	0,219	0,000	0,000	0,001	0,000	0,000
Mopeds	<50 cm³	97/24/EC I	25,0	25,0	0,0	80	80	0	0,219	0,000	0,000	0,001	0,000	0,000
Motorcycles	2-stroke >50 cm³	Conventional	30,4	32,4	37,0	97	104	118	0,150	0,150	0,150	0,002	0,002	0,002
Motorcycles	4-stroke <250 cm³	Conventional	23,2	26,7	35,6	74	85	114	0,200	0,200	0,200	0,002	0,002	0,002
Motorcycles	4-stroke <250 cm³	97/24/EC	23,2	26,7	35,6	74	85	114	0,200	0,200	0,200	0,002	0,002	0,002
Motorcycles	4-stroke 250 - 750 cm³	Conventional	28,6	28,6	34,7	92	92	111	0,200	0,200	0,200	0,002	0,002	0,002
Motorcycles	4-stroke 250 - 750 cm³	97/24/EC	28,6	28,6	34,7	92	92	111	0,200	0,200	0,200	0,002	0,002	0,002
Motorcycles	4-stroke >750 cm³	Conventional	37,5	34,4	38,6	120	110	123	0,200	0,200	0,200	0,002	0,002	0,002

Motorcycles	4-stroke >750 cm³	97/24/EC	37,5	34,4	38,6	120	110	123	0,200	0,200	0,200	0,002	0,002	0,002

Sector	Subsector	Tech	COu	COr	COh	NOxu	NOxr	NOxh	NMVOCu	NMVOCr	NMVOCh
Passenger Cars	Gasoline <1,4 l	PRE ECE	27,505	19,333	15,520	1,849	2,062	2,023	2,262	1,568	1,221
Passenger Cars	Gasoline <1,4 l	ECE 15/00-01	18,966	14,480	18,620	1,849	2,062	2,023	1,770	1,227	1,095
Passenger Cars	Gasoline <1,4 l	ECE 15/02	15,859	8,200	8,260	1,619	2,102	2,909	1,757	1,032	0,924
Passenger Cars	Gasoline <1,4 l	ECE 15/03	16,752	8,793	7,620	1,680	2,253	3,276	1,757	1,032	0,924
Passenger Cars	Gasoline <1,4 l	ECE 15/04	9,087	4,956	4,292	1,691	2,089	2,662	1,388	0,866	0,672
Passenger Cars	Gasoline <1,4 l	Euro I	1,898	0,557	3,176	0,314	0,356	0,593	0,175	0,064	0,082
Passenger Cars	Gasoline <1,4 l	Euro II	1,898	0,557	3,176	0,314	0,356	0,593	0,175	0,064	0,082
Passenger Cars	Gasoline <1,4 l	Euro III	1,898	0,557	3,176	0,314	0,356	0,593	0,175	0,064	0,082
Passenger Cars	Gasoline 1,4 - 2,0 l	PRE ECE	27,505	19,333	15,520	2,164	2,683	3,130	2,262	1,568	1,221
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/00-01	18,966	14,480	18,620	2,164	2,683	3,130	1,770	1,227	1,095
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/02	15,859	8,200	8,260	1,831	2,377	3,283	1,757	1,032	0,924
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/03	16,752	8,793	7,620	1,917	2,580	3,472	1,757	1,032	0,924
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/04	9,087	4,956	4,292	2,122	2,757	3,524	1,388	0,866	0,672
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro I	2,583	0,937	2,402	0,323	0,349	0,530	0,138	0,066	0,067
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro II	2,583	0,937	2,402	0,323	0,349	0,530	0,138	0,066	0,067
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro III	2,583	0,937	2,402	0,323	0,349	0,530	0,138	0,066	0,067
Passenger Cars	Gasoline >2,0 l	PRE ECE	27,505	19,333	15,520	2,860	4,090	5,500	2,262	1,568	1,221
Passenger Cars	Gasoline >2,0 l	ECE 15/00-01	18,966	14,480	18,620	2,860	4,090	5,500	1,770	1,227	1,095
Passenger Cars	Gasoline >2,0 l	ECE 15/02	15,859	8,200	8,260	2,066	2,675	3,680	1,757	1,032	0,924
Passenger Cars	Gasoline >2,0 l	ECE 15/03	16,752	8,793	7,620	2,806	3,441	4,604	1,757	1,032	0,924
Passenger Cars	Gasoline >2,0 l	ECE 15/04	9,087	4,956	4,292	2,293	2,750	3,687	1,388	0,866	0,672
Passenger Cars	Gasoline >2,0 l	Euro I	3,838	0,814	0,976	0,427	0,406	0,521	0,232	0,147	0,105
Passenger Cars	Gasoline >2,0 l	Euro II	3,838	0,814	0,976	0,427	0,406	0,521	0,232	0,147	0,105
Passenger Cars	Gasoline >2,0 l	Euro III	3,838	0,814	0,976	0,427	0,406	0,521	0,232	0,147	0,105
Passenger Cars	Diesel <2,0 l	Euro I	0,432	0,109	0,165	0,679	0,488	0,619	0,073	0,028	0,020
Passenger Cars	Diesel <2,0 l	Euro II	0,432	0,109	0,165	0,679	0,488	0,619	0,073	0,028	0,020
Passenger Cars	Diesel <2,0 l	Euro III	0,432	0,109	0,165	0,679	0,488	0,619	0,073	0,028	0,020
Passenger Cars	Diesel <2,0 l	Conventional	0,651	0,472	0,384	0,520	0,433	0,528	0,141	0,081	0,052
Passenger Cars	Diesel >2,0 l	Euro I	0,432	0,109	0,165	0,679	0,488	0,619	0,073	0,028	0,020
Passenger Cars	Diesel >2,0 l	Euro II	0,432	0,109	0,165	0,679	0,488	0,619	0,073	0,028	0,020
Passenger Cars	Diesel >2,0 l	Euro III	0,432	0,109	0,165	0,679	0,488	0,619	0,073	0,028	0,020
Passenger Cars	Diesel >2,0 l	Conventional	0,651	0,472	0,384	0,824	0,723	0,861	0,141	0,081	0,052
Passenger Cars	LPG	Conventional	2,043	2,373	9,723	2,203	2,584	2,861	1,002	0,632	0,465
Passenger Cars	2-Stroke	Conventional	20,700	7,500	8,700	0,300	1,020	0,720	15,250	7,160	5,875

Sector	Subsector	Tech	COu	COr	COh	NOxu	NOxr	NOxh	NMVOCu	NMVOCr	NMVOCh
Light Duty Vehicles	Gasoline <3,5t	Conventional	14,925	6,075	7,389	2,671	3,118	3,387	1,727	0,689	0,421
Light Duty Vehicles	Gasoline <3,5t	Euro I	4,187	0,862	1,087	0,427	0,400	0,429	0,181	0,090	0,062
Light Duty Vehicles	Gasoline <3,5t	Euro II	4,187	0,862	1,087	0,427	0,400	0,429	0,181	0,090	0,062
Light Duty Vehicles	Gasoline <3,5t	Euro III	4,187	0,862	1,087	0,427	0,400	0,429	0,181	0,090	0,062
Light Duty Vehicles	Diesel <3,5 t	Conventional	1,124	1,009	1,060	1,673	0,843	0,834	0,126	0,101	0,096
Light Duty Vehicles	Diesel <3,5 t	Euro I	0,393	0,328	0,423	1,138	0,975	1,022	0,126	0,101	0,096
Light Duty Vehicles	Diesel <3,5 t	Euro II	0,393	0,328	0,423	1,138	0,975	1,022	0,126	0,101	0,096
Light Duty Vehicles	Diesel <3,5 t	Euro III	0,393	0,328	0,423	1,138	0,975	1,022	0,126	0,101	0,096
Heavy Duty Vehicles	Gasoline >3,5 t	Conventional	70,000	55,000	55,000	4,500	7,500	7,500	6,860	5,390	3,430
Heavy Duty Vehicles	Diesel 3,5 - 7,5 t	Conventional	3,156	2,170	1,777	3,247	2,169	2,615	1,688	1,082	0,838
Heavy Duty Vehicles	Diesel 3,5 - 7,5 t	Euro I	3,156	2,170	1,777	3,247	2,169	2,615	1,688	1,082	0,838
Heavy Duty Vehicles	Diesel 3,5 - 7,5 t	Euro II	3,156	2,170	1,777	3,247	2,169	2,615	1,688	1,082	0,838
Heavy Duty Vehicles	Diesel 3,5 - 7,5 t	Euro III	3,156	2,170	1,777	3,247	2,169	2,615	1,688	1,082	0,838
Heavy Duty Vehicles	Diesel 7,5 - 16 t	Conventional	3,156	2,170	1,777	6,684	4,293	4,091	1,688	1,082	0,838
Heavy Duty Vehicles	Diesel 7,5 - 16 t	Euro I	3,156	2,170	1,777	6,684	4,293	4,091	1,688	1,082	0,838
Heavy Duty Vehicles	Diesel 7,5 - 16 t	Euro II	3,156	2,170	1,777	6,684	4,293	4,091	1,688	1,082	0,838
Heavy Duty Vehicles	Diesel 7,5 - 16 t	Euro III	3,156	2,170	1,777	6,684	4,293	4,091	1,688	1,082	0,838
Heavy Duty Vehicles	Diesel 16 - 32 t	Conventional	3,156	2,170	1,777	12,561	9,060	7,610	1,598	1,025	0,788
Heavy Duty Vehicles	Diesel 16 - 32 t	Euro I	3,156	2,170	1,777	12,561	9,060	7,610	1,598	1,025	0,788
Heavy Duty Vehicles	Diesel 16 - 32 t	Euro II	3,156	2,170	1,777	12,561	9,060	7,610	1,598	1,025	0,788
Heavy Duty Vehicles	Diesel 16 - 32 t	Euro III	3,156	2,170	1,777	12,561	9,060	7,610	1,598	1,025	0,788
Heavy Duty Vehicles	Diesel >32t	Conventional	3,156	2,170	1,777	18,269	13,523	11,517	1,598	1,025	0,788
Heavy Duty Vehicles	Diesel >32t	Euro I	3,156	2,170	1,777	18,269	13,523	11,517	1,598	1,025	0,788
Heavy Duty Vehicles	Diesel >32t	Euro II	3,156	2,170	1,777	18,269	13,523	11,517	1,598	1,025	0,788
Heavy Duty Vehicles	Diesel >32t	Euro III	3,156	2,170	1,777	18,269	13,523	11,517	1,598	1,025	0,788
Buses	Urban Buses	Conventional	4,687	3,204	2,494	15,288	11,731	9,853	1,138	0,696	0,479
Buses	Urban Buses	Euro I	4,687	3,204	2,494	15,288	11,731	9,853	1,138	0,696	0,479
Buses	Urban Buses	Euro II	4,687	3,204	2,494	15,288	11,731	9,853	1,138	0,696	0,479
Buses	Urban Buses	Euro III	4,687	3,204	2,494	15,288	11,731	9,853	1,138	0,696	0,479
Buses	Coaches	Conventional	3,227	2,053	1,612	12,210	8,260	7,844	1,713	1,090	0,837
Buses	Coaches	Euro I	3,227	2,053	1,612	12,210	8,260	7,844	1,713	1,090	0,837
Buses	Coaches	Euro II	3,227	2,053	1,612	12,210	8,260	7,844	1,713	1,090	0,837
Buses	Coaches	Euro III	3,227	2,053	1,612	12,210	8,260	7,844	1,713	1,090	0,837
Mopeds	<50 cm³	Conventional	15,000	15,000	0,000	0,030	0,030	0,000	8,781	9,000	0,000
Mopeds	<50 cm³	97/24/EC I	15,000	15,000	0,000	0,030	0,030	0,000	8,781	9,000	0,000
Motorcycles	2-stroke >50 cm³	Conventional	23,380	25,490	27,500	0,032	0,088	0,133	9,190	8,252	8,210
Motorcycles	4-stroke <250 cm³	Conventional	22,380	26,300	38,600	0,130	0,242	0,362	1,350	0,760	1,120
Motorcycles	4-stroke <250 cm³	97/24/EC	22,380	26,300	38,600	0,130	0,242	0,362	1,350	0,760	1,120
Motorcycles	4-stroke 250 - 750 cm³	Conventional	20,440	21,517	25,810	0,136	0,251	0,374	1,150	0,744	0,810
Motorcycles	4-stroke 250 - 750 cm³	97/24/EC	20,440	21,517	25,810	0,136	0,251	0,374	1,150	0,744	0,810
Motorcycles	4-stroke >750 cm³	Conventional	14,880	18,030	24,300	0,148	0,266	0,392	2,320	1,410	0,990

Motorcycles	4-stroke >750 cm³	97/24/EC	14,880	18,030	24,300	0,148	0,266	0,392	2,320	1,410	0,990

Sector	Subsector	Tech	NH3u	NH3r	NH3h
Passenger Cars	Gasoline <1,4 l	PRE ECE	0,002	0,002	0,002
Passenger Cars	Gasoline <1,4 l	ECE 15/00-01	0,002	0,002	0,002
Passenger Cars	Gasoline <1,4 l	ECE 15/02	0,002	0,002	0,002
Passenger Cars	Gasoline <1,4 l	ECE 15/03	0,002	0,002	0,002
Passenger Cars	Gasoline <1,4 l	ECE 15/04	0,002	0,002	0,002
Passenger Cars	Gasoline <1,4 l	Euro I	0,070	0,100	0,100
Passenger Cars	Gasoline <1,4 l	Euro II	0,070	0,100	0,100
Passenger Cars	Gasoline <1,4 l	Euro III	0,070	0,100	0,100
Passenger Cars	Gasoline 1,4 - 2,0 l	PRE ECE	0,002	0,002	0,002
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/00-01	0,002	0,002	0,002
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/02	0,002	0,002	0,002
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/03	0,002	0,002	0,002
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/04	0,002	0,002	0,002
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro I	0,070	0,100	0,100
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro II	0,070	0,100	0,100
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro III	0,070	0,100	0,100
Passenger Cars	Gasoline >2,0 l	PRE ECE	0,002	0,002	0,002
Passenger Cars	Gasoline >2,0 l	ECE 15/00-01	0,002	0,002	0,002
Passenger Cars	Gasoline >2,0 l	ECE 15/02	0,002	0,002	0,002
Passenger Cars	Gasoline >2,0 l	ECE 15/03	0,002	0,002	0,002
Passenger Cars	Gasoline >2,0 l	ECE 15/04	0,002	0,002	0,002
Passenger Cars	Gasoline >2,0 l	Euro I	0,070	0,100	0,100
Passenger Cars	Gasoline >2,0 l	Euro II	0,070	0,100	0,100
Passenger Cars	Gasoline >2,0 l	Euro III	0,070	0,100	0,100
Passenger Cars	Diesel <2,0 l	Euro I	0,001	0,001	0,001
Passenger Cars	Diesel <2,0 l	Euro II	0,001	0,001	0,001
Passenger Cars	Diesel <2,0 l	Euro III	0,001	0,001	0,001
Passenger Cars	Diesel <2,0 l	Conventional	0,001	0,001	0,001
Passenger Cars	Diesel >2,0 l	Euro I	0,001	0,001	0,001
Passenger Cars	Diesel >2,0 l	Euro II	0,001	0,001	0,001
Passenger Cars	Diesel >2,0 l	Euro III	0,001	0,001	0,001
Passenger Cars	Diesel >2,0 l	Conventional	0,001	0,001	0,001
Passenger Cars	LPG	Conventional	0,000	0,000	0,000
Passenger Cars	2-Stroke	Conventional	0,002	0,002	0,002

Sector	Subsector	Tech	NH3u	NH3r	NH3h
Light Duty Vehicles	Gasoline <3,5t	Conventional	0,002	0,002	0,002
Light Duty Vehicles	Gasoline <3,5t	Euro I	0,070	0,100	0,100
Light Duty Vehicles	Gasoline <3,5t	Euro II	0,070	0,100	0,100
Light Duty Vehicles	Gasoline <3,5t	Euro III	0,070	0,100	0,100
Light Duty Vehicles	Diesel <3,5 t	Conventional	0,001	0,001	0,001
Light Duty Vehicles	Diesel <3,5 t	Euro I	0,001	0,001	0,001
Light Duty Vehicles	Diesel <3,5 t	Euro II	0,001	0,001	0,001
Light Duty Vehicles	Diesel <3,5 t	Euro III	0,001	0,001	0,001
Heavy Duty Vehicles	Gasoline >3,5 t	Conventional	0,002	0,002	0,002
Heavy Duty Vehicles	Diesel 3,5 - 7,5 t	Conventional	0,003	0,003	0,003
Heavy Duty Vehicles	Diesel 3,5 - 7,5 t	Euro I	0,003	0,003	0,003
Heavy Duty Vehicles	Diesel 3,5 - 7,5 t	Euro II	0,003	0,003	0,003
Heavy Duty Vehicles	Diesel 3,5 - 7,5 t	Euro III	0,003	0,003	0,003
Heavy Duty Vehicles	Diesel 7,5 - 16 t	Conventional	0,003	0,003	0,003
Heavy Duty Vehicles	Diesel 7,5 - 16 t	Euro I	0,003	0,003	0,003
Heavy Duty Vehicles	Diesel 7,5 - 16 t	Euro II	0,003	0,003	0,003
Heavy Duty Vehicles	Diesel 7,5 - 16 t	Euro III	0,003	0,003	0,003
Heavy Duty Vehicles	Diesel 16 - 32 t	Conventional	0,003	0,003	0,003
Heavy Duty Vehicles	Diesel 16 - 32 t	Euro I	0,003	0,003	0,003
Heavy Duty Vehicles	Diesel 16 - 32 t	Euro II	0,003	0,003	0,003
Heavy Duty Vehicles	Diesel 16 - 32 t	Euro III	0,003	0,003	0,003
Heavy Duty Vehicles	Diesel >32t	Conventional	0,003	0,003	0,003
Heavy Duty Vehicles	Diesel >32t	Euro I	0,003	0,003	0,003
Heavy Duty Vehicles	Diesel >32t	Euro II	0,003	0,003	0,003
Heavy Duty Vehicles	Diesel >32t	Euro III	0,003	0,003	0,003
Buses	Urban Buses	Conventional	0,003	0,003	0,003
Buses	Urban Buses	Euro I	0,003	0,003	0,003
Buses	Urban Buses	Euro II	0,003	0,003	0,003
Buses	Urban Buses	Euro III	0,003	0,003	0,003
Buses	Coaches	Conventional	0,003	0,003	0,003
Buses	Coaches	Euro I	0,003	0,003	0,003
Buses	Coaches	Euro II	0,003	0,003	0,003
Buses	Coaches	Euro III	0,003	0,003	0,003
Mopeds	<50 cm³	Conventional	0,001	0,001	0,000
Mopeds	<50 cm³	97/24/EC I	0,001	0,001	0,000
Motorcycles	2-stroke >50 cm³	Conventional	0,002	0,002	0,002
Motorcycles	4-stroke <250 cm³	Conventional	0,002	0,002	0,002
Motorcycles	4-stroke <250 cm³	97/24/EC	0,002	0,002	0,002
Motorcycles	4-stroke 250 - 750 cm³	Conventional	0,002	0,002	0,002
Motorcycles	4-stroke 250 - 750 cm³	97/24/EC	0,002	0,002	0,002
Motorcycles	4-stroke >750 cm³	Conventional	0,002	0,002	0,002

Motorcycles	4-stroke >750 cm³	97/24/EC	0,002	0,002	0,002

Annex 4: Fuel use factors (MJ/km) and emission factors (g/km)

Year	Sector	FCu (MJ)	FCr (MJ)	FCh (MJ)	CO2u	CO2r	CO2h	CH4u	CH4r	CH4h	N2Ou	N2Or	N2Oh	SO2u	SO2r	SO2h
1985	Passenger Cars	3,229	2,099	2,408	236	153	176	0,153	0,027	0,024	0,007	0,007	0,007	0,070	0,043	0,053
1986	Passenger Cars	3,197	2,090	2,390	234	153	175	0,151	0,027	0,024	0,007	0,007	0,007	0,045	0,028	0,034
1987	Passenger Cars	3,185	2,079	2,369	233	152	173	0,152	0,027	0,024	0,007	0,007	0,007	0,046	0,028	0,034
1988	Passenger Cars	3,116	2,068	2,345	228	151	171	0,144	0,027	0,024	0,007	0,007	0,007	0,045	0,028	0,034
1989	Passenger Cars	3,088	2,063	2,335	226	151	171	0,141	0,027	0,024	0,007	0,007	0,007	0,032	0,020	0,024
1990	Passenger Cars	3,082	2,054	2,318	225	150	169	0,143	0,027	0,024	0,008	0,007	0,008	0,031	0,020	0,023
1991	Passenger Cars	3,121	2,036	2,297	228	149	168	0,157	0,026	0,024	0,011	0,008	0,010	0,030	0,019	0,023
1992	Passenger Cars	3,133	2,020	2,276	229	148	166	0,165	0,025	0,023	0,014	0,009	0,011	0,021	0,014	0,016
1993	Passenger Cars	3,161	2,003	2,255	231	146	165	0,181	0,025	0,023	0,017	0,009	0,013	0,012	0,008	0,009
1994	Passenger Cars	3,162	1,981	2,226	231	145	163	0,189	0,024	0,022	0,021	0,010	0,016	0,012	0,008	0,009
1995	Passenger Cars	3,213	1,960	2,202	235	143	161	0,208	0,023	0,021	0,025	0,011	0,018	0,013	0,008	0,009
1996	Passenger Cars	3,275	1,945	2,182	239	142	159	0,234	0,022	0,021	0,028	0,012	0,020	0,013	0,008	0,009
1997	Passenger Cars	3,225	1,912	2,142	236	140	157	0,215	0,020	0,019	0,032	0,013	0,023	0,013	0,008	0,009
1998	Passenger Cars	3,201	1,901	2,128	234	139	156	0,198	0,018	0,017	0,034	0,013	0,024	0,013	0,008	0,009
1999	Passenger Cars	3,218	1,886	2,110	235	138	154	0,194	0,016	0,015	0,037	0,014	0,026	0,010	0,006	0,007
2000	Passenger Cars	3,207	1,875	2,097	234	137	153	0,187	0,014	0,014	0,038	0,015	0,027	0,007	0,004	0,005
2001	Passenger Cars	3,241	1,865	2,085	237	136	152	0,188	0,013	0,013	0,040	0,015	0,028	0,007	0,004	0,005
2002	Passenger Cars	3,205	1,860	2,079	234	136	152	0,167	0,012	0,012	0,041	0,016	0,029	0,007	0,004	0,005
1985	Light Duty Vehicles	3,927	2,790	3,000	290	206	222	0,045	0,010	0,008	0,016	0,016	0,016	0,781	0,572	0,626
1986	Light Duty Vehicles	3,907	2,792	3,006	289	206	222	0,042	0,009	0,007	0,016	0,016	0,016	0,473	0,348	0,380
1987	Light Duty Vehicles	3,917	2,791	3,004	289	206	222	0,043	0,009	0,008	0,016	0,016	0,016	0,473	0,347	0,379
1988	Light Duty Vehicles	3,869	2,791	3,003	286	206	222	0,041	0,009	0,008	0,016	0,016	0,016	0,466	0,346	0,378
1989	Light Duty Vehicles	3,847	2,792	3,007	284	206	222	0,039	0,009	0,007	0,016	0,016	0,016	0,312	0,233	0,254
1990	Light Duty Vehicles	3,842	2,792	3,007	284	206	222	0,038	0,009	0,007	0,016	0,016	0,016	0,312	0,233	0,255
1991	Light Duty Vehicles	3,872	2,792	3,007	286	206	222	0,040	0,009	0,007	0,016	0,016	0,016	0,314	0,233	0,254
1992	Light Duty Vehicles	3,873	2,790	3,002	286	206	222	0,042	0,010	0,008	0,016	0,016	0,016	0,202	0,150	0,164
1993	Light Duty Vehicles	3,907	2,790	2,999	289	206	222	0,044	0,010	0,008	0,016	0,016	0,016	0,079	0,058	0,063
1994	Light Duty Vehicles	3,945	2,791	3,002	291	206	222	0,044	0,010	0,008	0,016	0,016	0,016	0,080	0,058	0,064
1995	Light Duty Vehicles	3,937	2,771	2,979	291	205	220	0,044	0,009	0,007	0,016	0,016	0,016	0,080	0,058	0,063
1996	Light Duty Vehicles	3,973	2,752	2,959	293	203	219	0,046	0,009	0,007	0,017	0,016	0,016	0,080	0,057	0,062
1997	Light Duty Vehicles	3,900	2,732	2,939	288	202	217	0,041	0,009	0,007	0,017	0,016	0,017	0,079	0,057	0,062
1998	Light Duty Vehicles	3,851	2,714	2,918	284	200	216	0,040	0,008	0,007	0,018	0,016	0,017	0,078	0,056	0,062
1999	Light Duty Vehicles	3,846	2,697	2,900	284	199	214	0,038	0,008	0,007	0,018	0,016	0,017	0,043	0,031	0,034
2000	Light Duty Vehicles	3,816	2,681	2,883	282	198	213	0,036	0,008	0,007	0,018	0,016	0,017	0,009	0,006	0,007
2001	Light Duty Vehicles	3,821	2,663	2,866	282	197	212	0,034	0,007	0,006	0,019	0,016	0,018	0,009	0,006	0,007
2002	Light Duty Vehicles	3,782	2,647	2,845	279	196	210	0,032	0,007	0,006	0,019	0,016	0,018	0,009	0,006	0,007

