National Environmental Research Institute
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NERI Technical Report No. 686, 2008

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Inventories until year 2006

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Morten Winther

Data sheet

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Abstract: This report explains the parts of the Danish inventories related to road transport and other mobile sources. Emission results are shown for CO_2, CH_4, N_2O, SO_2, NO_X, NMVOC, CO, particulate matter (PM), heavy metals, dioxins and PAH. From 1990-2006 the fuel use and CO_2 emissions for road transport have increased by 36 %, and CH_4 emissions have decreased by 51 %. A N_2O emission increase of 29 % is related to the relatively high emissions from older gasoline catalyst cars. The 1985-2006 emission decreases for PM (exhaust only), CO, NO_X and NMVOC are 30, 69, 28 and 71 % respectively, due to the introduction of vehicles complying with gradually stricter emission standards. For SO_2 the emission drop is 99% (due to reduced sulphur content in the diesel fuel), whereas the NH_3 emissions increase by 3065% (due to the introduction of catalyst cars). For other mobile sources the calculated emission changes for CO_2 (and fuel use), CH_4 and N_2O are -10, 5 and -11%, from 1990 to 2006. The emissions of SO_2, particulates (all size fractions), NO_X, NMVOC and CO have decreased by 88, 56, 14, 12 and 9% from 1985 to 2006. For NH_3 the emissions have increased by 8% in the same time period. 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.
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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 are shown for CO_2, CH_4 and N_2O in a time-series from 1990-2006 as reported to the UNFCCC convention. For SO_2, NO_X, NMVOC, CO, NH_3 and particulate matter (PM) emission results are shown from 1985-2006, and for heavy metals, dioxins and PAH emission results are shown from 1990-2006, as reported to the UNECE LRTAP convention. All results are grouped according to the UNFCCC Common Reporting Format (CRF) and UNECE National Format for Reporting (NFR) codes.

Summary

This report explains the emission inventories for road transport and other mobile sources, which are 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, NH_3, particulate matter (PM), heavy metals, dioxins and PAH are shown in time-series as required by the UNFCCC and the UNECE LRTAP conventions, and grouped according to the UNFCCC Common Reporting Format (CRF) and UNECE National Format for Reporting (NFR) classification codes.

Table 0.1 Mobile sources and CRF 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 emission calculations for road transport are made with an internal NERI model, with a structure similar to the European COPERT III (COmputer Programme to calculate the Emissions from Road Transport) methodology. The new emission factors from the updated COPERT IV version have been implemented in the NERI model. 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.

For air traffic the 2001-2006 estimates are made on a city-pair level, using flight data from the Danish Civil Aviation Agency (CAA-DK) and landing/take off (LTO) and distance related emission factors from the EMEP/CORINAIR guidebook. 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.

For regional ferries, the fuel consumption and emissions are calculated as a product of number of round trips, sailing time per round trip, engine size, engine load factor and fuel consumption/emission factor. For small ferries and other national sea transport, the calculations are simply fuel based using the fuel consumption findings from a previous Danish research study in combination with average fuel related emission factors.

Non-road working machines and equipment, and recreational craft are grouped in the following sectors: Agriculture, Forestry, Industry, Household/Gardening and Inland Waterways. 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.

For military, railways and fisheries the emissions are calculated as the product of fuel use and emission factors.

Fuel sales data are obtained from the Danish energy statistics provided by the Danish Energy Authority (DEA). 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 national sea transport, the fuel consumption of heavy oil and gas oil is calculated directly by NERI. Fuel adjustments are made in the fishery sector (gas oil) and stationary industry sources (heavy fuel oil) in order to maintain the grand national energy balance.

Emissions from road transport

Set in relation to the Danish national emission totals, the largest emission shares for road transport are noted for NO_X, CO, CO_2, NMVOC, TSP, $PM_{2.5}$ and PM_{10}. In 2006 the emission percentages were 36, 29, 23, 21, 12, 11 and 8, respectively. The emissions of NH_3, N_2O, CH_4 and SO_2 have marginal shares of 2.2, 1.9, 0.5 and 0.3 %, respectively.

From 1990 to 2006 the calculated emission changes for CO_2 (and fuel use), CH_4 and N_2O are 36, -51 and 29 %. For NO_X, NMVOC, CO and particulates (exhaust only: Size is below $PM_{2.5}$), the 1985-2006 emission changes are -28, -71, -69, and -30 %.

The most significant emission changes from 1985 to 2006 occur for SO_2 and NH_3. For SO_2 the emission drop is 99 % (due to reduced sulphur content in the diesel fuel), whereas the NH_3 emissions increase by 3065 % (due to the introduction of catalyst cars).

Table 0.2 Emissions from road transport in 2006, changes from 1985 (1990[1]) to 2006, and 2006 shares of national emission totals

CRF ID	SO_2 [tons]	NO_X [tons]	NMVOC [tons]	CH_4 [tons]	CO [tons]	CO_2 [ktons]	N_2O [tons]	NH_3 [tons]	TSP [tons]	PM_{10} [tons]	$PM_{2.5}$ [tons]
Road (1A3b)	79	66993	23171	1290	171521	12594	402	1951	3101	3101	3101
Total Road non-exhaust									2663	1726	937
Total Road	79	66993	23171	1290	171521	12594	402	1951	5764	4828	4039
Total national, 2006	25048	185304	108182	262623	590599	55749	21026	89530	25048	38460	27726
Road- % of national, 2006	0.3	36	21	0.5	29	23	1.9	2.2	12	8.1	11
Road- % change 1985-2006	-99	-28	-71	-51[1]	-69	36[1]	29[1]	3065	-30[2]	-30[2]	-30[2]

Road transport exhaust PM emissions almost solely come from diesel fuelled vehicles. The largest source is light duty trucks 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. 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 2006 the TSP (total particulate matter), PM_{10} and $PM_{2.5}$ shares were 46, 36 and 23 % of the respective road traffic totals. The non-exhaust PM is 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 passenger 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, CO, NMVOC, TSP and $PM_{2.5}$ have the largest shares of the national totals in 2006. The shares are 23, 21, 13, 10 and 9 %, respectively. The 2006 CO_2, SO_2 and PM_{10} emission shares are 7 %, whereas the emissions of N_2O, NH_3 and CH_4 have marginal shares of 1 % or less in 2006.

From 1990 to 2006 the calculated emission changes for CO_2 (and fuel use), CH_4 and N_2O are -10, 5 and -11 %. The emissions of SO_2, particulates (all size fractions), NO_X, NMVOC and CO have decreased by 88, 56, 14, 12 and 9 % from 1985 to 2006. For NH_3 the emissions have increased by 8 % in the same time period.

[1] For the greenhouse gases CO_2, CH_4 and N_2O, the emission changes are relative to 1990

[2] Exhaust only

Table 0.3 Emissions from other mobile sources in 2006, changes from 1985 (1990[3]) to 2006, and 2006 shares of national emission totals

CRF ID	SO_2 [tons]	NO_X [tons]	NMVOC [tons]	CH_4 [tons]	CO [tons]	CO_2 [ktons]	N_2O [tons]	NH_3 [tons]	TSP [tons]	PM_{10} [tons]	$PM_{2.5}$ [tons]
Industry-Other (1A2f)	30	10807	1583	44	7515	1021	43	2	991	991	991
Civil Aviation (1A3a)	45	596	155	6	838	141	8	0	3	3	3
Railways (1A3c)	1	3542	230	9	626	227	6	1	120	120	120
Navigation (1A3d)	1089	7436	1195	32	7192	455	26	0	291	289	288
Residential (1A4b)	1	275	8037	233	87744	233	4	0	79	79	79
Ag./for./fish. (1A4c)	632	20199	2541	94	16976	1599	77	3	1086	1084	1084
Military (1A5)	26	619	56	6	391	126	4	0	21	21	21
Total other mobile	1824	43475	13796	425	121282	3802	168	7	2590	2587	2585
Total national, 2006	25048	185304	108182	262623	590599	55749	21026	89530	25048	38460	27726
Other mobile- % of national, 2006	7.3	23	13	0.2	21	6.8	0.8	0.0	10	6.7	9.3
Other mobile - % change 1985-2006	-88	-14	-12	5[3]	-9	-10[3]	-11[3]	8	-56	-56	-56

The largest source of NO_X and particulate emissions are agriculture/forestry/fisheries, followed by industry and navigation. For NMVOC and CO most of the emissions come from gasoline fuelled working machinery in the residential sector.

Heavy metals

For heavy metals the development in emissions follows the fuel use trends. The road transport shares for copper (Cu), zinc (Zn), chromium (Cr) and cadmium (Cd) are 71, 15, 15 and 6 % of national totals in 2006, and for other mobile sources the lead (Pb), Cu and nickel (Ni) shares are 21, 17 and 5 %. For the remaining components, the emission shares are less than 5 %.

The road transport emissions have increased by 36 % from 1990 to 2006. For Pb though there has been an almost 100 % emission decline, due to the phasing out of leaded gasoline fuels until 1994. For other mobile sources the emissions of Cd, Zn and Cu have emission decreases of 20 % or less in the same time period. The emissions of Pb, Ni, arsenic (Ar), selenium (Se), mercury (Hg) and Cr decrease even further. The respective emission declines are 79, 81, 68, 40, 26 and 23 %. For Ni, Se, Ar and Hg the emission decreases are due to a reduction in residual oil fuel use, and for Pb the reason for the emission drop is the contemporary phasing out of gasoline fuelled tractors and lead in gasoline fuel.

PAH's

The PAH emission shares for road transport and other mobile sources are 5 % or less of the national total in 2006.

Uncertainties

For mobile sources in 2006 the CO_2 emissions are determined with the highest accuracy, followed by the CH_4, TSP, PM_{10}, SO_2, NMVOC, NO_X,

[3] For the greenhouse gases CO_2, CH_4 and N_2O, the emission changes are relative to 1990

$PM_{2.5}$, CO and N_2O emissions with increasing levels of uncertainties. The uncertainties are 4, 34, 47, 48, 49, 49, 50, 50, 51 and 136 %, respectively. The uncertainties for the 1990-2006 emission trends are 4, 6, 8, 4, 10, 7, 7, 12 and 62 % for the emissions in the same consecutive order. For NH_3, heavy metals and POPs the 2006 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.

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 vist i tidsserier iht. til UNFCCC og UNECE LRTAP konventionernes krav, og resultaterne grupperes i henhold til UNFCCCs Common Reporting Format (CRF) og UNECEs National Format for Reporting (NFR) rapporteringskoder.

Tabel 0.1 Mobile kilder og CRF koder

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 en intern DMU-model der benytter samme modelprincip som den europæiske emissionsmodel COPERT III (COmputer Programme to calculate the Emissions from Road Transport). DMU-modellen bruger de opdaterede emissionsfaktorer fra den opdaterede version af COPERT – COPERT IV. I DMU-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.

For luftfart opgøres emissionerne for 2001-2006 på city-pair basis. Til beregningerne bruges flydata fra Statens Luftfartsvæsen (SLV) samt landing/take off (LTO) og cruise emissionsfaktorer pr. fløjet distance fra EMEP/CORINAIR guidebogen. 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.

National søfart er opdelt i regionale færger, småfærger og øvrig søtransport. For regionale færger beregnes emissionerne som produktet af antallet af dobbeltture, sejltid pr. dobbelttur, motorstørrelsen, motorlastfaktoren og emissionsfaktoren. For små færger og øvrig søtransport beregnes emissionerne som produktet af emissionsfaktorer og totalt brændstofforbrug, der tages fra en tidligere dansk emissionsundersøgelse.

For militær, jernbane og fiskeri beregnes emissionerne som produktet af brændstofsalg og emissionsfaktorer.

For arbejdsredskaber- og maskiner indenfor landbrug, skovbrug, industri og have/hushold, samt småbåde og fritidsfartøjer beregnes emissionerne beregnes som produktet af antallet af maskiner, lastfaktorer, motorstørrelser, årlige driftstider og emissionsfaktorer.

Data for energiforbrug stammer fra Energistyrelsens energistatistik. For vejtransport og luftfart justeres emissionsresultaterne ud fra en brændstofbalance. For national søtransport beregner DMU brændstofforbruget direkte for diesel og tung olie, og efterfølgende justeres brændstofforbruget for fiskeri (diesel) og stationære kilder indenfor industri. Brændstofbalancerne sikrer, at hele det oplyste brændstofsalg ligger til grund for emissionsopgørelserne.

Emissioner fra vejtrafik

Set i forhold til landets samlede emissionstotal beregnes vejtrafikkens største emissionsandele for NO_X, CO, CO_2, NMVOC, TSP, $PM_{2.5}$ og PM_{10}. Procentandelene for disse stoffer ligger på hhv. 36, 29, 23, 21, 12, 11 and 8 i 2006. Emissionsandelene for NH_3, N_2O, CH_4 og SO_2 er små og ligger på hhv. 2.2, 1.9, 0.5 og 0.3 %.

De beregnede emissionsændringer fra 1990-2006 er på hhv. 36, -51 and 29 % for CO_2 (og energiforbrug), CH_4 og N_2O. For NO_X, NMVOC, CO og partikler (kun udstødning: < $PM_{2.5}$), er de beregnede ændringer på hhv. -28, -71, -69, and -30 % i perioden 1985-2006.

De mest markante emissionsændringer fra 1985 til 2006 sker for SO_2 og NH_3. SO_2-emissionerne falder med 99 % (pga. et lavere svovlindhold i diesel), hvorimod NH_3-emissionerne stiger med 3065 % (pga. indførslen af katalysatorbiler).

Tabel 0.2 Emissioner fra vejtrafik i 2006, ændringer fra 1985 (1990[1]) til 2006, og 2006 andele af den samlede danske emissionstotal

CRF ID	SO_2 [tons]	NO_X [tons]	NMVOC [tons]	CH_4 [tons]	CO [tons]	CO_2 [ktons]	N_2O [tons]	NH_3 [tons]	TSP [tons]	PM_{10} [tons]	$PM_{2.5}$ [tons]
Vej, 2006	79	66993	23171	1290	171521	12594	402	1951	3101	3101	3101
Vej slidrelateret, 2006									2663	1726	937
Total Vej, 2006	79	66993	23171	1290	171521	12594	402	1951	5764	4828	4039
Total national, 2006	25048	185304	108182	262623	590599	55749	21026	89530	25048	38460	27726
Vej- % af national, 2006	0.3	36	21	0.5	29	23	1.9	2.2	12	8.1	11
Vej- % ændring 1985-2006	-99	-28	-71	-51[1]	-69	36[1]	29[1]	3065	-30[2]	-30[2]	-30[2]

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 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 2004 på hhv. 46, 36 og 23 %. 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, CO, NMVOC, TSP og $PM_{2.5}$-emissioner udgjorde i 2006 hhv. 23, 21, 13, 10 og 9 % af landets total. I 2006 er emissionsandelen for CO_2, SO_2 og PM_{10} på 7 %, mens andelene for N_2O, NH_3 og CH_4 kun er på 1 % eller mindre.

Fra 1990-2006 beregnes emissionsændringer for CO_2 (og energiforbrug), CH_4 og N_2O på hhv. -10, 5 og -11 %. Fra 1985-2006 falder emissionerne for SO_2, partikler (alle størrelsesfraktioner), NO_X, NMVOC og CO med hhv. 88, 56, 14, 12 og 9 %, omvendt stiger NH_3-emissionen 8 %.

[1] For drivhusgasserne CO_2, CH_4 og N_2O er ændringerne ift. 1990

[2] Kun udstødning

Tabel 0.3 Emissioner fra andre mobile kilder i 2006, ændringer fra 1985[3] til 2006, og 2006 andele af den samlede danske emissionstotal

CRF ID	SO_2 [tons]	NO_X [tons]	NMVOC [tons]	CH_4 [tons]	CO [tons]	CO_2 [ktons]	N_2O [tons]	NH_3 [tons]	TSP [tons]	PM_{10} [tons]	$PM_{2.5}$ [tons]
Industri, arbejdsredskaber (1A2f)	30	10807	1583	44	7515	1021	43	2	991	991	991
Civil luftfart (1A3a)	45	596	155	6	838	141	8	0	3	3	3
Jernbane (1A3c)	1	3542	230	9	626	227	6	1	120	120	120
National søfart (1A3d)	1089	7436	1195	32	7192	455	26	0	291	289	288
Have-hushold (1A4b)	1	275	8037	233	87744	233	4	0	79	79	79
Landbrug/skovbrug/fiskeri (1A4c)	632	20199	2541	94	16976	1599	77	3	1086	1084	1084
Militær (1A5)	26	619	56	6	391	126	4	0	21	21	21
Total andre mobile	1824	43475	13796	425	121282	3802	168	7	2590	2587	2585
Total national, 2006	25048	185304	108182	262623	590599	55749	21026	89530	25048	38460	27726
Andre mobile- % af national, 2006	7.3	23	13	0.2	21	6.8	0.8	0.0	10	6.7	9.3
Andre mobile - %-ændring 1985-2006	-88	-14	-12	5[6]	-9	-10[3]	-11[3]	8	-56	-56	-56

De største emissionskilder for NO_X og partikler er dieselmaskiner der bruges indenfor landbrug/skovbrug/fiskeri, efterfulgt af industri og national søfart. Den største del af NMVOC- og CO-emissionerne kommer fra benzindrevne arbejdsredskaber og maskiner indenfor have- og hushold.

Tungmetaller

For tungmetaller følger emissionerne udviklingen i energiforbruget. I 2006 er vejtrafikkens emissionsandele af de nationale totaler for kobber (Cu), zink (Zn), chrom (Cr) og cadmium (Cd) på hhv. 71, 15, 15 og 6 %, og for andre mobile kilder er bly (Pb), Cu and nikkel (Ni) emissionsandelene på 21, 17 og 5 %. For de øvrige komponenter er emissionsandelene på mindre end 5 %.

Vejtrafikkens tungmetalemissioner er steget med 36 % fra 1990 til 2006. Dog har der været et fald på næsten 100 % for Pb, pga. udfasningen af bly i benzin frem til 1994.

For andre mobile kilder er emissionsfaldene for Cd, Zn og Cu på 20 % eller mindre. For Pb, Ni, arsen (Ar), selen (Se), kviksølv (Hg) og Cr falder emissionerne yderligere. De respektive emissionsreduktioner er hhv. 79, 81, 68, 40, 26 og 23 %. For Ni, Se, Ar og Hg skyldes emissionsfaldet en nedgang i forbruget af tung olie, mens grunden til de lavere Pb-emissioner er udfasningen af bly i benzin.

PAH

PAH emissionsandelene for vejtransport og andre mobile kilder udgør 5 % eller mindre af de nationale totaler i 2006.

[3] For the greenhouse gases CO_2, CH_4 and N_2O, the emission changes are relative to 1990

Usikkerheder

I 2006 er CO_2-emissionerne de mest præcise, fulgt af CH_4, TSP, PM_{10}, SO_2, NMVOC, NO_X, $PM_{2.5}$, CO og N_2O -estimaterne med stigende usikkerheder. Usikkerhederne er på hhv. 4, 34, 47, 48, 49, 49, 50, 50, 51 og 136 %. I samme emissionsrækkefølge er usikkerheden på emissionsudviklingen fra 1990 til 2006 på hhv. 4, 6, 8, 4, 10, 7, 7, 12 and 62 %. For NH_3, tungmetaller og POP er 2006-emissionerne bestemt med en usikkerhed på mellem 700 og 1000 %. Her er usikkerheden på 1990-2006 emissionsudviklingen signifikant lavere, men varierer dog meget fra stof til stof.

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 documents the Danish 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 2006, the UNFCCC and UNECE conventions and the Danish emission reduction targets. A brief overview of the inventory structure is given in Chapter 3. In Chapter 4 and 5, the inventory input data and calculation methods are given for road transport and other mobile sources, respectively, while fuel use data and emission results are provided in Chapters 4 and 5, respectively. Fuel consumption and emission results are treated in Chapter 6, whereas uncertainties and time-series inconsistencies are explained in Chapters 7.

2 Total Danish emissions, international conventions and reduction targets

2.1 Total Danish emissions

The total Danish emissions in 2006 are listed in the Tables 2.1-2.4. A thorough documentation of the Danish inventory can be seen in Nielsen et al (2008a) for greenhouse gases reported to the UNFCCC convention, and in Nielsen et al. (2008b) for the remaining emission components reported to the LRTAP Convention. The emission reports are organised in six 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_Miljoetilstand/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. Although estimated, these emissions are reported as memo items only.

Further emission data for mobile sources are provided in Chapter 6.

Table 2.1 Greenhouse gas emission for the year 2006

	CH_4 [Mg]	CO_2 [Gg]	N_2O [Mg]
1. Energy	28308	55838	1517
2. Industrial Processes		1611	
3. Solvent and Other Product Use	0	102	120
4. Agriculture	173561	0	19227
5. Land-Use Change and Forestry	-24	-1802	0
6. Waste	60778		161
National total	262623	55749	21026
International transport (sea, air)	134	6016	305

Table 2.2 Emissions 2006 reported to the LRTAP Convention

	SO_2 [Mg]	NO_X [Mg]	NMVOC [Mg]	CO [Mg]	NH_3 [Mg]	TSP [Mg]	PM_{10} [Mg]	$PM_{2.5}$ [Mg]
1. Energy	24790	185267	74341	590324	2295	32135	28798	26060
2. Industrial Processes	258	37	1113	274	184	0	0	0
3. Solvent and Other Product Use	0	0	32726	0	0	0	0	0
4. Agriculture	0	0	1794	0	87051	14838	9662	1666
5. Land-Use Change and Forestry	0	0	0	0	0	0	0	0
6. Waste	0	0	0	0	0	0	0	0
National total	25048	185304	108182	590599	89530	46973	38460	27726
International transport (sea, air)	53761	95891	3135	10589	0	8341	8258	8217

Table 2.3 Heavy metal emissions 2006 reported to the LRTAP Convention

Pollutant	As [kg]	Cd [kg]	Cr [kg]	Cu [kg]	Hg [kg]	Ni [kg]	Pb [kg]	Se [kg]	Zn [kg]
1. Energy	653	707	1354	9497	1279	10718	6084	1906	26371
2. Industrial Processes	0	5	0	45	0	0	68	0	634
3. Solvent and Other Product Use	0	0	0	0	0	0	0	0	0
4. Agriculture	0	0	0	0	0	0	0	0	0
5. Land-Use Change and Forestry	0	0	0	0	0	0	0	0	0
6. Waste	0	0	0	0	0	0	0	0	0
Total Danish emission	653	711	1354	9542	1279	10718	6152	1906	27005
International transport (sea, air)	401	34	208	1794	31	23232	207	378	1667

Table 2.4 PAH emissions 2006 reported to the LRTAP Convention

Pollutant	Benzo(a)-pyrene kg	Benzo(b)fluoranthene kg	Benzo(k)fluoranthene kg	Indeno(1,2,3-c,d)pyrene kg
1. Energy	3971	4304	2375	2887
2. Industrial Processes	0	0	0	0
3. Solvent and Other Product Use	0	0	0	0
4. Agriculture	0	0	0	0
5. Land-Use Change and Forestry	0	0	0	0
6. Waste	0	0	0	0
7. Other	3971	4304	2375	2887
Total Danish emission	4	15	7	22
International transport (sea, air)	3971	4304	2375	2887

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 National Emission Ceilings Directive (NECD)

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 eight protocols:

EMEP Protocol, 1984 (Geneva).

Protocol on Reduction of Sulphur Emissions, 1985 (Helsinki).

Protocol concerning the Control of Emissions of Nitrogen Oxides, 1988 (Sofia).

Protocol concerning the Control of Emissions of Volatile Organic Compounds, 1991 (Geneva).

Protocol on Further Reduction of Sulphur Emissions, 1994 (Oslo).

Protocol on Heavy Metals, 1988 (Aarhus).

Protocol on Persistent Organic Pollutants (POPs), 1998 (Aarhus).

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 2.5.

Table 2.5 Danish reduction targets / emission ceiling, Gothenburg protocol

Pollutant	Reduction/emission ceiling	Reference	Comment
SO_2	55 Gg in 2010	Gothenburg protocol	The ceiling equals 220 % of the 2006 emission
NO_X	127 Gg in 2010	Gothenburg protocol	The ceiling equals 69 % of the 2006 emission
NMVOC	85 Gg in 2010	Gothenburg protocol	The ceiling equals 79 % of the 2006 emission

Further, in the EU NECD ("The National Emission Ceilings Directive) the national emission ceilings given in the Gothenburg protocol, has been implemented.