Year	Sector	FCu (MJ)	FCr (MJ)	FCh (MJ)	CO2u	CO2r	CO2h	CH4u	CH4r	CH4h	N2Ou	N2Or	N2Oh	SO2u	SO2r	SO2h
1985	Heavy Duty Vehicles	12,039	9,738	10,290	891	721	761	0,152	0,067	0,063	0,030	0,030	0,030	2,814	2,277	2,408
1986	Heavy Duty Vehicles	12,030	9,737	10,294	890	720	762	0,152	0,067	0,063	0,030	0,030	0,030	1,687	1,366	1,445
1987	Heavy Duty Vehicles	12,029	9,736	10,294	890	720	762	0,152	0,067	0,063	0,030	0,030	0,030	1,687	1,366	1,445
1988	Heavy Duty Vehicles	12,037	9,738	10,291	891	721	762	0,152	0,067	0,063	0,030	0,030	0,030	1,688	1,367	1,445
1989	Heavy Duty Vehicles	12,037	9,738	10,291	891	721	762	0,152	0,067	0,063	0,030	0,030	0,030	1,126	0,911	0,963
1990	Heavy Duty Vehicles	11,965	9,685	10,256	885	717	759	0,151	0,067	0,063	0,030	0,030	0,030	1,119	0,906	0,960
1991	Heavy Duty Vehicles	12,016	9,691	10,226	889	717	757	0,151	0,066	0,062	0,030	0,030	0,030	1,124	0,907	0,957
1992	Heavy Duty Vehicles	12,023	9,677	10,218	890	716	756	0,152	0,066	0,062	0,030	0,030	0,030	0,731	0,588	0,622
1993	Heavy Duty Vehicles	11,898	9,723	10,189	880	719	754	0,150	0,067	0,062	0,030	0,030	0,030	0,278	0,227	0,238
1994	Heavy Duty Vehicles	11,929	9,663	10,141	883	715	750	0,146	0,065	0,061	0,030	0,030	0,030	0,279	0,226	0,237
1995	Heavy Duty Vehicles	11,911	9,673	10,013	881	716	741	0,142	0,064	0,059	0,030	0,030	0,030	0,278	0,226	0,234
1996	Heavy Duty Vehicles	11,938	9,657	10,026	883	715	742	0,137	0,061	0,058	0,030	0,030	0,030	0,279	0,226	0,235
1997	Heavy Duty Vehicles	12,176	9,836	10,152	901	728	751	0,133	0,061	0,057	0,030	0,030	0,030	0,285	0,230	0,238
1998	Heavy Duty Vehicles	12,246	9,904	10,209	906	733	755	0,129	0,059	0,056	0,030	0,030	0,030	0,286	0,232	0,239
1999	Heavy Duty Vehicles	12,389	10,028	10,306	917	742	763	0,126	0,059	0,055	0,030	0,030	0,030	0,159	0,129	0,133
2000	Heavy Duty Vehicles	12,422	10,055	10,329	919	744	764	0,121	0,057	0,053	0,030	0,030	0,030	0,029	0,024	0,024
2001	Heavy Duty Vehicles	12,685	10,273	10,476	939	760	775	0,121	0,057	0,053	0,030	0,030	0,030	0,030	0,024	0,025
2002	Heavy Duty Vehicles	12,739	10,323	10,510	943	764	778	0,114	0,055	0,051	0,030	0,030	0,030	0,030	0,024	0,025
1985	2-wheelers	1,159	1,230	1,578	85	90	115	0,211	0,117	0,193	0,001	0,001	0,002	0,003	0,003	0,004
1986	2-wheelers	1,163	1,235	1,578	85	90	115	0,210	0,121	0,193	0,001	0,001	0,002	0,003	0,003	0,004
1987	2-wheelers	1,166	1,238	1,578	85	90	115	0,210	0,124	0,193	0,001	0,001	0,002	0,003	0,003	0,004
1988	2-wheelers	1,168	1,241	1,578	85	91	115	0,210	0,126	0,192	0,001	0,001	0,002	0,003	0,003	0,004
1989	2-wheelers	1,170	1,243	1,578	85	91	115	0,210	0,128	0,193	0,001	0,001	0,002	0,003	0,003	0,004
1990	2-wheelers	1,173	1,245	1,578	86	91	115	0,209	0,130	0,192	0,001	0,001	0,002	0,003	0,004	0,005
1991	2-wheelers	1,182	1,242	1,578	86	91	115	0,208	0,127	0,193	0,001	0,001	0,002	0,003	0,003	0,004
1992	2-wheelers	1,178	1,253	1,578	86	91	115	0,209	0,137	0,192	0,001	0,001	0,002	0,003	0,003	0,004
1993	2-wheelers	1,190	1,249	1,578	87	91	115	0,207	0,133	0,192	0,001	0,001	0,002	0,003	0,003	0,004
1994	2-wheelers	1,188	1,258	1,578	87	92	115	0,207	0,141	0,193	0,001	0,001	0,002	0,003	0,003	0,004
1995	2-wheelers	1,182	1,254	1,578	86	92	115	0,208	0,137	0,193	0,001	0,001	0,002	0,003	0,003	0,004
1996	2-wheelers	1,185	1,256	1,578	86	92	115	0,208	0,139	0,193	0,001	0,001	0,002	0,003	0,003	0,004
1997	2-wheelers	1,186	1,257	1,578	87	92	115	0,208	0,140	0,192	0,001	0,001	0,002	0,003	0,003	0,004
1998	2-wheelers	1,186	1,257	1,578	87	92	115	0,208	0,140	0,193	0,001	0,001	0,002	0,003	0,003	0,004
1999	2-wheelers	1,195	1,264	1,578	87	92	115	0,207	0,146	0,192	0,001	0,002	0,002	0,003	0,003	0,004
2000	2-wheelers	1,198	1,265	1,572	87	92	115	0,202	0,150	0,193	0,001	0,002	0,002	0,003	0,003	0,004
2001	2-wheelers	1,210	1,272	1,568	88	93	114	0,199	0,158	0,193	0,002	0,002	0,002	0,003	0,003	0,004
2002	2-wheelers	1,209	1,271	1,566	88	93	114	0,197	0,159	0,193	0,002	0,002	0,002	0,003	0,003	0,004

Year	Sector	NOxu	NOxr	NOxh	NMVOCu	NMVOCr	NMVOCh	NMVOCu	NMVOCr	NMVOCh	COu	COr	COh	NH3u	NH3r	NH3h
1985	Passenger Cars	1,856	2,195	2,802	3,046	1,051	0,926	4,928	1,441	1,001	36,756	10,183	10,658	0,002	0,002	0,002
1986	Passenger Cars	1,850	2,195	2,812	2,947	1,029	0,901	4,837	1,421	0,977	34,663	9,688	10,036	0,002	0,002	0,002
1987	Passenger Cars	1,851	2,192	2,809	2,907	1,006	0,873	4,775	1,394	0,947	33,221	9,125	9,376	0,002	0,002	0,002
1988	Passenger Cars	1,832	2,187	2,808	2,686	0,976	0,835	4,625	1,378	0,913	29,040	8,378	8,477	0,002	0,002	0,002
1989	Passenger Cars	1,823	2,185	2,813	2,593	0,958	0,814	4,554	1,364	0,892	27,344	7,992	7,972	0,002	0,002	0,002
1990	Passenger Cars	1,791	2,142	2,763	2,527	0,929	0,787	4,440	1,325	0,863	26,382	7,625	7,554	0,004	0,004	0,004
1991	Passenger Cars	1,718	2,014	2,609	2,520	0,864	0,732	4,313	1,219	0,802	26,666	7,061	7,065	0,008	0,011	0,011
1992	Passenger Cars	1,649	1,901	2,475	2,416	0,804	0,681	4,195	1,139	0,738	25,631	6,538	6,663	0,012	0,017	0,017
1993	Passenger Cars	1,595	1,798	2,356	2,402	0,746	0,633	3,990	1,045	0,684	25,790	6,025	6,323	0,016	0,023	0,023
1994	Passenger Cars	1,488	1,624	2,149	2,200	0,654	0,555	3,671	0,919	0,601	23,663	5,243	5,741	0,023	0,032	0,032
1995	Passenger Cars	1,430	1,495	1,993	2,157	0,584	0,497	3,526	0,817	0,533	23,607	4,701	5,507	0,027	0,039	0,039
1996	Passenger Cars	1,393	1,395	1,875	2,176	0,526	0,449	3,393	0,731	0,477	24,352	4,267	5,365	0,032	0,045	0,045
1997	Passenger Cars	1,283	1,240	1,694	1,835	0,435	0,376	2,896	0,614	0,400	20,485	3,464	4,975	0,037	0,053	0,053
1998	Passenger Cars	1,197	1,129	1,549	1,619	0,382	0,329	2,552	0,539	0,350	18,258	3,057	4,674	0,040	0,057	0,057
1999	Passenger Cars	1,102	0,995	1,369	1,477	0,322	0,277	2,270	0,456	0,295	17,050	2,617	4,306	0,043	0,062	0,062
2000	Passenger Cars	1,027	0,893	1,232	1,335	0,277	0,238	1,886	0,370	0,251	15,805	2,309	4,104	0,046	0,065	0,065
2001	Passenger Cars	0,958	0,796	1,107	1,261	0,234	0,203	1,710	0,310	0,214	15,723	2,064	4,048	0,048	0,069	0,069
2002	Passenger Cars	0,907	0,749	1,041	1,119	0,213	0,185	1,539	0,284	0,194	14,127	1,911	3,885	0,048	0,068	0,068
1985	Light Duty Vehicles	2,020	1,146	1,174	0,637	0,179	0,139	0,875	0,225	0,149	5,929	1,684	1,904	0,001	0,001	0,001
1986	Light Duty Vehicles	2,002	1,123	1,148	0,597	0,173	0,136	0,818	0,216	0,145	5,515	1,633	1,840	0,001	0,001	0,001
1987	Light Duty Vehicles	2,010	1,128	1,154	0,610	0,174	0,137	0,833	0,218	0,146	5,647	1,645	1,855	0,001	0,001	0,001
1988	Light Duty Vehicles	1,981	1,133	1,159	0,581	0,176	0,137	0,816	0,221	0,147	5,389	1,655	1,867	0,001	0,001	0,001
1989	Light Duty Vehicles	1,963	1,117	1,142	0,549	0,172	0,135	0,775	0,215	0,145	5,077	1,621	1,824	0,001	0,001	0,001
1990	Light Duty Vehicles	1,960	1,117	1,141	0,546	0,171	0,135	0,771	0,215	0,145	5,044	1,620	1,823	0,001	0,001	0,001
1991	Light Duty Vehicles	1,979	1,118	1,143	0,568	0,172	0,135	0,790	0,215	0,145	5,242	1,622	1,826	0,001	0,001	0,001
1992	Light Duty Vehicles	1,981	1,138	1,165	0,586	0,177	0,138	0,833	0,224	0,148	5,453	1,666	1,881	0,001	0,001	0,001
1993	Light Duty Vehicles	2,004	1,147	1,176	0,620	0,179	0,140	0,865	0,226	0,149	5,785	1,688	1,908	0,001	0,001	0,001
1994	Light Duty Vehicles	2,006	1,135	1,162	0,618	0,176	0,138	0,890	0,220	0,146	5,767	1,661	1,874	0,001	0,001	0,001
1995	Light Duty Vehicles	1,945	1,115	1,144	0,605	0,170	0,134	0,856	0,210	0,142	5,616	1,553	1,758	0,002	0,002	0,002
1996	Light Duty Vehicles	1,907	1,091	1,121	0,612	0,163	0,130	0,836	0,197	0,136	5,646	1,441	1,636	0,003	0,003	0,003
1997	Light Duty Vehicles	1,811	1,064	1,094	0,543	0,154	0,125	0,745	0,185	0,130	4,957	1,317	1,500	0,003	0,004	0,004
1998	Light Duty Vehicles	1,735	1,050	1,082	0,507	0,149	0,122	0,690	0,177	0,127	4,638	1,232	1,410	0,004	0,005	0,005
1999	Light Duty Vehicles	1,688	1,031	1,064	0,487	0,142	0,118	0,647	0,167	0,122	4,399	1,137	1,307	0,004	0,006	0,006
2000	Light Duty Vehicles	1,629	1,018	1,052	0,459	0,137	0,115	0,575	0,156	0,118	4,159	1,064	1,229	0,005	0,007	0,007
2001	Light Duty Vehicles	1,593	0,998	1,032	0,442	0,130	0,111	0,536	0,145	0,113	3,903	0,964	1,119	0,005	0,007	0,007
2002	Light Duty Vehicles	1,504	0,974	1,010	0,407	0,123	0,105	0,493	0,136	0,108	3,675	0,891	1,044	0,006	0,008	0,008

Year	Sector	NOxu	NOxr	NOxh	NMVOCu	NMVOCr	NMVOCh	NMVOCu	NMVOCr	NMVOCh	COu	COr	COh	NH3u	NH3r	NH3h
1985	Heavy Duty Vehicles	12,461	9,226	8,535	1,528	1,007	0,792	1,528	1,007	0,792	3,717	2,417	1,861	0,003	0,003	0,003
1986	Heavy Duty Vehicles	12,445	9,220	8,535	1,529	1,007	0,791	1,529	1,007	0,791	3,698	2,405	1,855	0,003	0,003	0,003
1987	Heavy Duty Vehicles	12,443	9,219	8,535	1,529	1,008	0,791	1,529	1,008	0,791	3,701	2,408	1,856	0,003	0,003	0,003
1988	Heavy Duty Vehicles	12,457	9,225	8,535	1,528	1,007	0,791	1,528	1,007	0,791	3,708	2,411	1,857	0,003	0,003	0,003
1989	Heavy Duty Vehicles	12,458	9,225	8,536	1,527	1,006	0,791	1,527	1,006	0,791	3,699	2,404	1,853	0,003	0,003	0,003
1990	Heavy Duty Vehicles	12,379	9,166	8,502	1,527	1,007	0,792	1,527	1,007	0,792	3,707	2,411	1,857	0,003	0,003	0,003
1991	Heavy Duty Vehicles	12,423	9,174	8,460	1,532	1,007	0,792	1,532	1,007	0,792	3,687	2,414	1,862	0,003	0,003	0,003
1992	Heavy Duty Vehicles	12,435	9,145	8,456	1,532	1,011	0,792	1,532	1,011	0,792	3,700	2,413	1,866	0,003	0,003	0,003
1993	Heavy Duty Vehicles	12,272	9,212	8,433	1,538	1,008	0,792	1,538	1,008	0,792	3,707	2,420	1,872	0,003	0,003	0,003
1994	Heavy Duty Vehicles	11,939	8,820	8,092	1,475	0,986	0,775	1,475	0,986	0,775	3,588	2,323	1,814	0,003	0,003	0,003
1995	Heavy Duty Vehicles	11,490	8,527	7,722	1,439	0,964	0,761	1,439	0,964	0,761	3,411	2,225	1,757	0,003	0,003	0,003
1996	Heavy Duty Vehicles	11,123	8,241	7,455	1,396	0,938	0,745	1,396	0,938	0,745	3,260	2,156	1,704	0,003	0,003	0,003
1997	Heavy Duty Vehicles	10,798	8,035	7,206	1,331	0,903	0,721	1,331	0,903	0,721	3,070	2,044	1,632	0,003	0,003	0,003
1998	Heavy Duty Vehicles	10,374	7,747	6,917	1,283	0,876	0,700	1,283	0,876	0,700	2,941	1,970	1,586	0,003	0,003	0,003
1999	Heavy Duty Vehicles	10,019	7,524	6,684	1,234	0,849	0,680	1,234	0,849	0,680	2,795	1,885	1,535	0,003	0,003	0,003
2000	Heavy Duty Vehicles	9,598	7,227	6,410	1,193	0,826	0,663	1,193	0,826	0,663	2,686	1,824	1,500	0,003	0,003	0,003
2001	Heavy Duty Vehicles	9,526	7,161	6,252	1,148	0,803	0,645	1,148	0,803	0,645	2,625	1,770	1,467	0,003	0,003	0,003
2002	Heavy Duty Vehicles	8,842	6,686	5,823	1,071	0,757	0,611	1,071	0,757	0,611	2,455	1,671	1,398	0,003	0,003	0,003
1985	2-wheelers	0,058	0,151	0,340	6,932	4,753	2,011	7,427	5,023	2,040	16,514	19,368	27,917	0,001	0,001	0,002
1986	2-wheelers	0,060	0,155	0,340	6,808	4,598	2,011	7,322	4,870	2,040	16,616	19,528	27,917	0,001	0,001	0,002
1987	2-wheelers	0,061	0,158	0,340	6,729	4,504	2,011	7,242	4,770	2,040	16,680	19,624	27,917	0,001	0,001	0,002
1988	2-wheelers	0,062	0,160	0,340	6,666	4,431	2,011	7,210	4,709	2,041	16,732	19,700	27,917	0,001	0,001	0,002
1989	2-wheelers	0,063	0,162	0,340	6,606	4,364	2,011	7,171	4,649	2,042	16,781	19,769	27,917	0,001	0,001	0,002
1990	2-wheelers	0,064	0,164	0,340	6,532	4,283	2,011	7,095	4,562	2,041	16,842	19,852	27,917	0,001	0,001	0,002
1991	2-wheelers	0,068	0,161	0,340	6,249	4,379	2,011	6,770	4,669	2,047	17,073	19,753	27,917	0,001	0,001	0,002
1992	2-wheelers	0,066	0,171	0,340	6,372	4,042	2,011	6,937	4,303	2,045	16,972	20,099	27,917	0,001	0,001	0,002
1993	2-wheelers	0,071	0,167	0,340	6,033	4,187	2,011	6,538	4,462	2,048	17,250	19,950	27,917	0,001	0,001	0,002
1994	2-wheelers	0,070	0,175	0,340	6,097	3,880	2,011	6,663	4,139	2,047	17,197	20,267	27,917	0,001	0,001	0,002
1995	2-wheelers	0,068	0,171	0,340	6,271	4,023	2,011	6,850	4,295	2,038	17,055	20,119	27,917	0,001	0,001	0,002
1996	2-wheelers	0,069	0,173	0,340	6,184	3,960	2,011	6,726	4,212	2,046	17,126	20,184	27,917	0,001	0,001	0,002
1997	2-wheelers	0,069	0,174	0,340	6,153	3,931	2,011	6,729	4,198	2,048	17,152	20,214	27,917	0,001	0,001	0,002
1998	2-wheelers	0,069	0,174	0,340	6,145	3,924	2,011	6,720	4,189	2,047	17,158	20,221	27,917	0,001	0,001	0,002
1999	2-wheelers	0,073	0,180	0,340	5,895	3,704	2,011	6,509	3,974	2,048	17,363	20,448	27,917	0,001	0,002	0,002
2000	2-wheelers	0,077	0,186	0,342	5,549	3,417	1,980	6,071	3,639	2,010	17,021	20,004	27,414	0,001	0,002	0,002
2001	2-wheelers	0,084	0,196	0,345	5,073	3,064	1,933	5,642	3,289	1,963	16,990	19,880	26,948	0,002	0,002	0,002
2002	2-wheelers	0,086	0,198	0,348	4,875	2,899	1,877	5,446	3,123	1,907	16,784	19,690	26,937	0,002	0,002	0,002

Annex 5: Fuel use (GJ) and emissions (tons) per vehicle category and as totals

Year	Sector	FC (GJ)	SO2	NOx	NMVOC	CH4	CO	CO2	N2O	NH3
1985	Passenger Cars	65998226	1413	53825	71922	2007	540484	4823200	179	48
1986	Passenger Cars	66376423	927	54512	71599	2007	517508	4850992	182	49
1987	Passenger Cars	66571313	943	54907	71062	2035	497147	4865325	184	49
1988	Passenger Cars	67036985	943	55829	70652	1997	449763	4899318	187	50
1989	Passenger Cars	66072647	677	55255	69046	1947	421127	4828973	187	50
1990	Passenger Cars	69608254	687	57332	71086	2079	427990	5087105	214	110
1991	Passenger Cars	73816548	709	57836	71423	2334	443231	5394444	280	281
1992	Passenger Cars	77348442	526	58614	70458	2467	434504	5652313	347	464
1993	Passenger Cars	79376296	307	57397	68127	2719	438753	5800343	407	639
1994	Passenger Cars	82258416	318	55069	63930	2876	410796	6010935	511	940
1995	Passenger Cars	83450719	329	52947	59334	3038	396227	6098344	587	1178
1996	Passenger Cars	84286667	335	50991	55425	3288	394948	6159584	651	1374
1997	Passenger Cars	86483699	344	48026	49139	3139	347652	6320175	761	1694
1998	Passenger Cars	88522087	356	45484	44559	2975	320454	6469358	833	1894
1999	Passenger Cars	89167631	292	41094	39478	2903	297453	6517606	896	2054
2000	Passenger Cars	88595697	203	37329	32628	2769	274087	6476748	938	2159
2001	Passenger Cars	88434195	202	33750	28933	2751	267408	6465693	981	2273
2002	Passenger Cars	89468068	205	32435	26637	2503	247451	6542849	1013	2310
1985	Light Duty Vehicles	16178208	3275	7434	2378	119	17016	1194974	77	6
1986	Light Duty Vehicles	19029695	2343	8637	2641	131	18884	1405791	91	7
1987	Light Duty Vehicles	19959842	2449	9088	2810	140	20160	1474454	95	7
1988	Light Duty Vehicles	20694140	2535	9422	2897	141	20398	1528662	99	7
1989	Light Duty Vehicles	21690131	1787	9790	2912	141	20435	1602386	105	7
1990	Light Duty Vehicles	23115080	1906	10428	3091	149	21687	1707662	112	8
1991	Light Duty Vehicles	23957024	1974	10830	3248	159	23002	1769846	115	8
1992	Light Duty Vehicles	23479719	1248	10678	3305	160	23176	1734385	112	8
1993	Light Duty Vehicles	23450531	481	10731	3389	167	24109	1732124	112	8
1994	Light Duty Vehicles	24974574	516	11211	3480	167	24458	1844855	120	9
1995	Light Duty Vehicles	24505598	504	10790	3295	164	23171	1810121	121	16
1996	Light Duty Vehicles	25221292	519	10851	3235	170	23111	1862973	127	24
1997	Light Duty Vehicles	25453281	526	10671	2991	159	21012	1880204	132	31
1998	Light Duty Vehicles	24752576	509	10197	2750	151	19304	1828342	132	37
1999	Light Duty Vehicles	25068712	287	10138	2630	146	18457	1851738	136	43
2000	Light Duty Vehicles	25282013	59	10060	2415	141	17666	1867429	139	49
2001	Light Duty Vehicles	25520318	60	9976	2282	135	16600	1885224	143	52
2002	Light Duty Vehicles	26775092	62	10146	2239	134	16450	1977649	153	65

Year	Sector	FC (GJ)	SO2	NOx	NMVOC	CH4	CO	CO2	N2O	NH3
1985	Heavy Duty Vehicles	29651116	6934	28239	3140	260	7555	2194138	84	8
1986	Heavy Duty Vehicles	32738906	4594	31157	3467	286	8301	2422634	93	9
1987	Heavy Duty Vehicles	31763074	4457	30226	3365	278	8061	2350423	90	8
1988	Heavy Duty Vehicles	31224098	4381	29732	3306	273	7936	2310539	88	8
1989	Heavy Duty Vehicles	32327613	3024	30782	3421	283	8196	2392200	91	8
1990	Heavy Duty Vehicles	33933165	3174	32300	3614	298	8675	2511006	96	9
1991	Heavy Duty Vehicles	34424256	3220	32781	3671	301	8792	2547345	98	9
1992	Heavy Duty Vehicles	33656314	2046	32044	3600	295	8622	2490515	96	9
1993	Heavy Duty Vehicles	33365322	780	31668	3560	292	8537	2468980	95	9
1994	Heavy Duty Vehicles	35732489	836	32553	3654	295	8705	2644149	103	10
1995	Heavy Duty Vehicles	36314627	849	31921	3638	293	8483	2687228	105	10
1996	Heavy Duty Vehicles	37071644	867	31494	3613	290	8346	2743246	107	10
1997	Heavy Duty Vehicles	37390997	875	30309	3433	282	7827	2766891	106	10
1998	Heavy Duty Vehicles	38573775	902	29875	3403	281	7719	2854414	109	10
1999	Heavy Duty Vehicles	39439479	508	29210	3320	277	7452	2918480	110	10
2000	Heavy Duty Vehicles	38127592	89	27017	3110	259	6950	2821398	106	10
2001	Heavy Duty Vehicles	38708387	91	26531	2991	257	6725	2864376	106	10
2002	Heavy Duty Vehicles	37849451	89	24060	2737	237	6175	2800810	103	10
1985	2-wheelers	654306	1	56	3446	100	9813	47764	1	1
1986	2-wheelers	617565	2	55	3164	94	9300	45082	1	1
1987	2-wheelers	603008	1	55	3031	91	9104	44020	1	1
1988	2-wheelers	600711	2	55	2986	91	9088	43852	1	1
1989	2-wheelers	588020	1	55	2889	89	8912	42925	1	1
1990	2-wheelers	618260	2	59	2984	93	9392	45133	1	1
1991	2-wheelers	647664	2	59	3092	98	9806	47280	1	1
1992	2-wheelers	673027	2	65	3136	101	10261	49131	1	1
1993	2-wheelers	693419	2	65	3175	104	10540	50620	1	1
1994	2-wheelers	704846	2	70	3139	106	10790	51454	1	1
1995	2-wheelers	714032	2	73	3210	107	10957	52124	1	1
1996	2-wheelers	755112	2	74	3420	113	11533	55123	1	1
1997	2-wheelers	803775	2	79	3632	121	12287	58676	1	1
1998	2-wheelers	866101	2	86	3905	130	13242	63225	1	1
1999	2-wheelers	854128	2	88	3655	128	13144	62351	1	1
2000	2-wheelers	879655	2	95	3472	130	13267	64215	1	1
2001	2-wheelers	790185	2	91	2820	116	11803	57683	1	1
2002	2-wheelers	933578	2	110	3202	136	13836	68151	1	1