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 time-tables for six greenhouse gases: CO_2, CH_4, N_2O, HFC, PFC and SF_6. The greenhouse gas emission of each of the six 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 2008-2012 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 Inventory structure

The Danish emission inventory is stored as figures for activity rates and emission factors in the emission database system CollectER, provided by the European Environment Agency. The CollectER database is based on the SNAP sector categories (Selected Nomenclature for Air Pollution), according to the CORINAIR system. For mobile sources, the aggregation of emission results into the formats used by the UNFCCC and UNECE Conventions is made by using the code correspondence information shown in Table 3.1. In the case of mobile sources, the CRF (Common Reporting Format) and NFR (National Format for Reporting) used by the UNFCCC and UNECE Conventions, respectively, are uniform.

Table 3.1 SNAP – CRF/NFR correspondence table for transport

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

Military transport activities (land and air) refer to the CRF/NFR sector Other (1A5), while the Transport-Navigation sector (1A3d) comprises national sea transport (ship movements between two Danish ports) and recreational craft (SNAP code 0803). For aviation, LTO (Landing and Take Off) [7] refer to the part of flying which is below 1000 m. The working machinery and equipment in industry (SNAP code 0808) is grouped in Industry-Other (1A2f), while agricultural and forestry non-road machinery (SNAP codes 0806 and 0807) is accounted for in the Agriculture/forestry/fisheries (1A4c) sector together with fishing activities.

For mobile sources, internal NERI databases for road transport, air traffic, sea transport and non road machinery have been set up in order to produce the emission inventories. The output results from the NERI databases are calculated in a SNAP format, as activity rates (fuel consumption) and emission factors, which are then exported directly to the central Danish CollectER database. Apart from national inventories, the NERI databases are used also as a calculation tool in research projects, envi-

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

ronmental impact assessment studies, and to produce basic emission information which requires various aggregation levels.

A thorough description of input data and calculation methods are given in the following two chapters for road transport and other mobile sources, respectively.

4 Input data and calculation methods 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, 2007). The actual calculations are made with a model developed by NERI, using the European COPERT III model methodology, and updated fuel use and emission factors from the latest version of COPERT - COPERT IV. The latter model approach is explained in (EMEP/CORINAIR, 2007). In COPERT, 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.

4.1 Vehicle fleet and mileage data

Corresponding to the COPERT III fleet classification, all present and future vehicles in the Danish fleet are grouped into vehicle classes, subclasses 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 4.1 gives an overview of the different model classes and sub-classes, and the layer level with implementation years are shown in Annex 1.

Table 4.1 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

New total mileage data for passenger cars, light duty trucks, heavy duty trucks and buses produced by the Danish vehicle inspection programme is used for the years 1990-2004. For 2005, total mileage data is provided by the Danish Road Directorate in a format similar to the 1990-2004 format (Foldager, 2007). For 2006, the information for 2005 is used, due to lack of data.

The new Danish mileage data is distributed into annual mileage per first registration year for the different vehicle categories in the inventory, by using the baseline vehicle stock and annual mileage information obtained from the Danish Road Directorate (Ekman, 2005). Fleet numbers in total vehicle categories for 2006 has been obtained from Statistics Denmark (Dalbro, 2007), and data are split into vehicle categories-first registration years, by using the 2004 distribution matrix.

The data set from Ekman (2005), which underpinned the Danish 2004 emission inventory, 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. Additional data for the moped fleet and motorcycle fleet disaggregation information is given by The National Motorcycle Association (Markamp, 2007).

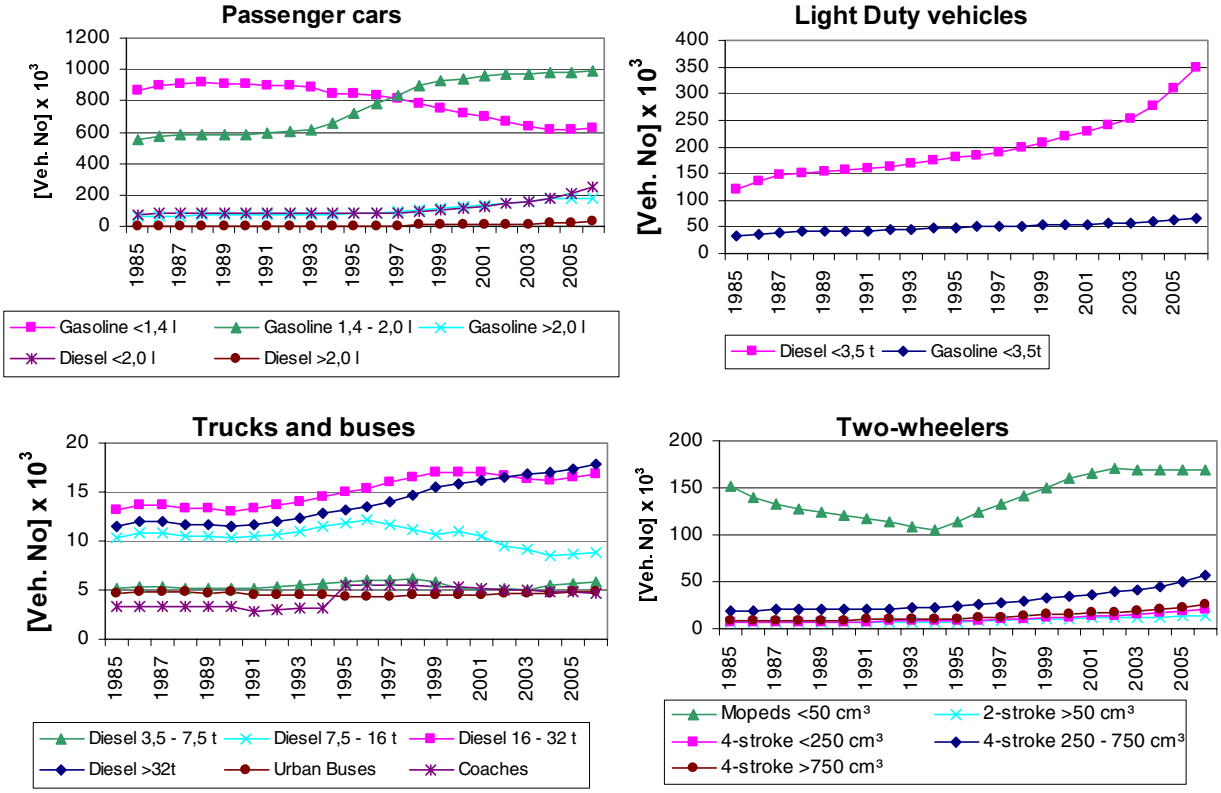


Figure 4.1 Number of vehicles in sub-classes in 1985-2006

The vehicle numbers per sub-class are shown in Figure 4.1. It must be noted that for 2005 and 2006, the 2004 stock shares are used to distribute the fleet into the different vehicle sub-categories for passenger cars and heavy duty trucks. Consequently, it gives less meaning to explain the fleet curves beyond 2004 for these vehicle types.

For passenger cars, the engine size differentiation is associated with some uncertainty. The increase in the total number of passenger cars is mostly due to a growth in the number of gasoline cars with engine sizes between 1.4 and 2 litres (from 1990-2002) and an increase in the number of gasoline cars (>2 litres) and diesel cars (< 2 litres). In the later years, there has been a decrease in the number of cars with an engine size smaller than 1.4 litres.

There has been a considerable growth in the number of diesel light-duty vehicles from 1985 to 2005. The two largest truck sizes have also increased in numbers during the 1990s. From 2000 onwards, this growth has continued for trucks larger than 32 tonnes, whereas the number of trucks with gross vehicle weights between 16 and 32 tonnes has decreased slightly.

The number of urban buses has been almost constant between 1985 and 2006. The sudden change in the level of coach numbers from 1994 to 1995 is due to uncertain fleet data.

The reason for the significant growth in the number of mopeds from 1994 to 2002 is the introduction of the so-called Moped 45 vehicle type. For motorcycles, the number of vehicles has grown in general throughout the entire 1985-2005 period. The increase is, however, most visible from the mid-1990s and onwards.

The vehicle numbers are summed up in layers for each year (Figure 4.2) by using the correspondence between layers and first year of registration:

$$N_{j,y} = \sum_{i=FYear(j)}^{LYear(j)} N_{i,y} \quad (4.1)$$

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

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

$$M_{j,y} = \frac{\sum_{i=FYear(j)}^{LYear(j)} N_{i,y} \cdot M_{i,y}}{\sum_{i=FYear(j)}^{LYear(j)} N_{i,y}} \quad (4.2)$$

Vehicle numbers and weighted annual mileages per layer are shown in Annex 1 and 2 for 1985-2006. The trends in vehicle numbers per layer are also shown in Figure 4.2. The latter figure shows how vehicles complying with the gradually stricter EU emission levels (EURO I, II, III, IV etc.) have been introduced into the Danish motor fleet.

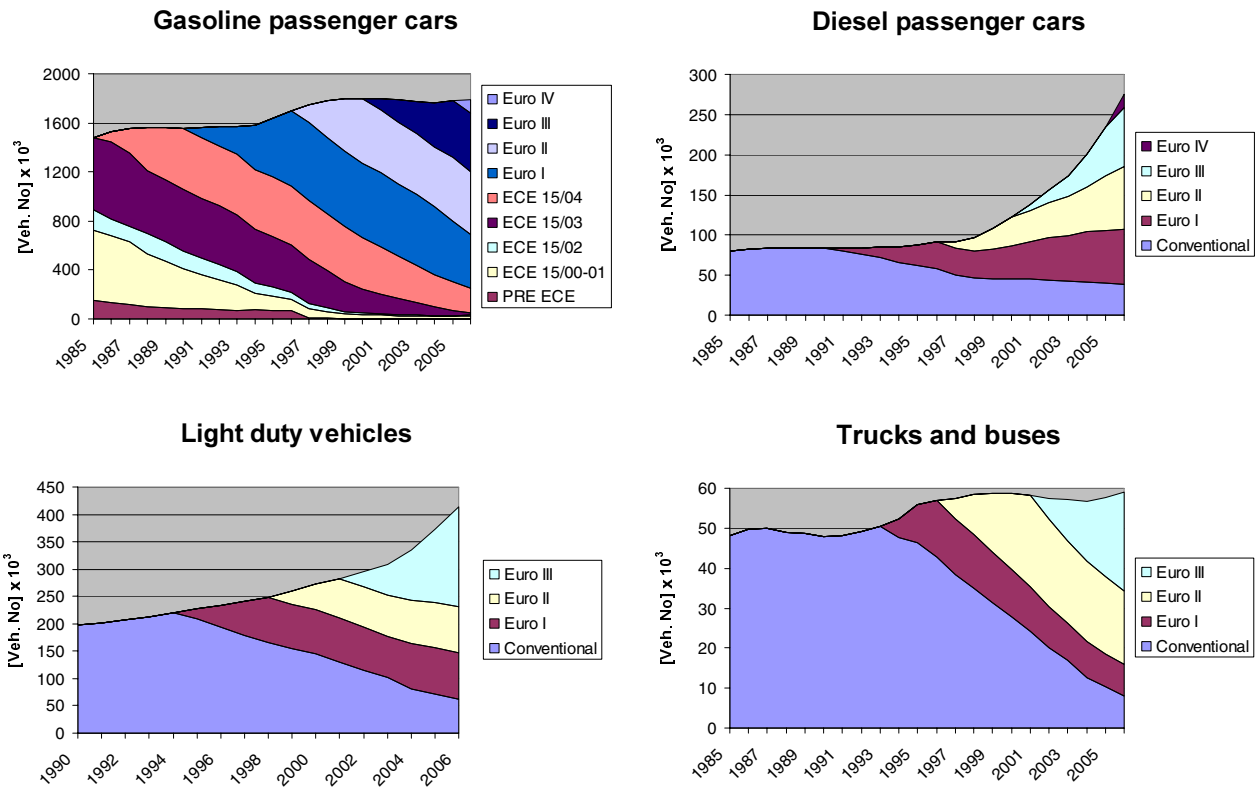


Figure 4.2 Layer distribution of vehicle numbers per vehicle type in 1985-2006

4.2 Emission legislation

For Euro 1-4 passenger cars and light duty trucks, the chassis dynamometer test cycle used in the EU for emission approval is the NEDC (New European Driving Cycle), see Nørgaard and Hansen (2004). The test cycle is also used also for fuel use measurements. The NEDC cycle consists of two parts, the first part being a 4-time repetition (driving length: 4 km) of the ECE test cycle. The latter test cycle is the so-called urban driving cycle8 (average speed: 19 km/h). The second part of the test is the run-through of the EUDC (Extra Urban Driving Cycle) test driving segment, simulating the fuel use under rural and highway driving conditions. The driving length of EUDC is 7 km at an average speed of 63 km/h. More information regarding the fuel measurement procedure can be found in the EU-directive 80/1268/EØF.

For NO_X, VOC (NMVOC + CH_4), CO and PM, the emissions from road transport vehicles have to comply with the different EU directives listed in Table 4.2. The emission directives distinguish between three vehicle classes according to vehicle reference mass[9]: Passenger cars and light duty trucks (<1305 kg), light duty trucks (1305-1760 kg) and light duty trucks (>1760 kg).The specific emission limits are shown in Annex 3.

[8] For Euro 3 and on, the emission approval test procedure was slightly changed. The 40 s engine warm up phase before start of the urban driving cycle was removed.

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

Table 4.2 Simplified overview of the existing EU emission directives for road transport

Vehicle category	Emission layer	EU directive	First reg. year Start
Passenger cars (gasoline)	PRE ECE		0
	ECE 15/00-01	70/220 - 74/290	1972[a]
	ECE 15/02	77/102	1981[b]
	ECE 15/03	78/665	1982[c]
	ECE 15/04	83/351	1987[d]
	Euro I	91/441	1991[e]
	Euro II	94/12	1997
	Euro III	98/69	2001
	Euro IV	98/69	2006
	Euro V	715/2007	2011
	Euro VI	715/2007	2015
Passenger cars (diesel and LPG)		Conventional	0
	ECE 15/04	83/351	1987[d]
	Euro I	91/441	1991[e]
	Euro II	94/12	1997
	Euro III	98/69	2001
	Euro IV	98/69	2006
	Euro V	715/2007	2011
	Euro VI	715/2007	2015
Light duty trucks (gasoline and diesel)		Conventional	0
	ECE 15/00-01	70/220 - 74/290	1972[a]
	ECE 15/02	77/102	1981[b]
	ECE 15/03	78/665	1982[c]
	ECE 15/04	83/351	1987[d]
	Euro I	93/59	1995
	Euro II	96/69	1999
	Euro III	98/69	2002
	Euro IV	98/69	2007
	Euro V	715/2007	2012
	Euro VI	715/2007	2016
Heavy duty vehicles		Conventional	0
	Euro 0	88/77	1991
	Euro I	91/542	1994
	Euro II	91/542	1997
	Euro III	1999/96	2002
	Euro IV	1999/96	2007
	Euro V	1999/96	2010
Mopeds		Conventional	0
	Euro I	97/24	2000
	Euro II	2002/51	2004
Motor cycles		Conventional	0
	Euro I	97/24	2000
	Euro II	2002/51	2004

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

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

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

Therefore, in order to represent the Danish fleet and to support average national emission estimates, emission factors, which derive from numerous emissions measurements, using a broad range of real world driving patterns and a sufficient number of test vehicles, must be chosen. It is similar important to have separate fuel use and emission data for cold-start emission calculations and gasoline evaporation (hydrocarbons).

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

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

4.3 Fuel consumption and emission factors

Trip-speed dependent basis factors for fuel consumption and emissions are taken from the COPERT model using trip speeds as shown in Table 3.1. The factors are listed in Annex 4. For EU emission levels not represented by actual data, the emission factors are scaled according to the reduction factors given in Annex 5.

The fuel consumption and emission factors used in the Danish inventory come from the COPERT IV model. The scientific basis for COPERT IV is fuel consumption and emission information from the European 5th framework research projects ARTEMIS and Particulates. In cases where no updates are made for vehicle categories and fuel consumption-/emission components, COPERT IV still uses COPERT III data; the source for these data are various European measurement programmes. In general the COPERT data are transformed into trip-speed dependent fuel consumption and emission factors for all vehicle categories and layers.

For passenger cars, real measurement results are behind the emission factors for Euro 1-4 vehicles (updated figures), and those earlier

(COPERT III data). For light duty trucks the measurements represent Euro 1 and prior vehicle technologies from COPERT III. For mopeds and motorcycles, updated fuel consumption and emission figures are behind the conventional and Euro 1-3 technologies.

The experimental basis for heavy-duty trucks and buses is updated computer simulated emission factors for Euro 0-V engines. In COPERT IV the number of heavy duty vehicle categories has increased substantially, and from the traffic data side it is not possible to support all these new vehicle categories with consistent fleet and mileage data. Thus, the COPERT III vehicle size classification still remains as the Danish inventory basis for heavy duty vehicles.

However, in order to use the new COPERT IV fuel consumption and emission information, the decision is to calculate average fuel consumption and emission factors per technology level (Euro O-V) from COPERT IV. The average factors comprise the specific COPERT IV size categories in overlap with a given COPERT III size category. Next, these average COPERT IV factors are scaled with the ratio of fuel consumption factors between COPERT III and "average COPERT IV" in order to end up with vehicle sizes corresponding to COPERT III weight classes.

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

4.4 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 EMEP/CORINAIR (2007), 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 4.3 and 4.4 show the calculations for the ”Urban Driving Cycle”:

$$UDF = U_A \cdot MTC + U_B \text{, MTC} < U_{MAX} \quad (4.3)$$

$$UDF = U_A \cdot U_{MAX} + U_B \text{, MTC} >= U_{MAX} \quad (4.4)$$

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

In the case of trip speeds below 19 km/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 vehicle numbers and annual mileage levels per first registration year:

$$DF_{j,y} = \frac{\sum_{i=FYear(j)}^{LYear(j)} DF_{i,y} \cdot N_{i,y} \cdot M_{i,y}}{\sum_{i=FYear(j)}^{LYear(j)} DF_{i,y} \cdot N_{i,y}} \quad (4.5)$$

where DF is the deterioration factor.

For N_2O and NH_3, COPERT IV takes into account deterioration as a linear function of mileage for gasoline fuelled EURO 1-4 passenger cars and light duty vehicles. The level of emission deterioration also relies on the content of sulphur in the fuel. The deterioration coefficients are given in EMEP/CORINAIR (2007), for the corresponding layer. A cut-off mileage of 120.000 km (pers. comm. Ntziachristos, 2007) is behind the calculation of the modified emission factors, and for the Danish situation the low sulphur level interval is assumed to be most representative.

4.5 Calculation method

4.5.1 Emissions and fuel consumption for hot engines

Emissions and fuel-use results for operationally hot engines are calculated for each year and for layer and road type. The procedure is to combine fuel consumption and emission factors (and deterioration factors for catalyst vehicles), number of vehicles, annual mileage levels and the relevant road-type shares given in Table 3.1. For non-catalyst vehicles this yields:

$$E_{j,k,y} = EF_{j,k,y} \cdot S_k \cdot N_{j,y} \cdot M_{j,y} \quad (4.6)$$

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

For catalyst vehicles the calculation becomes:

$$E_{j,k,y} = DF_{j,k,y} \cdot EF_{j,k,y} \cdot S_k \cdot N_{j,y} \cdot M_{j,y} \quad (4.7)$$

4.5.2 Extra emissions and fuel consumption for cold engines

Extra emissions of NO_X, VOC, CH_4, CO, PM, N_2O, NH_3 and fuel consumption from cold start are simulated separately. For CO_2 and SO_2, the extra emissions are derived from the cold start fuel consumption results.

In terms of cold start data for NO_X, VOC, CO, PM and fuel consumption no updates are made to the COPERT IV methodology, and the calculation approach is the same as in COPERT III. Each trip is associated with a certain cold-start emission level and is assumed to take place under urban driving conditions. The number of trips is distributed evenly across the months. First, cold emission factors are calculated as the hot emission factor times the cold:hot emission ratio. Secondly, the extra emission factor during cold start is found by subtracting the hot emission factor from the cold emission factor. Finally, this extra factor is applied on the fraction of the total mileage driven with a cold engine (the β-factor) for all vehicles in the specific layer.

The cold:hot ratios depend on the average trip length and the monthly ambient temperature distribution. The Danish temperatures for 2006, 2005 and 2004 are given in Cappelen et al. (2007, 2006, 2005). For 2000-2003, 1990-1999 and 1980-1989 the temperature data are from Cappelen (2004, 2000 and 2003). The cold:hot ratios 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:

$$CE_{j,y} = \beta \cdot N_{j,y} \cdot M_{j,y} \cdot EF_{U,j,y} \cdot (CEr - 1) \quad (4.8)$$

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

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

For catalyst vehicles the cold extra emissions are found from:

$$CE_{j,y} = \beta_{red} \cdot \beta_{EUROI} \cdot N_{j,y} \cdot M_{j,y} \cdot EF_{U,j,y} \cdot (CEr_{EUROI} - 1) \quad (4.9)$$

where β_{red} = the β reduction factor.

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

For N_2O and NH_3, specific cold start emission factors are also proposed by COPERT IV. For catalyst vehicles, however, just like in the case of hot emission factors, the emission factors for cold start are functions of cu-

mulated mileage (emission deterioration). The level of emission deterioration also relies on the content of sulphur in the fuel. The deterioration coefficients are given in EMEP/CORINAIR (2007), for the corresponding layer. For cold start, the cut-off mileage and sulphur level interval for hot engines are used, as described in the deterioration factors paragraph.

4.5.3 Evaporative emissions from gasoline vehicles

For each year, evaporative emissions of hydrocarbons are simulated in the forecast model as hot and warm running losses, hot and warm soak loss and diurnal emissions. For evaporation, no updates are made to the COPERT IV methodology, and the calculation approach is the same as in COPERT III. All emission types depend on RVP (Reid Vapour Pressure) and ambient temperature. The emission factors are shown in Ntziachristos et al. (2000).

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

$$R_{j,y} = N_{j,y} \cdot M_{j,y} \cdot ((1-\beta) \cdot HR + \beta \cdot WR) \quad (4.10)$$

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

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

$$S_{j,y}{}^{C} = N_{j,y} \cdot \frac{M_{j,y}}{l_{trip}} \cdot ((1-\beta) \cdot HS + \beta \cdot WS) \quad (4.11)$$

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

$$E_{j,y}{}^{d}(U) = 365 \cdot N_{j,y} \cdot e^{d}(U) \quad (4.12)$$

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

4.5.4 Fuel consumption balance

The calculated fuel consumption in COPERT III must equal the statistical fuel sale totals according to the UNFCCC and UNECE guidelines for emissions reporting. The statistical fuel sales for road transport are derived from the Danish Energy Authority data (see DEA, 2007). The DEA data are further processed for gasoline in order to account for e.g. non road and recreational craft fuel consumption, which are not directly stated in the statistics, please refer to paragraph 5.5.5 for further information regarding the transformation of DEA fuel data.

A balance between estimated fuel consumption and fuel sold is obtained by means of the so called fuel scale factors, derived separately for gasoline and diesel. The latter factors go into the equations 4.6-4.11 by multiplication with the annual mileage, since this parameter is regarded as the most uncertain variable of the calculation expressions as such.

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 IV:DEA gasoline fuel use ratio (Figure 4.3).

For diesel the fuel balance is made by adjusting the mileage for light and heavy-duty vehicles and buses, given that the mileage figures 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 IV:DEA diesel fuel use ratio (Figure 4.3).

In the figures 4.3 and 4.4 the COPERT IV:DEA gasoline and diesel fuel use ratios are shown for fuel sales and fuel consumption from 1985-2006. The data behind the figures are also listed in Annex 8. The fuel consumption figures are related to the traffic on Danish roads.

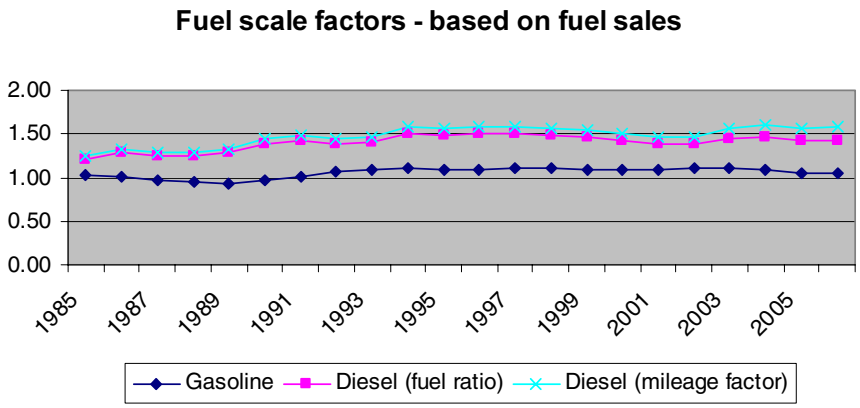


Figure 4.3 DEA:NERI Fuel ratios and diesel mileage adjustment factor based on DEA fuel sales data and NERI fuel consumption estimates

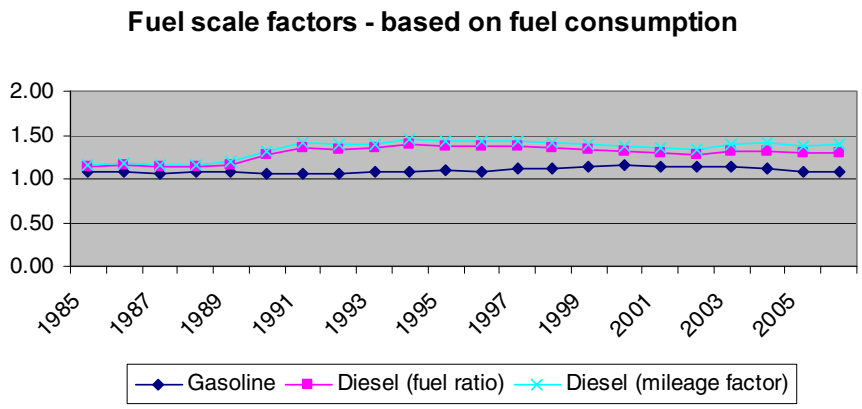


Figure 4.4 DEA:NERI Fuel ratios and diesel mileage adjustment factor based on DEA fuel consumption data and NERI fuel consumption estimates

From the Figures 4.3 and 4.4 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 reasons for this inaccuracy are a combination of the uncertainties related to COPERT IV 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 and improved data for trip speed and mileage split for urban, rural and highway driving. 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 and Energy in a COPERT IV model input format.

The final fuel use and emission factors are shown in Annex 6 for 1990-2006. The total fuel use and emissions are shown in Annex 7, per vehicle category and as grand totals, for 1990-2006 (and NFR format in Annex 15). In Annex 14, fuel-use and emission factors as well as total emissions are given in CollectER format for 2006.

In the Figures 4.5 and 4.6, the fuel related emission factors for gasoline and diesel, respectively, are shown for CH_4 and N_2O (from 1990-2006), and SO_2, NO_X, NMVOC, CO, NH_3 and TSP (from 1985-2006), per vehicle type for the Danish road transport.

Table 4.3 Fuel-specific emission factors for CO_2 for road transport in Denmark

Fuel type	CO_2 [kg/GJ]
Gasoline	73 (72.8 in 2006)
Diesel	74
LPG	65

The emission factors for CO_2 (Table 4.3) are country specific values, and come from the DEA. From 2006, bio ethanol has become available from a limited number of gas filling stations in Denmark. Bio ethanol is regarded as CO_2 neutral and has a sulphur content of zero, and hence, the aggregated CO_2 (and SO_2) factors for gasoline have been adjusted, on the basis of the energy content of pure gasoline and bio ethanol.

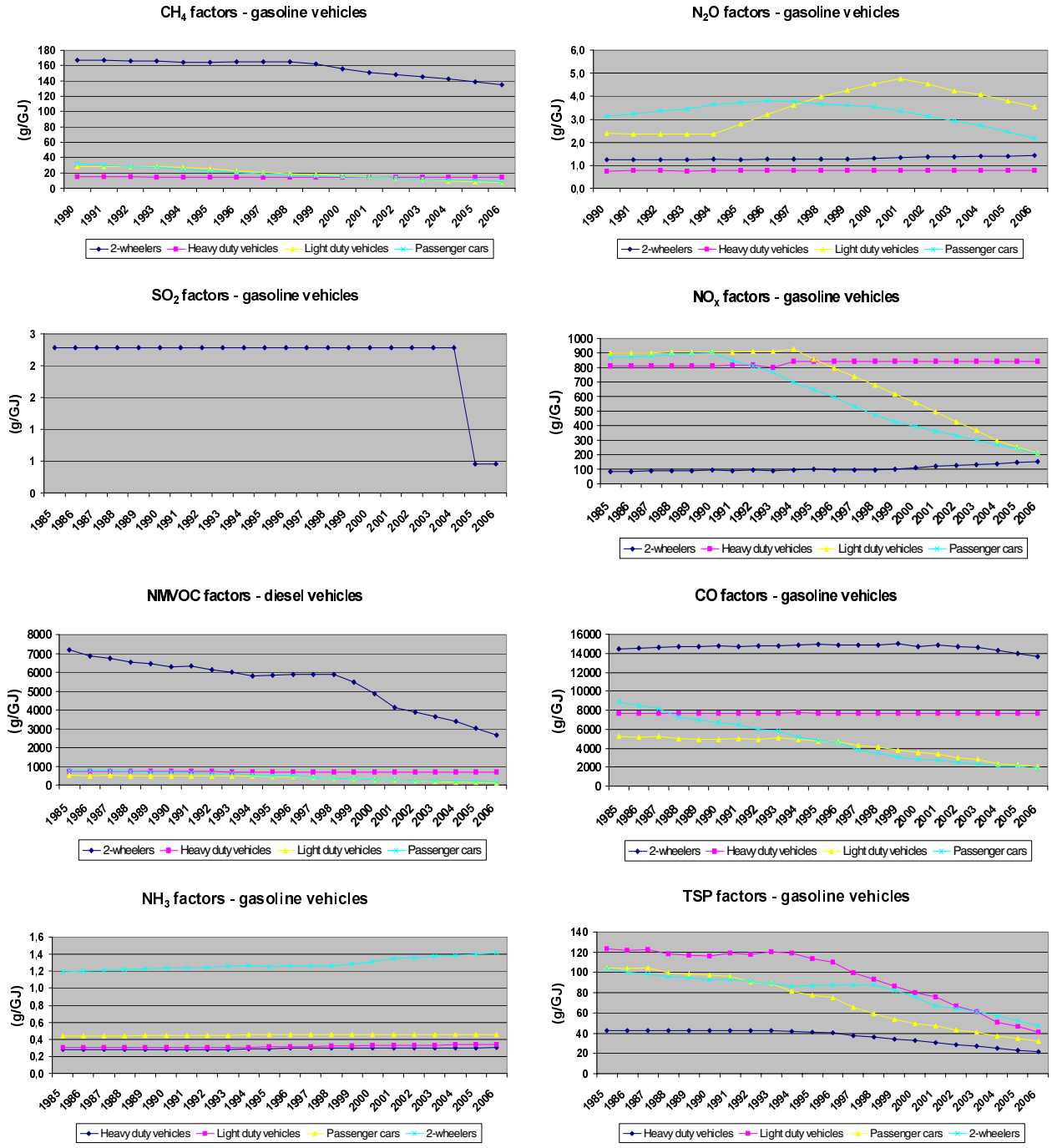


Figure 4.5 Fuel related emission factors of CH_4, N_2O (1990-2006), SO_2, NO_X, NMVOC, CO, NH_3 and TSP (1985-2006) for gasoline per vehicle type for Danish road transport

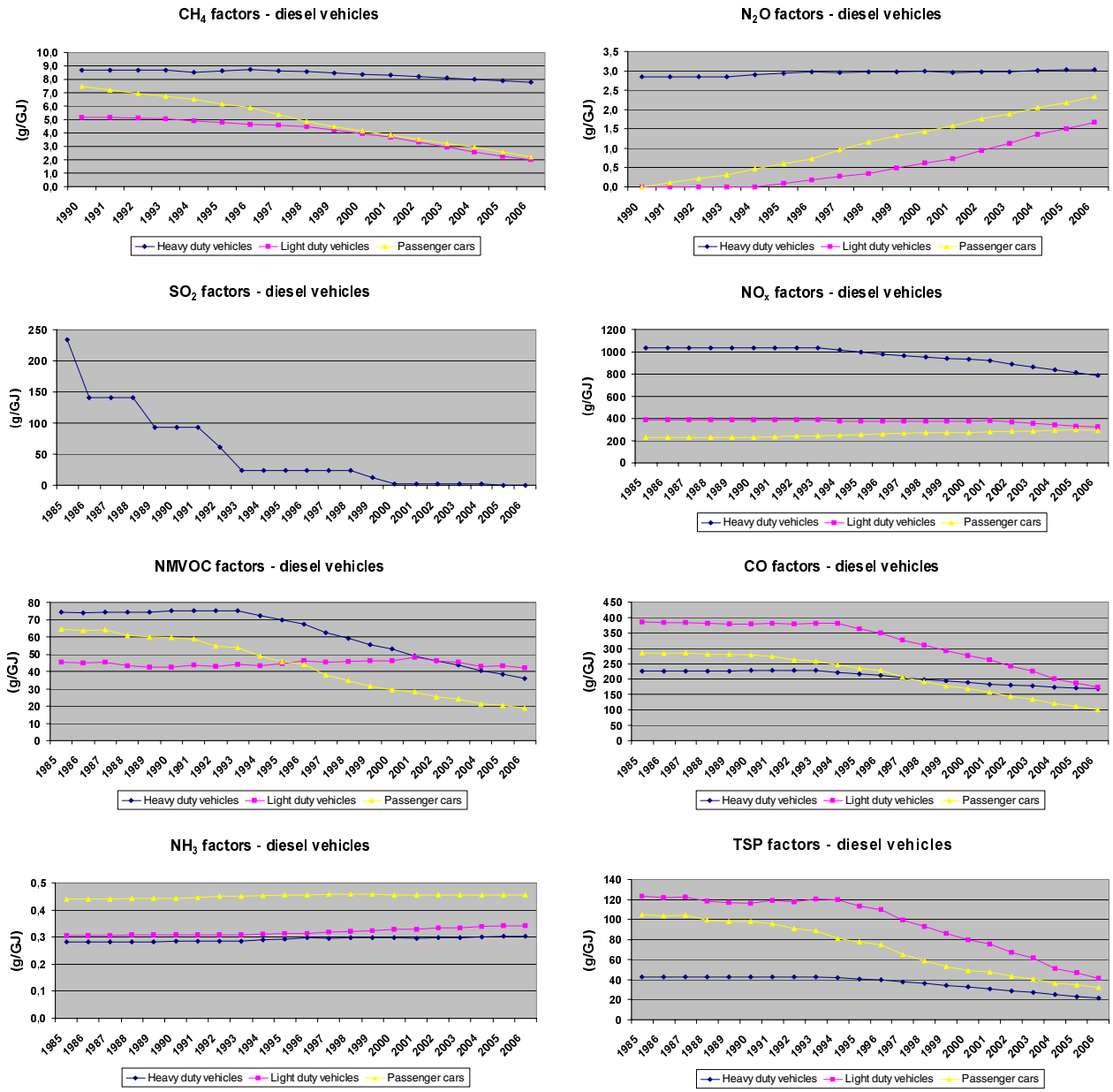


Figure 4.6 Fuel related emission factors of CH_4, N_2O (1990-2006), SO_2, NO_x, NMVOC, NH_3 and TSP (1985-2006) for diesel per vehicle type for Danish road transport

4.5.5 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 2000-2006 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 (2007). The emission factors and total emissions for 2006 are shown in Annex 14.

5 Input data and calculation methods for other mobile sources

Other mobile sources are divided into several sub-sectors: sea transport, fishery, air traffic, railways, military, and working machinery and materiel in the industry, forestry, agriculture and household and gardening sectors. The emission calculations are made using the detailed method as described in the EMEP/CORINAIR Emission Inventory Guidebook (EMEP/CORINAIR, 2007) for air traffic, off-road working machinery and equipment, and ferries, while for the remaining sectors the simple method is used.

5.1 Activity data

5.1.1 Air traffic

The activity data for air traffic consists of air traffic statistics provided by the Danish Civil Aviation Agency (CAA-DK) and Copenhagen Airport. Fuel statistics for jet fuel use and aviation gasoline are obtained from the Danish energy statistics (DEA, 2007).

For 2001 onwards, per flight records are provided by CAA-DK as data codes for aircraft type, and origin and destination airports (city-pairs).

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

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

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

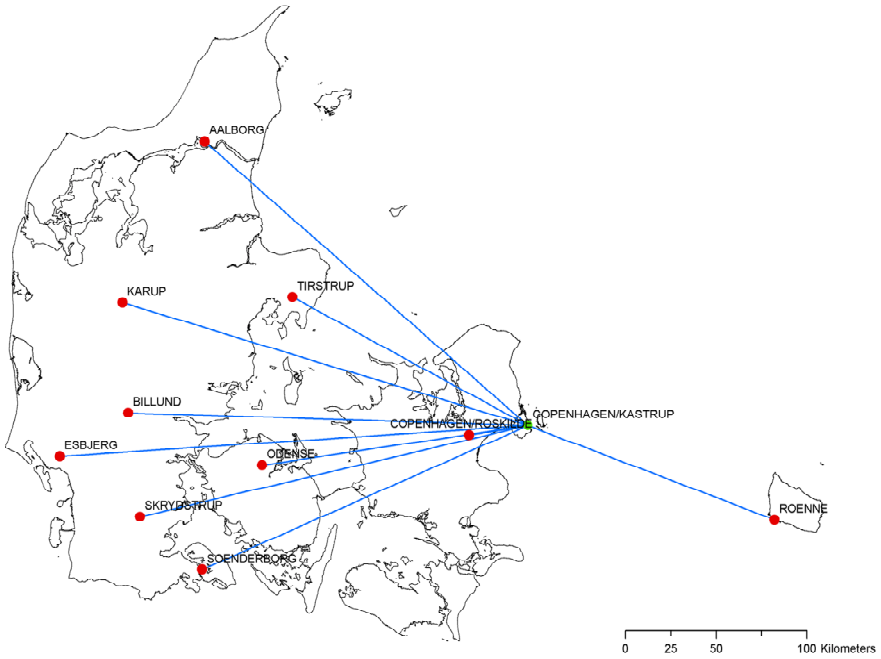


Figure 5.1 Most frequent domestic flying routes for large aircraft in Denmark

Copenhagen Airport is the starting or end point for most of the domestic aviation made by large aircraft in Denmark (Figure 5.1). Even though many domestic flights not touching Copenhagen Airport are also reported in the flight statistics kept by CAA-DK, these flights, however, are predominantly made with small piston engine aircraft using aviation gasoline. Hence, the consumption of jet fuel by flights not using Copenhagen is merely marginal.

5.1.2 Non-road working machinery and equipment

Non-road working machinery and equipment are used in agriculture, forestry and industry, for household/gardening purposes and in inland waterways (recreational craft). Information on the number of different types of machines, their respective load factors, engine sizes and annual working hours has been provided by Winther et al. (2006). The stock development from 1985-2006 for the most important types of machinery are shown in Figures 5.2-5.9 below. The stock data are also listed in Annex 10, together with figures for load factors, engine sizes and annual working hours. As regards stock data for the remaining machinery types, please refer to (Winther et al., 2006).

For agriculture, the total number of agricultural tractors and harvesters per year are shown in the Figures 5.2-5.3, respectively. The Figures clearly show a decrease in the number of small machines, these being replaced by machines in the large engine-size ranges.

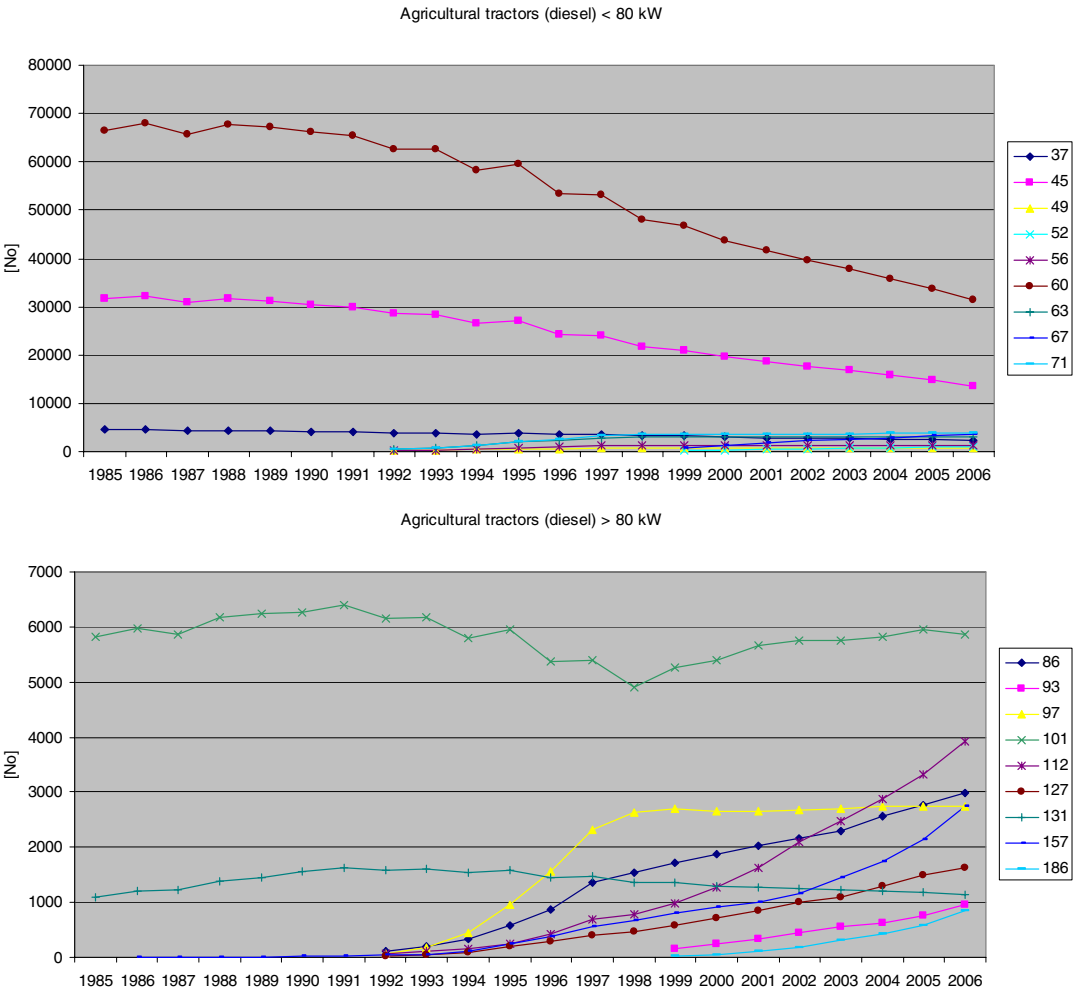


Figure 5.2 Total numbers in kW classes for tractors from 1985 to 2006

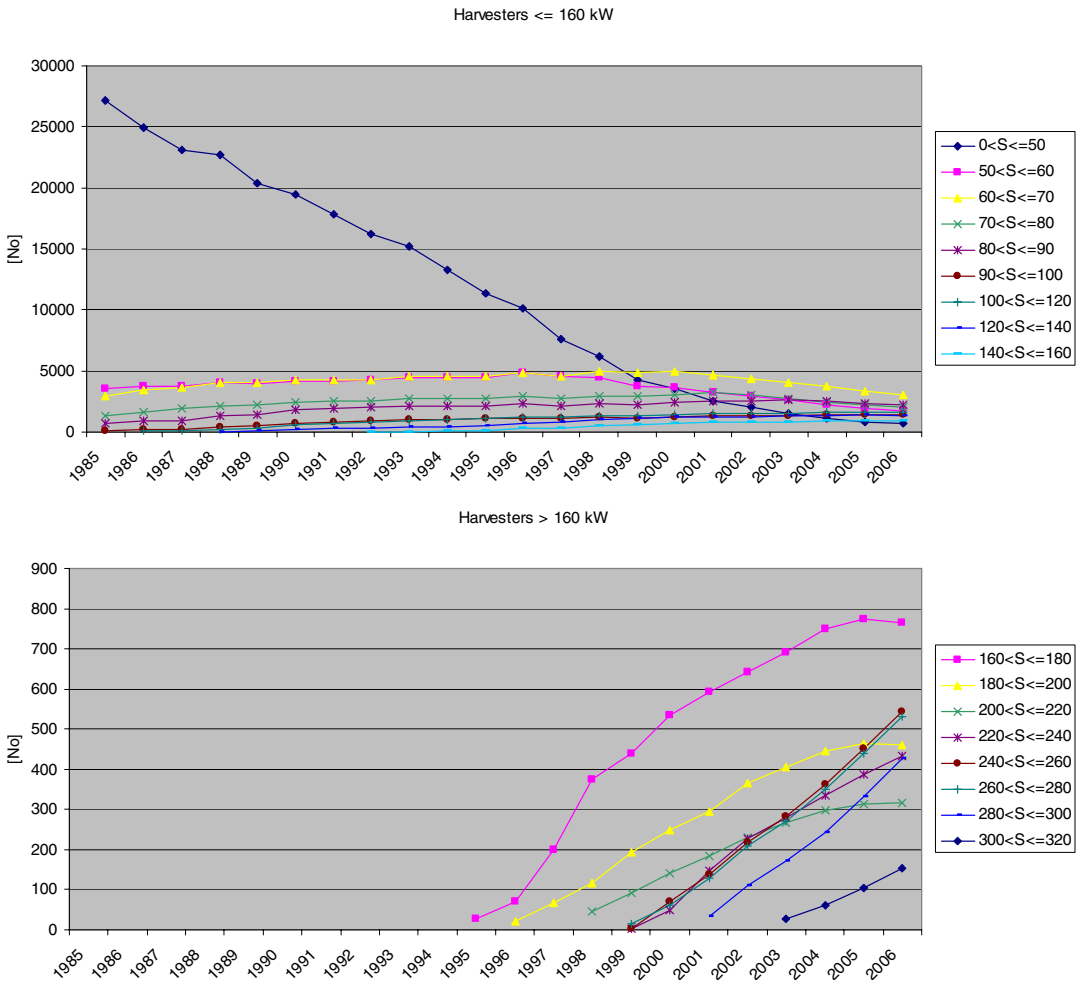


Figure 5.3 Total numbers in kW classes for harvesters from 1985 to 2006

The tractor and harvester developments towards fewer vehicles and larger engines, shown in Figure 5.4, are very clear. From 1985 to 2006, tractor and harvester numbers decrease by around 20 % and 48 %, respectively, whereas the average increase in engine size for tractors is 21 %, and 125 % for harvesters, in the same time period.