Year	Sector	FC (GJ)	SO2	NOx	NMVOC	CH4	CO	CO2	N2O	NH3
1985	Total	112481857	11624	89554	80886	2486	574867	8260076	340	62
1986	Total	118762589	7865	94361	80871	2518	553993	8724499	367	65
1987	Total	118897236	7850	94276	80268	2544	534472	8734221	370	65
1988	Total	119555934	7860	95038	79841	2503	487184	8782370	376	66
1989	Total	120678411	5490	95881	78269	2460	458670	8866485	384	66
1990	Total	127274759	5769	100118	80774	2620	467745	9350906	423	128
1991	Total	132845492	5905	101506	81436	2891	484830	9758915	494	299
1992	Total	135157502	3822	101402	80499	3024	476563	9926345	556	482
1993	Total	136885568	1571	99862	78250	3283	481940	10052066	615	656
1994	Total	143670326	1671	98904	74203	3444	454750	10551393	735	959
1995	Total	144984976	1684	95730	69476	3602	438837	10647817	813	1204
1996	Total	147334715	1723	93410	65693	3862	437939	10820927	886	1408
1997	Total	150131752	1746	89086	59195	3700	388778	11025946	1000	1735
1998	Total	152714538	1769	85642	54617	3536	360719	11215339	1074	1943
1999	Total	154529949	1089	80531	49083	3454	336505	11350175	1143	2108
2000	Total	152884957	353	74501	41624	3299	311969	11229790	1185	2219
2001	Total	153453085	355	70348	37026	3259	302537	11272977	1230	2336
2002	Total	155026190	358	66749	34814	3010	283912	11389459	1270	2386

Annex 6: Activity data, fuel use and emission factors for non-road working machinery and equipment

Diesel

SNAP	Type	No.	Size	LF	Hours	Life time	Stage I	Stage II	NO_x (g/kWh)			NMVOC (g/kWh)			CH_4
			[kW]		[h]	[years]	[year]		Conv.	Stage I	Stage II	Conv.	Stage I	Stage II	[g/kWh
0808	Vibr.plader	3500	6	0,6	300	10			14,36	14,36	14,36	3,82	3,82	3,82	0,05
0808	Køle- og fryseanlæg (distribution)	3000	8	0,5	1250	6			14,36	14,36	14,36	3,82	3,82	3,82	0,05
0808	Køle- og fryseanlæg (fjern)	3500	15	0,5	200	7			14,36	14,36	14,36	3,82	3,82	3,82	0,05
0808	Tromler og stampere	2800	30	0,45	600	14		2000	14,36	14,36	8	2,91	2,91	1,5	0,05
0806	Traktorer (landbrug)	5000	25	0,4	50	30		2002	14,36	14,36	8	2,91	2,91	1,5	0,05
0808	Dieseltrucks (0-2 tons)	700	35	0,27	600	20		2000	14,36	14,36	8	2,91	2,91	1,5	0,05
0808	Højtryksrensere	50	30	0,8	500	10		2000	14,36	14,36	8	2,91	2,91	1,5	0,05
0808	Fejemaskiner o.l.	200	30	0,4	300	10		2000	14,36	14,36	8	2,91	2,91	1,5	0,05
0808	Personlifte	150	30	0,4	400	10		2000	14,36	14,36	8	2,91	2,91	1,5	0,05
0807	Flishuggere	100	35	0,5	250	10		2000	14,36	14,36	8	2,91	2,91	1,5	0,05
0806	Traktorer (landbrug)	29000	32,5	0,4	100	30		2002	14,36	14,36	8	2,91	2,91	1,5	0,05
0808	Minilæssere	2800	30	0,5	700	14		2000	14,36	14,36	8	2,91	2,91	1,5	0,05
0808	Traktorer (samfærdsel,industri)	3000	50	0,4	500	30	2002	2004	14,36	9,2	7	2,28	1,3	1,3	0,05
0808	Kompressor	5000	45	0,5	500	13	1999	2004	14,36	9,2	7	2,28	1,3	1,3	0,05
0806	Traktorer (landbrug)	66600	50	0,5	300	30	2002	2004	14,36	9,2	7	2,28	1,3	1,3	0,05
0808	Generator	5000	45	0,5	200	15	1999	2004	14,36	9,2	7	2,28	1,3	1,3	0,05
0808	Dieseltrucks (3-5 tons)	3900	50	0,27	600	20	1999	2004	14,36	9,2	7	2,28	1,3	1,3	0,05
0808	Dieseltrucks (2-3 tons)	2900	45	0,27	600	20	1999	2004	14,36	9,2	7	2,28	1,3	1,3	0,05
0808	Grave- og læssemaskiner	4200	50	0,45	700	14	1999	2004	14,36	9,2	7	2,28	1,3	1,3	0,05
0806	Selvkørende køretøjer	1100	60	0,75	150	15	1999	2004	14,36	9,2	7	2,28	1,3	1,3	0,05
0806	Traktorer (landbrug)	32000	70	0,5	500	30	2002	2004	14,36	9,2	7	2,28	1,3	1,3	0,05
0806	Traktorer (maskinstation)	5500	70	0,6	800	30	2002	2004	14,36	9,2	7	2,28	1,3	1,3	0,05
0808	Hydr. gravemaskiner på bånd	2000	110	0,6	1100	10	1999	2003	14,36	9,2	6	1,67	1,3	1	0,05
0806	Mejetærskere (i alt)	33700	85	0,75	100	15	1999	2003	14,36	9,2	6	1,67	1,3	1	0,05
0806	Mejetærskere (maskinstation)	2000	120	0,75	150	15	1999	2003	14,36	9,2	6	1,67	1,3	1	0,05
0808	Mellemtunge køretøjer	350	125	0,5	300	10	1999	2003	14,36	9,2	6	1,67	1,3	1	0,05
0808	Dieseltrucks (>10 tons)	200	120	0,27	600	20	1999	2003	14,36	9,2	6	1,67	1,3	1	0,05
0808	Larvebåndslæssere	100	100	0,5	1100	10	1999	2003	14,36	9,2	6	1,67	1,3	1	0,05
0808	Motorgrader	100	100	0,4	700	10	1999	2003	14,36	9,2	6	1,67	1,3	1	0,05
0808	Hydr. gravemaskiner på hjul	1000	100	0,6	1200	10	1999	2003	14,36	9,2	6	1,67	1,3	1	0,05
0808	Lette køretøjer	500	100	0,5	400	10	1999	2003	14,36	9,2	6	1,67	1,3	1	0,05

0808	Vejbaneudlæggere	300	80	0,35	700	10	1999	2003	14,36	9,2	6	1,67	1,3	1	0,05
0808	Pumper	1000	75	0,5	5	15	1999	2003	14,36	9,2	6	1,67	1,3	1	0,05
0808	Dieseltrucks (5-10 tons)	900	75	0,27	600	20	1999	2003	14,36	9,2	6	1,67	1,3	1	0,05
0808	Gummihjulslæssere	2500	120	0,5	1200	10	1999	2003	14,36	9,2	6	1,67	1,3	1	0,05
0808	Larvebåndsdosere	250	140	0,5	1100	10	1999	2002	14,36	9,2	6	1,3	1,3	1	0,05
0808	Dumpere	500	180	0,4	1200	10	1999	2002	14,36	9,2	6	1,3	1,3	1	0,05
0808	Affaldskompaktorer	100	160	0,25	1300	10	1999	2002	14,36	9,2	6	1,3	1,3	1	0,05
0808	Tunge køretøjer	650	175	0,5	200	10	1999	2002	14,36	9,2	6	1,3	1,3	1	0,05

SNAP	Type	N2O	NH3	CO (g/kWh)			TSP (g/kWh)		
		[g/kWh]	[g/kWh]	Conv.	Stage I	Stage II	Conv.	Stage I	Stage II
0808	Vibr.plader	0,035	0,002	8,38	8,38	8,38	2,22	2,22	2,22
0808	Køle- og fryseanlæg (distribution)	0,035	0,002	8,38	8,38	8,38	2,22	2,22	2,22
0808	Køle- og fryseanlæg (fjern)	0,035	0,002	8,38	8,38	8,38	2,22	2,22	2,22
0808	Tromler og stampere	0,035	0,002	6,43	6,43	5,5	1,81	1,81	0,8
0806	Traktorer (landbrug)	0,035	0,002	6,43	6,43	5,5	1,81	1,81	0,8
0808	Dieseltrucks (0-2 tons)	0,035	0,002	6,43	6,43	5,5	1,81	1,81	0,8
0808	Højtryksrensere	0,035	0,002	6,43	6,43	5,5	1,81	1,81	0,8
0808	Fejemaskiner o.l.	0,035	0,002	6,43	6,43	5,5	1,81	1,81	0,8
0808	Personlifte	0,035	0,002	6,43	6,43	5,5	1,81	1,81	0,8
0807	Flishuggere	0,035	0,002	6,43	6,43	5,5	1,81	1,81	0,8
0806	Traktorer (landbrug)	0,035	0,002	6,43	6,43	5,5	1,81	1,81	0,8
0808	Minilæssere	0,035	0,002	6,43	6,43	5,5	1,81	1,81	0,8
0808	Traktorer (samfærdsel,industri)	0,035	0,002	5,06	5,06	5	1,51	0,85	0,4
0808	Kompressor	0,035	0,002	5,06	5,06	5	1,51	0,85	0,4
0806	Traktorer (landbrug)	0,035	0,002	5,06	5,06	5	1,51	0,85	0,4
0808	Generator	0,035	0,002	5,06	5,06	5	1,51	0,85	0,4
0808	Dieseltrucks (3-5 tons)	0,035	0,002	5,06	5,06	5	1,51	0,85	0,4
0808	Dieseltrucks (2-3 tons)	0,035	0,002	5,06	5,06	5	1,51	0,85	0,4
0808	Grave- og læssemaskiner	0,035	0,002	5,06	5,06	5	1,51	0,85	0,4
0806	Selvkørende køretøjer	0,035	0,002	5,06	5,06	5	1,51	0,85	0,4
0806	Traktorer (landbrug)	0,035	0,002	5,06	5,06	5	1,51	0,85	0,4
0806	Traktorer (maskinstation)	0,035	0,002	5,06	5,06	5	1,51	0,85	0,4
0808	Hydr. gravemaskiner på bånd	0,035	0,002	3,76	3,76	3,76	1,23	0,7	0,3
0806	Mejetærskere (i alt)	0,035	0,002	3,76	3,76	3,76	1,23	0,7	0,3
0806	Mejetærskere (maskinstation)	0,035	0,002	3,76	3,76	3,76	1,23	0,7	0,3
0808	Mellemtunge køretøjer	0,035	0,002	3,76	3,76	3,76	1,23	0,7	0,3
0808	Dieseltrucks (>10 tons)	0,035	0,002	3,76	3,76	3,76	1,23	0,7	0,3
0808	Larvebåndslæssere	0,035	0,002	3,76	3,76	3,76	1,23	0,7	0,3
0808	Motorgrader	0,035	0,002	3,76	3,76	3,76	1,23	0,7	0,3
0808	Hydr. gravemaskiner på hjul	0,035	0,002	3,76	3,76	3,76	1,23	0,7	0,3
0808	Lette køretøjer	0,035	0,002	3,76	3,76	3,76	1,23	0,7	0,3
0808	Vejbaneudlæggere	0,035	0,002	3,76	3,76	3,76	1,23	0,7	0,3
0808	Pumper	0,035	0,002	3,76	3,76	3,76	1,23	0,7	0,3
0808	Dieseltrucks (5-10 tons)	0,035	0,002	3,76	3,76	3,76	1,23	0,7	0,3
0808	Gummihjulslæssere	0,035	0,002	3,76	3,76	3,76	1,23	0,7	0,3

0808	Larvebåndsdosere	0,035	0,002	3	3	3	1,1	0,54	0,2
0808	Dumpere	0,035	0,002	3	3	3	1,1	0,54	0,2
0808	Affaldskompaktorer	0,035	0,002	3	3	3	1,1	0,54	0,2
0808	Tunge køretøjer	0,035	0,002	3	3	3	1,1	0,54	0,2

Gasoline

SNAP	Type	No.	Size [kW]	LF	Hours [h]	Life time [years]	NOx [g/kWh]	VOC [g/kWh]	CH4 [g/kWh]	NMVOC [g/kWh]	CO [g/kWh]	CO2 [kg/kWh]	PM [g/kWh]	N2O [g/kWh]	NH3 [g/kWh]	FC [g/kWh]	FC [MJ/kWh]
0806	Andre enheder	100	5	0,4	50	10	4,0	38	1,8	35,9	700	1,288	0,41	0,03	0,002	403	17,6
0806	Motorfodervogne	11000	8	0,4	200	10	4,0	28	1,4	27,0	550	1,264	0,40	0,03	0,002	395	17,3
0806	Motorkoste	2500	3	0,3	50	10	4,0	52	2,5	49,9	967	1,315	0,42	0,03	0,002	411	18,0
0806	Motorskrabere	750	3	0,3	50	10	4,0	52	2,5	49,9	967	1,315	0,42	0,03	0,002	411	18,0
0806	Strømaskiner	1100	3	0,3	50	10	4,0	52	2,5	49,9	967	1,315	0,42	0,03	0,002	411	18,0
0806	Traktorer (andre)	20000	30	0,4	50	37	4,1	14	0,7	13,8	367	1,200	0,38	0,03	0,002	375	16,4
0806	Traktorer (godkendt)	10000	30	0,4	100	37	4,1	14	0,7	13,8	367	1,200	0,38	0,03	0,002	375	16,4
0807	Kædesave (skovbrug)	2000	3	0,6	800	2	1,0	383	3,8	379,3	700	1,530	0,49	0,01	0,002	479	21,0
0808	Andet mat.	1000	5	0,5	40	10	4,0	38	1,8	35,9	700	1,288	0,41	0,03	0,002	403	17,6
0808	Fejemaskiner o.l.	500	10	0,4	150	10	4,0	25	1,2	23,8	500	1,253	0,40	0,03	0,002	392	17,2
0808	Generator	11000	2,5	0,4	80	10	4,0	59	2,8	56,3	1100	1,325	0,42	0,03	0,002	414	18,1
0808	Højtryksrensere	500	5	0,6	200	10	4,0	38	1,8	35,9	700	1,288	0,41	0,03	0,002	403	17,6
0808	Kapmaskiner	800	4	0,5	50	10	4,0	43	2,1	41,4	800	1,300	0,41	0,03	0,002	407	17,8
0808	Kompressor	500	4	0,35	15	8	4,0	43	2,1	41,4	800	1,300	0,41	0,03	0,002	407	17,8
0808	Motorbor	100	3	0,4	10	10	1,0	383	3,8	379,3	700	1,530	0,49	0,01	0,002	479	21,0
0808	Personlifte	50	20	0,4	400	10	4,1	17	0,8	16,6	400	1,219	0,39	0,03	0,002	381	16,7
0808	Pumper	10000	4	0,4	300	5	4,0	43	2,1	41,4	800	1,300	0,41	0,03	0,002	407	17,8
0808	Skæremaskiner	100	10	0,7	150	10	1,1	251	2,5	248,9	420	1,460	0,46	0,01	0,002	457	20,0
0808	Stampere	3000	2,5	0,4	80	10	1,0	416	4,1	411,5	780	1,541	0,49	0,01	0,002	482	21,1
0808	Vibr.plader	2500	4	0,5	200	10	4,0	43	2,1	41,4	800	1,300	0,41	0,03	0,002	407	17,8
0809	Andet	200	2	0,5	20	10	1,0	462	4,6	457,3	900	1,555	0,50	0,01	0,002	486	21,3
0809	Brændekløvere	100	4	0,5	15	10	4,0	43	2,1	41,4	800	1,300	0,41	0,03	0,002	407	17,8
0809	Buskryddere	50000	0,8	0,6	15	10	1,0	759	7,5	751,1	1800	1,613	0,51	0,01	0,002	504	22,1
0809	Flishuggere	200	10	0,7	100	10	1,1	251	2,5	248,9	420	1,460	0,46	0,01	0,002	457	20,0
0809	Fræsere	150000	4	0,6	25	10	4,0	43	2,1	41,4	800	1,300	0,41	0,03	0,002	407	17,8
0809	Hækklippere	15000	0,6	0,5	10	10	1,0	902	8,9	893,4	2300	1,632	0,52	0,01	0,002	510	22,4
0809	Kompostkværne	500	3	0,7	20	10	1,0	383	3,8	379,3	700	1,530	0,49	0,01	0,002	479	21,0
0809	Kædesave (offentlig)	10000	2,5	0,4	150	10	1,0	416	4,1	411,5	780	1,541	0,49	0,01	0,002	482	21,1
0809	Kædesave (privat)	250000	2	0,3	12	20	1,0	462	4,6	457,3	900	1,555	0,50	0,01	0,002	486	21,3
0809	Minitraktorer	40000	8	0,5	150	10	4,0	28	1,4	27,0	550	1,264	0,40	0,03	0,002	395	17,3
0809	Plæneklippere (små)	800000	2,5	0,4	20	10	4,0	59	2,8	56,3	1100	1,325	0,42	0,03	0,002	414	18,1
0809	Plæneklippere (store)	35000	6	0,5	125	10	4,0	34	1,6	32,1	633,33	1,279	0,41	0,03	0,002	400	17,5
0809	Sugere	300	4	0,5	80	10	1,0	340	3,4	336,8	600	1,513	0,48	0,01	0,002	473	20,7
0809	Trimmere	60000	0,8	0,5	15	10	1,0	759	7,5	751,1	1800	1,613	0,51	0,01	0,002	504	22,1

LPG

SNAP	Type	No.	Size [kW]	LF	Hours [h]	NOx [g/kWh]	VOC [g/kWh]	CH4 [g/kWh]	NMVOC [g/kWh]	CO [g/kWh]	CO2 [kg/kWh]	PM [g/kWh]	N2O [g/kWh]	NH3 [g/kWh]	FC [g/kWh]	FC [MJ/kWh]
0808	Gastrucks (0-2 tons)	5300	33	0,27	600	10	14,5	1	13,5	15	1,047	0,20	0,05	0,003	350	16,1
0808	Gastrucks (2-3 tons)	4800	40	0,27	600	10	14,5	1	13,5	15	1,047	0,20	0,05	0,003	350	16,1
0808	Gastrucks (3-5 tons)	2100	50	0,27	600	10	14,5	1	13,5	15	1,047	0,20	0,05	0,003	350	16,1
0808	Gastrucks (5-10 tons)	100	78	0,27	600	10	14,5	1	13,5	15	1,047	0,20	0,05	0,003	350	16,1

Annex 7: Emission factors and total emissions for 1990 and 2002 in CollectER format

Year	SNAP ID	Category	Fuel type	Mode	Fuel [GJ]	SO2 [g/GJ]	NOx [g/GJ]	NMVOC [g/GJ]	CH4 [g/GJ]	CO [g/GJ]	CO2 [kg/GJ]	NH3 [g/GJ]	N2O [g/GJ]	TSP [g/GJ]
1990	70101	Passenger cars	Diesel	Highway driving	716028	93,68	253,78	24,51	4,30	179,70	74	12,62	0,47	79,48
1990	70101	Passenger cars	Gasoline 2-stroke	Highway driving	28730	2,97	288,90	2357,34	10,03	3490,86	73	2,01	0,80	48,15
1990	70101	Passenger cars	Gasoline conventional	Highway driving	7394952	2,25	1311,04	369,53	11,10	3612,94	73	2,13	0,85	12,33
1990	70101	Passenger cars	Gasoline catalyst	Highway driving	183522	1,95	190,36	35,59	7,47	943,80	73	16,76	47,89	0,34
1990	70101	Passenger cars	LPG	Highway driving	1512	0,00	1151,70	187,09	10,06	3914,25	65	6,04	0,00	10,06
1990	70102	Passenger cars	Diesel	Rural driving	2039148	93,68	253,33	46,16	2,75	268,08	74	15,34	0,57	75,13
1990	70102	Passenger cars	Gasoline 2-stroke	Rural driving	115355	2,97	352,84	2476,82	13,84	2594,44	73	1,73	0,69	41,51
1990	70102	Passenger cars	Gasoline conventional	Rural driving	22799974	2,24	1139,51	488,47	13,94	4110,62	73	2,40	0,96	14,24
1990	70102	Passenger cars	Gasoline catalyst	Rural driving	570376	1,95	143,35	42,55	9,25	370,07	73	8,53	53,34	0,37
1990	70102	Passenger cars	LPG	Rural driving	4361	0,00	1248,46	305,18	16,91	1146,38	65	7,25	0,00	14,49
1990	70103	Passenger cars	Diesel	Urban driving	3046172	93,68	208,31	85,82	2,37	310,69	74	9,59	0,36	117,16
1990	70103	Passenger cars	Gasoline 2-stroke	Urban driving	181888	2,97	61,43	3122,63	30,71	4238,59	73	1,02	0,41	24,57
1990	70103	Passenger cars	Gasoline conventional	Urban driving	31532452	2,25	633,42	894,14	50,15	9534,02	73	1,62	0,65	13,98
1990	70103	Passenger cars	Gasoline catalyst	Urban driving	987315	1,95	163,59	299,31	68,50	3772,36	73	15,24	20,13	0,32
1990	70103	Passenger cars	LPG	Urban driving	6471	0,00	642,80	421,67	33,67	1249,98	65	4,56	0,00	12,16
1990	70201	Light duty vehicles	Diesel	Highway driving	2313348	93,68	270,67	31,16	1,62	344,14	74	5,52	0,32	104,48
1990	70201	Light duty vehicles	Gasoline conventional	Highway driving	254498	2,97	1369,26	170,29	10,11	2987,40	73	2,43	0,81	16,17
1990	70201	Light duty vehicles	Gasoline catalyst	Highway driving	0	0,00	0,00	0,00	0,00	0,00	73	0,00	0,00	0,00
1990	70202	Light duty vehicles	Diesel	Rural driving	8280955	93,68	299,25	35,71	1,78	358,42	74	6,04	0,36	107,73
1990	70202	Light duty vehicles	Gasoline conventional	Rural driving	1057020	2,97	1188,86	262,59	15,25	2316,18	73	2,29	0,76	15,25
1990	70202	Light duty vehicles	Gasoline catalyst	Rural driving	0	0,00	0,00	0,00	0,00	0,00	73	0,00	0,00	0,00
1990	70203	Light duty vehicles	Diesel	Urban driving	9666704	93,68	489,77	57,53	2,29	403,83	74	4,51	0,27	126,74
1990	70203	Light duty vehicles	Gasoline conventional	Urban driving	1542555	2,97	638,11	671,68	58,35	7008,46	73	1,37	0,46	9,12
1990	70203	Light duty vehicles	Gasoline catalyst	Urban driving	0	0,00	0,00	0,00	0,00	0,00	73	0,00	0,00	0,00
1990	70301	Heavy duty vehicles	Diesel	Highway driving	7558528	93,68	828,80	76,83	6,11	174,57	74	2,92	0,28	45,30
1990	70301	Heavy duty vehicles	Gasoline	Highway driving	6630	2,97	1037,77	474,61	9,69	7610,35	73	0,83	0,28	55,35
1990	70302	Heavy duty vehicles	Diesel	Rural driving	14175012	93,68	946,10	102,99	6,86	237,86	74	3,10	0,27	54,49
1990	70302	Heavy duty vehicles	Gasoline	Rural driving	19287	2,97	1141,55	820,40	16,74	8371,39	73	0,91	0,30	60,88
1990	70303	Heavy duty vehicles	Diesel	Urban driving	12151405	93,68	1035,68	126,62	12,65	297,36	74	2,51	0,25	61,38
1990	70303	Heavy duty vehicles	Gasoline	Urban driving	22301	2,97	456,62	696,09	14,21	7102,99	73	0,61	0,20	40,59
1990	704	Mopeds	Gasoline		270104	2,97	27,40	8057,18	162,00	13698,63	73	0,74	0,74	109,59
1990	70501	Motorcycles	Gasoline	Highway driving	68816	2,97	215,21	1274,28	121,98	17689,89	73	1,27	1,27	32,95
1990	70502	Motorcycles	Gasoline	Rural driving	128454	2,97	173,17	1528,62	146,07	16834,36	73	1,52	1,52	39,46
1990	70503	Motorcycles	Gasoline	Urban driving	150886	2,97	93,28	2018,58	147,26	15322,43	73	1,53	1,53	39,78