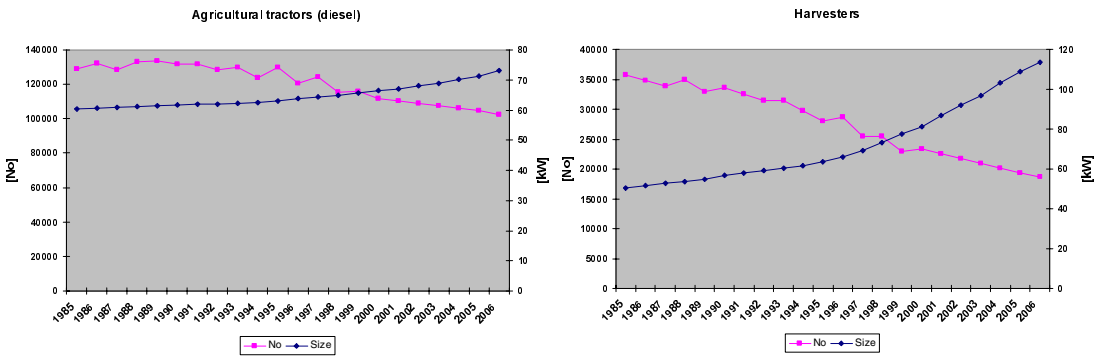
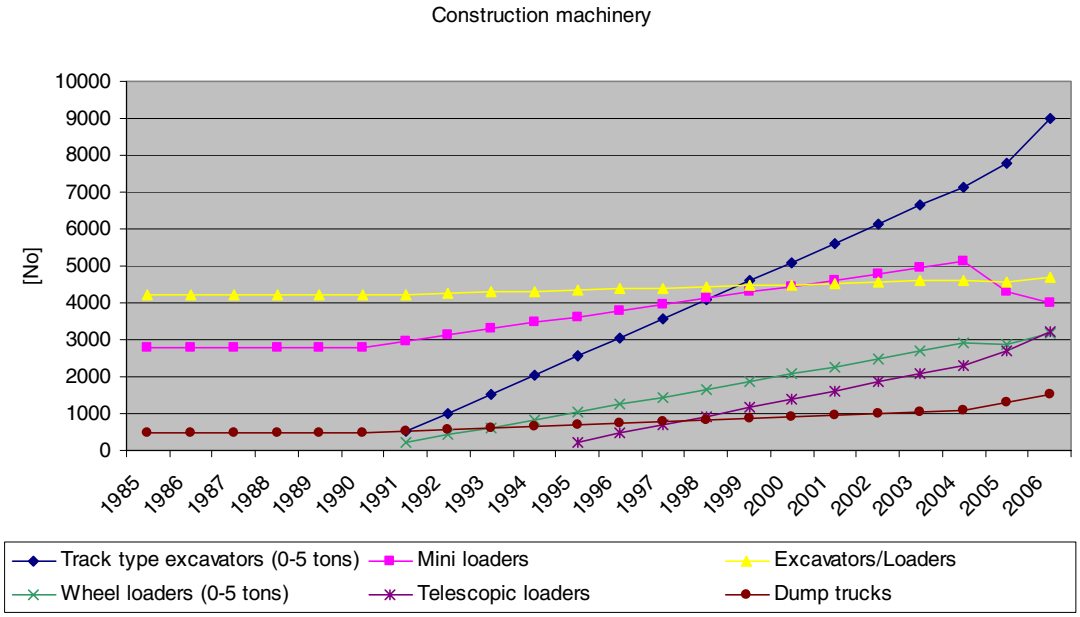


Figure 5.4 Total numbers and average engine size for tractors and harvesters (1985 to 2006)

The most important machinery types for industrial use are different types of construction machinery and fork lifts. The Figures 5.5 and 5.6 show the 1985-2005 stock development for specific types of construction machinery and diesel fork lifts. Due to lack of data, the construction machinery stock for 1990 is used also for 1985-1989. For most of the machin-

ery types there is an increase in machinery numbers from 1990 onwards, due to increased construction activities. It is assumed that track type excavators/ wheel type loaders (0-5 tonnes), and telescopic loaders first enter into use in 1991 and 1995, respectively.



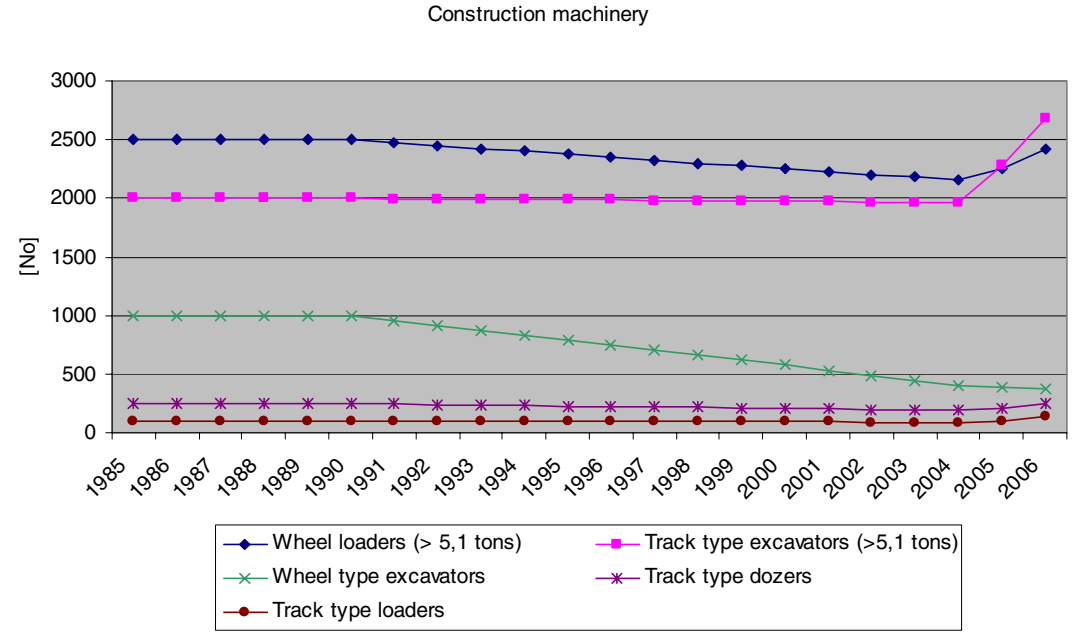


Figure 5.5 1985-2006 stock development for specific types of construction machinery

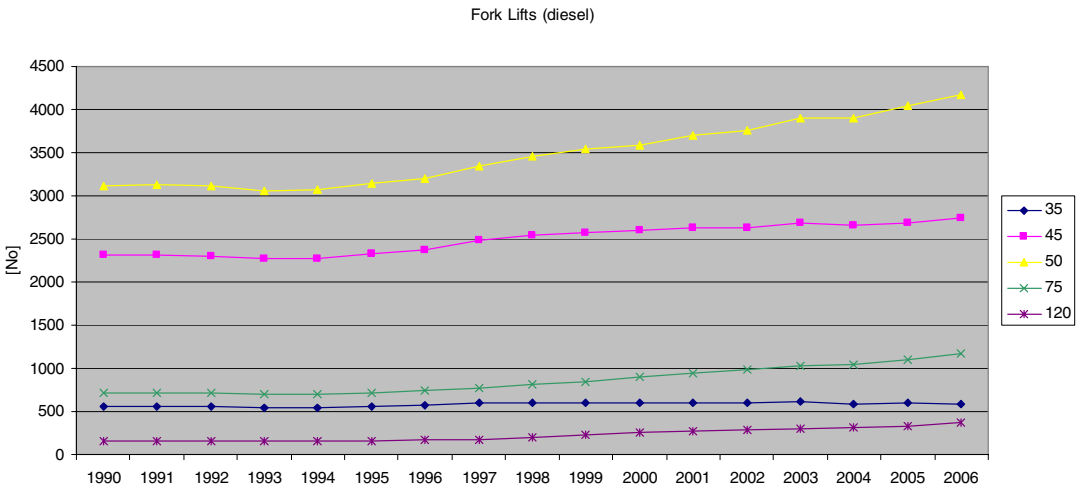


Figure 5.6 Total numbers of diesel fork lifts in kW classes from 1985 to 2006

The emission level shares for tractors, harvesters, construction machinery and diesel fork lifts are shown in Figure 5.7, and present an overview of the penetration of the different pre-Euro engine classes, and engine stages complying with the gradually stricter EU stage I and II emission limits. The average lifetimes of 30, 25, 20 and 10 years for tractors, harvesters, fork lifts and construction machinery, respectively, influence the individual engine technology turn-over speeds.

The EU emission directive Stage I and II implementation years relate to engine size, and for all four machinery groups the emission level shares for the specific size segments will differ slightly from the picture shown in Figure 5.7. Due to scarce data for construction machinery, the emission level penetration rates are assumed to be linear and the general technology turnover pattern is as shown in Figure 5.7.

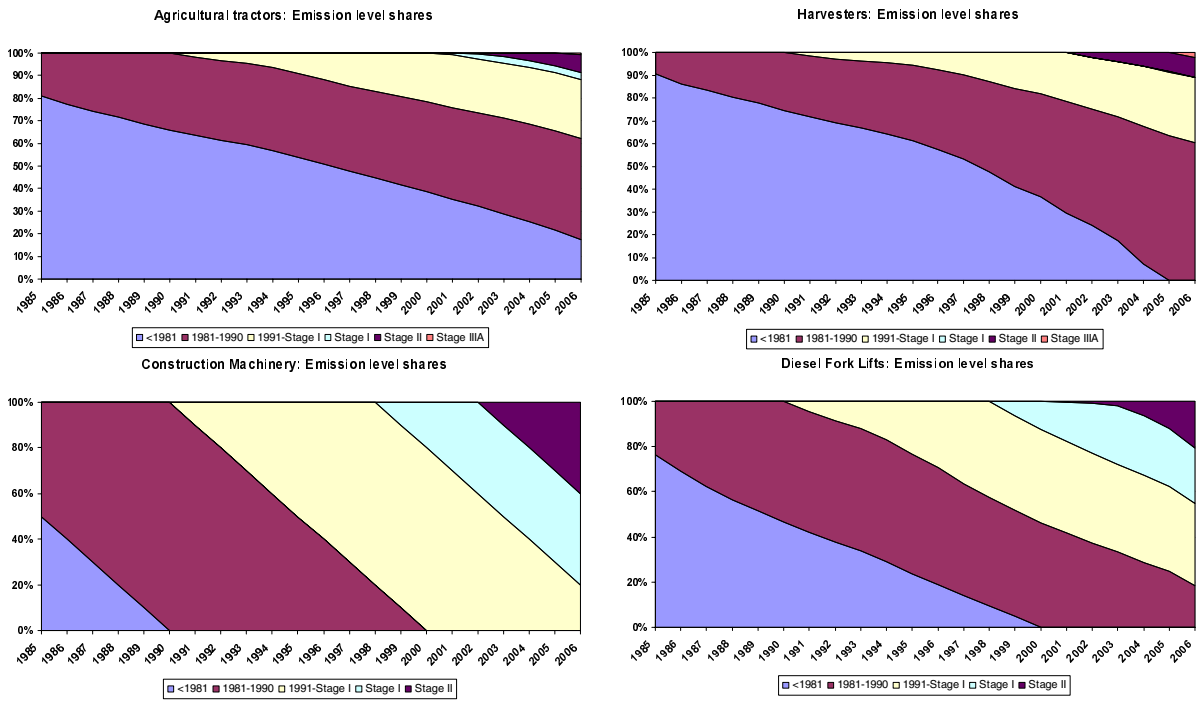


Figure 5.7 Emission level shares for tractors, harvesters, construction machinery and diesel fork lifts (1985 to 2006)

The 1985-2005 stock development for the most important household and gardening machinery types is shown in Figure 5.8.

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

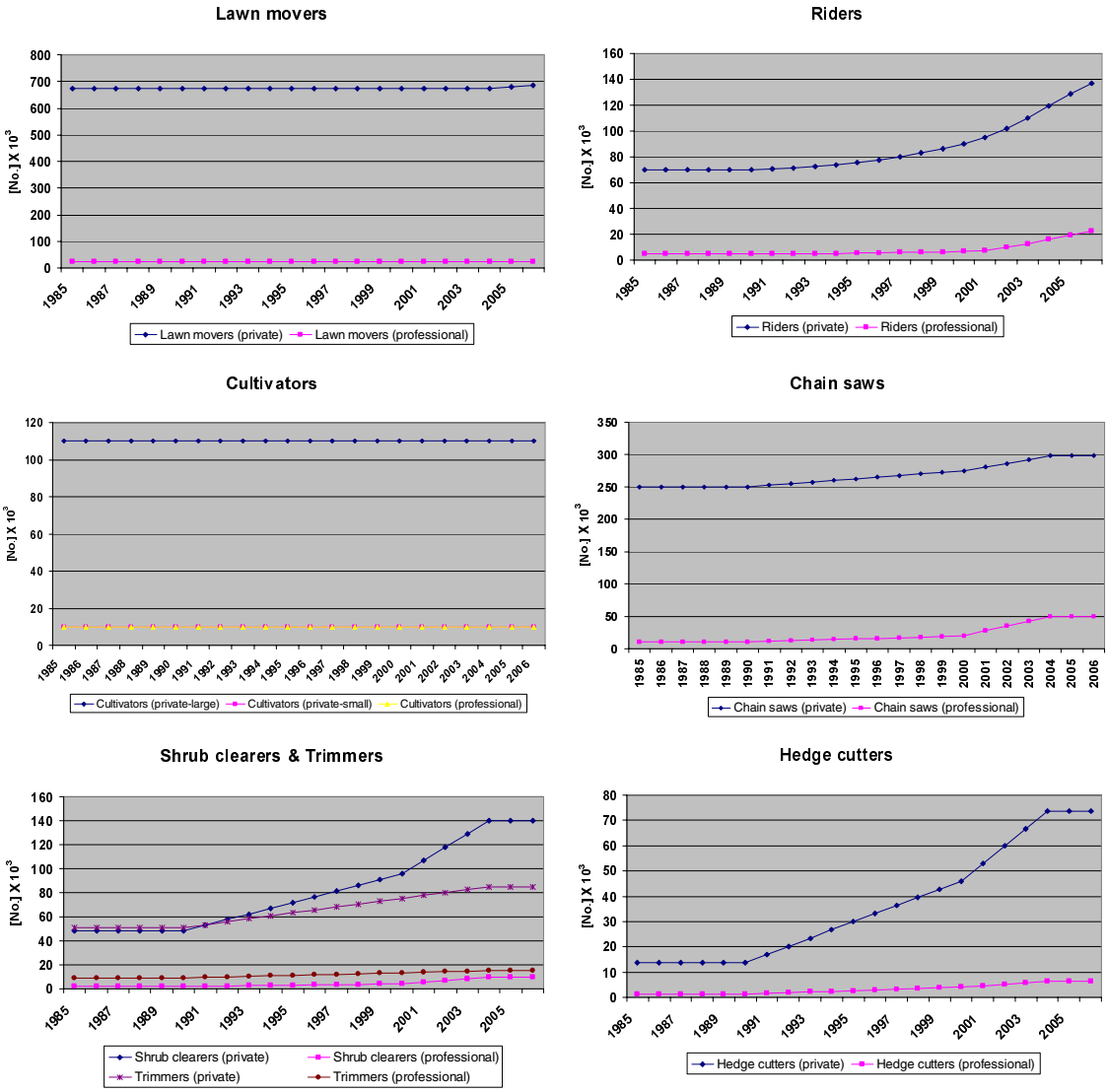


Figure 5.8 Stock development 1985-2006 for the most important household and gardening machinery types

Figure 5.9 shows the development in numbers of different recreational craft from 1985-2005. The 2004 stock data for recreational craft are repeated for 2005 and 2006, since no new fleet information has been obtained.

For diesel boats, increases in stock and engine size are expected during the whole period, except for the number of motor boats (< 27 ft.) and the engine sizes for sailing boats (<26 ft.), where the figures remain unchanged. A decrease in the total stock of sailing boats (<26 ft.) by 21 % and increases in the total stock of yawls/cabin boats and other boats (<20 ft.) by around 25 % are expected. Due to a lack of information specific to

Denmark, the shifting rate from 2-stroke to 4-stroke gasoline engines is based on a German non-road study (IFEU, 2004).

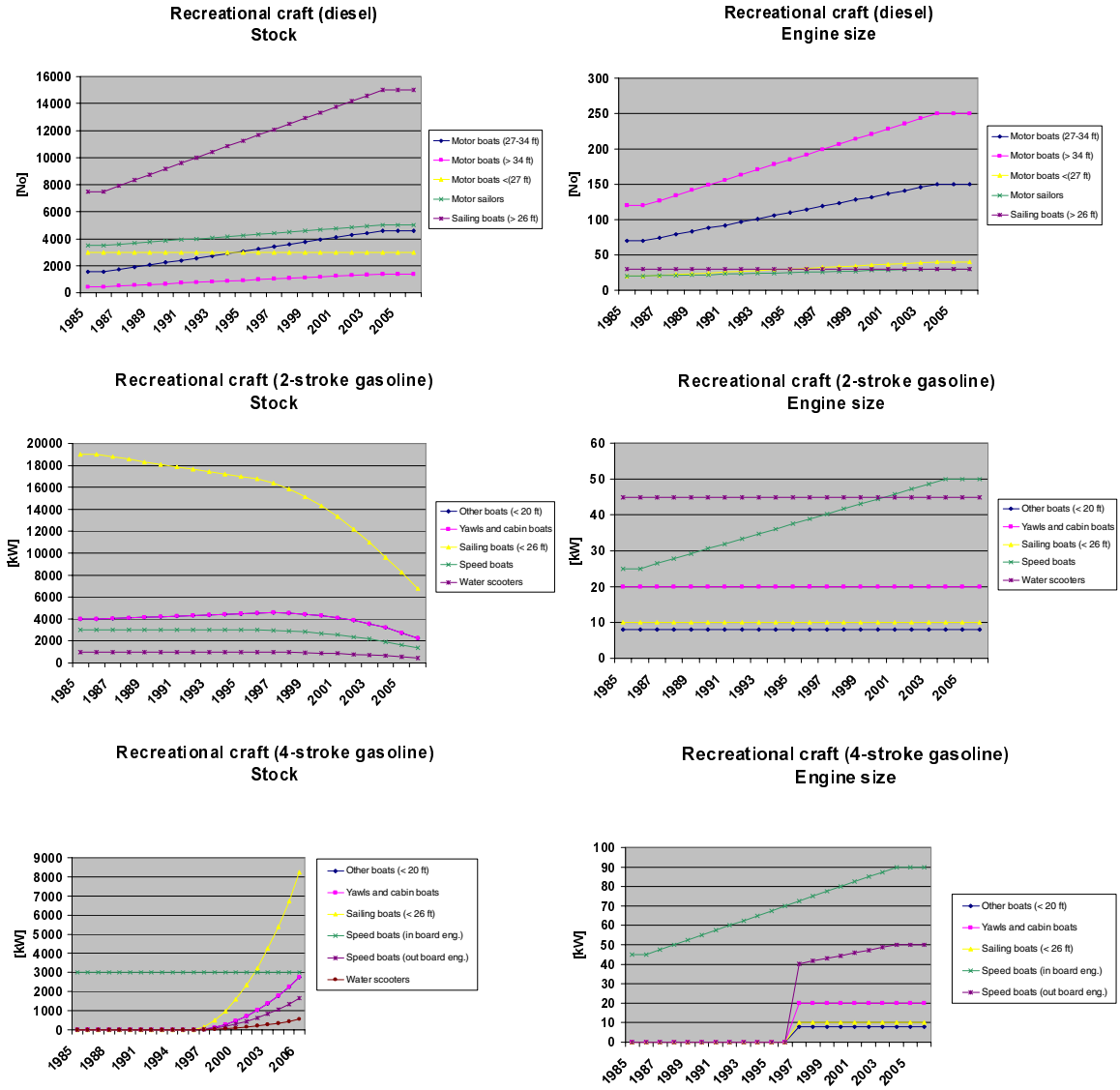


Figure 5.9 1985-2006 Stock and engine size development for recreational craft

5.1.3 National sea transport

A new methodology is used to estimate the fuel consumption figures for national sea transport, based on fleet activity estimates for regional ferries, local ferries and other national sea transport (Winther 2008a, 2008b).

Table 5.1 lists the most important domestic ferry routes in Denmark in the period 1990-2006. For these ferry routes the following detailed traffic and technical data have been gathered: Ferry name, year of service, engine size (MCR), engine type, fuel type, average load factor, auxiliary engine size and sailing time (single trip).

Table 5.1 Ferry routes comprised in the present project

Ferry service	Service period
Halsskov-Knudshoved	1990-1999
Hundested-Grenaa	1990-1996
Kalundborg-Juelsminde	1990-1996
Kalundborg-Samsø	1990-
Kalundborg-Århus	1990-
Korsør-Nyborg, DSB	1990-1997
Korsør-Nyborg, Vognmandsruten	1990-1999
København-Rønne	1990-2004
Køge-Rønne	2004-
Sjællands Odde-Ebeltoft	1990-
Sjællands Odde-Århus	1999-
Tårs-Spodsbjerg	1990-

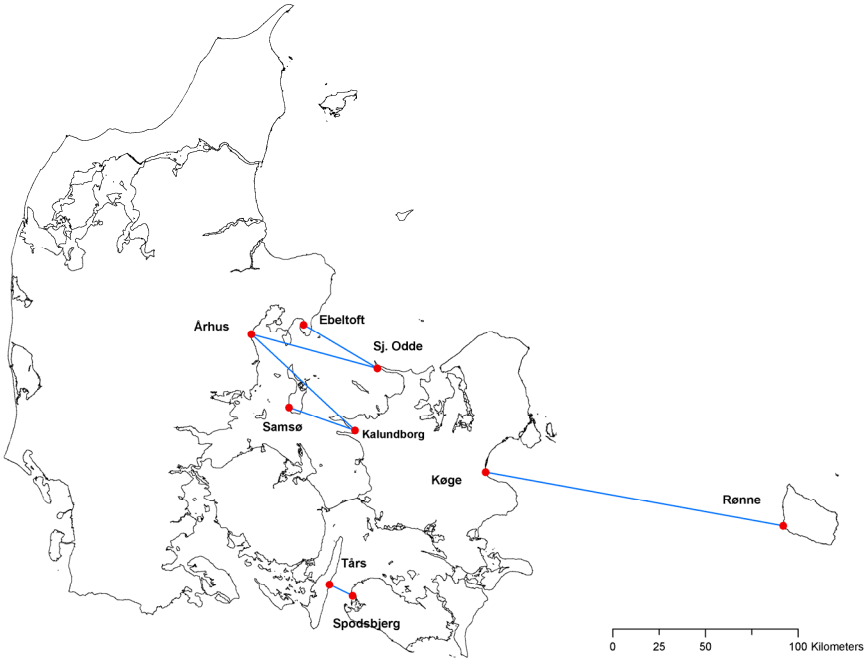


Figure 5.10 Domestic regional ferry routes in Denmark (2006)

The number of round trips per ferry route is shown in Figure 5.11. The traffic data are also listed in Annex 11, together with different ferry specific technical and operational data.

For each ferry, Annex 12 lists the relevant information as regards ferry route, name, year of service, engine size (MCR), engine type, fuel type, average load factor, auxiliary engine size and sailing time (single trip). There is a lack of historical traffic data for 1985-1989, and hence, data for 1990 is used for these years, to support the fuel use and emission calculations.