Year	SNAPID	Category	Fuel type	Mode	Fuel [GJ]	SO2 [g/GJ]	NOx [g/GJ]	NMVOC [g/GJ]	CH4 [g/GJ]	CO [g/GJ]	CO2 [kg/GJ]	NH3 [g/GJ]	N2O [g/GJ]	TSP [g/GJ]
1990	801	Military	Diesel		146162	93,68	778,10	83,81	6,66	250,19	74	4,04	0,28	69,87
1990	801	Military	Jet fuel	< 3000 ft	986	4,60	250,57	24,94	2,65	229,89	72	2,30		
1990	801	Military	Jet fuel	> 3000 ft	4913	4,60	250,57	24,94	2,65	229,89	72	2,30		
1990	801	Military	Gasoline		149678	2,28	871,06	1129,29	33,78	6687,29	73	2,24	1,63	
1990	801	Military	Aviation gasoline		1347105	4,57	859,00	1242,60	21,90	6972,00	73	2,00	1,60	
1990	802	Railways	Diesel		4010007	93,68	1225,13	79,94	3,07	223,21	74	2,04	0,20	50,26
1990	802	Railways	Kerosene		70	5,00	50,00	3,00	7,00	20,00	72	2,00		
1990	802	Railways	Gasoline		0	2,28	871,06	1129,29	33,78	6687,29	73	2,24	1,63	
1990	803	Inland waterways	Diesel		544970	93,68	1249,33	270,13	4,35	595,20	74	3,05	0,17	164,83
1990	803	Inland waterways	Gasoline		371237	2,28	64,34	10809,58	108,10	18485,08	73	0,52	0,10	
1990	80402	National sea traffic	Residual oil		3559806	1466,99	1393,64	56,92	1,76	180,93	78	4,89		139,36
1990	80402	National sea traffic	Diesel		2782388	93,68	1334,89	54,52	1,69	173,30	74	4,68		42,15
1990	80402	National sea traffic	Kerosene		452	4,60	50,00	3,00	7,00	20,00	72	2,00		
1990	80402	National sea traffic	LPG		1794		1249,00	384,90	20,30	443,00	65	2,00		
1990	80403	Fishing	Residual oil		285426	1466,99	1393,64	56,92	1,76	180,93	78	4,89		139,36
1990	80403	Fishing	Diesel		10051143	93,68	1334,89	54,52	1,69	173,30	74	4,68		42,15
1990	80403	Fishing	Kerosene		25787	4,60	50,00	3,00	7,00	20,00	72	2,00		
1990	80403	Fishing	Gasoline		9001	2,28	64,34	10809,58	108,10	18485,08	73	0,52	0,10	
1990	80403	Fishing	LPG		42320		1249,00	384,90	20,30	443,00	65	2,00		
1990	80404	International sea traffic	Residual oil		28543368	1711,49	2127,14	56,92	1,76	180,93	78	4,89		200,49
1990	80404	International sea traffic	Diesel		11632674	468,38	2037,47	54,52	1,69	173,30	74	4,68		42,15
1990	80501	Air traffic, other airports	Jet fuel	Dom. < 3000 ft	378795	2,30	310,41	16,54	1,76	100,94	72	6,35		
1990	80501	Air traffic, other airports	Aviation gasoline		104947	4,57	859,00	1242,60	21,90	6972,00	73	2,00	1,60	
1990	80502	Air traffic, other airports	Jet fuel	Int. < 3000 ft	136077	2,30	306,48	18,38	1,95	177,11	72	6,90		
1990	80502	Air traffic, other airports	Aviation gasoline		30660	4,57	859,00	1242,60	21,90	6972,00	73	2,00	1,60	
1990	80503	Air traffic, other airports	Jet fuel	Dom. > 3000 ft	910427	2,30	330,34	9,28	0,99	93,07	72	2,30		
1990	80504	Air traffic, other airports	Jet fuel	Int. > 3000 ft	1612988	2,30	242,81	6,20	0,66	54,25	72	2,30		
1990	806	Agriculture	Diesel		17292498	93,68	1273,14	190,59	4,43	424,13	74	3,10	0,18	128,88
1990	806	Agriculture	Gasoline		520115	2,28	244,33	1022,05	51,10	24741,09	73	1,80	0,12	
1990	807	Forestry	Diesel		5001	93,68	1255,79	238,29	4,37	526,70	74	3,06	0,17	150,34
1990	807	Forestry	Gasoline		60375	2,28	48,66	18095,47	180,95	33391,26	73	0,48	0,10	
1990	808	Industry	Diesel		9277501	93,68	1286,85	174,83	4,48	390,74	74	3,14	0,18	122,38
1990	808	Industry	Gasoline		142938	2,28	216,67	3096,74	119,76	44820,30	73	1,63	0,11	
1990	808	Industry	LPG		1251154	0,00	621,12	838,51	62,11	931,68	65	3,11	0,19	12,44
1990	809	Household and gardening	Gasoline		1187573	2,28	213,71	3726,00	116,17	42616,59	73	1,61	0,11	
1990	80501	Air traffic, Copenhagen airport	Jet fuel	Dom. < 3000 ft	441215	2,30	280,41	23,40	2,49	144,24	72	5,03		
1990	80501	Air traffic, Copenhagen airport	Aviation gasoline		8642	4,57	859,00	1242,60	21,90	6972,00	73	2,00	1,60	
1990	80502	Air traffic, Copenhagen airport	Jet fuel	Int. < 3000 ft	2037255	2,30	326,94	34,43	3,66	159,73	72	3,76		
1990	80502	Air traffic, Copenhagen airport	Aviation gasoline		5612	4,57	859,00	1242,60	21,90	6972,00	73	2,00	1,60	
1990	80503	Air traffic, Copenhagen airport	Jet fuel	Dom. > 3000 ft	1160709	2,30	315,28	8,51	0,90	79,30	72	2,30		
1990	80504	Air traffic, Copenhagen airport	Jet fuel	Int. > 3000 ft	20653862	2,30	291,18	8,79	0,93	36,07	72	2,30		

Year	SNAP ID	Category	Fuel type	Mode	Fuel [GJ]	SO2 [g/GJ]	NOx [g/GJ]	NMVOC [g/GJ]	CH4 [g/GJ]	CO [g/GJ]	CO2 [kg/GJ]	NH3 [g/GJ]	N2O [g/GJ]	TSP [g/GJ]	PM10 [g/GJ]	PM2.5 [g/GJ]
2002	70101	Passenger cars	Diesel	Highway driving	2104778	2,34	284,55	12,88	4,39	102,66	74	13,18	0,49	43,63	43,63	43,63
2002	70101	Passenger cars	Gasoline 2-stroke	Highway driving	834	2,28	288,90	2357,34	10,03	3490,86	73	2,01	0,80	48,15	48,15	48,15
2002	70101	Passenger cars	Gasoline conventional	Highway driving	2889850	2,28	1368,76	331,97	11,45	2545,90	73	2,20	0,88	10,28	10,28	10,28
2002	70101	Passenger cars	Gasoline catalyst	Highway driving	9902730	2,28	293,17	33,94	4,44	2045,65	73	17,19	49,12	0,34	0,34	0,34
2002	70101	Passenger cars	LPG	Highway driving	116	0,00	1151,70	187,09	10,06	3914,25	65	6,04	0,00	10,06	10,06	10,06
2002	70102	Passenger cars	Diesel	Rural driving	4463829	2,34	258,40	21,41	2,64	102,77	74	15,05	0,56	29,76	29,76	29,76
2002	70102	Passenger cars	Gasoline 2-stroke	Rural driving	2342	2,28	352,84	2476,82	13,84	2594,44	73	1,73	0,69	41,51	41,51	41,51
2002	70102	Passenger cars	Gasoline conventional	Rural driving	6326306	2,28	1163,54	450,58	14,17	3096,23	73	2,44	0,97	11,45	11,45	11,45
2002	70102	Passenger cars	Gasoline catalyst	Rural driving	21472312	2,28	208,85	34,99	4,95	610,36	73	8,78	54,85	0,38	0,38	0,38
2002	70102	Passenger cars	LPG	Rural driving	235	0,00	1248,46	305,18	16,91	1146,38	65	7,25	0,00	14,49	14,49	14,49
2002	70103	Passenger cars	Diesel	Urban driving	5116462	2,34	261,74	59,77	2,68	251,13	74	9,99	0,37	57,36	57,36	57,36
2002	70103	Passenger cars	Gasoline 2-stroke	Urban driving	3011	2,28	61,43	3122,63	30,71	4238,59	73	1,02	0,41	24,57	24,57	24,57
2002	70103	Passenger cars	Gasoline conventional	Urban driving	7353822	2,28	632,96	881,29	53,98	8271,10	73	1,59	0,64	11,08	11,08	11,08
2002	70103	Passenger cars	Gasoline catalyst	Urban driving	29831080	2,28	200,55	267,47	60,27	4168,00	73	15,92	21,03	0,33	0,33	0,33
2002	70103	Passenger cars	LPG	Urban driving	295	0,00	615,43	433,89	34,65	1341,58	65	4,39	0,00	11,72	11,72	11,72
2002	70201	Light duty vehicles	Diesel	Highway driving	3295673	2,34	326,74	32,40	1,69	232,00	74	5,95	0,35	62,06	62,06	62,06
2002	70201	Light duty vehicles	Gasoline conventional	Highway driving	147550	2,28	1369,26	170,29	10,11	2987,40	73	2,43	0,81	16,17	16,17	16,17
2002	70201	Light duty vehicles	Gasoline catalyst	Highway driving	273957	2,28	148,94	19,36	3,12	579,23	73	12,03	34,36	0,24	0,24	0,24
2002	70202	Light duty vehicles	Diesel	Rural driving	10040568	2,34	348,04	37,13	1,85	224,61	74	6,51	0,38	59,68	59,68	59,68
2002	70202	Light duty vehicles	Gasoline conventional	Rural driving	521554	2,28	1188,86	262,59	15,25	2316,18	73	2,29	0,76	15,25	15,25	15,25
2002	70202	Light duty vehicles	Gasoline catalyst	Rural driving	967300	2,28	131,04	26,25	3,57	433,64	73	5,19	32,44	0,23	0,23	0,23
2002	70203	Light duty vehicles	Diesel	Urban driving	9731291	2,34	413,46	63,87	2,54	264,22	74	4,70	0,28	76,47	76,47	76,47
2002	70203	Light duty vehicles	Gasoline conventional	Urban driving	630891	2,28	623,61	702,94	61,07	7468,02	73	1,32	0,44	8,83	8,83	8,83
2002	70203	Light duty vehicles	Gasoline catalyst	Urban driving	1167027	2,28	143,89	150,84	28,37	3359,41	73	9,97	13,17	0,17	0,17	0,17
2002	70301	Heavy duty vehicles	Diesel	Highway driving	10490395	2,34	553,54	57,73	4,83	126,21	74	2,85	0,28	25,57	25,57	25,57
2002	70301	Heavy duty vehicles	Gasoline	Highway driving	9584	2,28	1037,77	474,61	9,69	7610,35	73	0,83	0,28	55,35	55,35	55,35
2002	70302	Heavy duty vehicles	Diesel	Rural driving	15941119	2,34	647,07	72,38	5,27	151,80	74	2,90	0,26	30,88	30,88	30,88
2002	70302	Heavy duty vehicles	Gasoline	Rural driving	19501	2,28	1141,55	820,40	16,74	8371,39	73	0,91	0,30	60,88	60,88	60,88
2002	70303	Heavy duty vehicles	Diesel	Urban driving	11368635	2,34	694,55	82,97	8,91	180,63	74	2,35	0,24	35,51	35,51	35,51
2002	70303	Heavy duty vehicles	Gasoline	Urban driving	19915	2,28	456,62	696,09	14,21	7102,99	73	0,61	0,20	40,59	40,59	40,59
2002	704	Mopeds	Gasoline		244496	2,28	26,64	7308,88	149,01	12510,68	73	0,74	0,74	109,59	109,59	109,59
2002	70501	Motorcycles	Gasoline	Highway driving	112965	2,28	221,92	1198,73	123,25	17201,47	73	1,28	1,28	32,70	32,70	32,70
2002	70502	Motorcycles	Gasoline	Rural driving	262763	2,28	179,41	1444,32	147,60	16168,61	73	1,53	1,53	39,16	39,16	39,16
2002	70503	Motorcycles	Gasoline	Urban driving	313351	2,28	98,28	1919,76	149,16	14632,30	73	1,55	1,55	39,57	39,57	39,57

Year	SNAPID	Category	Fuel type	Mode	Fuel [GJ]	SO2 [g/GJ]	NOx [g/GJ]	NMVOC [g/GJ]	CH4 [g/GJ]	CO [g/GJ]	CO2 [kg/GJ]	NH3 [g/GJ]	N2O [g/GJ]	TSP [g/GJ]	PM10 [g/GJ]	PM2.5 [g/GJ]
2002	801	Military	Diesel		434684	2,34	492,12	58,33	4,41	183,98	74	5,23	0,31	44,52	44,52	44,52
2002	801	Military	Jet fuel	< 3000 ft	66	4,60	250,57	24,94	2,65	229,89	72	2,30	0,00	1,16	1,16	1,16
2002	801	Military	Jet fuel	> 3000 ft	8272	4,60	250,57	24,94	2,65	229,89	72	2,30	0,00	1,16	1,16	1,16
2002	801	Military	Gasoline		77781	2,28	376,42	370,81	32,62	3280,61	73	10,80	28,65	4,43	4,43	4,43
2002	801	Military	Aviation gasoline		700033	4,57	859,00	1242,60	21,90	6972,00	73	2,00	1,60	10,00	10,00	10,00
2002	802	Railways	Diesel		2844583	2,34	1190,04	86,91	3,34	223,26	74	2,04	0,20	43,93	43,93	43,93
2002	802	Railways	Kerosene		0	5,00	50,00	3,00	7,00	20,00	72	2,00	0,00	121,95	115,85	110,06
2002	802	Railways	Gasoline		0	2,28	397,09	400,36	35,56	3516,78	73	10,55	27,87	4,43	4,43	4,43
2002	803	Inland waterways	Diesel		1001571	23,42	1249,33	270,13	4,35	595,20	74	3,05	0,17	164,83	156,59	148,76
2002	803	Inland waterways	Gasoline		902453	2,28	64,34	10809,58	108,10	18485,08	73	0,52	0,10	23,25	23,25	23,25
2002	80402	National sea traffic	Residual oil		2064248	810,26	1393,60	56,90	1,76	180,90	78	4,90		139,40	132,43	125,81
2002	80402	National sea traffic	Diesel		3421700	93,68	1334,90	54,50	1,69	173,30	74	4,70	0,00	42,15	40,04	38,04
2002	80402	National sea traffic	Kerosene		696	4,60	50,00	3,00	7,00	20,00	72	2,00	2,00	97,56	92,68	88,05
2002	80402	National sea traffic	LPG		0	0,00	1249,00	384,90	20,30	443,00	65	2,00	0,00	12,44	12,44	12,44
2002	80403	Fishing	Residual oil		3821	810,26	1393,60	56,90	1,76	180,90	78	4,90		139,40	132,43	125,81
2002	80403	Fishing	Diesel		8244841	93,68	1334,90	54,50	1,69	173,30	74	4,70	0,00	42,15	40,04	38,04
2002	80403	Fishing	Kerosene		592	4,60	50,00	3,00	7,00	20,00	72	2,00		97,56	92,68	88,05
2002	80403	Fishing	Gasoline		3351	2,28	64,34	10809,60	108,10	18485,10	73	0,52	0,10	23,25	23,25	23,25
2002	80403	Fishing	LPG		20976	0,00	1249,00	384,90	20,30	443,00	65	2,00	0,00	12,44	12,44	12,44
2002	80404	International sea traffic	Residual oil		17546654	1681,38	2127,10	56,90	1,76	180,90	78	4,90		200,50	190,48	180,95
2002	80404	International sea traffic	Diesel		21579480	468,38	2037,50	54,50	1,69	173,30	74	4,70		42,15	40,04	38,04
2002	80501	Air traffic, other airports	Jet fuel	Dom. < 3000 ft	217050	2,30	310,16	22,58	2,40	132,06	72	10,87		1,16	1,16	1,16
2002	80501	Air traffic, other airports	Aviation gasoline		97530	4,57	859,00	1242,60	21,90	6972,00	73	2,00	1,60	10,00	10,00	10,00
2002	80502	Air traffic, other airports	Jet fuel	Int. < 3000 ft	233379	2,30	300,42	20,98	2,23	189,16	72	7,69		1,16	1,16	1,16
2002	80502	Air traffic, other airports	Aviation gasoline		7200	4,57	859,00	1242,60	21,90	6972,00	73	2,00	1,60	10,00	10,00	10,00
2002	80503	Air traffic, other airports	Jet fuel	Dom. > 3000 ft	520189	2,30	312,37	14,16	1,50	108,33	72	2,30		1,16	1,16	1,16
2002	80504	Air traffic, other airports	Jet fuel	Int. > 3000 ft	2205821	2,30	242,33	8,27	0,88	65,26	72	2,30		1,16	1,16	1,16
2002	806	Agriculture	Diesel		15994341	23,42	1240,45	186,29	4,43	424,08	74	3,10	0,18	124,99	118,74	112,87
2002	806	Agriculture	Gasoline		489194	2,28	244,33	1022,05	51,10	24741,09	73	1,80	0,12	23,25	23,25	23,25
2002	807	Forestry	Diesel		4625	23,42	1088,93	206,16	4,37	512,98	74	3,06	0,17	126,23	119,92	113,98
2002	807	Forestry	Gasoline		56786	2,28	48,66	18095,47	180,95	33391,26	73	0,48	0,10	23,25	23,25	23,25
2002	808	Industry	Diesel		8581034	23,42	1131,35	160,73	4,48	389,65	74	3,14	0,18	105,35	100,08	95,13
2002	808	Industry	Gasoline		134440	2,28	216,67	3096,74	119,76	44820,30	73	1,63	0,11	23,25	23,25	23,25
2002	808	Industry	LPG		1498955	0,00	621,12	838,51	62,11	931,68	65	3,11	0,19	12,44	12,44	12,44
2002	809	Household and gardening	Gasoline		1116970	2,28	213,71	3726,00	116,17	42616,59	73	1,61	0,11	23,25	23,25	23,25
2002	80501	Air traffic, Copenhagen airport	Jet fuel	Dom. < 3000 ft	272988	2,30	294,64	26,14	2,78	159,41	72	7,22		1,16	1,16	1,16
2002	80501	Air traffic, Copenhagen airport	Aviation gasoline		791	4,57	859,00	1242,60	21,90	6972,00	73	2,00	1,60	10,00	10,00	10,00
2002	80502	Air traffic, Copenhagen airport	Jet fuel	Int. < 3000 ft	2821218	2,30	330,82	35,49	3,77	191,08	72	3,96	0,00	1,16	1,16	1,16
2002	80502	Air traffic, Copenhagen airport	Aviation gasoline		1145	4,57	859,00	1242,60	21,90	6972,00	73	2,00	1,60	10,00	10,00	10,00
2002	80503	Air traffic, Copenhagen airport	Jet fuel	Dom. > 3000 ft	916659	2,30	305,20	12,24	1,30	59,71	72	2,30	0,00	1,16	1,16	1,16
2002	80504	Air traffic, Copenhagen airport	Jet fuel	Int. > 3000 ft	23250413	2,30	308,23	10,43	1,11	35,22	72	2,30	0,00	1,16	1,16	1,16

Year	Category	Mode	SNAP ID	SO2 [tons]	NOx [tons]	NMVOC [tons]	CH4 [tons]	CO [tons]	CO2 [ktons]	NH3 [tons]	N2O [tons]	TSP [tons]
1990	Passenger cars	Highway driving	70101	84	9922	2825	87	27126	608	28	15	150
1990	Passenger cars	Rural driving	70102	244	26625	11543	330	94784	1866	91	54	483
1990	Passenger cars	Urban driving	70103	359	20785	29322	1662	306081	2613	95	41	803
1990	Light duty vehicles	Highway driving	70201	217	975	115	6	1556	190	13	1	246
1990	Light duty vehicles	Rural driving	70202	779	3735	573	31	5416	690	52	4	908
1990	Light duty vehicles	Urban driving	70203	910	5719	1592	112	14715	828	46	3	1239
1990	Heavy duty vehicles	Highway driving	70301	708	6271	584	46	1370	560	22	2	343
1990	Heavy duty vehicles	Rural driving	70302	1328	13433	1476	98	3533	1050	44	4	774
1990	Heavy duty vehicles	Urban driving	70303	1138	12595	1554	154	3772	901	30	3	747
1990	Mopeds		704	1	7	2176	44	3700	20	0	0	30
1990	Motorcycles	Highway driving	70501	0	15	88	8	1217	5	0	0	2
1990	Motorcycles	Rural driving	70502	0	22	196	19	2162	9	0	0	5
1990	Motorcycles	Urban driving	70503	0	14	305	22	2312	11	0	0	6
1990	Evaporation		706	0	0	28425	0	0	0	0	0	0
1990	Military		801	21	494	57	5	422	119	4	0	10
1990	Railways		802	376	4913	321	12	895	297	8	1	202
1990	Inland waterways		803	52	705	4160	43	7187	67	2	0	90
1990	National sea traffic		80402	5483	8678	355	11	1127	484	30	0	613
1990	Fishing		80403	1360	13870	678	19	1979	771	49	0	463
1990	International sea traffic		80404	54300	84417	2259	70	7180	3087	194	0	6213
1990	Air traffic, Dom. < 3000 ft.		80501	2	339	158	4	894	67	5	0	0
1990	Air traffic, Int. < 3000 ft.		80502	5	739	118	9	602	159	9	0	0
1990	Air traffic, Dom. > 3000 ft.		80503	5	667	18	2	177	149	5	0	0
1990	Air traffic, Int. > 3000 ft.		80504	51	6406	192	20	832	1603	51	0	0
1990	Agriculture		806	1621	22143	3827	103	20203	1318	55	3	2229
1990	Forestry		807	1	9	1094	11	2019	5	0	0	1
1990	Industry		808	869	12747	3114	136	11197	778	33	2	1151
1990	Household and gardening		809	3	254	4425	138	50610	87	2	0	0

Year	Category	Mode	SNAP ID	SO2 [tons]	NOx [tons]	NMVOC [tons]	CH4 [tons]	CO [tons]	CO2 [ktons]	NH3 [tons]	N2O [tons]	TSP [tons]	PM10 [tons]	PM2.5 [tons]
2002	Passenger cars	Highway driving	70101	34	7458	1325	86	27834	1090	204	490	125	125	125
2002	Passenger cars	Rural driving	70102	74	13000	3703	208	33159	2360	271	1186	214	214	214
2002	Passenger cars	Urban driving	70103	97	11977	14775	2209	186458	3093	538	634	385	385	385
2002	Light duty vehicles	Highway driving	70201	9	1320	137	8	1364	275	23	11	207	207	207
2002	Light duty vehicles	Rural driving	70202	27	4241	535	30	3883	852	72	36	607	607	607
2002	Light duty vehicles	Urban driving	70203	27	4585	1241	96	11203	851	58	18	750	750	750
2002	Heavy duty vehicles	Highway driving	70301	25	5817	610	51	1397	777	30	3	269	269	269
2002	Heavy duty vehicles	Rural driving	70302	37	10337	1170	84	2583	1181	46	4	493	493	493
2002	Heavy duty vehicles	Urban driving	70303	27	7905	957	102	2195	843	27	3	404	404	404
2002	Mopeds		704	1	7	1787	36	3059	18	0	0	27	27	27
2002	Motorcycles	Highway driving	70501	0	25	135	14	1943	8	0	0	4	4	4
2002	Motorcycles	Rural driving	70502	1	47	380	39	4249	19	0	0	10	10	10
2002	Motorcycles	Urban driving	70503	1	31	602	47	4585	23	0	0	12	12	12
2002	Evaporation		706	0	0	7458	0	0	0	0	0	0	0	0
2002	Military		801	5	416	55	4	317	89	4	0	20	20	20
2002	Railways		802	7	3385	247	10	635	211	6	1	125	125	125
2002	Inland waterways		803	23	1192	11070	112	19051	140	3	0	172	165	158
2002	National sea traffic		80402	1993	7444	304	9	966	414	26	0	432	410	390
2002	Fishing		80403	775	11038	494	15	1501	612	39	0	348	331	315
2002	International sea traffic		80404	39610	81292	2174	67	6914	2966	187	0	4428	4206	3996
2002	Air traffic, Dom. < 3000 ft.		80501	2	232	134	3	758	42	5	0	2	2	2
2002	Air traffic, Int. < 3000 ft.		80502	7	1011	115	11	641	221	13	0	4	4	4
2002	Air traffic, Dom. > 3000 ft.		80503	3	442	19	2	111	103	3	0	2	2	2
2002	Air traffic, Int. > 3000 ft.		80504	59	7701	261	28	963	1833	59	0	30	30	30
2002	Agriculture		806	376	19960	3480	96	18886	1219	51	3	2011	1911	1817
2002	Forestry		807	0	8	1029	10	1899	4	0	0	2	2	2
2002	Industry		808	201	10668	3052	148	10766	742	32	2	926	881	838
2002	Household and gardening		809	3	239	4162	130	47601	82	2	0	26	26	26