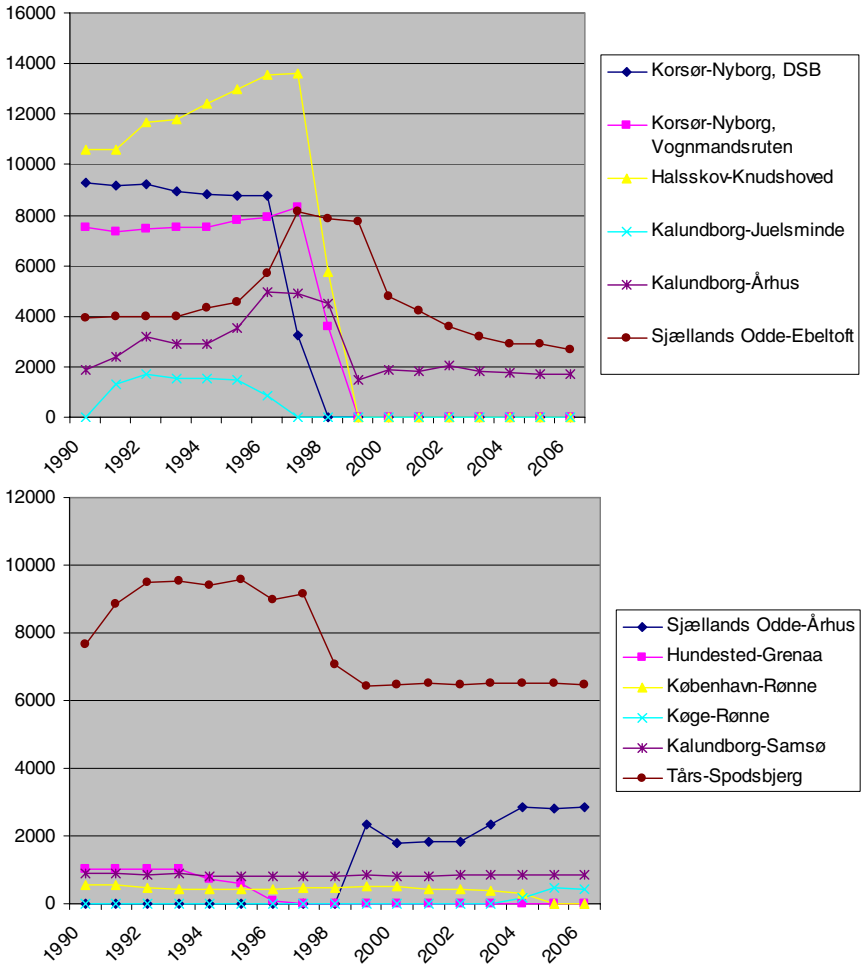


Figure 5.11 No. of round trips for the most important ferry routes in Denmark 1990-2006

It is seen from Table 5.1 (and Figure 5.11) that several ferry routes were closed in the time period from 1996-1998, mainly due to the opening of the Great Belt Bridge (connecting Zealand and Funen) in 1997. Hundested-Grenaa and Kalundborg-Juelsminde was closed in 1996, Korsør-Nyborg (DSB) closed in 1997, and Halsskov-Knudshoved and Korsør-Nyborg (Vognmandsruten) was closed in 1998. The ferry line København-Rønne was replaced by Køge-Rønne in 2004 and from 1999 a new ferry connection was opened between Sjællands Odde and Århus. In general fast ferries were introduced in the period 1995 - 1998.

For the local ferries, a bottom-up estimate of fuel consumption for 1996 has been taken from the Danish work in Wismann (2001). The latter project calculated fuel consumption and emissions for all sea transport in Danish waters in 1995/1996 and 1999/2000. In order to cover the entire 1990-2006 inventory period, the fuel figure for 1996 has been adjusted according to the developments in local ferry route traffic shown in Annex 11.

For the remaining part of the traffic between two Danish ports, other national sea transport, new bottom-up estimates for fuel consumption have been calculated for the years 1995 and 1999 by Wismann (2007). The calculations use the database set up for Denmark in the Wismann (2001) study, with actual traffic data from the Lloyd's LMIS database (not including ferries). The database was split into three vessel types: bulk carriers, container ships, and general cargo ships; and five size classes: 0-

1000, 1000-3000, 3000-10000, 10000-20000 and >20000 DTW. The calculations assume that bulk carriers and container ships use heavy fuel oil, and that general cargo ships use gas oil. For further information regarding activity data for local ferries and other national sea transport, please refer to Winther (2008a).

The fleet activity data for regional ferries, and the fleet activity based fuel consumption estimates for local ferries and other national sea transport provided by Winther (2008a) replace the previous fuel based activity data which originated directly from the DEA statistics.

5.1.4 Other sectors

The activity data for military, railways, international sea transport and fishery consists of fuel consumption information from DEA (2007). For international sea transport, the basis is fuel sold in Danish ports for vessels with a foreign destination, as prescribed by the IPCC guidelines.

For fisheries, the calculation methodology described by Winther (2008a) remains fuel based. However, the input fuel data differ from the fuel sales figures previously used. The changes are the result of further data processing of the DEA reported gas oil sales for national sea transport and fisheries, prior to inventory input. For years when the fleet activity estimates of fuel consumption for national sea transport are smaller than reported fuel sold, fuel is added to fisheries in the inventory. Conversely, lower fuel sales in relation to bottom-up estimates for national sea transport means that fuel is being subtracted from the original fisheries fuel sales figure in order to make up the final fuel consumption input for fisheries.

The updated fuel consumption time-series for national sea transport lead, in turn, to changes in the energy statistics for fisheries (gas oil) and industry (heavy fuel oil), so the national energy balance can remain unchanged.

For all sectors, fuel-use figures are given in Annex 14 for 2006 in CollectER format.

5.2 Emission legislation

For non-road working machinery and equipment, and recreational craft and railway locomotives/motor cars, the emission directives list specific emission limit values (g/kWh) for CO, VOC, NO_X (or VOC + NO_X) and TSP, depending on engine size (kW for diesel, ccm for gasoline) and date of implementation (referring to engine market date).

For diesel, the directives 97/68 and 2004/26 relate to non-road machinery other than agricultural and forestry tractors, and the directives have different implementation dates for machinery operating under transient and constant loads. The latter directive also comprises emission limits for railway machinery. For tractors the relevant directives are 2000/25 and 2005/13. For gasoline, the directive 2002/88 distinguishes between hand-held (SH) and not hand-held (NS) types of machinery.

For engine type approval, the emissions (and fuel use) are measured using various test cycles (ISO 8178). Each test cycle consists of a number of measurement points for specific engine loads during constant operation. The specific test cycle used depends on the machinery type in question and the test cycles are described in more details in the directives.

Table 5.2 Overview of EU emission directives relevant for diesel fuelled non-road machinery

Stage/Engine size [kW]	CO	VOC	NO_X	VOC+NO_X	PM	Diesel machinery			Tractors	
							Implement. date		EU	Implement.
		[g/kWh]				EU Directive	Transient	Constant	directive	date
Stage I										
37<=P<75	6.5	1.3	9.2	-	0.85	97/68	1/4 1999	-	2000/25	1/7 2001
Stage II										
130<=P<560	3.5	1	6	-	0.2	97/68	1/1 2002	1/1 2007	2000/25	1/7 2002
75<=P<130	5	1	6	-	0.3		1/1 2003	1/1 2007		1/7 2003
37<=P<75	5	1.3	7	-	0.4		1/1 2004	1/1 2007		1/1 2004
18<=P<37	5.5	1.5	8	-	0.8		1/1 2001	1/1 2007		1/1 2002
Stage IIIA										
130<=P<560	3.5	-	-	4	0.2	2004/26	1/1 2006	1/1 2011	2005/13	1/1 2006
75<=P<130	5	-	-	4	0.3		1/1 2007	1/1 2011		1/1 2007
37<=P<75	5	-	-	4.7	0.4		1/1 2008	1/1 2012		1/1 2008
19<=P<37	5.5	-	-	7.5	0.6		1/1 2007	1/1 2011		1/1 2007
Stage IIIB										
130<=P<560	3.5	0.19	2	-	0.025	2004/26	1/1 2011	-	2005/13	1/1 2011
75<=P<130	5	0.19	3.3	-	0.025		1/1 2012	-		1/1 2012
56<=P<75	5	0.19	3.3	-	0.025		1/1 2012	-		1/1 2012
37<=P<56	5	-	-	4.7	0.025		1/1 2013	-		1/1 2013
Stage IV										
130<=P<560	3.5	0.19	0.4	-	0.025	2004/26	1/1 2014		2005/13	1/1 2014
56<=P<130	5	0.19	0.4	-	0.025		1/10 2014			1/10 2014

Table 5.3 Overview of the EU Emission Directive 2002/88 for gasoline fuelled non-road machinery

	Category	Engine size [ccm]	CO [g/kWh]	HC [g/kWh]	NO_X [g/kWh]	HC+NO_X [g/kWh]	Impl. date
	Stage I						
Hand held	SH1	S<20	805	295	5.36	-	1/2 2005
	SH2	20=<S<50	805	241	5.36	-	1/2 2005
	SH3	50=<S	603	161	5.36	-	1/2 2005
Not hand held	SN3	100=<S<225	519	-	-	16.1	1/2 2005
	SN4	225=<S	519	-	-	13.4	1/2 2005
	Stage II						
Hand held	SH1	S<20	805	-	-	50	1/2 2008
	SH2	20=<S<50	805	-	-	50	1/2 2008
	SH3	50=<S	603	-	-	72	1/2 2009
Not hand held	SN1	S<66	610	-	-	50	1/2 2005
	SN2	66=<S<100	610	-	-	40	1/2 2005
	SN3	100=<S<225	610	-	-	16.1	1/2 2008
	SN4	225=<S	610	-	-	12.1	1/2 2007

For recreational craft, Directive 2003/44 comprises the emission legislation limits for diesel engines, and for 2-stroke and 4-stroke gasoline engines, respectively. The CO and VOC emission limits depend on engine size (kW) and the inserted parameters presented in the calculation formulas in Table 5.4. For NO_X, a constant limit value is given for each of the three engine types. For TSP, the constant emission limit regards diesel engines only.

Table 5.4 Overview of the EU Emission Directive 2003/44 for recreational craft

Engine type	Impl. date	CO=A+B/P^n			HC=A+B/P^n			NO_X	TSP
		A	B	n	A	B	n		
2-stroke gasoline	1/1 2007	150.0	600.0	1.0	30.0	100.0	0.75	10.0	-
4-stroke gasoline	1/1 2006	150.0	600.0	1.0	6.0	50.0	0.75	15.0	-
Diesel	1/1 2006	5.0	0.0	0	1.5	2.0	0.5	9.8	1.0

Table 5.5 Overview of the EU Emission Directive 2004/26 for railway locomotives and motorcars

	Engine size [kW]		CO [g/kWh]	HC [g/kWh]	NO_X [g/kWh]	HC+NO_X [g/kWh]	PM [g/kWh]	Impl. date
Locomotives	Stage IIIA							
	130<=P<560	RL A	3.5	-	-	4	0.2	1/1 2007
	560<P	RH A	3.5	0.5	6	-	0.2	1/1 2009
	2000<=P and piston displacement >= 5 l/cyl.	RH A	3.5	0.4	7.4	-	0.2	1/1 2009
	Stage IIIB	RB	3.5	-	-	4	0.025	1/1 2012
Motor cars	Stage IIIA							
	130<P	RC A	3.5	-	-	4	0.2	1/1 2006
	Stage IIIB							
	130<P	RC B	3.5	0.19	2	-	0.025	1/1 2012

Aircraft engine emissions of NO_X, CO, VOC and smoke are regulated by ICAO (International Civil Aviation Organization). The engine emission certification standards are contained in Annex 16 — Environmental Protection, Volume II — Aircraft Engine Emissions to the Convention on International Civil Aviation (ICAO Annex 16, 1993). The emission standards relate to the total emissions (in grams) from the so-called LTO (Landing and Take Off) cycle divided by the rated engine thrust (kN). The ICAO LTO cycle contains the idealised aircraft movements below 3000 ft (915 m) during approach, landing, airport taxiing, take off and climb out.

For smoke all aircraft engines manufactured from 1 January 1983 have to meet the emission limits agreed by ICAO. For NO_X, CO, VOC The emission legislation is relevant for aircraft engines with a rated engine thrust larger than 26.7 kN. In the case of CO and VOC, the ICAO regulations apply for engines manufactured from 1 January 1983.

For NO_X, the emission regulations fall in four categories

For engines of a type or model for which the date of manufacture of the first individual production model is on or before 31 December 1995, and for which the production date of the individual engine is on or before 31 December 1999.

For engines of a type or model for which the date of manufacture of the first individual production model is after 31 December 1995, or for individual engines with a production date after 31 December 1999.

For engines of a type or model for which the date of manufacture of the first individual production model is after 31 December 2003.

For engines of a type or model for which the date of manufacture of the first individual production model is after 31 December 2007.

The regulations published by ICAO are given in the form of the total quantity of pollutants (D_p) emitted in the LTO cycle divided by the maximum sea level thrust (F_{oo}) and plotted against engine pressure ratio at maximum sea level thrust.

The limit values for NO_X are given by the formulae in Table 5.6.

Table 5.6 Current certification limits for NO_X for turbo jet and turbo fan engines

	Engines first produced before 31.12.1995 & for engines manufactured up to 31.12.1999	Engines first produced after 31.12.1995 & for engines manufactured after 31.12.1999	Engines for which the date of manufacture of the first individual production model was after 31 December 2003	Engines for which the date of manufacture of the first individual production model was after 31 December 2007
Applies to engines >26.7 kN	$Dp/F_{oo} = 40 + 2\pi_{oo}$	$Dp/F_{oo} = 32 + 1.6\pi_{oo}$		
Engines of pressure ratio less than 30				
Thrust more than 89 kN			$Dp/F_{oo} = 19 + 1.6\pi_{oo}$	$Dp/F_{oo} = 16.72 + 1.4080\pi_{oo}$
Thrust between 26.7 kN and not more than 89 kN			$Dp/F_{oo} = 37.572 + 1.6\pi_{oo} - 0.208F_{oo}$	$Dp/F_{oo} = 38.54862 + (1.6823\pi_{oo}) - (0.2453F_{oo}) - (0.00308\pi_{oo}F_{oo})$
Engines of pressure ratio more than 30 and less than 62.5				
Thrust more than 89 kN			$Dp/F_{oo} = 7+2.0\pi_{oo}$	$Dp/F_{oo} = -1.04+ (2.0*\pi_{oo})$
Thrust between 26.7 kN and not more than 89 kN			$Dp/F_{oo} = 42.71 +1.4286\pi_{oo} - 0.4013F_{oo} +0.00642\pi_{oo}F_{oo}$	$Dp/F_{oo} = 46.1600 + (1.4286\pi_{oo}) - (0.5303F_{oo}) - (0.00642\pi_{oo}F_{oo})$
Engines with pressure ratio 82.6 or more			$Dp/F_{oo} = 32+1.6\pi_{oo}$	$Dp/F_{oo} = 32+1.6\pi_{oo}$

Source: International Standards and Recommended Practices, Environmental Protection, ICAO Annex 16 Volume II Part III Paragraph 2.3.2, 2nd edition July 1993, plus amendments: Amendment 3 (20 March 1997),Amendment 4 (4 November 1999),Amendment 5 (24 November 2005)

where:

D_p = the sum of emissions in the LTO cycle in g

F_{oo} = thrust at sea level take-off (100 %)

π_{oo} = pressure ratio at sea level take-off thrust point (100 %)

The equivalent limits for HC and CO are $D_p/F_{oo} = 19.6$ for HC and $D_p/F_{oo} = 118$ for CO (ICAO Annex 16 Vol. II paragraph 2.2.2). Smoke is limited to a regulatory smoke number = 83 $(F_{oo})^{-0.274}$ or a value of 50, whichever is the lower.

A further description of the technical definitions in relation to engine certification as well as actual engine exhaust emission measurement data can be found in the ICAO Engine Exhaust Emission Database. The latter database is accessible from http://www.caa.co.uk, hosted by the UK Civil Aviation Authority.

For seagoing vessels, NO_X emissions are regulated as explained in Marpol 73/78 Annex VI, formulated by IMO (International Maritime Organisation). The legislation is relevant for diesel engines with a power output higher than 130 kW, which are installed on a ship constructed on or after 1 January 2000 and diesel engines with a power output higher than 130 kW which undergo major conversion on or after 1 January 2000.

The NO_X emission limits for ship engines in relation to their rated engine speed (n) given in RPM (Revolutions Per Minute) are the following:

17 g/kWh, $n < 130$ RPM

$45 \times n^{-0.2}$ g/kWh, $130 \leq n < 2000$ RPM

9.8 g/kWh, $n \geq 2000$ RPM

Further, the Marine Environment Protection Committee (MEPC) of IMO has approved proposed amendments to MARPOL Annex VI to be agreed by IMO in October 2008 in order to strengthen the emission standards for NO_X and the sulphur contents of heavy fuel oil used by ship engines.

For NO_X emission regulations, a three tiered approach is considered, which comprises the following:

Tier I: Diesel engines (> 130 kW) installed on a ship constructed on or after 1 January 2000 and prior to 1 January 2011.

Tier II: Diesel engines (> 130 kW) installed on a ship constructed on or after 1 January 2011.

Tier III[10]: Diesel engines (> 130 kW) installed on a ship constructed on or after 1 January 2016.

As for the existing NO_X emission limits, the new Tier I-III NO_X legislation values rely on the rated engine speeds. The emission limit equations are shown in Table 5.7.

Table 5.7 Tier I-III NO_X emission limits for ship engines (amendments to MARPOL Annex VI)

	NO_X limit	RPM (n)
Tier I	17 g/kWh	n < 130
	$45 \times n^{-0.2}$ g/kWh	130 ≤ n < 2000
	9.8 g/kWh	n ≥ 2000
Tier II	14.4 g/kWh	n < 130
	$44 \times n^{-0.23}$ g/kWh	130 ≤ n < 2000
	7.7 g/kWh	n ≥ 2000
Tier III	3.4 g/kWh	n < 130
	$9 \times n^{-0.2}$ g/kWh	130 ≤ n < 2000
	2 g/kWh	n ≥ 2000

The Tier I emission limits are identical with the existing emission limits from MARPOL Annex VI.

Also to be agreed by IMO in October 2008, the NO_X Tier I limits are to be applied for existing engines with a power output higher than 5000 kW and a displacement per cylinder at or above 90 litres, installed on a ship constructed on or after 1 January 1990 but prior to 1 January 2000.

In relation to the sulphur content in heavy fuel and marine gas oil used by ship engines, Table 5.8 shows the current legislation in force, and the amendment of MARPOL Annex VI to be agreed by IMO in October 2008.

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

Table 5.8 Current legislation in relation to marine fuel quality

Legislation		Heavy fuel oil		Gas oil	
		S- %	Impl. date	S- %	Impl. date
EU-directive 93/12		None		0.2[1]	1.10.1994
EU-directive 1999/32		None		0.2	1.1.2000
EU-directive 2005/33	SECA - Baltic sea	1.5	11.08.2006	0.1	1.1.2008
	SECA - North sea	1.5	11.08.2007	0.1	1.1.2008
	Outside SECA's	None		0.1	1.1.2008
MARPOL Annex VI	SECA – Baltic sea	1.5	19.05.2006		
	SECA – North sea	1.5	21.11.2007		
	Outside SECA	4.5	19.05.2006		
MARPOL Annex VI amendments	SECA's	1	01.03.2010		
	SECA's	0.1	01.01.2015		
	Outside SECA's	0.5	01.01.2020[2]		

[1] Sulphur content limit for fuel sold inside EU

[2] Subject to a feasibility review to be completed no later than 2018. If the conclusion of such a review becomes negative the effective date would default 1 January 2025

For non road machinery, the EU directive 2003/17/EC gives a limit value of 50 ppm sulphur in diesel (from 2005).

5.3 Emission factors

The CO_2 emission factors are country-specific and come from the DEA. The SO_2 emission factors are fuel related, and rely on the sulphur contents given in the relevant EU fuel directives or in the Danish legal announcements. However, for jet fuel the default factor from IPCC (1996) is used. Road transport diesel is assumed to be used by engines in military and railways, and road transport gasoline is assumed to be used by non road working machinery and recreational craft. Hence, these types of machinery have the same SO_2 emission factors, as for road transport.

For all mobile sources, the emission factor source for N_2O, NH_3, heavy metals and PAH is the EMEP/CORINAIR guidebook (CORINAIR, 2007).

For military ground equipment, aggregated emission factors for gasoline and diesel are derived, which originate from road traffic emission simulations. For piston engine aircraft using aviation gasoline, aggregated emission factors for conventional cars are used.

For railways, specific Danish measurements from the Danish State Railways (DSB) (Næraa, 2007) are used to calculate the emission factors of NO_X, VOC, CO and TSP, and a NMVOC/CH_4 split is made based on own judgment.

For agriculture, forestry, industry, household gardening and inland waterways, the NO_X, VOC, CO and TSP emission factors are derived from

various European measurement programmes; see IFEU (2004) and Winther et al. (2006). The NMVOC/CH_4 split is taken from USEPA (2004).

For national sea transport and fisheries, the NO_X emission factors predominantly come from the engine manufacturer MAN Diesel, as a function of engine production year. The CO, VOC and TSP emission factors come from the Danish TEMA2000 emission model (Trafikministeriet, 2000), whereas the PM_{10} and $PM_{2.5}$ size fractions are obtained from MAN Diesel. The VOC/CH_4 splits are taken from EMEP/CORINAIR (2007). For ship engines, the basis emission factors are shown in Annex 12.

The source for aviation (jet fuel) emission factors is the EMEP/CORINAIR guidebook (CORINAIR, 2007). This reference provides fuel flows and emission indices for the different LTO modes, and fuel consumption and emission factors for cruise given in flight distance intervals. In total, 46 representative aircraft types are present in the databank.

For all sectors, emission factors are given in CollectER format in Annex 14 for 2006. Table 5.9 shows the emission factors for CO_2, SO_2, NO_X, NMVOC, CO, NH_3 and TSP in CollectER format used to calculate the emissions from other mobile sources in Denmark.

5.4 Factors for deterioration, transient loads and gasoline evaporation for non road machinery

The emission effects of engine wear are taken into account for diesel and gasoline engines by using the so-called deterioration factors. For diesel engines alone, transient factors are used in the calculations, to account for the emission changes caused by varying engine loads. The evaporative emissions of NMVOC are estimated for gasoline fuelling and tank evaporation. The factors for deterioration, transient loads and gasoline evaporation are taken from IFEU (2004), and are shown in Annex 9. For more details regarding the use of these factors, please refer to paragraph 5.5.2 or Winther et al. (2006).