Annex 8: Non-exhaust emission factors and total non-exhaust emissions of TSP, PM10 and PM2.5 in 2002

Year	Source	Category	Mileage [kmkveh]	TSP [mg/km]	PM_{10} [mg/km]	$PM_{2.5}$ [mg/km]	TSP [tons]	PM_{10} [tons]	$PM_{2.5}$ [tons]
2002	Brake wear	Passenger cars	37711561	7,6	7,5	3,0	287	281	112
2002	Brake wear	Light duty vehicles	8710474	13,7	13,4	5,3	119	117	47
2002	Brake wear	Heavy duty vehicles	2623728	34,8	34,1	13,6	91	89	36
2002	Brake wear	Buses	815496	47,1	46,1	18,4	38	38	15
2002	Brake wear	Mopeds	223287	6,2	6,1	2,4	1	1	1
2002	Brake wear	Motorcycles	515274	4,2	4,2	1,7	2	2	1
2002	Road abrasion	Passenger cars	37711561	15,0	7,5	4,1	566	283	153
2002	Road abrasion	Light duty vehicles	8710474	15,0	7,5	4,1	131	65	35
2002	Road abrasion	Heavy duty vehicles	2623728	76,0	38,0	20,5	199	100	54
2002	Road abrasion	Buses	815496	76,0	38,0	20,5	62	31	17
2002	Road abrasion	Mopeds	223287	6,0	3,0	1,6	1	1	0
2002	Road abrasion	Motorcycles	515274	6,0	3,0	1,6	3	2	1
2002	Tyre wear	Passenger cars	37711561	12,4	7,5	5,2	469	282	197
2002	Tyre wear	Light duty vehicles	8710474	20,5	12,3	8,6	178	107	75
2002	Tyre wear	Heavy duty vehicles	2623728	59,4	35,6	25,0	156	94	65
2002	Tyre wear	Buses	815496	29,4	17,6	12,3	24	14	10
2002	Tyre wear	Mopeds	223287	6,4	3,8	2,7	1	1	1
2002	Tyre wear	Motorcycles	515274	5,6	3,3	2,3	3	2	1
2002	Total	Passenger cars					1322	846	462
2002	Total	Light duty vehicles					428	289	157
2002	Total	Heavy duty vehicles					446	283	155
2002	Total	Buses					124	83	42
2002	Total	Mopeds					4	3	1
2002	Total	Motorcycles					8	5	3

Annex 9: Heavy metal emission factors and total emissions for 1990 and 2002 in CollectER format

SNAP ID	Category	Fuel type	Mode	Arsenic [g/GJ]	Cadmium [g/GJ]	Chromium [g/GJ]	Copper [g/GJ]	Mercury [g/GJ]	Nickel [g/GJ]	Lead [g/GJ]	Selenium [g/GJ]	Zinc [g/GJ]
070101	Passenger cars	Diesel	Highway driving		0,000234	0,001171	0,039812		0,001639	0,000000	0,000234	0,023419
070101	Passenger cars	Gasoline 2-stroke	Highway driving		0,000228	0,001141	0,038813		0,001598	0,000685	0,000228	0,022831
070101	Passenger cars	Gasoline conventional	Highway driving		0,000228	0,001141	0,038813		0,001598	0,000685	0,000228	0,022831
070101	Passenger cars	Gasoline catalyst	Highway driving		0,000228	0,001141	0,038813		0,001598	0,000685	0,000228	0,022831
070101	Passenger cars	LPG	Highway driving		0,000000	0,000000	0,000000		0,000000	0,000000	0,000000	0,000000
070102	Passenger cars	Diesel	Rural driving		0,000234	0,001171	0,039812		0,001639	0,000000	0,000234	0,023419
070102	Passenger cars	Gasoline 2-stroke	Rural driving		0,000228	0,001141	0,038813		0,001598	0,000685	0,000228	0,022831
070102	Passenger cars	Gasoline conventional	Rural driving		0,000228	0,001141	0,038813		0,001598	0,000685	0,000228	0,022831
070102	Passenger cars	Gasoline catalyst	Rural driving		0,000228	0,001141	0,038813		0,001598	0,000685	0,000228	0,022831
070102	Passenger cars	LPG	Rural driving		0,000000	0,000000	0,000000		0,000000	0,000000	0,000000	0,000000
070103	Passenger cars	Diesel	Urban driving		0,000234	0,001171	0,039812		0,001639	0,000000	0,000234	0,023419
070103	Passenger cars	Gasoline 2-stroke	Urban driving		0,000228	0,001141	0,038813		0,001598	0,000685	0,000228	0,022831
070103	Passenger cars	Gasoline conventional	Urban driving		0,000228	0,001141	0,038813		0,001598	0,000685	0,000228	0,022831
070103	Passenger cars	Gasoline catalyst	Urban driving		0,000228	0,001141	0,038813		0,001598	0,000685	0,000228	0,022831
070103	Passenger cars	LPG	Urban driving		0,000000	0,000000	0,000000		0,000000	0,000000	0,000000	0,000000
070201	Light duty vehicles	Diesel	Highway driving		0,000234	0,001171	0,039812		0,001639	0,000000	0,000234	0,023419
070201	Light duty vehicles	Gasoline conventional	Highway driving		0,000228	0,001141	0,038813		0,001598	0,000685	0,000228	0,022831
070201	Light duty vehicles	Gasoline catalyst	Highway driving		0,000228	0,001141	0,038813		0,001598	0,000685	0,000228	0,022831
070202	Light duty vehicles	Diesel	Rural driving		0,000234	0,001171	0,039812		0,001639	0,000000	0,000234	0,023419
070202	Light duty vehicles	Gasoline conventional	Rural driving		0,000228	0,001141	0,038813		0,001598	0,000685	0,000228	0,022831
070202	Light duty vehicles	Gasoline catalyst	Rural driving		0,000228	0,001141	0,038813		0,001598	0,000685	0,000228	0,022831
070203	Light duty vehicles	Diesel	Urban driving		0,000234	0,001171	0,039812		0,001639	0,000000	0,000234	0,023419
070203	Light duty vehicles	Gasoline conventional	Urban driving		0,000228	0,001141	0,038813		0,001598	0,000685	0,000228	0,022831
070203	Light duty vehicles	Gasoline catalyst	Urban driving		0,000228	0,001141	0,038813		0,001598	0,000685	0,000228	0,022831
070301	Heavy duty vehicles	Diesel	Highway driving		0,000234	0,001171	0,039812		0,001639	0,000000	0,000234	0,023419
070301	Heavy duty vehicles	Gasoline	Highway driving		0,000228	0,001141	0,038813		0,001598	0,000685	0,000228	0,022831
070302	Heavy duty vehicles	Diesel	Rural driving		0,000234	0,001171	0,039812		0,001639	0,000000	0,000234	0,023419
070302	Heavy duty vehicles	Gasoline	Rural driving		0,000228	0,001141	0,038813		0,001598	0,000685	0,000228	0,022831
070303	Heavy duty vehicles	Diesel	Urban driving		0,000234	0,001171	0,039812		0,001639	0,000000	0,000234	0,023419
070303	Heavy duty vehicles	Gasoline	Urban driving		0,000228	0,001141	0,038813		0,001598	0,000685	0,000228	0,022831
0704	Mopeds	Gasoline			0,000228	0,001141	0,038813		0,001598	0,000685	0,000228	0,022831
070501	Motorcycles	Gasoline	Highway driving		0,000228	0,001141	0,038813		0,001598	0,000685	0,000228	0,022831
070502	Motorcycles	Gasoline	Rural driving		0,000228	0,001141	0,038813		0,001598	0,000685	0,000228	0,022831
070503	Motorcycles	Gasoline	Urban driving		0,000228	0,001141	0,038813		0,001598	0,000685	0,000228	0,022831

SNAP ID	Category	Fuel type	Mode	Arsenic [mg/GJ]	Cadmium [mg/GJ]	Chromium [mg/GJ]	Copper [mg/GJ]	Mercury [mg/GJ]	Nickel [mg/GJ]	Lead [mg/GJ]	Selenium [mg/GJ]	Zinc [mg/GJ]
0801	Military	Diesel			0,23	1,17	39,81		1,64		0,23	23,42
0801	Military	Jet fuel	< 3000 ft	0,00	0,23	1,14	38,81	0,00	1,60	0,00	0,23	22,83
0801	Military	Jet fuel	> 3000 ft	0,00	0,23	1,14	38,81	0,00	1,60	0,00	0,23	22,83
0801	Military	Gasoline			0,23	1,14	38,81		1,60	0,68	0,23	22,83
0801	Military	Aviation gasoline		0,00	0,23	1,14	38,81	0,00	1,60	12785,39	0,23	22,83
0802	Railways	Diesel			0,23	1,17	39,81		1,64		0,23	23,42
0802	Railways	Kerosene										
0802	Railways	Gasoline			0,23	1,14	38,81		1,60	0,68	0,23	22,83
0803	Inland waterways	Diesel			0,23	1,17	39,81		1,64		0,23	23,42
0803	Inland waterways	Gasoline			0,23	1,14	38,81		1,60	0,68	0,23	22,83
080402	National sea traffic	Residual oil		12,22	0,73	4,89	12,22	0,49	733,50	4,89	9,78	22,00
080402	National sea traffic	Diesel		1,17	0,23	0,94	1,17	1,17	1,64	2,34	4,68	11,71
080402	National sea traffic	Kerosene										
080402	National sea traffic	LPG										
080403	Fishing	Residual oil		12,22	0,73	4,89	12,22	0,49	733,50	4,89	9,78	22,00
080403	Fishing	Diesel		1,17	0,23	0,94	1,17	1,17	1,64	2,34	4,68	11,71
080403	Fishing	Kerosene										
080403	Fishing	Gasoline			0,23	1,14	38,81		1,60	0,68	0,23	22,83
080403	Fishing	LPG										
080404	International sea traffic	Residual oil		12,22	0,73	4,89	12,22	0,49	733,50	4,89	9,78	22,00
080404	International sea traffic	Diesel		1,17	0,23	0,94	1,17	1,17	1,64	2,34	4,68	11,71
080501	Air traffic, other airports	Jet fuel	Dom. < 3000 ft		0,23	1,14	38,81		1,60	0,00	0,23	22,83
080501	Air traffic, other airports	Aviation gasoline			0,23	1,14	38,81		1,60	13505,69	0,23	22,83
080502	Air traffic, other airports	Jet fuel	Int. < 3000 ft		0,23	1,14	38,81		1,60	0,00	0,23	22,83
080502	Air traffic, other airports	Aviation gasoline			0,23	1,14	38,81		1,60	13505,69	0,23	22,83
080503	Air traffic, other airports	Jet fuel	Dom. > 3000 ft		0,23	1,14	38,81		1,60	0,00	0,23	22,83
080504	Air traffic, other airports	Jet fuel	Int. > 3000 ft		0,23	1,14	38,81		1,60	0,00	0,23	22,83
0806	Agriculture	Diesel			0,23	1,17	39,81		1,64		0,23	23,42
0806	Agriculture	Gasoline			0,23	1,14	38,81		1,60	0,68	0,23	22,83
0807	Forestry	Diesel			0,23	1,17	39,81		1,64		0,23	23,42
0807	Forestry	Gasoline			0,23	1,14	38,81		1,60	0,68	0,23	22,83
0808	Industry	Diesel			0,23	1,17	39,81		1,64		0,23	23,42
0808	Industry	Gasoline			0,23	1,14	38,81		1,60	0,68	0,23	22,83
0808	Industry	LPG										
0809	Household and gardening	Gasoline			0,23	1,14	38,81		1,60	0,68	0,23	22,83
080501	Air traffic, CPH. airport	Jet fuel	Dom. < 3000 ft		0,23	1,14	38,81		1,60		0,23	22,83
080501	Air traffic, CPH. airport	Aviation gasoline			0,23	1,14	38,81		1,60	13505,69	0,23	22,83
080502	Air traffic, CPH. airport	Jet fuel	Int. < 3000 ft	0,00	0,23	1,14	38,81	0,00	1,60	0,00	0,23	22,83
080502	Air traffic, CPH. airport	Aviation gasoline		0,00	0,23	1,14	38,81	0,00	1,60	13505,69	0,23	22,83
080503	Air traffic, CPH. airport	Jet fuel	Dom. > 3000 ft	0,00	0,23	1,14	38,81	0,00	1,60	0,00	0,23	22,83
080504	Air traffic, CPH. airport	Jet fuel	Int. > 3000 ft	0,00	0,23	1,14	38,81	0,00	1,60	0,00	0,23	22,83

Year	Category	Mode	SNAP ID	Arsenic [kg]	Cadmium [kg]	Chromium [kg]	Copper [kg]	Mercury [kg]	Nickel [kg]	Lead [kg]	Selenium [kg]	Zinc [kg]
1990	Passenger cars	Highway driving	70101	0	2	9	319	0	13	11192	2	187
1990	Passenger cars	Rural driving	70102	0	6	29	976	0	40	34552	6	574
1990	Passenger cars	Urban driving	70103	0	8	40	1372	0	56	48111	8	807
1990	Light duty vehicles	Highway driving	70201	0	1	3	105	0	4	374	1	62
1990	Light duty vehicles	Rural driving	70202	0	2	11	383	0	16	1555	2	225
1990	Light duty vehicles	Urban driving	70203	0	3	14	463	0	19	2269	3	272
1990	Heavy duty vehicles	Highway driving	70301	0	2	9	301	0	12	10	2	177
1990	Heavy duty vehicles	Rural driving	70302	0	3	17	565	0	23	28	3	333
1990	Heavy duty vehicles	Urban driving	70303	0	3	14	485	0	20	33	3	285
1990	Mopeds		704	0	0	0	14	0	1	397	0	8
1990	Motorcycles	Highway driving	70501	0	0	0	3	0	0	101	0	2
1990	Motorcycles	Rural driving	70502	0	0	0	6	0	0	189	0	4
1990	Motorcycles	Urban driving	70503	0	0	0	8	0	0	222	0	4
1990	Evaporation		706	0	0	0	0	0	0	0	0	0
1990	Military		801	0	0	2	64	0	3	64	0	38
1990	Railways		802	0	1	5	160	0	7	0	1	94
1990	Inland waterways		803	0	0	1	36	0	1	546	0	21
1990	National sea traffic		80402	47	3	20	47	5	2616	24	48	111
1990	Fishing		80403	15	3	11	16	12	226	38	50	124
1990	International sea traffic		80404	363	24	150	363	28	20956	167	334	764
1990	Air traffic, Dom. < 3000 ft.		80501	0	0	1	36	0	1	1534	0	21
1990	Air traffic, Int. < 3000 ft.		80502	0	1	3	86	0	4	490	1	50
1990	Air traffic, Dom. > 3000 ft.		80503	0	0	2	80	0	3	0	0	47
1990	Air traffic, Int. > 3000 ft.		80504	0	5	25	864	0	36	0	5	508
1990	Agriculture		806	0	4	21	709	0	29	765	4	417
1990	Forestry		807	0	0	0	3	0	0	89	0	2
1990	Industry		808	0	2	11	375	0	15	210	2	221
1990	Household and gardening		809	0	0	1	46	0	2	1747	0	27

Year	Category	Mode	SNAP ID	Arsenic [kg]	Cadmium [kg]	Chromium [kg]	Copper [kg]	Mercury [kg]	Nickel [kg]	Lead [kg]	Selenium [kg]	Zinc [kg]
2002	Passenger cars	Highway driving	70101	0	3	17	580	0	24	9	3	341
2002	Passenger cars	Rural driving	70102	0	7	37	1257	0	52	19	7	739
2002	Passenger cars	Urban driving	70103	0	10	48	1647	0	68	25	10	969
2002	Light duty vehicles	Highway driving	70201	0	1	4	148	0	6	0	1	87
2002	Light duty vehicles	Rural driving	70202	0	3	13	458	0	19	1	3	269
2002	Light duty vehicles	Urban driving	70203	0	3	13	457	0	19	1	3	269
2002	Heavy duty vehicles	Highway driving	70301	0	2	12	418	0	17	0	2	246
2002	Heavy duty vehicles	Rural driving	70302	0	4	19	635	0	26	0	4	374
2002	Heavy duty vehicles	Urban driving	70303	0	3	13	453	0	19	0	3	267
2002	Mopeds		704	0	0	0	9	0	0	0	0	6
2002	Motorcycles	Highway driving	70501	0	0	0	4	0	0	0	0	3
2002	Motorcycles	Rural driving	70502	0	0	0	10	0	0	0	0	6
2002	Motorcycles	Urban driving	70503	0	0	0	12	0	1	0	0	7
2002	Evaporation		706	0	0	0	0	0	0	0	0	0
2002	Military		801	0	0	1	48	0	2	106	0	28
2002	Railways		802	0	1	3	113	0	5	0	1	67
2002	Inland waterways		803	0	0	2	75	0	3	1	0	44
2002	National sea traffic		80402	29	2	13	29	5	1520	18	36	85
2002	Fishing		80403	10	2	8	10	10	16	19	39	97
2002	International sea traffic		80404	240	18	106	240	34	12906	136	273	639
2002	Air traffic, Dom. < 3000 ft.		80501	0	0	1	23	0	1	1328	0	13
2002	Air traffic, Int. < 3000 ft.		80502	0	1	3	119	0	5	113	1	70
2002	Air traffic, Dom. > 3000 ft.		80503	0	0	2	56	0	2	0	0	33
2002	Air traffic, Int. > 3000 ft.		80504	0	6	29	988	0	41	0	6	581
2002	Agriculture		806	0	4	19	656	0	27	0	4	386
2002	Forestry		807	0	0	0	2	0	0	0	0	1
2002	Industry		808	0	2	10	347	0	14	0	2	204
2002	Household and gardening		809	0	0	1	43	0	2	1	0	26

Annex 10: PAH emission factors and total emissions for 1990 and 2002 in CollectER format

Year	SNAP ID	Category	Fuel type	Mode	Dioxins/ Furans [g/GJ]	Flouranthene [g/GJ]	Benzo(b) flouranthene [g/GJ]	Benzo(k) flouranthene [g/GJ]	Benzo(a) pyrene [g/GJ]	Benzo(g,h,i) perylene [g/GJ]	indeno(1,2,3-c,d) pyrene [g/GJ]
1990	070101	Passenger cars	Diesel	Highway driving	7,01E-10	1,79E-02	1,54E-03	1,34E-03	1,33E-03	2,81E-03	1,19E-03
1990	070101	Passenger cars	Gasoline 2-stroke	Highway driving							
1990	070101	Passenger cars	Gasoline conventional	Highway driving	9,18E-09	7,78E-03	3,76E-04	1,28E-04	2,05E-04	1,24E-03	4,40E-04
1990	070101	Passenger cars	Gasoline catalyst	Highway driving	1,03E-08	1,34E-03	1,72E-04	1,25E-04	1,53E-04	2,68E-04	1,87E-04
1990	070101	Passenger cars	LPG	Highway driving							
1990	070102	Passenger cars	Diesel	Rural driving	8,52E-10	2,18E-02	1,88E-03	1,63E-03	1,62E-03	3,41E-03	1,44E-03
1990	070102	Passenger cars	Gasoline 2-stroke	Rural driving							
1990	070102	Passenger cars	Gasoline conventional	Rural driving	1,03E-08	8,73E-03	4,22E-04	1,44E-04	2,30E-04	1,39E-03	4,94E-04
1990	070102	Passenger cars	Gasoline catalyst	Rural driving	1,15E-08	1,49E-03	1,92E-04	1,39E-04	1,71E-04	2,99E-04	2,08E-04
1990	070102	Passenger cars	LPG	Rural driving							
1990	070103	Passenger cars	Diesel	Urban driving	5,33E-10	1,36E-02	1,17E-03	1,02E-03	1,01E-03	2,13E-03	9,02E-04
1990	070103	Passenger cars	Gasoline 2-stroke	Urban driving							
1990	070103	Passenger cars	Gasoline conventional	Urban driving	6,95E-09	5,89E-03	2,85E-04	9,70E-05	1,55E-04	9,38E-04	3,33E-04
1990	070103	Passenger cars	Gasoline catalyst	Urban driving	6,18E-09	8,05E-04	1,04E-04	7,48E-05	9,20E-05	1,61E-04	1,12E-04
1990	070103	Passenger cars	LPG	Urban driving							
1990	070201	Light duty vehicles	Diesel	Highway driving	4,87E-10	1,24E-02	1,07E-03	9,32E-04	9,25E-04	1,95E-03	8,25E-04
1990	070201	Light duty vehicles	Gasoline conventional	Highway driving	8,69E-09	7,37E-03	3,56E-04	1,21E-04	1,94E-04	1,17E-03	4,16E-04
1990	070201	Light duty vehicles	Gasoline catalyst	Highway driving	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
1990	070202	Light duty vehicles	Diesel	Rural driving	5,33E-10	1,36E-02	1,17E-03	1,02E-03	1,01E-03	2,13E-03	9,02E-04
1990	070202	Light duty vehicles	Gasoline conventional	Rural driving	8,20E-09	6,95E-03	3,36E-04	1,14E-04	1,83E-04	1,11E-03	3,93E-04
1990	070202	Light duty vehicles	Gasoline catalyst	Rural driving	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
1990	070203	Light duty vehicles	Diesel	Urban driving	3,98E-10	1,02E-02	8,76E-04	7,62E-04	7,56E-04	1,59E-03	6,74E-04
1990	070203	Light duty vehicles	Gasoline conventional	Urban driving	4,90E-09	4,15E-03	2,01E-04	6,84E-05	1,09E-04	6,61E-04	2,35E-04
1990	070203	Light duty vehicles	Gasoline catalyst	Urban driving	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
1990	070301	Heavy duty vehicles	Diesel	Highway driving	1,01E-09	1,97E-03	5,03E-04	5,62E-04	8,31E-05	7,11E-05	1,29E-04
1990	070301	Heavy duty vehicles	Gasoline	Highway driving							
1990	070302	Heavy duty vehicles	Diesel	Rural driving	1,03E-09	2,02E-03	5,15E-04	5,75E-04	8,50E-05	7,27E-05	1,32E-04
1990	070302	Heavy duty vehicles	Gasoline	Rural driving							
1990	070303	Heavy duty vehicles	Diesel	Urban driving	8,31E-10	1,63E-03	4,16E-04	4,64E-04	6,86E-05	5,87E-05	1,07E-04
1990	070303	Heavy duty vehicles	Gasoline	Urban driving							
1990	0704	Mopeds	Gasoline								
1990	070501	Motorcycles	Gasoline	Highway driving	1,36E-08	1,15E-02	5,58E-04	1,90E-04	3,04E-04	1,84E-03	6,53E-04
1990	070502	Motorcycles	Gasoline	Rural driving	1,63E-08	1,38E-02	6,68E-04	2,28E-04	3,64E-04	2,20E-03	7,82E-04
1990	070503	Motorcycles	Gasoline	Urban driving	1,64E-08	1,39E-02	6,73E-04	2,30E-04	3,67E-04	2,22E-03	7,88E-04