Table 5.9 Fuel based emission factors for CO_2, CH_4, N_2O, SO_2, NO_X, NMVOC, CO, NH_3 and TSP for other mobile sources in Denmark (2006)

SNAP ID	NFR ID	Category	Fuel type	Mode	CH_4	CO_2	N_2O	SO_2	NO_X	NMVOC	CO	NH_3	TSP
					(g/GJ)	(kg/GJ)	(g/GJ)	(g/GJ)	(g/GJ)	(g/GJ)	(g/GJ)	(g/GJ)	(g/GJ)
801	1A5	Military	Diesel		6.44	74	5.66	0.47	538.08	35.10	158.94	0.34	30.51
801	1A5	Military	Jet fuel	< 3000 ft	2.65	72	2.30	22.99	250.57	24.94	229.89	0.00	1.16
801	1A5	Military	Jet fuel	> 3000 ft	2.65	72	2.30	22.99	250.57	24.94	229.89	0.00	1.16
801	1A5	Military	Gasoline		22.26	73	11.50	0.46	206.69	260.01	2050.72	25.15	2.58
801	1A5	Military	Avgas		21.90	73	2.00	22.99	859.00	1242.60	6972.00	1.60	10.00
802	1A3c	Railways	Diesel		2.88	74	2.04	0.47	1155.92	74.96	204.41	0.20	39.02
803	1A3d	Inland waterways	Diesel		2.76	74	2.97	93.68	868.57	168.09	450.77	0.17	103.58
803	1A3d	Inland waterways	Gasoline		55.94	73	1.13	0.46	446.85	2050.43	15870.55	0.09	90.85
80402	1A3d	National sea traffic	Residual oil		2.01	78	4.89	948.66	1748.91	59.46	196.16		88.60
80402	1A3d	National sea traffic	Diesel		1.55	74	4.68	93.68	1288.42	50.25	136.65		23.21
80402	1A3d	National sea traffic	Kerosene		7.00	72	0.00	2.30	50.00	3.00	20.00		5.00
80402	1A3d	National sea traffic	LPG		20.26	65	0.00		1249.00	384.94	443.00		0.20
80403	1A4c	Fishing	Residual oil		1.76	78	4.90	1101.71	1393.60	56.90	180.90		139.40
80403	1A4c	Fishing	Diesel		1.73	74	4.68	93.68	1355.43	56.36	185.92		23.21
80403	1A4c	Fishing	Kerosene		7.00	72	0.00	2.30	50.00	3.00	20.00		5.00
80403	1A4c	Fishing	Gasoline		108.10	73	0.52	2.28	64.34	10809.60	18485.10	0.10	23.25
80403	1A4c	Fishing	LPG		20.26	65	0.00		1249.00	384.94	443.00		0.20
80404	Memo item	Int. sea traffic	Residual oil		1.86	78	4.89	1638.14	2053.70	60.73	200.35		253.29
80404	Memo item	Int. sea traffic	Diesel		1.7	74	4.68	93.68	1516.56	55.34	182.57		23.21
80501	1A3a	Air traffic, other airports	Jet fuel	Dom. < 3000 ft	3.36	72	18.05	22.99	287.66	27.15	148.43		1.16
80501	1A3a	Air traffic, other airports.	Avgas		21.9	73	2	22.83	859.00	1242.60	6972.00	1.60	10.00
80502	Memo item	Air traffic, other airports	Jet fuel	Int. < 3000 ft	1.79	72	8.48	22.99	289.45	33.27	200.52		1.16
80502	Memo item	Air traffic, other airports	Avgas		21.9	73	2	22.83	859.00	1242.60	6972.00	1.60	10.00
80503	1A3a	Air traffic, other airports	Jet fuel	Dom. > 3000 ft	2.62	72	2.3	22.99	279.30	20.57	127.01		1.16
80504	Memo item	Air traffic, other airports	Jet fuel	Int. > 3000 ft	0.71	72	2.3	22.99	238.63	8.64	62.41		1.16
806	1A4c	Agriculture	Diesel		1.5	74	3.13	2.34	779.40	83.90	420.46	0.18	62.65
806	1A4c	Agriculture	Gasoline		132.74	73	1.57	0.46	107.59	1143.22	21833.70	1.41	29.26
807	1A4c	Forestry	Diesel		0.94	74	3.21	2.34	650.75	50.31	296.03	0.18	34.88
807	1A4c	Forestry	Gasoline		54.12	73	0.42	0.46	73.12	6684.07	16521.92	0.08	76.48
808	1A2f	Industry	Diesel		1.69	74	3.08	2.34	738.43	93.38	414.76	0.18	77.29
808	1A2f	Industry	Gasoline		103.02	73	1.41	0.46	197.21	1491.92	13052.28	0.10	13.85
808	1A2f	Industry	LPG		7.69	65	3.5	0.00	1328.11	146.09	104.85	0.21	4.89
809	1A4b	Household/gardening	Gasoline		71.57	73	1.17	0.46	86.20	2522.22	27536.91	0.09	24.90
80501	1A3a	Air traffic, Copenhagen	Jet fuel	Dom. < 3000 ft	4.65	72	9.84	22.99	275.95	35.84	193.29		1.16
80501	1A3a	Air traffic, Copenhagen	Avgas		21.9	73	2	22.83	859.00	1242.60	6972.00	1.60	10.00
80502	Memo item	Air traffic, Copenhagen	Jet fuel	Int. < 3000 ft	4.18	72	4.07	22.99	341.71	44.14	223.20	0.00	1.16
80502	Memo item	Air traffic, Copenhagen	Avgas		21.9	73	2	22.83	859.00	1242.60	6972.00	1.60	10.00
80503	1A3a	Air traffic, Copenhagen	Jet fuel	Dom. > 3000 ft	2.3	72	2.3	22.99	274.14	18.44	66.15	0.00	1.16
80504	Memo item	Air traffic, Copenhagen	Jet fuel	Int. > 3000 ft	1.15	72	2.3	22.99	315.36	11.20	34.29	0.00	1.16

[1] References. SO_2 and CO_2: Country-specific; Military: Aggregated emission factors for road transport; Railways (NO_X, NMVOC and TSP): Danish State Railways; Agriculture, forestry, industry, household gardening and inland waterways (NO_X, VOC and TSP): IFEU (2004); National sea transport/fishing/international sea transport: MAN B&W (NO_X) and TEMA2000 (NMVOC, TSP); Aviation - jet fuel (NO_X, NMVOC and TSP): EMEP/CORINAIR; Aviation - av.gasoline: Aggregated emission factors for conventional gasoline cars. N_2O: EMEP/CORINAIR. CH_4: Railways: DSB/NERI; Agriculture/Forestry/Industry/Household-Gardening: IFEU/USEPA; National sea traffic/Fishing/international sea transport: TEMA2000/EMEP-CORINAIR; domestic and international aviation: EMEP/CORINAIR

5.5 Calculation method

5.5.1 Air traffic

For aviation, the domestic and international estimates are made separately for landing and take-off (LTOs < 3000 ft), and cruising (> 3000 ft).

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

$$FC^{a}_{LTO} = \sum_{m=1}^{4} t_m \cdot ff_{a,m} \quad (5.1)$$

Where FC = fuel consumption (kg), m = LTO mode (approach/landing, taxiing, take off, climb out), t = times in mode (s), ff = fuel flow (kg/s), a = representative aircraft type.

The emissions for one LTO cycle are estimated as follows:

$$E^{a}_{LTO} = \sum_{m=1}^{4} FC_{a,m} \cdot EI_{a,m} \quad (5.2)$$

Due to lack of specific airport data, for approach/descent, take off and climb out, standardised times-in-modes of 4, 0.7 and 2.2 minutes are used as defined by ICAO (ICAO, 1995), whereas for taxiing the appropriate time interval is 13 minutes in Copenhagen Airport and 5 minutes in other airports present in the Danish inventory.

To estimate cruise results, fuel consumption and emissions for standard flying distances from EMEP/CORINAIR (2007) are interpolated or extrapolated – in each case determined by the great circle distance between the origin and the destination airports.

If the great circle distance, y, is smaller than the maximum distance for which fuel consumption and emission data are given in the EMEP/CORINAIR data bank the fuel consumption or emission E (y) becomes:

$$E(y) = E_{x_i} + \frac{(y - x_i)}{x_{i+1} - x_i} \cdot (E_{x_{i+1}} - E_{x_i}) \qquad y<x_{max},\ i = 0,1,2\ldots.max\text{-}1 \quad (5.3)$$

In (5.3) x_i and x_{max} denominate the separate distances and the maximum distance, respectively, with known fuel use and emissions. If the flight distance y exceeds x_{max} the maximum figures for fuel use and emissions must be extrapolated and the equation then becomes:

$$E(y) = E_{x_{max}} + \frac{(y - x_{max})}{x_{max} - x_{max-1}} \cdot (E_{x_{max}} - E_{x_{max-1}}) \qquad y>x_{max} \quad (5.4)$$

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

The overall fuel precision in the model is around 0.8, derived as the fuel ratio between model estimates and statistical sales. The fuel difference is accounted for by adjusting cruising fuel use and emissions in the model according to domestic and international cruising fuel shares.

Prior to 2001, the calculation procedure was first to estimate each year's fuel use and emissions for LTO. Secondly, total cruising fuel use was found year by year as the statistical fuel use total minus the calculated fuel use for LTO. Lastly, the cruising fuel use was split into a domestic and international part by using the results from a Danish city-pair emission inventory in 1998 (Winther, 2001a). For more details of this latter fuel allocation procedure, see Winther (2001b).

5.5.2 Non-road working machinery and recreational craft

Prior to adjustments for deterioration effects and transient engine operations, the fuel use and emissions in year X, for a given machinery type, engine size and engine age, are calculated as:

$$E_{Basis}(X)_{i,j,k} = N_{i,j,k} \cdot HRS_{i,j,k} \cdot P \cdot LF_i \cdot EF_{y,z} \quad (5.5)$$

where E_{Basis} = fuel use/emissions in the basic situation, N = number of engines, HRS = annual working hours, P = average rated engine size in kW, LF = load factor, EF = fuel use/emission factor in g/kWh, i = machinery type, j = engine size, k = engine age, y = engine-size class and z = emission level. The basic fuel use and emission factors are shown in Annex 9.

The deterioration factor for a given machinery type, engine size and engine age in year X depends on the engine-size class (only for gasoline), y, and the emission level, z. The deterioration factors for diesel and gasoline 2-stroke engines are found from:

$$DF_{i,j,k}(X) = \frac{K_{i,j,k}}{LT_i} \cdot DF_{y,z} \quad (5.6)$$

where DF = deterioration factor, K = engine age, LT = lifetime, i = machinery type, j = engine size, k = engine age, y = engine-size class and z = emission level.

For gasoline 4-stroke engines the deterioration factors are calculated as:

$$DF_{i,j,k}(X) = \sqrt{\frac{K_{i,j,k}}{LT_i}} \cdot DF_{y,z} \quad (5.7)$$

The deterioration factors inserted in (5.6) and (5.7) are shown in Annex 9. No deterioration is assumed for fuel use (all fuel types) or for LPG engine emissions and, hence, DF = 1 in these situations.

The transient factor for a given machinery type, engine size and engine age in year X, relies only on emission level and load factor, and is denominated as:

$$TF_{i,j,k}(X) = TF_z \quad (5.8)$$

Where i = machinery type, j = engine size, k = engine age and z = emission level.

The transient factors inserted in (5.8) are shown in Annex 9. No transient corrections are made for gasoline and LPG engines and, hence, $TF_z = 1$ for these fuel types.

The final calculation of fuel use and emissions in year X for a given machinery type, engine size and engine age, is the product of the expressions 5.5-5.8:

$$E(X)_{i,j,k} = E_{Basis}(X)_{i,j,k} \cdot TF(X)_{i,j,k} \cdot (1 + DF(X)_{i,j,k}) \quad (5.9)$$

The evaporative hydrocarbon emissions from fuelling are calculated as:

$$E_{Evap,fueling,i} = FC_i \cdot EF_{Evap,fueling} \quad (5.10)$$

Where $E_{Evap,fueling}$, = hydrocarbon emissions from fuelling, i = machinery type, FC = fuel consumption in kg, $EF_{Evap,fueling}$ = emission factor in g NMVOC/kg fuel.

For tank evaporation, the hydrocarbon emissions are found from:

$$E_{Evap,\tan k,i} = N_i \cdot EF_{Evap,\tan k,i} \quad (5.11)$$

Where $E_{Evap,tank,i}$ = hydrocarbon emissions from tank evaporation, N = number of engines, i = machinery type and $EF_{Evap,fueling}$ = emission factor in g NMVOC/year.

5.5.3 Ferries, other national sea transport and fisheries

The fuel use and emissions in year X, for regional ferries are calculated as:

$$E(X) = \sum_i N_i \cdot T_i \cdot S_{i,j} \cdot P_i \cdot LF_j \cdot EF_{k,l,y} \quad (5.12)$$

Where E = fuel use/emissions, N = number of round trips, T = sailing time per round trip in hours, S = ferry share of ferry service round trips, P = engine size in kW, LF = engine load factor, EF = fuel consumption/emission factor in g/kWh, i = ferry route, j = ferry, k = fuel type, l = engine type, y = engine year.

For the remaining navigation categories, the emissions are calculated using a simplified approach:

$$E(X) = \sum_i EC_{i,k} EF_{k,l,y} \quad (5.13)$$

Where E = fuel consumption/emissions, EC = energy consumption, EF = fuel consumption/emission factor in g/kg fuel, i = category (local ferries,

other national sea, fishery, international sea), k = fuel type, l = engine type, y = average engine year.

The emission factor inserted in (5.13) is found as an average of the emission factors representing the engine ages which are comprised by the average lifetime in a given calculation year, X:

$$EF_{k,l,y} = \frac{\sum_{year=X}^{year=X-LT} EF_{k,l}}{LT_{k,l}} \quad (5.14)$$

5.5.4 Other sectors

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

$$E = FC \cdot EF \quad (5.15)$$

where E = emission, FC = fuel consumption and EF = emission factor. The calculated emissions for other mobile sources are shown in CollectER format in Annex 14 for the years 2006 and as time-series 1985-2006 in Annex 15 (NFR format).

5.5.5 Energy balance: DEA statistics and NERI estimates

Following convention rules, the DEA statistical fuel sales figures are behind the full Danish inventory. However, in some cases for mobile sources the DEA statistical sectors do not fully match the inventory sectors. This is the case for non road machinery, where relevant DEA statistical sectors also include fuel consumed by stationary sources.

In other situations, fuel consumption figures estimated by NERI from specific bottom-up calculations are regarded as more reliable than DEA reported sales. This is the case for national sea transport.

In the following the transferral of fuel consumption data from DEA statistics into inventory relevant categories is explained for national sea transport and fisheries, non road machinery and recreational craft, and road transport. A full list of all fuel consumption data, DEA figures as well as intermediate fuel consumption data, and final inventory input figures is shown in Annex 13.

National sea transport and fisheries

For national sea transport in Denmark, the new fuel consumption estimates obtained by NERI (Winther, 2008a) are regarded as much more accurate than the DEA fuel sales data, since the large fluctuations in reported fuel sales cannot be explained by the actual development in the traffic between different national ports. As a consequence, the new bottom-up estimates replace the previous fuel based figures for national sea transport.

There are different potential reasons for the differences between estimated fuel consumption and reported sales for national sea transport in Denmark. According to the DEA, the latter fuel differences are most

likely explained by inaccurate costumer specifications made by the oil suppliers. This inaccuracy can be caused by a sector misallocation in the sales statistics between national sea transport and fisheries for gas oil, and between national sea transport and industry for heavy fuel oil (Peter Dal, DEA, personal communication, 2007).

Stockpiles of fuel reserves kept by the shipping companies may also explain some of the fuel differences. Looking at the findings from Winther (2008a), this effect is regarded to be minor only for gas oil, whereas for heavy fuel oil, there may be an important stockpiling effect in the 1990's where reported sales and estimated consumption become the largest, in shifting order, respectively.

In order to maintain the national energy balance, as a consequence, for fisheries and industry the updated fuel consumption time series for national sea transport lead, in turn, to changes in the fuel activity data for fisheries (gas oil) and industry (heavy fuel oil).

For fisheries, fuel investigations made prior to the initiation of the work made by Winther (2008a) have actually pointed out a certain area of inaccuracy in the DEA statistics. No engines installed in fishing vessels use heavy fuel oil, even though a certain amount of heavy fuel oil is listed in the DEA numbers for some statistical years (H. Amdissen, Danish Fishermen's Association, personal communication, 2006). Hence, for fisheries small amounts of fuel oil are transferred to national sea transport, and in addition small amounts of gasoline and diesel are transferred to recreational craft.

Non road machinery and recreational craft

For diesel and LPG, the non-road fuel consumption estimated by NERI is partly covered by the fuel-use amounts in the following DEA sectors: agriculture and forestry, market gardening, and building and construction. The remaining quantity of non-road diesel and LPG is taken from the DEA industry sector.

For gasoline, the DEA residential sector, together with the DEA sectors mentioned for diesel and LPG, contribute to the non-road fuel consumption total. In addition, a certain amount of fuel from road transport is needed to reach the fuel-use goal.

The amount of diesel and LPG in DEA industry not being used by non-road machinery is included in the sectors, "Combustion in manufacturing industry" (0301) and "Non-industrial combustion plants" (0203) in the Danish emission inventory.

For recreational craft, the calculated fuel-use totals for diesel and gasoline are subsequently subtracted from the DEA fishery sector. For gasoline, the DEA reported fuel consumption for fisheries is far too small to fill the fuel gap, and hence the missing fuel amount is taken from the DEA road transport sector.

5.5.6 Bunkers

The distinction between domestic and international emissions from aviation and navigation should be in accordance with the Revised 1996 IPCC

Guidelines for National Greenhouse Gas Inventories. For the national emission inventory this, in principle, means that fuel sold (and associated emissions) for flights/sea transportation starting from a seaport/airport in the Kingdom of Denmark, with destinations inside or outside the Kingdom of Denmark, are regarded as domestic or international, respectively.

Aviation

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

Navigation

In DEA statistics, the domestic fuel total consists of fuel sold to Danish ferries and other ships sailing between two Danish ports. The DEA international fuel total consists of the fuel sold in Denmark to international ferries, international warships, other ships with foreign destinations, transport to Greenland and the Faroe Islands, tank vessels and foreign fishing boats.

In Greenland, all marine fuel sales are treated as domestic. In the Faroe Islands, fuel sold in Faroese ports for Faroese fishing vessels and other Faroese ships is treated as domestic. The fuel sold to Faroese ships bunkering outside Faroese waters and the fuel sold to foreign ships in Faroese ports or outside Faroese waters is classified as international (Lastein and Winther, 2003).

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

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

6 Fuel consumption and emissions

6.1 Fuel consumption

Table 6.1 Fuel use (PJ) for domestic transport in 2006 in NFR sectors

NFR ID	Fuel use (PJ)
Industry-Other (1A2f)	13.9
Civil Aviation (1A3a)	2.0
Road (1A3b)	171.5
Railways (1A3c)	3.1
Navigation (1A3d)	6.1
Residential (1A4b)	3.2
Ag./for./fish. (1A4c)	21.6
Military (1A5)	1.7
Total	223.1

Table 6.1 shows the fuel use for domestic transport based on DEA statistics for 2006 in NFR sectors. The fuel use figures in time-series 1985-2006 are given in Annex 15 (NFR format) and are shown for 2006 in Annex 14 (CollectER format). Road transport has a major share of the fuel consumption for domestic transport. In 2006 this sector's fuel consumption share is 77 %, while the fuel consumption shares for Agriculture/forestry/fisheries and Industry-Other are 10 and 6 %, respectively. For the remaining sectors the total fuel consumption share is 7 %.

From 1985 to 2006, diesel and gasoline fuel use has increased by 47 % and 23 %, respectively, and in 2006 the fuel use shares for diesel and gasoline were 63 % and 36 %, respectively (Figures 6.1 and 6.2). Other fuels only have a 1 % share of the domestic transport total. Almost all gasoline is used in road transportation vehicles. Gardening machinery and recreational craft are merely small consumers. Regarding diesel, there is considerable fuel use in most of the domestic transport categories, whereas a more limited use of residual oil and jet fuel is being used in the navigation sector and by aviation (civil and military flights), respectively.

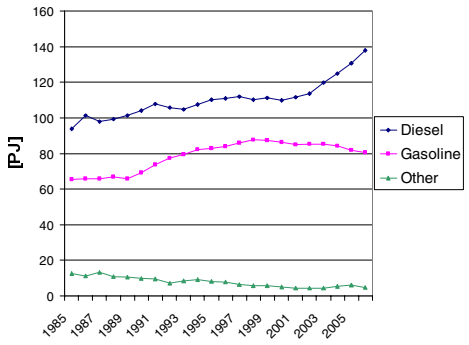


Figure 6.1 Fuel consumption per fuel type for domestic transport 1985-2006

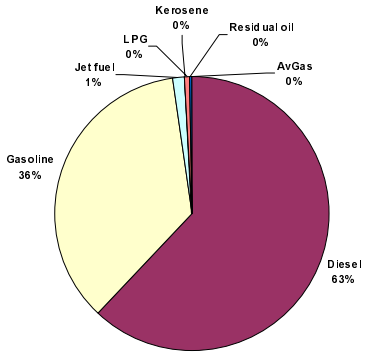


Figure 6.2 Fuel use share per fuel type for domestic transport in 2006

6.1.1 Road transport

As shown in Figure 6.3, the energy use for road transport has generally increased from except from a small fuel consumption decline noted in 2000. The fuel consumption development is due to a slight decreasing trend in the use of gasoline fuels from 1999 onwards combined with a steady growth in the use of diesel. Within sub-sectors, passenger cars represent the most fuel-consuming vehicle category, followed by heavy-duty vehicles, light duty vehicles and 2-wheelers, in decreasing order (Figure 6.4).

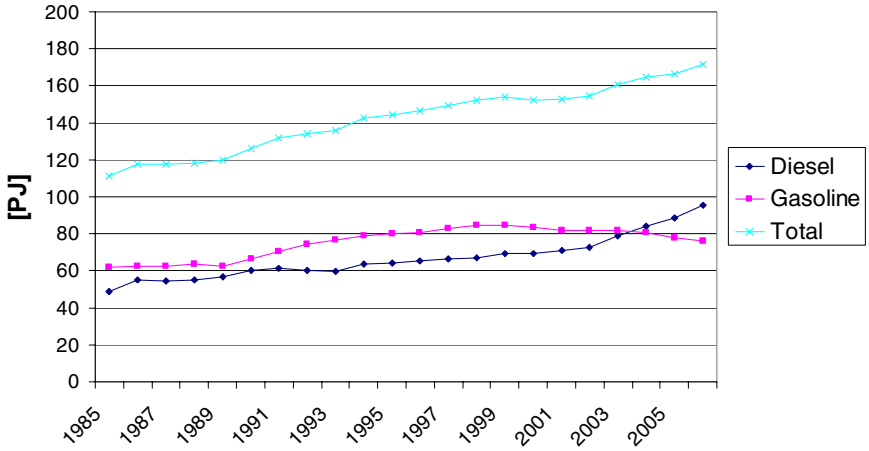


Figure 6.3 Fuel consumption per fuel type and as totals for road transport 1985-2006

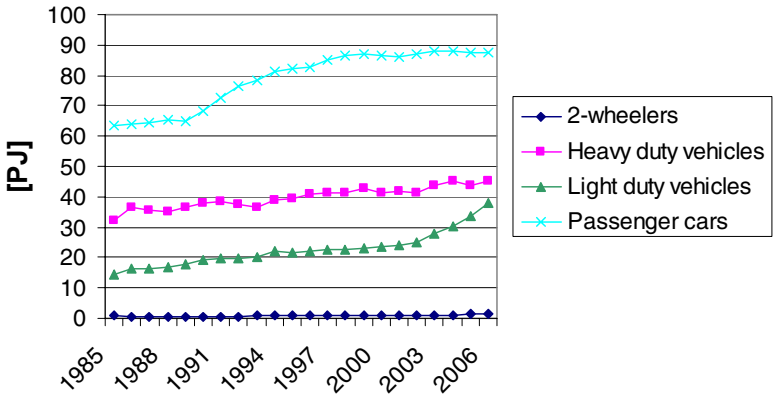


Figure 6.4 Total fuel consumption per vehicle type for road transport 1985-2006

As shown in Figure 6.5, fuel consumption for gasoline passenger cars dominates the overall gasoline consumption trend. The development in diesel fuel consumption in recent years (Figure 6.6) is characterised by increasing fuel consumption for diesel passenger cars and light duty vehicles, while the fuel consumption for trucks and buses (heavy-duty vehicles), since 1999, has fluctuated. The sudden increase in fuel consumption for heavy-duty vehicles in 2003 is, however, significant.

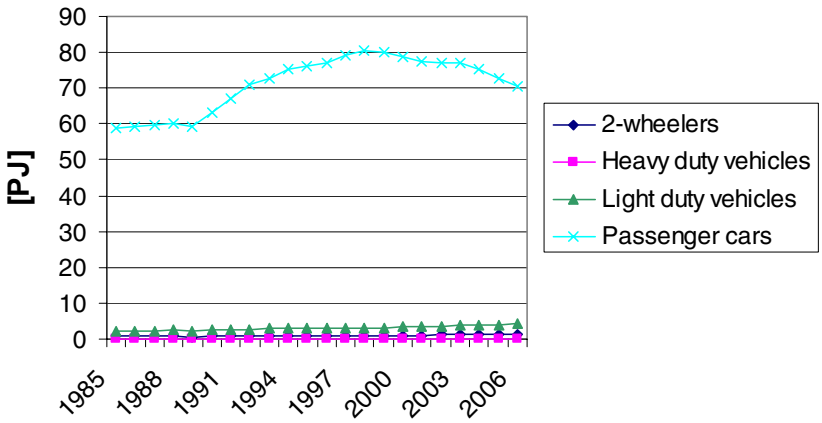


Figure 6.5 Gasoline fuel consumption per vehicle type for road transport 1985-2006

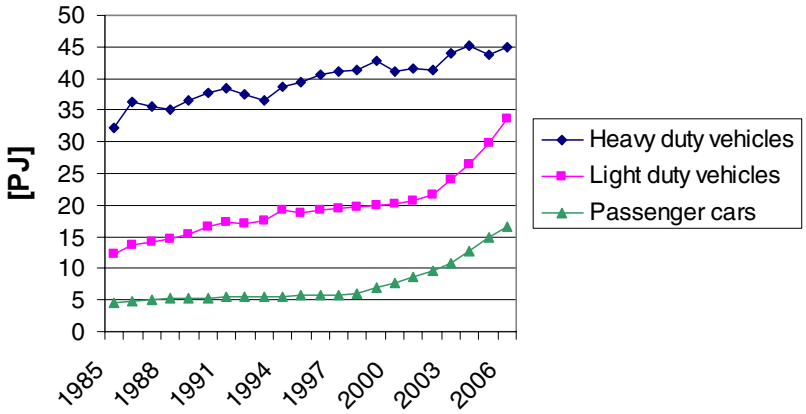


Figure 6.6 Diesel fuel consumption per vehicle type for road transport 1985-2006

In 2006, fuel consumption shares for gasoline passenger cars, heavy-duty vehicles, diesel light duty vehicles, diesel passenger cars and gasoline light duty vehicles were 41, 26, 20, 10 and 2 %, respectively (Figure 6.7).

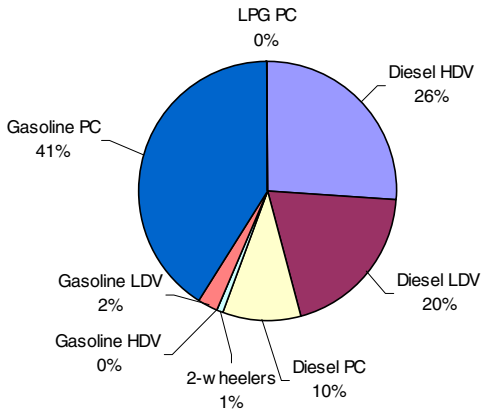


Figure 6.7 Fuel consumption share (PJ) per vehicle type for road transport in 2006

6.1.2 Other mobile sources

It must be noted that the fuel consumption figures behind the Danish inventory for mobile equipment in the agriculture, forestry, industry, household and gardening (residential), and inland waterways (part of navigation) sectors, are less certain than for other mobile sectors. For these types of machinery, the DEA statistical figures do not directly provide fuel consumption information, and fuel consumption totals are sub-

sequently estimated from activity data and fuel consumption factors. For 2006 no new stock information has been gathered for recreational craft, and thus the 2004 total stock information is repeated for this year.

As seen in Figure 6.8, classified according to CRF the most important sectors are Agriculture/forestry/fisheries (1A4c), Industry-other (mobile machinery part of 1A2f) and Navigation (1A3d). Minor fuel consuming sectors are Civil Aviation (1A3a), Railways (1A3c), Other (military mobile fuel consumption: 1A5) and Residential (1A4b).

The 1985-2006 time-series are shown per fuel type in Figures 6.9-6.12 for diesel, gasoline and jet fuel, respectively.

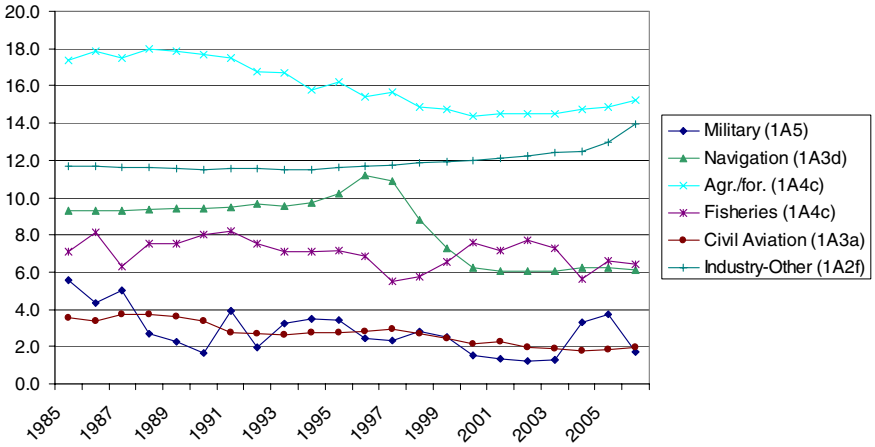


Figure 6.8 Total fuel consumption in CRF sectors for other mobile sources 1985-2006

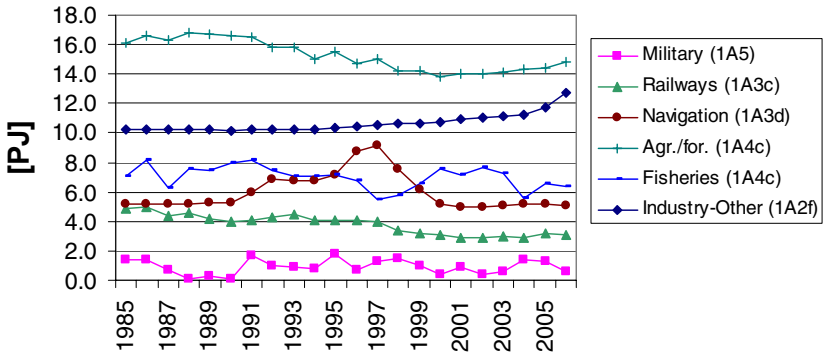


Figure 6.9 Diesel fuel consumption in CRF sectors for other mobile sources 1985-2006

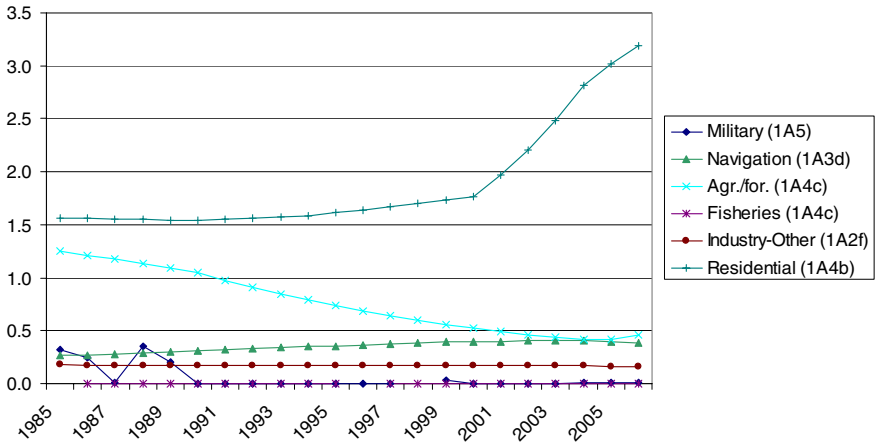


Figure 6.10 Gasoline fuel consumption in CRF sectors for other mobile source 1985-2006

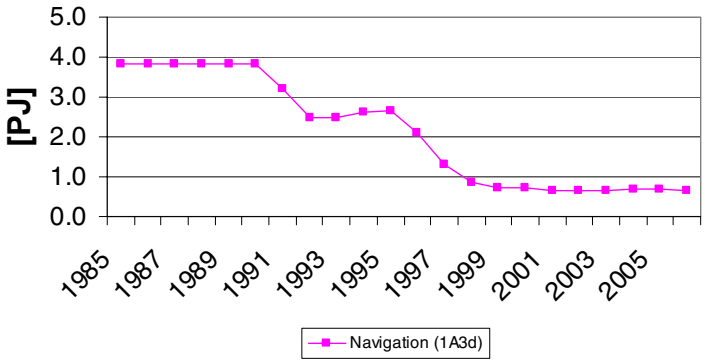


Figure 6.11 Residual oil fuel consumption in CRF sectors for other mobile sources 1985-2006

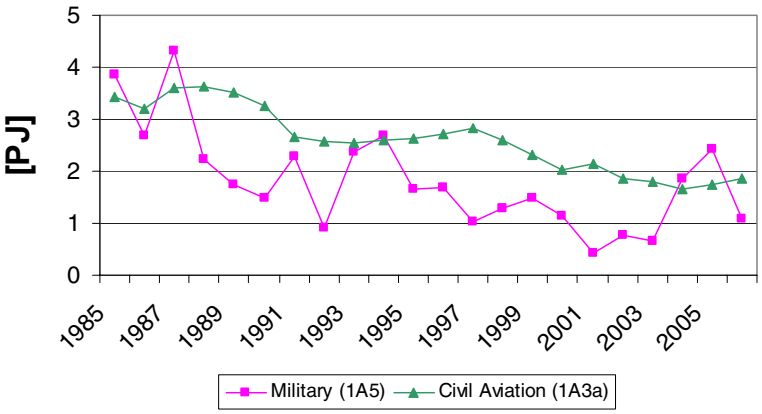


Figure 6.12 Jet fuel consumption in CRF sectors for other mobile sources 1985-2006

In terms of diesel, the fuel consumption decreases for agricultural machines until 2000, due to fewer numbers of tractors and harvesters. After that, the increase in the engine sizes of new sold machines has more than outbalanced the trend towards smaller total stock numbers. The fuel consumption for industry has increased from the beginning of the 1990's, due to an increase in the activities for construction machinery. The fuel consumption increase has been very pronounced in 2005 and 2006. For

fisheries, the development in fuel consumption reflects the activities in this sector.

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

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

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

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

6.1.3 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.

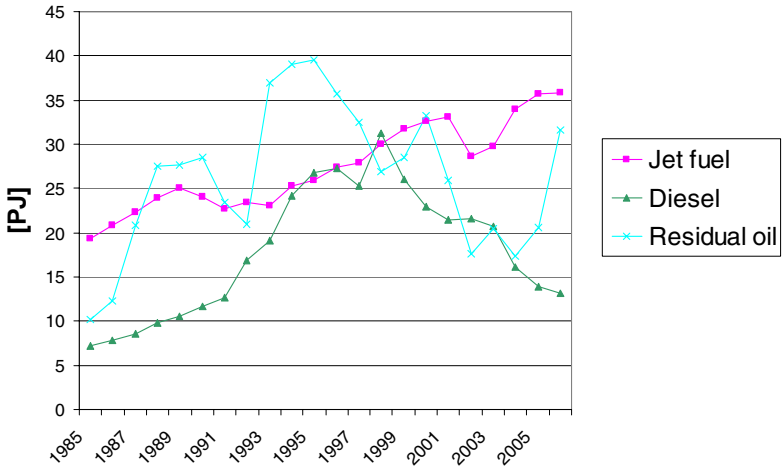


Figure 6.13 Bunker fuel use 1985-2006

6.2 Emissions of CO_2, CH_4 and N_2O

In Table 6.12 the CO_2, CH_4 and N_2O emissions for road transport and other mobile sources are shown for 2006 in CRF sectors. The emission figures in time-series 1990-2006 are given in Annex 13 (CRF format) and are shown for 1990 and 2006 in Annex 14 (CollectER format).

From 1990 to 2006 the road transport emissions of CO_2 and N_2O have increased by 36 and 29 %, respectively, whereas the emissions of CH_4 have decreased by 51 % (from Figures 6.14-6.16). From 1990 to 2006 the other mobile CO_2 emissions have decreased by 10 %, (from Figures 6.18-6.20).

Table 6.2 Emissions of CO_2, CH_4 and N_2O in 2006 for road transport and other mobile sources

CRF Sector	CH_4 [tons]	CO_2 [ktons]	N_2O [tons]
Industry-Other (1A2f)	44	1021	43
Civil Aviation (1A3a)	6	141	8
Railways (1A3c)	9	227	6
Navigation (1A3d)	32	455	26
Residential (1A4b)	233	233	4
Ag./for./fish. (1A4c)	94	1599	77
Military (1A5)	6	126	4
Total other mobile	425	3802	168
Road (1A3b)	1290	12594	402
Total mobile	1715	16397	570

6.2.1 Road transport

CO_2 emissions directly rely on fuel consumption, and in this way, the development in the emission reflects the trend in fuel consumption. As shown in Figure 6.14, 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 2006, the respective emission shares were 51, 26, 22 and 1 %, respectively (Figure 6.17).

The majority of CH_4 emissions from road transport come from gasoline passenger cars (Figure 6.15). The emission drop from 1992 onwards is

explained by the penetration of catalyst cars into the Danish fleet. The 2006 emission shares for CH_4 were 52, 27, 14 and 7 % for passenger cars, heavy-duty vehicles, 2-wheelers and light-duty vehicles, respectively (Figure 6.17).

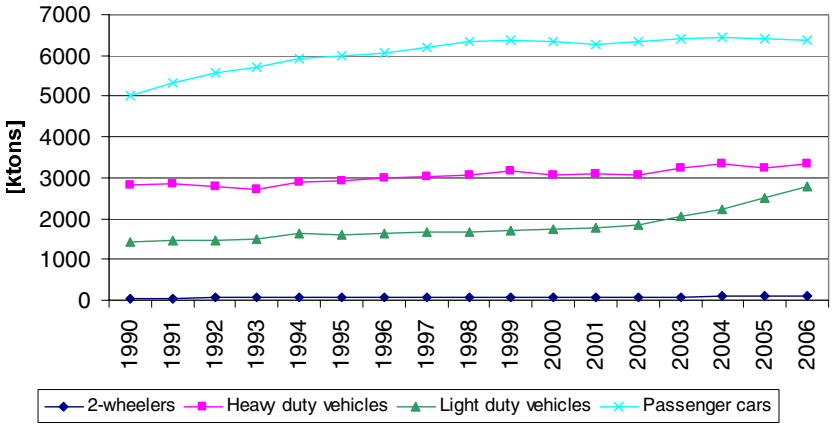


Figure 6.14 CO_2 emissions (k-tonnes) per vehicle type for road transport 1990-2006

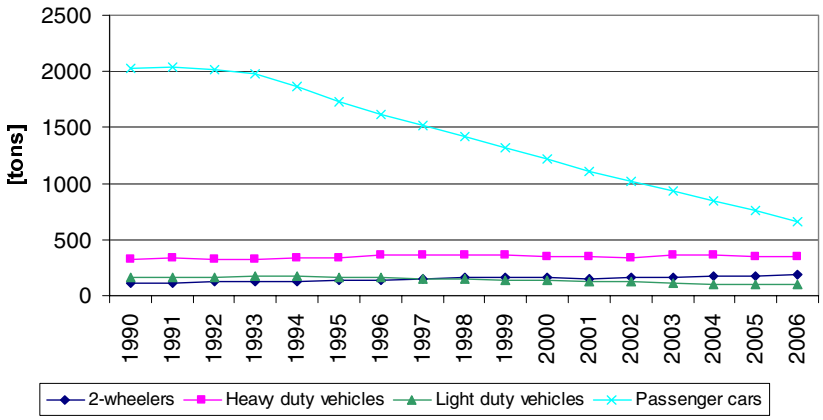


Figure 6.15 CH_4 emissions (tonnes) per vehicle type for road transport 1990-2006

An undesirable environmental side effect of the introduction of catalyst cars is the increase in the emissions of N_2O from the first generation of catalyst cars (Euro 1) compared to conventional cars. The emission factors for later catalytic converter technologies are considerably lower than the ones for Euro 1, thus causing the emissions to decrease from 1998 onwards (Figure 6.16). In 2006, emission shares for passenger cars, light and heavy-duty vehicles were 48, 34 and 18 %, of the total road transport N_2O, respectively (Figure 6.17).

Referring to the third IPCC assessment report, 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 the CO_2 shares.

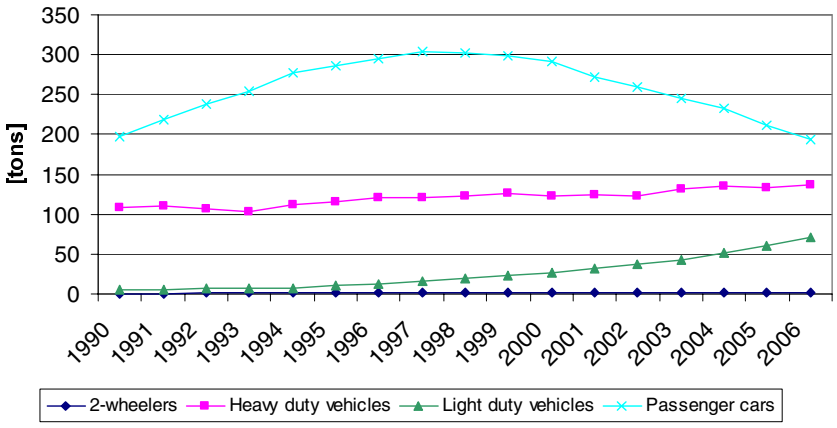


Figure 6.16 N_2O emissions (tonnes) per vehicle type for road transport 1990-2006

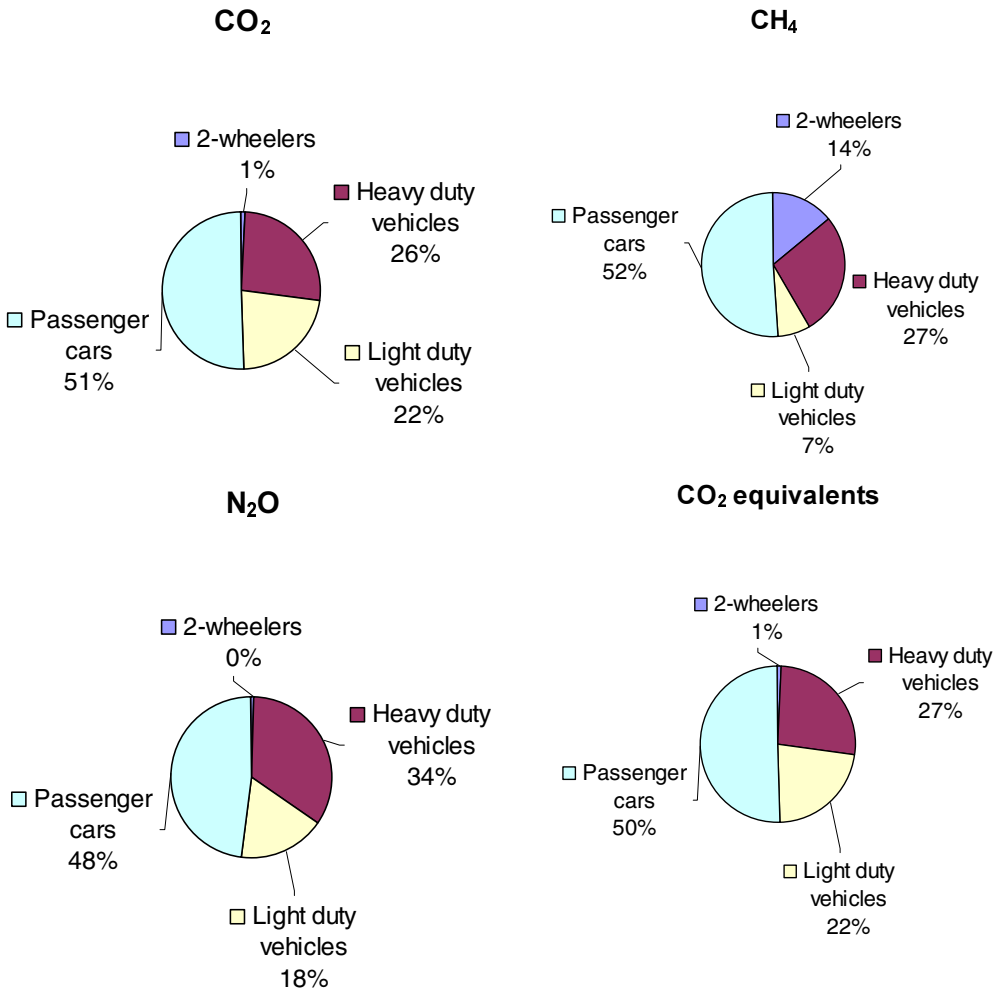


Figure 6.17 CO_2, CH_4 and N_2O emission shares and GHG equivalent emission distribution for road transport in 2006

6.2.2 Other mobile sources

For other mobile sources, the highest CO_2 emissions in 2006 come from Agriculture/forestry/fisheries (1A4c), Industry-other (1A2f), Navigation (1A3d), with shares of 42, 27 and 12 %, respectively (Figure 6.21). The 1990-2006 emission trend is directly related to the fuel-use development in the same time-period. Minor CO_2 emission contributors are sectors such as Residential (1A4b), Railways (1A3c), Civil Aviation (1A3a) and

Military (1A5). In 2006, the CO_2 emission shares for these sectors were 6, 6, 4 and 3 %, respectively (Figure 6.21).

For CH_4, far the most important sector is Residential (1A4b), see Figure 6.21. The emission share of 56 % in 2006 is due to a relatively large gasoline fuel consumption for gardening machinery. The 2006 emission shares for Agriculture/forestry/fisheries (1A4c), Industry (1A2f) and Navigation (1A3d) are 22, 10 and 8 %, respectively, whereas the remaining sectors have emission shares of 2 % or less.

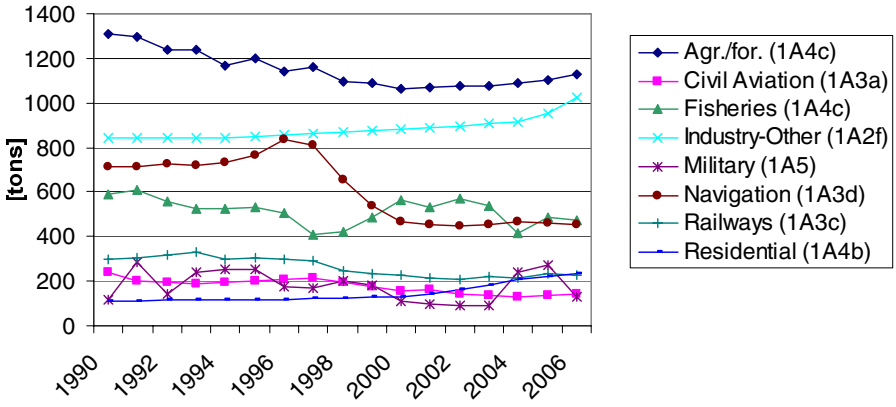


Figure 6.18 CO_2 emissions (k-tonnes) in CRF sectors for other mobile sources 1990-2006

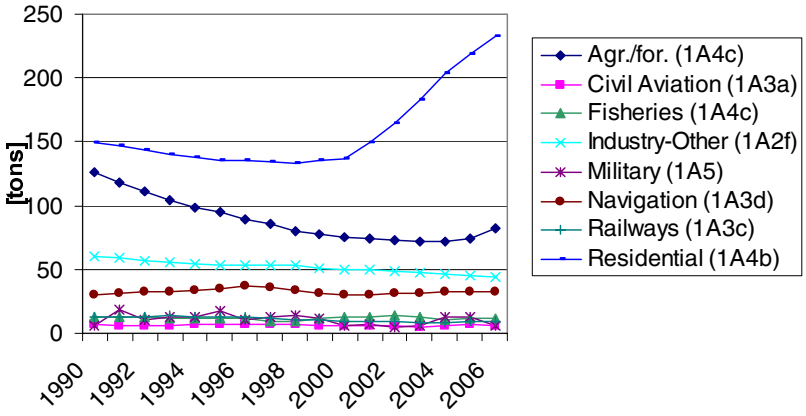


Figure 6.19 CH_4 emissions (tonnes) in CRF sectors for other mobile sources 1990-2006

For N_2O, the emission trend in sub-sectors is the same as for fuel consumption and CO_2 emissions (Figure 6.20).

As for road transport, CO_2 alone contributes with by far the most CO_2 emission equivalents in the case of other mobile sources, and per sector the CO_2 emission equivalent shares are almost the same as those for CO_2, itself (Figure 6.21).