Year	SNAP ID	Category	Fuel type	Mode	Dioxins/ Furans [g/GJ]	Flouranthene [g/GJ]	Benzo(b) flouranthene [g/GJ]	Benzo(k) flouranthene [g/GJ]	Benzo(a) pyrene [g/GJ]	Benzo(g,h,i) perylene [g/GJ]	indeno(1,2,3-c,d) pyrene [g/GJ]
2002	070101	Passenger cars	Diesel	Highway driving	7,32E-10	1,28E-02	7,81E-04	7,08E-04	8,54E-04	1,66E-03	8,06E-04
2002	070101	Passenger cars	Gasoline 2-stroke	Highway driving							
2002	070101	Passenger cars	Gasoline conventional	Highway driving	1,39E-08	8,81E-03	5,72E-04	4,40E-04	4,84E-04	1,14E-03	4,40E-04
2002	070101	Passenger cars	Gasoline catalyst	Highway driving	0,00E+00	8,84E-04	1,96E-04	2,45E-04	1,96E-04	3,93E-04	2,95E-04
2002	070101	Passenger cars	LPG	Highway driving							
2002	070102	Passenger cars	Diesel	Rural driving	8,36E-10	1,46E-02	8,92E-04	8,08E-04	9,75E-04	1,90E-03	9,20E-04
2002	070102	Passenger cars	Gasoline 2-stroke	Rural driving							
2002	070102	Passenger cars	Gasoline conventional	Rural driving	1,53E-08	9,74E-03	6,33E-04	4,87E-04	5,36E-04	1,27E-03	4,87E-04
2002	070102	Passenger cars	Gasoline catalyst	Rural driving	0,00E+00	9,87E-04	2,19E-04	2,74E-04	2,19E-04	4,39E-04	3,29E-04
2002	070102	Passenger cars	LPG	Rural driving							
2002	070103	Passenger cars	Diesel	Urban driving	5,55E-10	9,69E-03	5,92E-04	5,36E-04	6,47E-04	1,26E-03	6,10E-04
2002	070103	Passenger cars	Gasoline 2-stroke	Urban driving							
2002	070103	Passenger cars	Gasoline conventional	Urban driving	1,00E-08	6,38E-03	4,14E-04	3,19E-04	3,51E-04	8,29E-04	3,19E-04
2002	070103	Passenger cars	Gasoline catalyst	Urban driving	0,00E+00	5,41E-04	1,20E-04	1,50E-04	1,20E-04	2,40E-04	1,80E-04
2002	070103	Passenger cars	LPG	Urban driving							
2002	070201	Light duty vehicles	Diesel	Highway driving	5,25E-10	9,16E-03	5,59E-04	5,07E-04	6,12E-04	1,19E-03	5,77E-04
2002	070201	Light duty vehicles	Gasoline conventional	Highway driving	1,27E-08	8,09E-03	5,26E-04	4,04E-04	4,45E-04	1,05E-03	4,04E-04
2002	070201	Light duty vehicles	Gasoline catalyst	Highway driving	0,00E+00	6,18E-04	1,37E-04	1,72E-04	1,37E-04	2,75E-04	2,06E-04
2002	070202	Light duty vehicles	Diesel	Rural driving	5,74E-10	1,00E-02	6,12E-04	5,55E-04	6,70E-04	1,30E-03	6,31E-04
2002	070202	Light duty vehicles	Gasoline conventional	Rural driving	1,20E-08	7,63E-03	4,95E-04	3,81E-04	4,19E-04	9,91E-04	3,81E-04
2002	070202	Light duty vehicles	Gasoline catalyst	Rural driving	0,00E+00	5,84E-04	1,30E-04	1,62E-04	1,30E-04	2,59E-04	1,95E-04
2002	070203	Light duty vehicles	Diesel	Urban driving	4,15E-10	7,24E-03	4,42E-04	4,01E-04	4,84E-04	9,40E-04	4,56E-04
2002	070203	Light duty vehicles	Gasoline conventional	Urban driving	6,95E-09	4,41E-03	2,87E-04	2,21E-04	2,43E-04	5,74E-04	2,21E-04
2002	070203	Light duty vehicles	Gasoline catalyst	Urban driving	0,00E+00	3,39E-04	7,51E-05	9,41E-05	7,51E-05	1,50E-04	1,13E-04
2002	070301	Heavy duty vehicles	Diesel	Highway driving	1,04E-09	2,04E-03	5,13E-04	7,61E-04	9,51E-05	7,59E-05	1,33E-04
2002	070301	Heavy duty vehicles	Gasoline	Highway driving							
2002	070302	Heavy duty vehicles	Diesel	Rural driving	1,06E-09	2,07E-03	5,23E-04	7,74E-04	9,67E-05	7,73E-05	1,35E-04
2002	070302	Heavy duty vehicles	Gasoline	Rural driving							
2002	070303	Heavy duty vehicles	Diesel	Urban driving	8,55E-10	1,68E-03	4,24E-04	6,28E-04	7,85E-05	6,28E-05	1,10E-04
2002	070303	Heavy duty vehicles	Gasoline	Urban driving							
2002	0704	Mopeds	Gasoline								
2002	070501	Motorcycles	Gasoline	Highway driving	2,01E-08	1,28E-02	8,30E-04	6,39E-04	7,02E-04	1,66E-03	6,39E-04
2002	070502	Motorcycles	Gasoline	Rural driving	2,41E-08	1,53E-02	9,94E-04	7,65E-04	8,41E-04	1,99E-03	7,65E-04
2002	070503	Motorcycles	Gasoline	Urban driving	2,43E-08	1,55E-02	1,00E-03	7,73E-04	8,50E-04	2,01E-03	7,73E-04

Year	SNAP ID	Category	Fuel type	Mode	Dioxins/ Furans [ng/GJ]	Flouranthene [microg/GJ]	Benzo(b) flouranthene [microg/GJ]	Benzo(k) flouranthene [microg/GJ]	Benzo(a) pyrene [microg/GJ]	Benzo(g,h,i) perylene [microg/GJ]	indeno(1,2,3-c,d) pyrene [microg/GJ]
1990	0801	Military	Diesel		0.71	4391.42	570.64	568.31	289.75	550.01	290.13
1990	0801	Military	Jet fuel	< 3000 ft	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1990	0801	Military	Jet fuel	> 3000 ft	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1990	0801	Military	Gasoline		6.27	5257.47	277.33	116.39	141.99	824.70	299.87
1990	0801	Military	Aviation gasoline		5.11	4328.53	209.06	71.27	114.03	688.95	244.70
1990	0802	Railways	Diesel		0.70	1365.92	348.03	388.90	57.47	49.17	89.40
1990	0802	Railways	Kerosene								
1990	0802	Railways	Gasoline		6.27	5257.47	277.33	116.39	141.99	824.70	299.87
1990	0803	Inland waterways	Diesel		0.71	4391.42	570.64	568.31	289.75	550.01	290.13
1990	0803	Inland waterways	Gasoline		5.11	4328.53	209.06	71.27	114.03	688.95	244.70
1990	080402	National sea traffic	Residual oil		13.42	5190.00	270.00	50.00	20.00	70.00	30.00
1990	080402	National sea traffic	Diesel		12.01	7420.00	640.00	300.00	150.00	1430.00	1180.00
1990	080402	National sea traffic	Kerosene								
1990	080402	National sea traffic	LPG								
1990	080403	Fishing	Residual oil		13.42	5190.00	270.00	50.00	20.00	70.00	30.00
1990	080403	Fishing	Diesel		12.01	7420.00	640.00	300.00	150.00	1430.00	1180.00
1990	080403	Fishing	Kerosene								
1990	080403	Fishing	Gasoline		11.42	3420.09	342.47	146.12	244.29	488.58	244.29
1990	080403	Fishing	LPG								
1990	080404	International sea traffic	Residual oil		13.42	4120.00	200.00	90.00	70.00	260.00	200.00
1990	080404	International sea traffic	Diesel		12.01	7420.00	640.00	300.00	150.00	1430.00	1180.00
1990	080501	Air traffic, other airports	Jet fuel	Dom. < 3000 ft	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1990	080501	Air traffic, other airports	Aviation gasoline		5.11	4328.53	209.06	71.27	114.03	688.95	244.70
1990	080502	Air traffic, other airports	Jet fuel	Int. < 3000 ft	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1990	080502	Air traffic, other airports	Aviation gasoline		5.11	4328.53	209.06	71.27	114.03	688.95	244.70
1990	080503	Air traffic, other airports	Jet fuel	Dom. > 3000 ft	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1990	080504	Air traffic, other airports	Jet fuel	Int. > 3000 ft	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1990	0806	Agriculture	Diesel		0.71	4391.42	570.64	568.31	289.75	550.01	290.13
1990	0806	Agriculture	Gasoline		5.11	4328.53	209.06	71.27	114.03	688.95	244.70
1990	0807	Forestry	Diesel		0.71	4391.42	570.64	568.31	289.75	550.01	290.13
1990	0807	Forestry	Gasoline		5.11	4328.53	209.06	71.27	114.03	688.95	244.70
1990	0808	Industry	Diesel		0.71	4391.42	570.64	568.31	289.75	550.01	290.13
1990	0808	Industry	Gasoline		5.11	4328.53	209.06	71.27	114.03	688.95	244.70
1990	0808	Industry	LPG								
1990	0809	Household and gardening	Gasoline		5.11	4328.53	209.06	71.27	114.03	688.95	244.70
1990	080501	Air traffic, CPH. airport	Jet fuel	Dom. < 3000 ft	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1990	080501	Air traffic, Copenhagen airport	Aviation gasoline		5.11	4328.53	209.06	71.27	114.03	688.95	244.70
1990	080502	Air traffic, Copenhagen airport	Jet fuel	Int. < 3000 ft	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1990	080502	Air traffic, Copenhagen airport	Aviation gasoline		5.11	4328.53	209.06	71.27	114.03	688.95	244.70
1990	080503	Air traffic, Copenhagen airport	Jet fuel	Dom. > 3000 ft	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1990	080504	Air traffic, Copenhagen airport	Jet fuel	Int. > 3000 ft	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Year	SNAP ID	Category	Fuel type	Mode	Dioxins/ Furans [ng/GJ]	Flouranthene [microg/GJ]	Benzo(b) flouranthene [microg/GJ]	Benzo(k) flouranthene [microg/GJ]	Benzo(a) pyrene [microg/GJ]	Benzo(g,h,i) perylene [microg/GJ]	indeno(1,2,3-c,d) pyrene [microg/GJ]
2002	0801	Military	Diesel		0,71	4349,86	510,47	495,91	255,72	464,46	264,30
2002	0801	Military	Jet fuel	< 3000 ft	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2002	0801	Military	Jet fuel	> 3000 ft	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2002	0801	Military	Gasoline		6,89	2151,74	179,80	115,04	118,07	357,51	178,80
2002	0801	Military	Aviation gasoline		5,11	4328,53	209,06	71,27	114,03	688,95	244,70
2002	0802	Railways	Diesel		0,72	1411,28	359,58	401,81	59,38	50,80	92,37
2002	0802	Railways	Kerosene								
2002	0802	Railways	Gasoline		6,89	2151,74	179,80	115,04	118,07	357,51	178,80
2002	0803	Inland waterways	Diesel		0,71	4349,86	510,47	495,91	255,72	464,46	264,30
2002	0803	Inland waterways	Gasoline		5,11	4328,53	209,06	71,27	114,03	688,95	244,70
2002	080402	National sea traffic	Residual oil		13,42	5190,00	270,00	50,00	20,00	70,00	30,00
2002	080402	National sea traffic	Diesel		12,01	7420,00	640,00	300,00	150,00	1430,00	1180,00
2002	080402	National sea traffic	Kerosene								
2002	080402	National sea traffic	LPG								
2002	080403	Fishing	Residual oil		13,42	5190,00	270,00	50,00	20,00	70,00	30,00
2002	080403	Fishing	Diesel		12,01	7420,00	640,00	300,00	150,00	1430,00	1180,00
2002	080403	Fishing	Kerosene								
2002	080403	Fishing	Gasoline		11,42	3420,00	342,00	146,00	244,00	489,00	244,00
2002	080403	Fishing	LPG								
2002	080404	International sea traffic	Residual oil		13,42	4120,00	200,00	90,00	70,00	260,00	200,00
2002	080404	International sea traffic	Diesel		12,01	7420,00	640,00	300,00	150,00	1430,00	1180,00
2002	080501	Air traffic, other airports	Jet fuel	Dom. < 3000 ft	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2002	080501	Air traffic, other airports	Aviation gasoline		5,11	4328,53	209,06	71,27	114,03	688,95	244,70
2002	080502	Air traffic, other airports	Jet fuel	Int. < 3000 ft	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2002	080502	Air traffic, other airports	Aviation gasoline		5,11	4328,53	209,06	71,27	114,03	688,95	244,70
2002	080503	Air traffic, other airports	Jet fuel	Dom. > 3000 ft	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2002	080504	Air traffic, other airports	Jet fuel	Int. > 3000 ft	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2002	0806	Agriculture	Diesel		0,71	4349,86	510,47	495,91	255,72	464,46	264,30
2002	0806	Agriculture	Gasoline		5,11	4328,53	209,06	71,27	114,03	688,95	244,70
2002	0807	Forestry	Diesel		0,71	4349,86	510,47	495,91	255,72	464,46	264,30
2002	0807	Forestry	Gasoline		5,11	4328,53	209,06	71,27	114,03	688,95	244,70
2002	0808	Industry	Diesel		0,71	4349,86	510,47	495,91	255,72	464,46	264,30
2002	0808	Industry	Gasoline		5,11	4328,53	209,06	71,27	114,03	688,95	244,70
2002	0808	Industry	LPG								
2002	0809	Household and gardening	Gasoline		5,11	4328,53	209,06	71,27	114,03	688,95	244,70
2002	080501	Air traffic, Copenhagen airport	Jet fuel	Dom. < 3000 ft	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2002	080501	Air traffic, Copenhagen airport	Aviation gasoline		5,11	4328,53	209,06	71,27	114,03	688,95	244,70
2002	080502	Air traffic, Copenhagen airport	Jet fuel	Int. < 3000 ft	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2002	080502	Air traffic, Copenhagen airport	Aviation gasoline		5,11	4328,53	209,06	71,27	114,03	688,95	244,70
2002	080503	Air traffic, Copenhagen airport	Jet fuel	Dom. > 3000 ft	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2002	080504	Air traffic, Copenhagen airport	Jet fuel	Int. > 3000 ft	0,00	0,00	0,00	0,00	0,00	0,00	0,00

Year	Category	Mode	SNAP ID	Dioxins/ Furans [kg]	Flouranthene [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]
1990	Passenger cars	Highway driving	70101	0,1	70,6	3,9	1,9	2,5	11,2	4,1
1990	Passenger cars	Rural driving	70102	0,2	244,3	13,6	6,7	8,6	38,8	14,3
1990	Passenger cars	Urban driving	70103	0,2	228,0	12,7	6,2	8,1	36,2	13,4
1990	Light duty vehicles	Highway driving	70201	0,0	30,7	2,6	2,2	2,2	4,8	2,0
1990	Light duty vehicles	Rural driving	70202	0,0	120,1	10,1	8,6	8,6	18,8	7,9
1990	Light duty vehicles	Urban driving	70203	0,0	104,7	8,8	7,5	7,5	16,4	6,9
1990	Heavy duty vehicles	Highway driving	70301	0,0	14,9	3,8	4,3	0,6	0,5	1,0
1990	Heavy duty vehicles	Rural driving	70302	0,0	28,6	7,3	8,2	1,2	1,0	1,9
1990	Heavy duty vehicles	Urban driving	70303	0,0	19,8	5,1	5,6	0,8	0,7	1,3
1990	Mopeds		704	0,0	0,0	0,0	0,0	0,0	0,0	0,0
1990	Motorcycles	Highway driving	70501	0,0	0,8	0,0	0,0	0,0	0,1	0,0
1990	Motorcycles	Rural driving	70502	0,0	1,8	0,1	0,0	0,1	0,3	0,1
1990	Motorcycles	Urban driving	70503	0,0	2,1	0,1	0,0	0,1	0,3	0,1
1990	Evaporation		706	0,0	0,0	0,0	0,0	0,0	0,0	0,0
1990	Military		801	0,0	0,7	0,1	0,1	0,0	0,1	0,0
1990	Railways		802	0,0	5,5	1,4	1,6	0,2	0,2	0,4
1990	Inland waterways		803	0,0	4,0	0,4	0,3	0,2	0,6	0,3
1990	National sea traffic		80402	0,1	39,1	2,7	1,0	0,5	4,2	3,4
1990	Fishing		80403	0,1	76,1	6,5	3,0	1,5	14,4	11,9
1990	International sea traffic		80404	0,5	203,9	13,2	6,1	3,7	24,1	19,4
1990	Air traffic, Dom. < 3000 ft.		80501	0,0	0,5	0,0	0,0	0,0	0,1	0,0
1990	Air traffic, Int. < 3000 ft.		80502	0,0	0,2	0,0	0,0	0,0	0,0	0,0
1990	Air traffic, Dom. > 3000 ft.		80503	0,0	0,0	0,0	0,0	0,0	0,0	0,0
1990	Air traffic, Int. > 3000 ft.		80504	0,0	0,0	0,0	0,0	0,0	0,0	0,0
1990	Agriculture		806	0,0	78,2	10,0	9,9	5,1	9,9	5,1
1990	Forestry		807	0,0	0,3	0,0	0,0	0,0	0,0	0,0
1990	Industry		808	0,0	41,4	5,3	5,3	2,7	5,2	2,7
1990	Household and gardening		809	0,0	5,1	0,3	0,1	0,1	0,8	0,3

Year	Category	Mode	SNAP ID	Dioxins/ Furans [kg]	Flouranthene [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]
2002	Passenger cars	Highway driving	70101	0,0	61,1	5,2	5,2	5,1	10,7	5,9
2002	Passenger cars	Rural driving	70102	0,1	148,0	12,7	12,6	12,5	25,9	14,3
2002	Passenger cars	Urban driving	70103	0,1	112,6	9,7	9,6	9,5	19,7	10,8
2002	Light duty vehicles	Highway driving	70201	0,0	31,6	2,0	1,8	2,1	4,2	2,0
2002	Light duty vehicles	Rural driving	70202	0,0	105,2	6,5	5,9	7,1	13,8	6,7
2002	Light duty vehicles	Urban driving	70203	0,0	73,7	4,6	4,2	5,0	9,7	4,7
2002	Heavy duty vehicles	Highway driving	70301	0,0	21,4	5,4	8,0	1,0	0,8	1,4
2002	Heavy duty vehicles	Rural driving	70302	0,0	33,0	8,3	12,3	1,5	1,2	2,2
2002	Heavy duty vehicles	Urban driving	70303	0,0	19,1	4,8	7,1	0,9	0,7	1,3
2002	Mopeds		704	0,0	0,0	0,0	0,0	0,0	0,0	0,0
2002	Motorcycles	Highway driving	70501	0,0	1,4	0,1	0,1	0,1	0,2	0,1
2002	Motorcycles	Rural driving	70502	0,0	4,0	0,3	0,2	0,2	0,5	0,2
2002	Motorcycles	Urban driving	70503	0,0	4,8	0,3	0,2	0,3	0,6	0,2
2002	Evaporation		706	0,0	0,0	0,0	0,0	0,0	0,0	0,0
2002	Military		801	0,0	1,9	0,2	0,2	0,1	0,2	0,1
2002	Railways		802	0,0	4,0	1,0	1,1	0,2	0,1	0,3
2002	Inland waterways		803	0,0	8,3	0,7	0,5	0,3	1,1	0,5
2002	National sea traffic		80402	0,1	36,1	2,8	1,1	0,6	5,0	4,1
2002	Fishing		80403	0,1	61,2	5,3	2,5	1,2	11,8	9,7
2002	International sea traffic		80404	0,5	232,4	17,3	8,1	4,5	35,4	29,0
2002	Air traffic, Dom. < 3000 ft.		80501	0,0	0,4	0,0	0,0	0,0	0,1	0,0
2002	Air traffic, Int. < 3000 ft.		80502	0,0	0,0	0,0	0,0	0,0	0,0	0,0
2002	Air traffic, Dom. > 3000 ft.		80503	0,0	0,0	0,0	0,0	0,0	0,0	0,0
2002	Air traffic, Int. > 3000 ft.		80504	0,0	0,0	0,0	0,0	0,0	0,0	0,0
2002	Agriculture		806	0,0	71,7	8,3	8,0	4,2	7,8	4,4
2002	Forestry		807	0,0	0,3	0,0	0,0	0,0	0,0	0,0
2002	Industry		808	0,0	37,9	4,4	4,3	2,2	4,1	2,3
2002	Household and gardening		809	0,0	4,8	0,2	0,1	0,1	0,8	0,3

Annex 11: Fuel use and emissions in IPCC sectors

Fuel

	IPCC ID	Unit	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Fuel	Other (1A5)	[PJ]	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	1,5	1,3	1,2
Fuel	Railways (1A3c)	[PJ]	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	3,1	2,9	2,8
Fuel	Navigation (1A3d)	[PJ]	6,5	7,4	7,8	6,9	7,6	7,3	8,6	8,0	8,9	8,5	9,0	9,4	8,5	7,2	6,7	6,8	6,7	7,4
Fuel	Ag./for./fish. (1A4c)	[PJ]	26,7	27,8	26,0	27,1	27,9	28,3	28,3	28,3	25,9	25,6	24,8	25,3	25,2	25,2	25,1	25,0	24,5	24,8
Fuel	Civil Aviation (1A3a)	[PJ]	2,6	2,8	3,0	3,1	3,1	3,0	2,7	2,7	2,6	2,7	2,8	2,9	3,0	2,7	2,4	2,2	2,3	2,0
Fuel	Industry-Other (1A2f)	[PJ]	10,7	10,7	10,7	10,7	10,7	10,7	10,6	10,6	10,5	10,5	10,4	10,4	10,4	10,3	10,3	10,2	10,2	10,2
Fuel	Residential (1A4b)	[PJ]	1,2	1,2	1,2	1,2	1,2	1,2	1,2	1,2	1,2	1,2	1,2	1,1	1,1	1,1	1,1	1,1	1,1	1,1
Fuel	Road (1A3b)	[PJ]	112,5	118,8	118,9	119,6	120,7	127,3	132,8	135,2	136,9	143,7	145,0	147,3	150,1	152,7	154,5	152,9	153,5	155,0
Fuel	Navigation int.(1A3d)	[PJ]	17,3	20,1	29,4	37,3	38,2	40,2	36,1	37,9	56,1	63,1	66,3	63,0	57,8	58,2	54,6	56,0	47,3	39,1
Fuel	Civil Aviation int. (1A3a)	[PJ]	20,3	21,4	23,2	24,6	25,6	24,5	22,7	23,5	23,1	25,3	25,9	27,4	27,9	30,0	31,8	32,6	33,1	28,5

SO_2, NO_x, NMVOC, CH_4, CO, CO_2, N_2O and NH_3

pol	IPCC ID	Unit	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
SO2	Other (1A5)	[tons]	337	211	113	31	38	21	164	65	32	31	50	25	35	41	20	6	4	5
SO2	Railways (1A3c)	[tons]	1152	695	618	641	393	376	382	263	105	95	96	95	93	78	40	7	7	7
SO2	Navigation (1A3d)	[tons]	4248	5521	6137	4381	6137	5535	6698	3393	3666	3274	2782	2093	1852	1683	1723	1653	1390	2017
SO2	Ag./for./fish. (1A4c)	[tons]	5326	3827	3679	3386	2895	2982	2747	2772	2534	2349	2299	1410	1478	1187	1161	1158	1117	1151
SO2	Civil Aviation (1A3a)	[tons]	6	7	7	7	7	7	7	6	6	7	7	7	7	6	6	5	6	5
SO2	Industry-Other (1A2f)	[tons]	2173	1304	1304	1304	869	869	863	856	850	843	837	208	206	205	203	201	201	201
SO2	Residential (1A4b)	[tons]	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
SO2	Road (1A3b)	[tons]	11624	7865	7850	7860	5490	5769	5905	3822	1571	1671	1684	1723	1746	1769	1089	353	355	358
SO2	Navigation int.(1A3d)	[tons]	20684	24627	39745	51685	52277	54300	46066	37478	65384	69311	76281	71536	65585	59858	60339	65168	54366	39610
SO2	Civil Aviation int. (1A3a)	[tons]	47	49	53	57	59	56	52	54	53	58	60	63	64	69	73	75	76	66
NOx	Other (1A5)	[tons]	2302	1986	1608	977	868	494	1864	1010	1296	1263	1716	937	1139	1296	955	509	607	416
NOx	Railways (1A3c)	[tons]	6025	6063	5391	5589	5145	4913	4995	5284	5485	4971	5015	4977	4846	4089	3730	3727	3396	3385
NOx	Navigation (1A3d)	[tons]	8316	9536	10108	8817	9813	9382	11195	10240	11202	10622	11218	11644	10247	8456	7694	7790	7626	8636
NOx	Ag./for./fish. (1A4c)	[tons]	33912	35344	33015	34467	35470	36022	36036	36024	32929	32431	31502	32186	31951	31957	31739	31494	30832	31005
NOx	Civil Aviation (1A3a)	[tons]	896	946	989	1043	1050	1006	908	897	894	937	957	975	1002	915	815	731	782	674
NOx	Industry-Other (1A2f)	[tons]	12747	12747	12747	12747	12747	12747	12673	12598	12524	12449	12375	12300	12226	12151	11766	11362	11029	10668
NOx	Residential (1A4b)	[tons]	254	254	254	254	254	254	252	251	249	248	246	245	243	242	240	239	239	239
NOx	Road (1A3b)	[tons]	89554	94361	94276	95038	95881	100118	101506	101402	99862	98904	95730	93410	89086	85642	80531	74501	70348	66749
NOx	Navigation int.(1A3d)	[tons]	36143	42057	61836	78416	80275	84417	75576	79058	117623	132160	138528	131504	120575	120988	113827	117148	98722	81292
NOx	Civil Aviation int. (1A3a)	[tons]	5952	6312	6817	7257	7487	7144	6618	6871	6727	7341	7539	7920	8075	8682	9229	9467	9600	8712
NMVOC	Other (1A5)	[tons]	615	488	187	482	315	57	204	113	146	130	191	107	133	149	128	64	75	55
NMVOC	Railways (1A3c)	[tons]	393	396	352	365	336	321	326	345	358	324	327	325	316	267	276	253	248	247
NMVOC	Navigation (1A3d)	[tons]	4472	4521	4545	4491	4533	4515	5278	5929	6661	7322	8035	8742	9374	9990	10647	11340	11333	11374
NMVOC	Ag./for./fish. (1A4c)	[tons]	5401	5470	5400	5460	5576	5599	5577	5530	5354	5316	5262	5177	5190	5161	5718	5740	5023	5002
NMVOC	Civil Aviation (1A3a)	[tons]	198	200	173	184	181	176	165	161	158	187	203	192	184	166	159	151	156	153
NMVOC	Industry-Other (1A2f)	[tons]	3114	3114	3114	3114	3114	3114	3120	3126	3132	3138	3144	3150	3155	3162	3142	3117	3086	3052
NMVOC	Residential (1A4b)	[tons]	4425	4425	4425	4425	4425	4425	4399	4372	4346	4320	4293	4267	4241	4214	4188	4162	4162	4162
NMVOC	Road (1A3b)	[tons]	80886	80871	80268	79841	78269	80774	81436	80499	78250	74203	69476	65693	59195	54617	49083	41624	37026	34815
NMVOC	Navigation int.(1A3d)	[tons]	967	1126	1655	2098	2148	2259	2022	2116	3149	3536	3707	3519	3226	3237	3045	3134	2641	2174
NMVOC	Civil Aviation int. (1A3a)	[tons]	253	273	297	323	342	309	285	291	284	280	315	332	337	350	354	370	382	376

pol	IPCC ID	Unit	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
CH4	Other (1A5)	[tons]	31	25	16	19	14	5	17	9	12	12	16	9	11	12	10	5	6	4
CH4	Railways (1A3c)	[tons]	15	15	14	14	13	12	13	13	14	12	13	12	12	10	11	10	10	9
CH4	Navigation (1A3d)	[tons]	52	54	54	53	54	53	63	68	77	83	90	98	103	108	114	121	120	122
CH4	Ag./for./fish. (1A4c)	[tons]	129	131	129	131	133	134	133	132	127	126	124	124	123	122	128	128	120	121
CH4	Civil Aviation (1A3a)	[tons]	6	6	6	7	7	6	6	6	6	6	7	7	7	6	6	5	6	5
CH4	Industry-Other (1A2f)	[tons]	136	136	136	136	136	136	138	139	140	141	142	143	144	145	147	148	148	148
CH4	Residential (1A4b)	[tons]	138	138	138	138	138	138	137	136	135	135	134	133	132	131	131	130	130	130
CH4	Road (1A3b)	[tons]	2486	2518	2544	2503	2460	2620	2891	3024	3283	3444	3602	3862	3700	3536	3454	3299	3259	3010
CH4	Navigation int.(1A3d)	[tons]	30	35	51	65	66	70	63	65	97	109	115	109	100	100	94	97	82	67
CH4	Civil Aviation int. (1A3a)	[tons]	24	26	28	30	31	29	26	27	26	28	32	34	35	36	37	38	40	39
CO	Other (1A5)	[tons]	4147	3071	1303	3129	1947	422	985	500	835	806	847	604	575	654	719	396	302	317
CO	Railways (1A3c)	[tons]	1098	1105	982	1018	937	895	910	963	999	906	914	907	883	745	717	694	637	635
CO	Navigation (1A3d)	[tons]	8176	8334	8408	8240	8370	8314	9729	10786	12094	13195	14453	15688	16687	17635	18715	19908	19887	20018
CO	Ag./for./fish. (1A4c)	[tons]	23748	23951	23683	23874	24126	24200	24092	23936	23380	23209	22986	22802	22744	22621	23500	23469	22220	22285
CO	Civil Aviation (1A3a)	[tons]	1174	1195	1052	1115	1104	1071	995	964	937	1104	1190	1136	1101	984	936	894	893	869
CO	Industry-Other (1A2f)	[tons]	11197	11197	11197	11197	11197	11197	11155	11113	11071	11028	10986	10944	10902	10860	10817	10772	10769	10766
CO	Residential (1A4b)	[tons]	50610	50610	50610	50610	50610	50610	50309	50009	49708	49407	49106	48805	48504	48203	47902	47601	47601	47601
CO	Road (1A3b)	[tons]	574867	553993	534472	487184	458670	467744	484830	476563	481940	454750	438837	437939	388778	360719	336505	311969	302537	283912
CO	Navigation int.(1A3d)	[tons]	3074	3578	5260	6670	6828	7180	6428	6725	10007	11241	11783	11185	10256	10291	9681	9963	8396	6914
CO	Civil Aviation int. (1A3a)	[tons]	1128	1215	1297	1421	1568	1435	1339	1378	1368	1313	1393	1475	1536	1621	1697	1751	1754	1604
CO2	Other (1A5)	[ktons]	402	316	361	196	165	119	287	141	237	252	252	176	171	204	182	111	97	89
CO2	Railways (1A3c)	[ktons]	364	366	326	338	311	297	302	319	331	300	303	301	293	247	232	228	211	210
CO2	Navigation (1A3d)	[ktons]	492	560	592	519	575	551	657	608	665	637	674	702	629	535	497	507	498	554
CO2	Ag./for./fish. (1A4c)	[ktons]	1975	2054	1925	2006	2062	2094	2093	2091	1919	1890	1838	1875	1862	1861	1857	1849	1810	1836
CO2	Civil Aviation (1A3a)	[ktons]	189	200	213	224	226	216	196	192	189	195	198	206	213	194	174	155	167	146
CO2	Industry-Other (1A2f)	[ktons]	778	778	778	778	778	778	775	771	767	764	760	757	753	749	746	742	742	742
CO2	Residential (1A4b)	[ktons]	87	87	87	87	87	87	86	86	85	85	84	84	83	83	82	82	82	82
CO2	Road (1A3b)	[ktons]	8260	8724	8734	8782	8866	9351	9759	9926	10052	10551	10648	10821	11026	11215	11350	11230	11273	11389
CO2	Navigation int.(1A3d)	[ktons]	1320	1537	2261	2869	2936	3087	2762	2887	4300	4829	5061	4803	4403	4414	4155	4279	3605	2966
CO2	Civil Aviation int. (1A3a)	[ktons]	1458	1544	1668	1771	1845	1762	1635	1695	1660	1819	1867	1970	2010	2158	2290	2348	2380	2053

pol	IPCC ID	Unit	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
NH3	Other (1A5)	[tons]	15	12	13	6	6	4	12	6	9	9	11	7	8	9	8	4	5	4
NH3	Railways (1A3c)	[tons]	10	10	9	9	9	8	8	9	9	8	8	8	8	7	6	6	6	6
NH3	Navigation (1A3d)	[tons]	29	33	35	30	34	32	39	35	39	37	39	40	35	29	26	26	26	29
NH3	Ag./for./fish. (1A4c)	[tons]	96	101	93	98	101	103	103	104	93	91	88	91	90	90	90	90	88	89
NH3	Civil Aviation (1A3a)	[tons]	8	9	9	10	10	10	9	9	9	9	9	11	11	9	9	8	8	8
NH3	Industry-Other (1A2f)	[tons]	33	33	33	33	33	33	33	33	33	33	33	32	32	32	32	32	32	32
NH3	Residential (1A4b)	[tons]	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
NH3	Road (1A3b)	[tons]	340	367	370	376	384	423	494	556	615	735	813	886	1000	1074	1143	1185	1230	1270
NH3	Navigation int.(1A3d)	[tons]	83	97	142	180	185	194	174	182	270	304	318	302	277	278	262	270	228	187
NH3	Civil Aviation int. (1A3a)	[tons]	49	51	56	59	62	60	56	58	57	63	64	69	70	75	80	82	82	72
N2O	Other (1A5)	[tons]	1	1	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0
N2O	Railways (1A3c)	[tons]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
N2O	Navigation (1A3d)	[tons]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N2O	Ag./for./fish. (1A4c)	[tons]	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
N2O	Civil Aviation (1A3a)	[tons]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N2O	Industry-Other (1A2f)	[tons]	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
N2O	Residential (1A4b)	[tons]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N2O	Road (1A3b)	[tons]	62	65	65	66	66	128	299	482	656	959	1204	1408	1735	1943	2108	2219	2336	2386
N2O	Navigation int.(1A3d)	[tons]		0						0	0									
N2O	Civil Aviation int. (1A3a)	[tons]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

TSP, PM_{10} and $PM_{2.5}$

pol	IPCC ID	Unit	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
TSP	Other (1A5)[3]	[tons]	98	100	48	10	22	10	115	69	63	52	115	45	75	79	56	19	39	20
TSP	Railways (1A3c)	[tons]	247	249	221	229	211	202	205	217	225	204	206	204	199	168	146	141	125	125
TSP	Navigation (1A3d)[4]	[tons]	570	695	753	606	757	703	837	725	687	626	593	572	512	497	508	524	520	604
TSP	Ag./for./fish. (1A4c)[5]	[tons]	2603	2646	2579	2624	2672	2693	2666	2665	2549	2508	2468	2497	2483	2450	2434	2412	2381	2361
TSP	Civil Aviation (1A3a)[6]	[tons]															2	3	4	3
TSP	Industry-Other (1A2f)[7]	[tons]	1151	1151	1151	1151	1151	1151	1143	1134	1126	1118	1110	1102	1093	1085	1047	1002	966	926
TSP	Residential (1A4b)[8]	[tons]															26	26	26	26
TSP	Road (1A3b)	[tons]	4989	5443	5473	5388	5493	5734	5892	5689	5644	5730	5430	5326	4880	4485	4290	3969	3774	3508
TSP	Navigation int.(1A3d)	[tons]	2332	2785	4547	5931	5990	6213	5236	4921	8221	8841	9048	8313	7569	6721	6819	7614	6099	4428
TSP	Civil Aviation int. (1A3a)[9]	[tons]															33	38	38	33
PM10	Other (1A5)	[tons]																19	39	20
PM10	Railways (1A3c)	[tons]																141	125	125
PM10	Navigation (1A3d)	[tons]																499	495	575
PM10	Ag./for./fish. (1A4c)	[tons]																2292	2262	2244
PM10	Civil Aviation (1A3a)	[tons]																3	4	3
PM10	Industry-Other (1A2f)	[tons]																953	918	881
PM10	Residential (1A4b)	[tons]																26	26	26
PM10	Road (1A3b)	[tons]	4989	5443	5473	5388	5493	5734	5892	5689	5644	5730	5430	5326	4880	4485	4290	3969	3774	3508
PM10	Navigation int.(1A3d)	[tons]																7233	5794	4206
PM10	Civil Aviation int. (1A3a)	[tons]																38	38	33
PM2.5	Other (1A5)	[tons]																19	39	20
PM2.5	Railways (1A3c)	[tons]																141	125	125
PM2.5	Navigation (1A3d)	[tons]																475	471	547
PM2.5	Ag./for./fish. (1A4c)	[tons]																2179	2151	2133
PM2.5	Civil Aviation (1A3a)	[tons]																3	4	3
PM2.5	Industry-Other (1A2f)	[tons]																907	874	838
PM2.5	Residential (1A4b)	[tons]																26	26	26
PM2.5	Road (1A3b)	[tons]	4989	5443	5473	5388	5493	5734	5892	5689	5644	5730	5430	5326	4880	4485	4290	3969	3774	3508
PM2.5	Navigation int.(1A3d)	[tons]																6871	5505	3996

[3] TSP emissions from jet fuel are not included from 1999 and backwards: In 1999 the emissions from jet fuel use were 25 tons.
[4] TSP emissions from gasoline are not included from 1998 and backwards. In 1998 the emissions from gasoline fuel use were 22 tons.
[5] TSP emissions from gasoline are not included from 1998 and backwards. In 1998 the emissions from gasoline fuel use were 13 tons.
[6] TSP emissions are not included from 1998 and backwards.
[7] TSP emissions from gasoline are not included from 1998 and backwards. In 1998 the emissions from gasoline fuel use were 21 tons.
[8] TSP emissions are not included from 1998 and backwards.
[9] TSP emissions are not included from 1998 and backwards.

PM2.5	Civil Aviation int. (1A3a)	[tons]	38	38	33

Heavy metals

pol	IPCC ID	Unit	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Arsenic	Other (1A5)	[kg]										0	0	0	0
Arsenic	Navigation (1A3d)	[kg]	47	57	46	38	32	26	22	19	21	22	22	22	29
Arsenic	Ag./for./fish. (1A4c)	[kg]	15	14	15	11	10	9	12	12	10	10	10	9	10
Arsenic	Civil Aviation (1A3a)	[kg]										0	0	0	0
Arsenic	Navigation int.(1A3d)	[kg]	363	302	276	475	505	514	332	426	366	379	432	342	240
Arsenic	Civil Aviation int. (1A3a)	[kg]										0	0	0	0
Cadmium	Other (1A5)	[kg]	0	1	0	1	1	1	1	1	1	1	0	0	0
Cadmium	Railways (1A3c)	[kg]	1	1	1	1	1	1	1	1	1	1	1	1	1
Cadmium	Navigation (1A3d)	[kg]	3	4	4	3	3	3	3	2	2	2	2	2	3
Cadmium	Ag./for./fish. (1A4c)	[kg]	7	7	7	6	6	6	6	6	6	6	6	6	6
Cadmium	Civil Aviation (1A3a)	[kg]	1	1	1	1	1	1	1	1	1	1	0	1	0
Cadmium	Industry-Other (1A2f)	[kg]	2	2	2	2	2	2	2	2	2	2	2	2	2
Cadmium	Residential (1A4b)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0
Cadmium	Road (1A3b)	[kg]	29	31	31	32	33	33	34	35	35	36	35	35	36
Cadmium	Navigation int.(1A3d)	[kg]	24	20	19	32	34	35	20	30	27	27	29	24	18
Cadmium	Civil Aviation int. (1A3a)	[kg]	6	5	5	5	6	6	6	6	7	7	8	8	7
Chromium	Other (1A5)	[kg]	2	5	2	4	4	4	3	3	3	3	2	2	1
Chromium	Railways (1A3c)	[kg]	5	5	5	5	5	5	5	5	4	4	4	3	3
Chromium	Navigation (1A3d)	[kg]	21	25	21	19	17	15	14	12	12	12	13	13	16
Chromium	Ag./for./fish. (1A4c)	[kg]	32	31	31	29	28	27	29	29	28	27	27	27	27
Chromium	Civil Aviation (1A3a)	[kg]	3	3	3	3	3	3	3	3	3	3	2	3	2
Chromium	Industry-Other (1A2f)	[kg]	11	11	11	11	11	11	11	10	10	10	10	10	10
Chromium	Residential (1A4b)	[kg]	1	1	1	1	1	1	1	1	1	1	1	1	1
Chromium	Road (1A3b)	[kg]	147	153	156	158	166	167	170	173	176	178	177	177	179
Chromium	Navigation int.(1A3d)	[kg]	150	127	118	199	213	218	133	182	161	164	184	147	106
Chromium	Civil Aviation int. (1A3a)	[kg]	28	26	27	26	29	30	31	32	34	36	37	38	33
Copper	Other (1A5)	[kg]	64	154	76	128	136	136	95	92	110	98	60	52	48
Copper	Railways (1A3c)	[kg]	160	162	172	178	162	163	162	157	133	125	123	114	113
Copper	Navigation (1A3d)	[kg]	83	97	90	86	84	82	81	82	88	92	97	97	104
Copper	Ag./for./fish. (1A4c)	[kg]	727	720	716	707	700	694	693	687	679	676	670	667	668
Copper	Civil Aviation (1A3a)	[kg]	117	106	103	102	105	107	111	115	105	94	84	90	79
Copper	Industry-Other (1A2f)	[kg]	375	372	369	366	364	361	358	355	352	350	347	347	347
Copper	Residential (1A4b)	[kg]	46	46	46	45	45	45	44	44	44	44	43	43	43
Copper	Road (1A3b)	[kg]	4999	5217	5305	5372	5639	5691	5784	5893	5994	6067	6003	6027	6090
Copper	Navigation int.(1A3d)	[kg]	363	302	276	475	505	514	332	426	366	379	432	342	240

Copper	Civil Aviation int. (1A3a)	[kg]	950	881	913	895	980	1007	1062	1083	1164	1235	1266	1283	1107

pol	IPCC ID	Unit	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Mercury	Other (1A5)	[kg]										0	0	0	0
Mercury	Navigation (1A3d)	[kg]	5	6	6	7	7	8	8	7	5	5	5	5	5
Mercury	Ag./for./fish. (1A4c)	[kg]	12	12	12	10	10	9	9	9	10	10	10	9	10
Mercury	Civil Aviation (1A3a)	[kg]										0	0	0	0
Mercury	Navigation int.(1A3d)	[kg]	28	26	30	40	47	51	14	46	50	44	43	38	34
Mercury	Civil Aviation int. (1A3a)	[kg]										0	0	0	0
Nickel	Other (1A5)	[kg]	3	6	3	5	6	6	4	4	5	4	2	2	2
Nickel	Railways (1A3c)	[kg]	7	7	7	7	7	7	7	6	5	5	5	5	5
Nickel	Navigation (1A3d)	[kg]	2617	3173	2513	1955	1589	1166	864	709	992	1061	1115	1118	1523
Nickel	Ag./for./fish. (1A4c)	[kg]	255	129	215	149	48	55	202	231	61	41	41	40	43
Nickel	Civil Aviation (1A3a)	[kg]	5	4	4	4	4	4	5	5	4	4	3	4	3
Nickel	Industry-Other (1A2f)	[kg]	15	15	15	15	15	15	15	15	15	14	14	14	14
Nickel	Residential (1A4b)	[kg]	2	2	2	2	2	2	2	2	2	2	2	2	2
Nickel	Road (1A3b)	[kg]	206	215	218	221	232	234	238	243	247	250	247	248	251
Nickel	Navigation int.(1A3d)	[kg]	20956	17236	15429	27162	28664	29023	19856	23826	19820	20967	24364	19050	12906
Nickel	Civil Aviation int. (1A3a)	[kg]	39	36	38	37	40	41	44	45	48	51	52	53	46
Lead	Other (1A5)	[kg]	64	80	62	120	0	102	98	123	116	78	114	88	106
Lead	Railways (1A3c)	[kg]	0	0	0	0		0	0	0	0	0	0	0	0
Lead	Navigation (1A3d)	[kg]	570	496	485	243	65	69	73	19	17	16	16	16	19
Lead	Ag./for./fish. (1A4c)	[kg]	892	655	564	245	58	57	58	20	20	20	20	19	20
Lead	Civil Aviation (1A3a)	[kg]	1534	1423	1378	1328	1639	1788	1640	1559	1399	1387	1369	1343	1328
Lead	Industry-Other (1A2f)	[kg]	210	153	131	55	10	9	9	0	0	0	0	0	0
Lead	Residential (1A4b)	[kg]	1747	1269	1086	455	79	79	78	1	1	1	1	1	1
Lead	Road (1A3b)	[kg]	99034	76876	69585	30165	5486	5545	5598	57	59	58	57	57	56
Lead	Navigation int.(1A3d)	[kg]	167	144	142	226	247	256	134	218	205	201	216	177	136
Lead	Civil Aviation int. (1A3a)	[kg]	490	465	452	456	153	175	126	145	145	124	118	114	113
Selenium	Other (1A5)	[kg]	0	1	0	1	1	1	1	1	1	1	0	0	0
Selenium	Railways (1A3c)	[kg]	1	1	1	1	1	1	1	1	1	1	1	1	1
Selenium	Navigation (1A3d)	[kg]	48	58	50	49	45	44	43	37	33	30	31	30	37
Selenium	Ag./for./fish. (1A4c)	[kg]	54	54	55	44	42	40	44	44	43	43	43	41	42
Selenium	Civil Aviation (1A3a)	[kg]	1	1	1	1	1	1	1	1	1	1	0	1	0
Selenium	Industry-Other (1A2f)	[kg]	2	2	2	2	2	2	2	2	2	2	2	2	2
Selenium	Residential (1A4b)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0
Selenium	Road (1A3b)	[kg]	29	31	31	32	33	33	34	35	35	36	35	35	36
Selenium	Navigation int.(1A3d)	[kg]	334	289	284	451	495	512	269	436	410	401	431	354	273

Selenium	Civil Aviation int. (1A3a)	[kg]	6	5	5	5	6	6	6	6	7	7	8	8	7

pol	IPCC ID	Unit	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Zinc	Other (1A5)	[kg]	38	91	45	75	80	80	56	54	65	58	35	31	28
Zinc	Railways (1A3c)	[kg]	94	95	101	105	95	96	95	93	78	73	72	67	67
Zinc	Navigation (1A3d)	[kg]	132	157	142	145	137	138	140	127	117	113	117	115	129
Zinc	Ag./for./fish. (1A4c)	[kg]	543	539	539	509	502	492	499	495	491	489	486	480	484
Zinc	Civil Aviation (1A3a)	[kg]	69	62	61	60	62	63	65	67	62	55	49	53	46
Zinc	Industry-Other (1A2f)	[kg]	221	219	217	216	214	212	211	209	207	206	204	204	204
Zinc	Residential (1A4b)	[kg]	27	27	27	27	26	26	26	26	26	26	26	26	26
Zinc	Road (1A3b)	[kg]	2941	3069	3121	3160	3317	3348	3402	3467	3526	3569	3531	3545	3582
Zinc	Navigation int.(1A3d)	[kg]	764	664	660	1038	1141	1183	607	1010	959	933	997	821	639
Zinc	Civil Aviation int. (1A3a)	[kg]	559	518	537	526	577	592	625	637	684	726	745	755	651

Dioxins and PAH

pol	IPCC ID	Unit	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Dioxins/furans	Other (1A5)	[g]	0	0	0	0	0	0	0	0	0	0	0	0	0
Dioxins/furans	Railways (1A3c)	[g]	0	0	0	0	0	0	0	0	0	0	0	0	0
Dioxins/furans	Navigation (1A3d)	[g]	0	0	0	0	0	0	0	0	0	0	0	0	0
Dioxins/furans	Ag./for./fish. (1A4c)	[g]	0	0	0	0	0	0	0	0	0	0	0	0	0
Dioxins/furans	Civil Aviation (1A3a)	[g]	0	0	0	0	0	0	0	0	0	0	0	0	0
Dioxins/furans	Industry-Other (1A2f)	[g]	0	0	0	0	0	0	0	0	0	0	0	0	0
Dioxins/furans	Residential (1A4b)	[g]	0	0	0	0	0	0	0	0	0	0	0	0	0
Dioxins/furans	Road (1A3b)	[g]	1	1	1	1	1	1	1	1	1	0	1	1	0
Dioxins/furans	Navigation int.(1A3d)	[g]	1	0	0	1	1	1	1	1	1	1	1	1	0
Dioxins/furans	Civil Aviation int. (1A3a)	[g]	0	0	0	0	0	0	0	0	0	0	0	0	0
Flouranthene	Other (1A5)	[kg]	1	7	4	4	3	8	3	6	6	4	2	4	2
Flouranthene	Railways (1A3c)	[kg]	5	5	6	6	6	6	6	6	5	4	4	4	4
Flouranthene	Navigation (1A3d)	[kg]	43	51	49	56	54	59	63	56	45	40	41	40	44
Flouranthene	Ag./for./fish. (1A4c)	[kg]	155	153	155	140	136	132	135	133	133	133	135	131	133
Flouranthene	Civil Aviation (1A3a)	[kg]	0	0	0	0	1	1	1	0	0	0	0	0	0
Flouranthene	Industry-Other (1A2f)	[kg]	41	40	40	41	39	40	39	38	37	37	38	38	38
Flouranthene	Residential (1A4b)	[kg]	5	5	5	5	5	5	5	5	5	5	5	5	5
Flouranthene	Road (1A3b)	[kg]	866	877	868	848	847	810	784	752	726	640	679	651	616
Flouranthene	Navigation int.(1A3d)	[kg]	204	190	212	294	340	361	349	322	343	311	306	266	232
Flouranthene	Civil Aviation int. (1A3a)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0
Benzo(b) flouranthene	Other (1A5)	[kg]	0	1	1	1	0	1	0	1	1	1	0	0	0
Benzo(b) flouranthene	Railways (1A3c)	[kg]	1	1	1	2	1	1	1	1	1	1	1	1	1
Benzo(b) flouranthene	Navigation (1A3d)	[kg]	3	4	4	4	4	5	5	5	4	3	3	3	3
Benzo(b) flouranthene	Ag./for./fish. (1A4c)	[kg]	17	16	16	15	15	14	15	14	14	14	14	13	14
Benzo(b) flouranthene	Civil Aviation (1A3a)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0
Benzo(b) flouranthene	Industry-Other (1A2f)	[kg]	5	5	5	5	5	5	5	5	5	5	5	4	4
Benzo(b) flouranthene	Residential (1A4b)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0
Benzo(b) flouranthene	Road (1A3b)	[kg]	68	69	69	68	70	69	68	67	66	62	63	61	60
Benzo(b) flouranthene	Navigation int.(1A3d)	[kg]	13	13	15	20	23	25	25	23	25	22	21	19	17
Benzo(b) flouranthene	Civil Aviation int. (1A3a)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0

pol	IPCC ID	Unit	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Benzo(k) flouranthene	Other (1A5)	[kg]	0	1	1	1	0	1	0	1	1	1	0	0	0
Benzo(k) flouranthene	Railways (1A3c)	[kg]	2	2	2	2	2	2	2	2	1	1	1	1	1
Benzo(k) flouranthene	Navigation (1A3d)	[kg]	1	2	2	2	2	2	3	2	2	2	2	2	2
Benzo(k) flouranthene	Ag./for./fish. (1A4c)	[kg]	13	13	13	12	12	12	12	11	11	11	11	10	10
Benzo(k) flouranthene	Civil Aviation (1A3a)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0
Benzo(k) flouranthene	Industry-Other (1A2f)	[kg]	5	5	5	5	5	5	5	5	5	5	4	4	4
Benzo(k) flouranthene	Residential (1A4b)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0
Benzo(k) flouranthene	Road (1A3b)	[kg]	51	52	52	51	54	54	54	54	53	68	52	51	67
Benzo(k) flouranthene	Navigation int.(1A3d)	[kg]	6	6	7	9	11	12	11	11	12	10	10	9	8
Benzo(k) flouranthene	Civil Aviation int. (1A3a)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0
Benzo(a) pyrene	Other (1A5)	[kg]	0	0	0	0	0	1	0	0	0	0	0	0	0
Benzo(a) pyrene	Railways (1A3c)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0
Benzo(a) pyrene	Navigation (1A3d)	[kg]	1	1	1	1	1	1	1	1	1	1	1	1	1
Benzo(a) pyrene	Ag./for./fish. (1A4c)	[kg]	7	6	6	6	6	6	6	6	6	5	6	5	5
Benzo(a) pyrene	Civil Aviation (1A3a)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0
Benzo(a) pyrene	Industry-Other (1A2f)	[kg]	3	3	3	3	3	3	2	2	2	2	2	2	2
Benzo(a) pyrene	Residential (1A4b)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0
Benzo(a) pyrene	Road (1A3b)	[kg]	40	41	41	41	43	42	42	41	40	45	39	38	45
Benzo(a) pyrene	Navigation int.(1A3d)	[kg]	4	4	4	5	6	7	7	6	7	6	6	5	4
Benzo(a) pyrene	Civil Aviation int. (1A3a)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0
Benzo(g,h,i) perylene	Other (1A5)	[kg]	0	1	1	1	0	1	0	1	1	0	0	0	0
Benzo(g,h,i) perylene	Railways (1A3c)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0
Benzo(g,h,i) perylene	Navigation (1A3d)	[kg]	5	6	6	8	8	10	11	9	7	6	6	6	6
Benzo(g,h,i) perylene	Ag./for./fish. (1A4c)	[kg]	24	24	24	22	21	20	20	20	20	20	20	19	20
Benzo(g,h,i) perylene	Civil Aviation (1A3a)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0
Benzo(g,h,i) perylene	Industry-Other (1A2f)	[kg]	5	5	5	5	5	5	5	4	4	4	4	4	4
Benzo(g,h,i) perylene	Residential (1A4b)	[kg]	1	1	1	1	1	1	1	1	1	1	1	1	1
Benzo(g,h,i) perylene	Road (1A3b)	[kg]	129	131	130	127	126	119	115	109	104	89	94	88	88
Benzo(g,h,i) perylene	Navigation int.(1A3d)	[kg]	24	24	30	37	45	49	48	45	52	45	41	37	35
Benzo(g,h,i) perylene	Civil Aviation int. (1A3a)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0
indeno(1,2,3-c,d) pyrene	Other (1A5)	[kg]	0	0	0	0	0	1	0	0	0	0	0	0	0
indeno(1,2,3-c,d) pyrene	Railways (1A3c)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0
indeno(1,2,3-c,d) pyrene	Navigation (1A3d)	[kg]	4	4	5	6	6	8	8	7	5	5	5	4	5
indeno(1,2,3-c,d) pyrene	Ag./for./fish. (1A4c)	[kg]	17	17	17	15	15	14	14	14	14	14	14	14	14
indeno(1,2,3-c,d) pyrene	Civil Aviation (1A3a)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0
indeno(1,2,3-c,d) pyrene	Industry-Other (1A2f)	[kg]	3	3	3	3	3	3	3	2	2	2	2	2	2

indeno(1,2,3-c,d) pyrene	Residential (1A4b)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0
indeno(1,2,3-c,d) pyrene	Road (1A3b)	[kg]	53	54	54	53	54	52	51	50	49	49	46	45	50
indeno(1,2,3-c,d) pyrene	Navigation int.(1A3d)	[kg]	19	20	24	30	36	39	39	36	42	36	34	30	29
indeno(1,2,3-c,d) pyrene	Civil Aviation int. (1A3a)	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0

Annex 12: Uncertainty estimates

Uncertainty estimation, CO_2

	IPCC Source category	Gas	Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty 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 CO_2	Gg CO_2	%	%	%	%	%	%	%	%	%
Civil Aviation	Aviation Gasoline	CO2	8,29	7,18	2	5	5,385	0,003	-0,000178	0,0006	-0,0009	0,0016	0,0018
	Jet Kerosene	CO2	208,16	138,74	2	5	5,385	0,052	-0,007758	0,0110	-0,0388	0,0312	0,0498
Road Transportation	Gasoline	CO2	4.914,00	6.020,54	2	5	5,385	2,271	0,035033	0,4788	0,1752	1,3542	1,3655
	Diesel Oil	CO2	4.436,10	5.368,90	2	5	5,385	2,025	0,026399	0,4270	0,1320	1,2076	1,2148
Railways	Diesel Oil	CO2	296,75	210,50	2	5	5,385	0,079	-0,010047	0,0167	-0,0502	0,0473	0,0690
Navigation	Residual Oil	CO2	277,66	161,01	2	5	5,385	0,061	-0,012259	0,0128	-0,0613	0,0362	0,0712
	Gas/Diesel Oil	CO2	246,26	320,04	2	5	5,385	0,121	0,003219	0,0255	0,0161	0,0720	0,0738
Agriculture	Diesel Oil	CO2	1280	1184	20	5	20,616	1,709	-0,021374	0,0941	-0,1069	2,6622	2,6644
	Gasoline	CO2	38	36	20	5	20,616	0,052	-0,000588	0,0028	-0,0029	0,0803	0,0804
Forestry	Diesel Oil	CO2	0	0	20	5	20,616	0,000	-6,19E-06	0,0000	0,0000	0,0008	0,0008
	Gasoline	CO2	4	4	20	5	20,616	0,006	-6,82E-05	0,0003	-0,0003	0,0093	0,0093
Industry	Diesel Oil	CO2	687	635	20	5	20,616	0,917	-0,011473	0,0505	-0,0574	1,4283	1,4295
	Gasoline	CO2	10	10	20	5	20,616	0,015	-0,000162	0,0008	-0,0008	0,0235	0,0235
	LPG	CO2	81	97	20	5	20,616	0,117	0,000407	0,0065	0,0020	0,1829	0,1829
Household and gardening	Gasoline	CO2	87	82	20	5	20,616	0,125	-0,001342	0,0069	-0,0067	0,1950	0,1951
	Total	CO2	12574,6037	14274,465				13,084					12,57911942
	Total uncer-tainties				**Overall uncertainty in the year (%):**			**3,617**			**Trend uncertainty (%):**		**3,547**

Uncertainty estimation, CH_4

IPCC Source category		Gas	Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty 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 CH4	Gg CH4	%	%	%	%		%	%	%	%
Civil Aviation	Aviation Gasoline	CH4	0,00	0,00	2	100	100,020	0,063	-0,000213	0,0007	-0,021308064	0,002003386	0,021402036
	Jet Kerosene	CH4	0,00	0,00	2	100	100,020	0,095	-0,000303	0,0011	-0,030295942	0,003026016	0,030446689
Road Transportation	Gasoline	CH4	2,27	2,69	2	40	40,050	31,488	0,045668	0,8850	1,826738205	2,50327431	3,098927999
	Diesel Oil	CH4	0,35	0,32	2	40	40,050	3,741	-0,025792	0,1051	-1,031661444	0,297400028	1,073672255
Railways	Diesel Oil	CH4	0,01	0,01	2	100	100,020	0,278	-0,001436	0,0031	-0,143592714	0,008838906	0,143864498
Navigation	Residual Oil	CH4	0,01	0,00	2	100	100,020	0,106	-0,001126	0,0012	-0,112564703	0,00338054	0,112615454
	Gas/Diesel Oil	CH4	0,01	0,01	2	100	100,020	0,284	0,000579	0,0032	0,057901801	0,009038035	0,05860294
Agriculture	Diesel Oil	CH4	0	0	20	100	101,980	2,113	-0,005061	0,0233	-0,506148753	0,659750951	0,831539462
	Gasoline	CH4	0	0	20	100	101,980	0,745	-0,001619	0,0082	-0,161870173	0,232619327	0,283396726
Forestry	Diesel Oil	CH4	0	0	20	100	101,980	0,001	-1,44E-06	0,0000	-0,000144413	0,000188191	0,000237216
	Gasoline	CH4	0	0	20	100	101,980	0,306	-0,000665	0,0034	-0,066538478	0,095615755	0,116489234
Industry	Diesel Oil	CH4	0	0	20	100	101,980	1,146	-0,002745	0,0126	-0,274505784	0,357769432	0,450946108
	Gasoline	CH4	0	0	20	100	101,980	0,480	-0,001043	0,0053	-0,104254515	0,149816732	0,182521388
	LPG	CH4	0	0	20	100	101,980	2,775	0,00185	0,0306	0,184988611	0,866329921	0,885860214
Household and gardening	Gasoline	CH4	0	0	20	100	101,980	3,867	-0,008399	0,0427	-0,8398684	1,207394781	1,470775675
	Total	CH4	3,03965538	3,4216856				1035,006					14,76426267
	Total uncertainties				**Overall uncertainty in the year (%):**			**32,172**			**Trend uncertainty (%):**		**3,842**

Uncertainty estimation, N_2O

	IPCC Source category	Gas	Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty 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 N2O	Gg N2O	%	%	%	%					
Civil Aviation	Aviation Gasoline	N2O	0,00	0,00	2	1000	1000,002	0,141	-0,000651	0,0004	-0,651388547	0,000990162	0,651389299
	Jet Kerosene	N2O	0,01	0,01	2	1000	1000,002	5,464	-0,02784	0,0136	-27,83992431	0,038365003	27,83995074
Road Transportation	Gasoline	N2O	0,15	0,89	2	50	50,040	31,902	0,915346	1,5828	45,76729291	4,476727935	45,98571727
	Diesel Oil	N2O	0,27	0,38	2	50	50,040	13,599	-0,524311	0,6747	-26,21557134	1,908373673	26,28494
Railways	Diesel Oil	N2O	0,01	0,01	2	1000	1000,002	4,154	-0,025763	0,0103	-25,76340152	0,029167053	25,76341803
Navigation	Residual Oil	N2O	0,02	0,01	2	1000	1000,002	7,240	-0,058802	0,0180	-58,80239977	0,050840038	58,80242175
	Gas/Diesel Oil	N2O	0,01	0,02	2	1000	1000,002	13,479	-0,03135	0,0335	-31,35032428	0,094648418	31,35046716
Agriculture	Diesel Oil	N2O	0,05	0,05	20	1000	1000,200	35,532	-0,148395	0,0882	-148,3950456	2,49457977	148,4160116
	Gasoline	N2O	0,00	0,00	20	1000	1000,200	0,631	-0,002569	0,0016	-2,568697096	0,044313227	2,569079297
Forestry	Diesel Oil	N2O	0,00	0,00	20	1000	1000,200	0,010	-4,24E-05	0,0000	-0,042369482	0,00071157	0,042375456
	Gasoline	N2O	0,00	0,00	20	1000	1000,200	0,019	-7,89E-05	0,0000	-0,078922382	0,001361488	0,078934125
Industry	Diesel Oil	N2O	0,03	0,03	20	1000	1000,200	19,268	-0,080507	0,0478	-80,5066993	1,352759533	80,51806375
	Gasoline	N2O	0,00	0,00	20	1000	1000,200	0,156	-0,000637	0,0004	-0,636794447	0,01098536	0,636889195
	LPG	N2O	0,00	0,00	20	1000	1000,200	3,333	-0,008869	0,0083	-8,869207891	0,233976721	8,872293599
Household and gardening	Gasoline	N2O	0,00	0,00	20	1000	1000,200	1,284	-0,005225	0,0032	-5,224651785	0,090133309	5,225429197
	Total	N2O	0,56273641	1,3970775				3130,901					37308,90934
	Total uncer-tainties					**Overall uncertainty in the year (%):**		**55,954**				**Trend uncertainty (%):**	**193,155**

Uncertainty estimation, SO_2

IPCC Source category	Gas	Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data	Input data	Input data	Input data							
		Gg SO2	Gg SO2	%	%	%	%	%	%	%	%	%
07	SO2	5769	355	2	50	50,040	5,527	-0,056863326	0,0234	-2,843166	0,06608914	2,8439343
08	SO2	9403	2855	10	50	50,990	45,358	0,056727989	0,1882	2,8363994	2,66137826	3,8894853
Total	SO2	15172,02	3209,7				2087,926					23,216058

Total uncertainties	Overall uncertainty in the year (%):	45,694	Trend uncertainty (%):	4,818

Uncertainty estimation, NO_x

IPCC Source category	Gas	Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data	Input data	Input data	Input data							
		Gg NOx	Gg NOx	%	%	%	%	%	%	%	%	%
07	NOx	100118	70348	2	50	50,040	27,691	-0,06449905	0,4455	-3,224953	1,26000568	3,4623595
08	NOx	57797	56778	10	100	100,499	44,886	0,064671278	0,3595	6,4671278	5,08476983	8,226702
Total	NOx	157914,7	127125,6				2781,490					79,666559

Total uncertainties	Overall uncertainty i the year (%):	52,740	Trend uncertainty (%):	8,926

Uncertainty estimation, NMVOC

IPCC Source category	Gas	Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data	Input data	Input data	Input data							
		Gg NMVOC	Gg NMVOC	%	%	%	%	%	%	%	%	%
07	NMVOC	80774	37026	2	50	50,040	32,441	-0,099893973	0,3766	-4,994699	1,06530625	5,1070434
08	NMVOC	17531	20086	10	100	100,499	35,345	0,10053548	0,2043	10,053548	2,88952046	10,460552
Total	NMVOC	98305,28	57111,69				2301,681					135,50505

Total uncertainties					**Overall uncertainty i the year (%):**	**47,976**			**Trend uncertainty (%):**	**11,641**

Uncertainty estimation, CO

IPCC Source category	Gas	Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data	Input data	Input data	Input data							
		Gg CO	Gg CO	%	%	%	%	%	%	%	%	%
07	CO	467744	302537	2	50	50,040	37,822	-0,066459994	0,5486	-3,323	1,55167838	3,6674287
08	CO	83725	97730	10	100	100,499	24,538	0,066922092	0,1772	6,6922092	2,50624656	7,1461134
Total	CO	551469,1	400267,1				2032,627					64,516969

Total uncertainties					**Overall uncertainty i the year (%):**	**45,085**			**Trend uncertainty (%):**	**8,032**

Uncertainty estimation, TSP

IPCC Source category	Gas	Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data	Input data	Input data	Input data							
		Gg TSP	Gg TSP	%	%	%	%	%	%	%	%	%
07	TSP	5735	3774	2	50	50,040	23,415	-0,088723924	0,3802	-4,436196	1,0754477	4,5646933
08	TSP	4191	4291	10	100	100,499	53,472	0,088861313	0,4323	8,8861313	6,11425656	10,786448
Total	TSP	9925,54	8065,21				3407,550					137,18389
Total uncertainties					**Overall uncertainty i the year (%):**		**58,374**			**Trend uncertainty (%):**		**11,713**

Uncertainty estimation, NH_3

IPCC Source category	Gas	Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data	Input data	Input data	Input data							
		Gg NH3	Gg NH3	%	%	%	%	%	%	%	%	%
07	NH3	128	2336	2	1000	1000,002	997,142	0,64427812	17,5148	644,27812	49,5392563	646,17988
08	NH3	5	7	10	1000	1000,050	2,860	-0,650204506	0,0502	-650,2045	0,71050022	650,20489
Total	NH3	133,36	2342,47				994299,882					840314,84
Total uncertainties					**Overall uncertainty i the year (%):**		**997,146**			**Trend uncertainty (%):**		**916,687**

Uncertainty estimation, Arsenic

IPCC Source category	Gas	Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data	Input data	Input data	Input data							
		kg	kg	%	%	%	%	%	%	%	%	%
07	Arsenic	0	0	2	1000	1000,002	0,000	0	0,0000	0	0	0
08	Arsenic	62	33	10	1000	1000,050	1000,050	0	0,5236	0	7,40498249	7,4049825
Total	Arsenic	62,47	32,71				1000100,000					54,833766

Total uncertainties	**Overall uncertainty i the year (%):**	**1000,050**		**Trend uncertainty (%):**	**7,405**

Uncertainty estimation, Cadmium

IPCC Source category	Gas	Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data	Input data	Input data	Input data							
		kg	kg	%	%	%	%	%	%	%	%	%
07	Cadmium	29	35	2	1000	1000,002	744,432	0,068244127	0,8222	68,244127	2,3255081	68,283738
08	Cadmium	14	12	10	1000	1000,050	255,582	-0,068492047	0,2823	-68,49205	3,99183772	68,608274
Total	Cadmium	43,08	47,58				619501,221					9369,764

Total uncertainties	**Overall uncertainty i the year (%):**	**787,084**		**Trend uncertainty (%):**	**96,798**

Uncertainty estimation, Chromium

IPCC Source category	Gas	Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data	Input data	Input data	Input data							
		kg	kg	%	%	%	%	%	%	%	%	%
07	Chromium	147	177	2	1000	1000,002	744,905	0,073358011	0,8167	73,358011	2,31003205	73,394373
08	Chromium	70	61	10	1000	1000,050	255,109	-0,073617658	0,2797	-73,61766	3,95541827	73,723842
Total	Chromium	216,99	237,91				619964,210					10821,939

Total uncertainties	**Overall uncertainty i the year (%):**	**787,378**	**Trend uncertainty (%):**	**104,029**

Uncertainty estimation, Copper

IPCC Source category	Gas	Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data	Input data	Input data	Input data							
		kg	kg	%	%	%	%	%	%	%	%	%
07	Copper	4999	6027	2	1000	1000,002	805,281	0,025386979	0,9445	25,386979	2,67137355	25,527141
08	Copper	1382	1457	10	1000	1000,050	194,731	-0,025530594	0,2284	-25,53059	3,22976657	25,734075
Total	Copper	6381,06	7484,04				686396,881					1313,8775

Total uncertainties	**Overall uncertainty i the year (%):**	**828,491**	**Trend uncertainty (%):**	**36,247**

Uncertainty estimation, Mercury

IPCC Source category	Gas	Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data	Input data	Input data	Input data							
		kg	kg	%	%	%	%	%	%	%	%	%
07	Mercury	0	0	2	1000	1000,002	0,000	0	0,0000	0	0	0
08	Mercury	17	15	10	1000	1000,050	1000,050	0	0,8627	0	12,1999381	12,199938
Total	Mercury	17,33	14,95				1000100,000					148,83849
Total uncertainties					**Overall uncertainty i the year (%):**		**1000,050**			**Trend uncertainty (%):**		**12,200**

Uncertainty estimation, Nickel

IPCC Source category	Gas	Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data	Input data	Input data	Input data							
		kg	kg	%	%	%	%	%	%	%	%	%
07	Nickel	206	248	2	1000	1000,002	172,715	0,049223607	0,0800	49,223607	0,22622712	49,224127
08	Nickel	2896	1189	10	1000	1000,050	827,327	-0,048800641	0,3831	-48,80064	5,41803616	49,100486
Total	Nickel	3102,27	1436,65				714300,418					4833,8724
Total uncertainties					**Overall uncertainty i the year (%):**		**845,163**			**Trend uncertainty (%):**		**69,526**

Uncertainty estimation, Lead

IPCC Source category	Gas	Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data	Input data	Input data	Input data							
		kg	kg	%	%	%	%	%	%	%	%	%
07	Lead	99034	57	2	1000	1000,002	37,054	-0,013380068	0,0005	-13,38007	0,00154204	13,380068
08	Lead	4654	1469	10	1000	1000,050	962,994	0,013501803	0,0142	13,501803	0,20036958	13,50329
Total	Lead	103688	1525,61				928730,673					361,36505

Total uncertainties	**Overall uncertainty i the year (%):**	**963,707**		**Trend uncertainty (%):**	**19,010**

Uncertainty estimation, Selenium

IPCC Source category	Gas	Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data	Input data	Input data	Input data							
		kg	kg	%	%	%	%	%	%	%	%	%
07	Selenium	29	35	2	1000	1000,002	307,093	0,077477898	0,2593	77,477898	0,73329592	77,481368
08	Selenium	107	80	10	1000	1000,050	692,943	-0,077039901	0,5850	-77,0399	8,27286985	77,482816
Total	Selenium	136,62	115,34				574475,324					12006,949

Total uncertainties	**Overall uncertainty i the year (%):**	**757,942**		**Trend uncertainty (%):**	**109,576**

Uncertainty estimation, Zinc

IPCC Source category	Gas	Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data	Input data	Input data	Input data							
		kg	kg	%	%	%	%	%	%	%	%	%
07	Zinc	2941	3545	2	1000	1000,002	777,656	0,039225345	0,8961	39,225345	2,53462687	39,30715
08	Zinc	1015	1014	10	1000	1000,050	222,356	-0,039415775	0,2562	-39,41578	3,62347451	39,581977
Total	Zinc	3956,04	4558,72				654191,619					3111,7849

Total uncertainties	**Overall uncertainty i the year (%):**	**808,821**		**Trend uncertainty (%):**	**55,783**

Uncertainty estimation, Dioxins

IPCC Source category	Gas	Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data	Input data	Input data	Input data							
		g dioxins	g dioxins	%	%	%	%	%	%	%	%	%
07	Dioxins	1	1	2	1000	1000,002	787,880	0,08121646	0,9176	81,21646	2,59549783	81,257923
08	Dioxins	0	0	10	1000	1000,050	212,132	-0,081568996	0,2471	-81,569	3,49393939	81,643791
Total	Dioxins	0,85	0,99				665755,376					13268,559

Total uncertainties	**Overall uncertainty i the year (%):**	**815,938**		**Trend uncertainty (%):**	**115,189**

Uncertainty estimation, Flouranthene

IPCC Source category	Gas	Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data	Input data	Input data	Input data							
		kg	kg	%	%	%	%	%	%	%	%	%
07	Flouranthene	866	651	2	1000	1000,002	735,357	-0,042308785	0,5920	-42,30879	1,67439983	42,341905
08	Flouranthene	233	234	10	1000	1000,050	264,658	0,042552244	0,2130	42,552244	3,01296753	42,658779
Total	Flouranthene	1099,09	884,81				610793,696					3612,6083
Total uncertainties					**Overall uncertainty i the year (%):**		**781,533**			**Trend uncertainty (%):**		**60,105**

Uncertainty estimation, Benzo(b) flouranthene

IPCC Source category	Gas	Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data	Input data	Input data	Input data							
		kg	kg	%	%	%	%	%	%	%	%	%
07	Benzo(b) flouranthene	68	61	2	1000	1000,002	718,035	-0,01667551	0,6620	-16,67551	1,87232612	16,780293
08	Benzo(b) flouranthene	24	24	10	1000	1000,050	281,981	0,016754096	0,2600	16,754096	3,67624977	17,152683
Total	Benzo(b) flouranthene	92,21	85,01				595086,941					575,79275
Total uncertainties					**Overall uncertainty i the year (%):**		**771,419**			**Trend uncertainty (%):**		**23,996**

Uncertainty estimation, Benzo(k) flouranthene

IPCC Source category	Gas	Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data	Input data	Input data	Input data							
		kg	kg	%	%	%	%	%	%	%	%	%
07	Benzo(k) flouranthene	51	51	2	1000	1000,002	729,541	-0,001934777	0,7274	-1,934777	2,05725837	2,8241236
08	Benzo(k) flouranthene	19	19	10	1000	1000,050	270,474	0,001943711	0,2696	1,9437109	3,81340525	4,2801953
Total	Benzo(k) flouranthene	69,98	69,77				605386,591					26,295746

Total uncertainties	**Overall uncertainty i the year (%):**	**778,066**	**Trend uncertainty (%):**	**5,128**

Uncertainty estimation, Benzo(a) pyrene

IPCC Source category	Gas	Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data	Input data	Input data	Input data							
		kg	kg	%	%	%	%	%	%	%	%	%
07	Benzo(a) pyrene	40	38	2	1000	1000,002	802,924	-0,011723822	0,7789	-11,72382	2,20294263	11,928996
08	Benzo(a) pyrene	9	9	10	1000	1000,050	197,087	0,011797571	0,1912	11,797571	2,70355934	12,103384
Total	Benzo(a) pyrene	49,38	47,9				683530,855					288,79285

Total uncertainties	**Overall uncertainty i the year (%):**	**826,759**	**Trend uncertainty (%):**	**16,994**

Uncertainty estimation, Benzo(g,h,i) perylene

IPCC Source category	Gas	Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data	Input data	Input data	Input data							
		kg	kg	%	%	%	%	%	%	%	%	%
07	Benzo(g,h,i) perylene	129	88	2	1000	1000,002	730,924	-0,04688714	0,5394	-46,88714	1,52576819	46,911958
08	Benzo(g,h,i) perylene	33	32	10	1000	1000,050	269,090	0,047163169	0,1986	47,163169	2,80842902	47,246712
Total	Benzo(g,h,i) perylene	162,65	120,04				606660,265					4432,9836

Total uncertainties	**Overall uncertainty i the year (%):**	**778,884**	**Trend uncertainty (%):**	**66,581**

Uncertainty estimation, indeno(1,2,3-c,d) pyrene

IPCC Source category	Gas	Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data	Input data	Input data	Input data							
		kg	kg	%	%	%	%	%	%	%	%	%
07	indeno(1,2,3-c,d) pyrene	53	45	2	1000	1000,002	662,944	-0,028688375	0,5843	-28,68837	1,65257668	28,735933
08	indeno(1,2,3-c,d) pyrene	23	23	10	1000	1000,050	337,074	0,028800332	0,2971	28,800332	4,20105709	29,10512
Total	indeno(1,2,3-c,d) pyrene	76,18	67,14				553114,029					1672,8619

Total uncertainties	**Overall uncertainty i the year (%):**	**743,716**	**Trend uncertainty (%):**	**40,901**

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