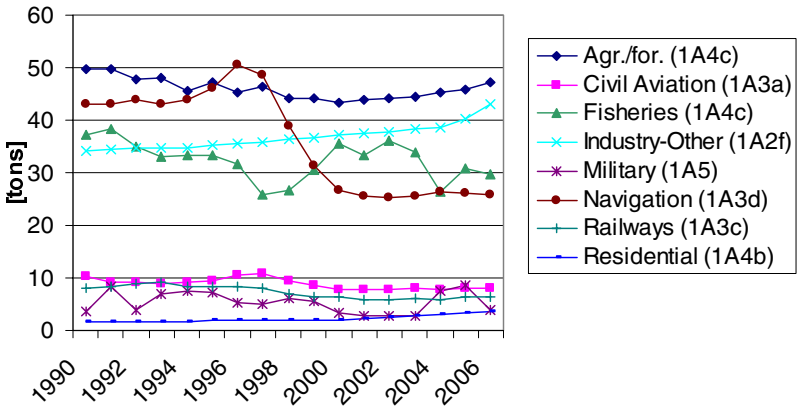


Figure 6.20 N_2O emissions (tonnes) in CRF sectors for other mobile sources 1990-2006

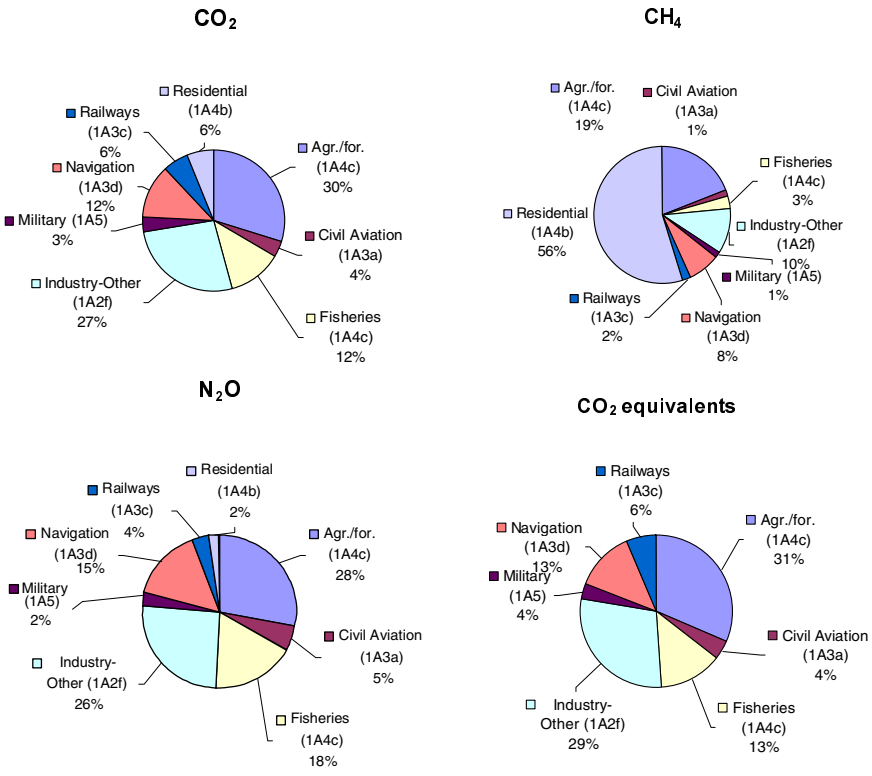


Figure 6.21 CO_2, CH_4 and N_2O emission shares and GHG equivalent emission distribution for other mobile sources in 2006

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

In Table 6.3 the SO_2, NO_X, NMVOC, CO NH_3, TSP, PM_{10} and $PM_{2.5}$ emissions for road transport and other mobile sources are shown for 2006 in NFR sectors. For particulate matter (PM; TSP, PM_{10} and $PM_{2.5}$), only the exhaust emission contributions are included in Table 6.3. Non-exhaust TSP, PM_{10} and $PM_{2.5}$ emissions are treated in a separate section below. The emission figures in the time-series 1985-2006 are given in Annex 15 (NFR format) and are shown for 2006 in Annex 14 (CollectER format).

From 1985 to 2006, the road transport emissions of SO_2, NO_X, NMVOC, CO and PM (all size fractions) have decreased by 99, 28, 71, 69 and 30 %, respectively (Figures 6.22-6.26), whereas the NH_3 emissions have increased by 3065 % during the same time period (Figure 6.27).

For other mobile sources, the emission changes for SO_2, NO_X, NMVOC, CO and PM (all size fractions) are -88, -14, -12, -9 and -56 %, respectively (Figures 6.29-6.33). The NH_3 emissions have increased by 8 % during the same time period (Figure 6.34).

Table 6.3 Emissions of SO_2, NO_X, NMVOC, CO NH_3, TSP, PM_{10} and $PM_{2.5}$ in 2006 for road transport and other mobile sources

NFR ID	SO_2 [tons]	NO_X [tons]	NMVOC [tons]	CO [tons]	NH_3 [tons]	TSP [tons]	PM_{10} [tons]	$PM_{2.5}$ [tons]
Industry-Other (1A2f)	30	10807	1583	7515	2	991	991	991
Civil Aviation (1A3a)	45	596	155	838	0	3	3	3
Railways (1A3c)	1	3542	230	626	1	120	120	120
Navigation (1A3d)	1089	7436	1195	7192	0	291	289	288
Residential (1A4b)	1	275	8037	87744	0	79	79	79
Ag./for./fish. (1A4c)	632	20199	2541	16976	3	1086	1084	1084
Military (1A5)	26	619	56	391	0	21	21	21
Total other mobile	1824	43475	13796	121282	7	2590	2587	2585
Road (1A3b)	79	66993	23171	171521	1951	3101	3101	3101
Total mobile	1904	110468	36967	292803	1958	5691	5688	5687

6.3.1 Road transport

The step-wise lowering of the sulphur content in diesel fuel has given rise to a substantial decrease in the road transport emissions of SO_2 (Figure 6.22). In 1999, the sulphur content was reduced from 500 ppm to 50 ppm (reaching gasoline levels), and for both gasoline and diesel the sulphur content was reduced to 10 ppm in 2005. Since Danish diesel and gasoline fuels have the same sulphur percentages, at present, the 2006 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: 50, 27, 22 and 1 %, respectively (Figure 6.28).

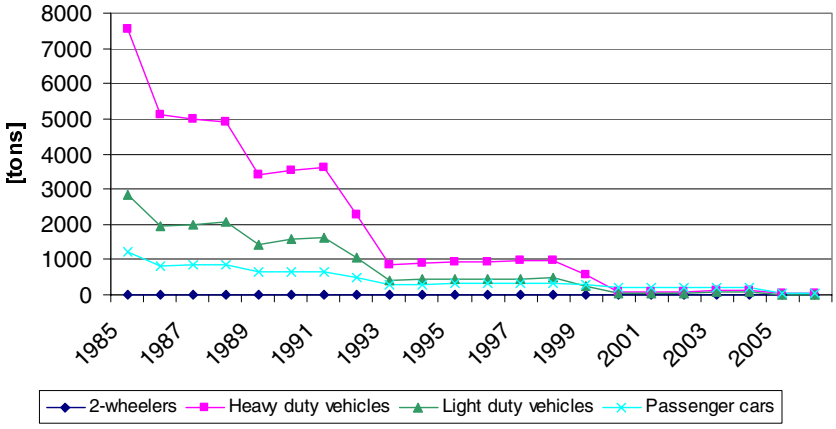


Figure 6.22 SO_2 emissions (tonnes) per vehicle type for road transport 1985-2006

Historically, the emission totals of NMVOC and CO have been very dominated by the contributions coming from private cars, as shown in Figures 6.24-6.25. However, the NMVOC and CO (and NO_X) emissions from this vehicle type have shown a steady decreasing tendency since

the introduction of private catalyst cars in 1990 (EURO I) and the introduction of even more emission-efficient EURO II and III private cars (introduced in 1997 and 2001, respectively).

In the case of NO_X the real traffic emissions for heavy duty vehicles do not follow the reductions as intended by the EU emission legislation. This is due to the so-called engine cycle-beating effect. Outside the legislative test cycle stationary measurement points, the electronic engine control for heavy duty Euro II and III engines switches to a fuel efficient engine running mode, thus leading to increasing NO_X emissions (Figure 6.23).

Exhaust particulate emissions from road transportation vehicles are well below $PM_{2.5}$. The emissions from light- and heavy-duty vehicles have significantly decreased since the mid-1990s due to gradually stricter EURO emission standards. The environmental benefit of introducing diesel private cars with lower particulate emissions since 1990 is more or less outbalanced by an increase in sales of new vehicles in recent years (Figure 6.26).

An undesirable environmental side effect of the introduction of catalyst cars is the increase in the emissions of NH_3 from the first two generations of catalyst cars (Euro 1 and 2) compared to conventional cars. The emission factors for later catalytic converter technologies are considerably lower than the ones for Euro 1 and 2, thus causing the emissions to decrease from 2001 onwards (Figure 6.24).

The 2006 emission shares for heavy-duty vehicles, passenger cars, light-duty vehicles and 2-wheelers for NO_X (54, 29, 17 and 0 %), NMVOC (7, 63, 13 and 17 %), CO (5, 76, 8, 11 %), PM (32, 45, 21 and 2 %) and NH_3 (1, 95, 4 and 0 %), are also shown in Figure 6.28.

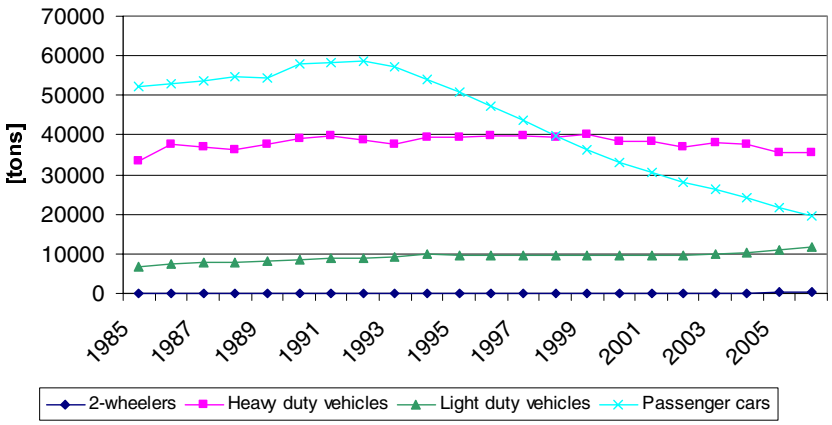


Figure 6.23 NO_X emissions (tonnes) per vehicle type for road transport 1985-2006

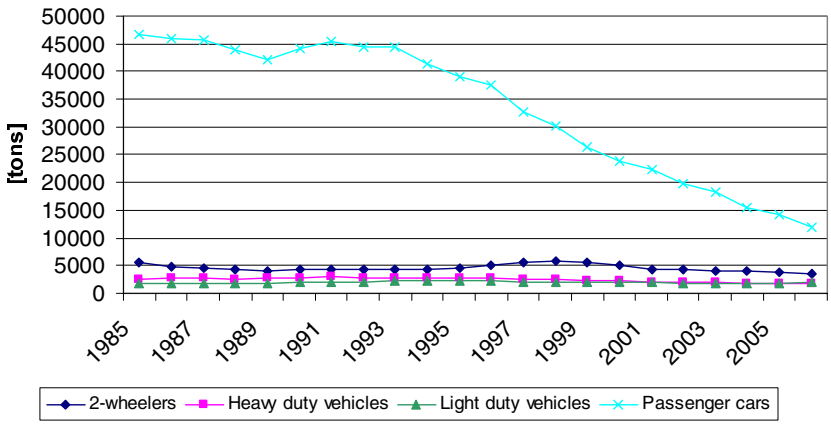


Figure 6.24 NMVOC emissions (tonnes) per vehicle type for road transport 1985-2006

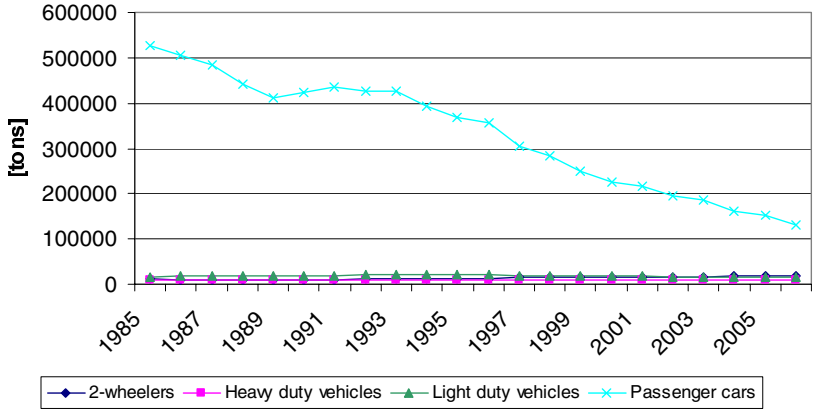


Figure 6.25 CO emissions (tonnes) per vehicle type for road transport 1985-2006

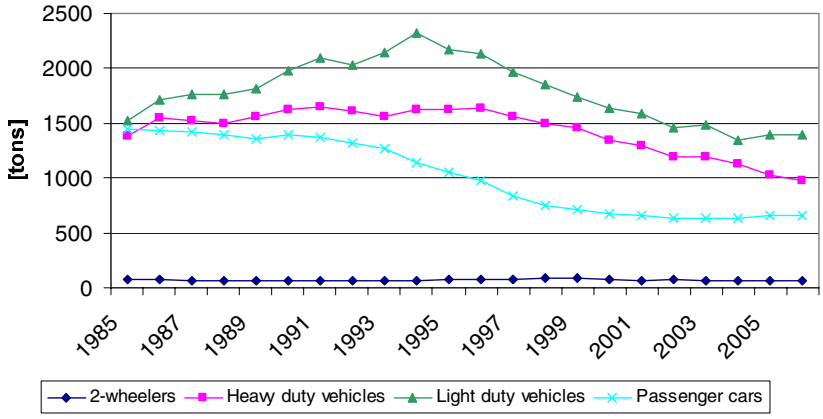


Figure 6.26 PM emissions (tonnes) per vehicle type for road transport 1985-2006

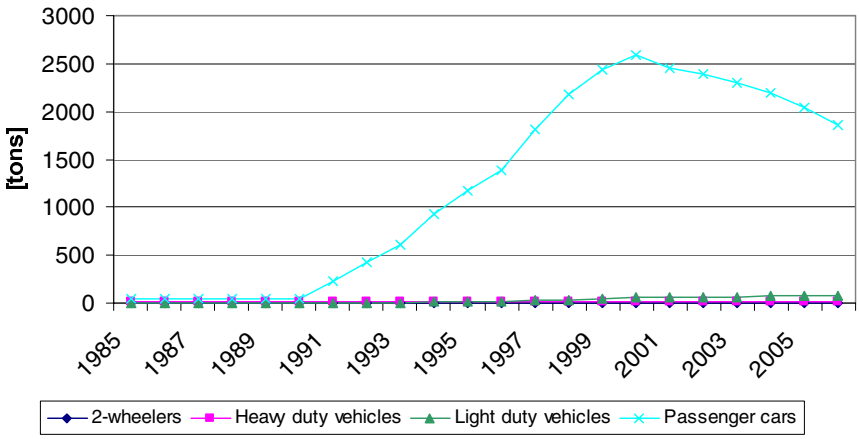


Figure 6.27 NH_3 emissions (tonnes) per vehicle type for road transport 1985-2006

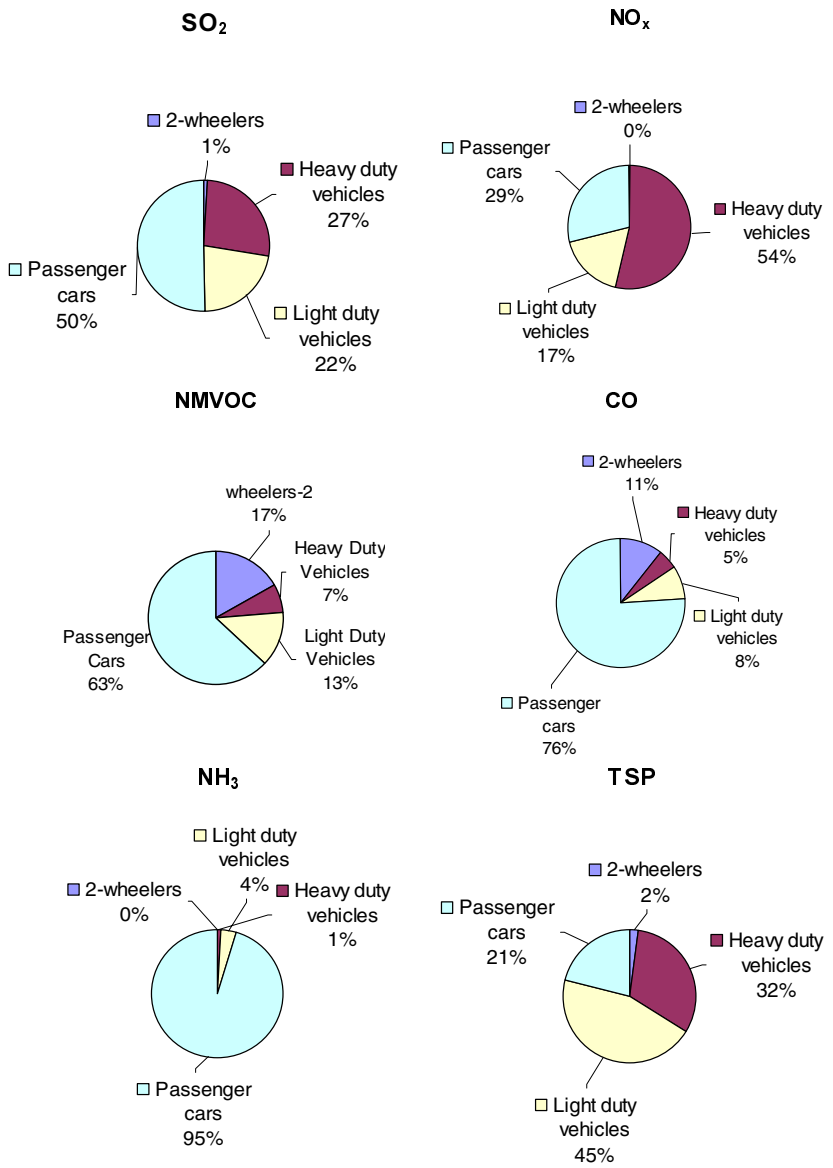


Figure 6.28 SO_2, NO_X, NMVOC, CO, NH_3 and PM emission shares per vehicle type for road transport in 2006

6.3.2 Other mobile sources

For SO_2 the trends in the Navigation (1A3d) emissions shown in Figure 6.29 mainly follow the development of the heavy fuel consumption (Figure 6.11). Though, from 1993 to 1995 relatively higher contents of sulphur in the fuel (estimated from sales) cause a significant increase in the emissions of SO_2. The SO_2 emissions for Fisheries (1A4c) correspond with the development in the consumption of marine gas oil. The main explanation for the development of the SO_2 emission curves for Railways (1A3c) and non-road machinery in Agriculture/forestry (1A4c) and Industry (1A2f), are the stepwise sulphur content reductions for diesel used by machinery in these sectors.

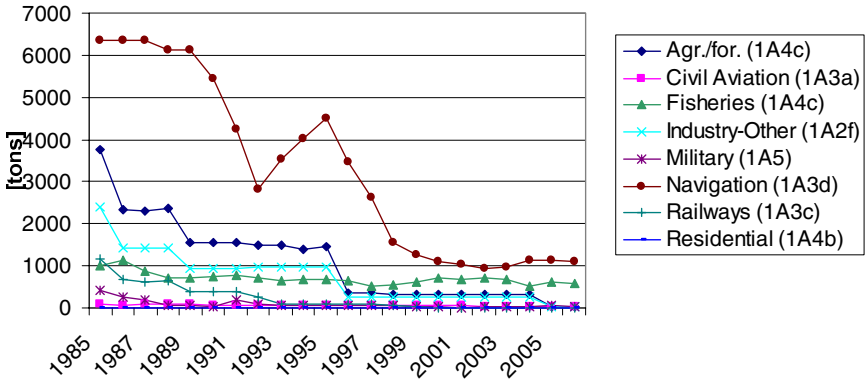


Figure 6.29 SO_2 emissions (k-tonnes) in NFR sectors for other mobile sources 1985-2006

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

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 6.28. The 2005 emission shares are 47, 25, 17 and 8 %, respectively (Figure 6.31). Minor emissions come from the sectors, Civil Aviation (1A3a), Military (1A5) and Residential (1A4b).

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

The emission development for industry NO_X is the product of a slight fuel-use increase from 1985 to 2006 and a development in emission factors as explained for agricultural machinery. For railways, the gradual shift towards electrification explains the declining trend in diesel fuel use and NO_X emissions for this transport sector until 2001.

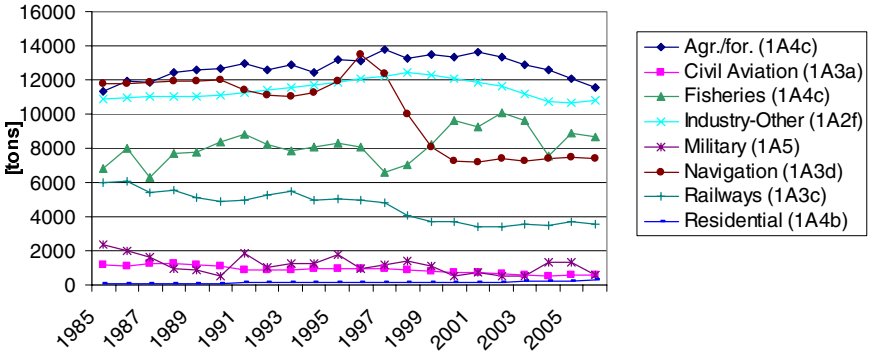


Figure 6.30 NO_X emissions (tonnes) in NFR sectors for other mobile sources 1985-2006

The 1985-2006 time-series of NMVOC and CO emissions are shown in the Figures 6.29 and 6.30 for other mobile sources. The 2006 sector emission shares are shown in Figure 6.35. For NMVOC, the most important sectors are Residential (1A4b), Agriculture/forestry/fisheries (1A4c), Industry (1A2f) and Navigation (1A3d), with 2006 emission shares of 58, 19, 11 and 9 %, respectively. The same four sectors also contribute with most of the CO emissions in the same consecutive order; the emission shares are 72, 14, 6 and 6 %, respectively. Minor NMVOC and CO emissions come from Railways (1A3c), Civil Aviation (1A3a) and Military (1A5).

For NMVOC and CO, the significant emission increases for the residential sector after 2000 are due to the increased number of gasoline working machines. Improved NMVOC emission factors for diesel machinery in agriculture and gasoline equipment in forestry (chain saws) are the most important explanations for the NMVOC emission decline in the Agriculture/forestry/fisheries sector. This explanation also applies for the industrial sector, which is dominated by diesel-fuelled machinery. From 1997 onwards, the NMVOC emissions from Navigation decrease due to the gradually phase-out of the 2-stroke engine technology for recreational craft. The main reason for the significant 1985-2005 CO emission decrease for Agriculture/forestry/fisheries is the phasing out of gasoline tractors.

As shown in Figure 6.35, for other mobile sources the largest TSP contributors in 2006 are Agriculture/forestry/fisheries (1A4c), Industry (1A2f) and Navigation (1A3d), with emission shares of 42, 38 and 11 %, respectively. The remaining sectors: Railways (1A3c), Civil aviation (1A3a), Military (1A5) and Residential (1A4b) represent only minor emission sources.

The 1985-2006 TSP emissions for navigation and fisheries are determined by the fuel use fluctuations in these years, and the development of the emission factors, which to a major extent is a function of the fuel sulphur content. The emission development for Agriculture/forestry is determined by the generally decreasing total diesel fuel use and gradually reducing emission factors over the time period.

The TSP emission development for industrial non-road machinery is the product of a slight fuel use increase from 1985 to 2006 and a development in emission factors, as explained for agricultural machinery. The TSP emission explanations for railways are the same as for NO_x (Figure 6.30).

The amounts of NH_3 emissions calculated for other mobile sources are very small. The largest emission sources are Agriculture/forestry-/fisheries (1A4c), Industry (1A2f) and Railways (1A3c), with emission shares of 44, 34 and 8 %, respectively.

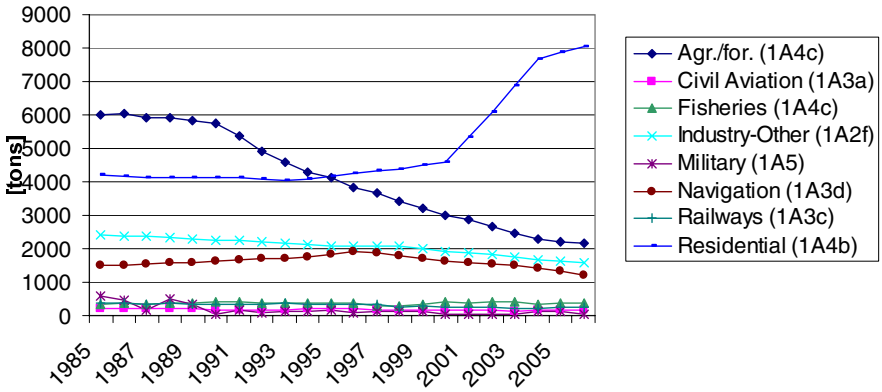


Figure 6.31 NMVOC emissions (tonnes) in NFR sectors for other mobile sources 1985-2006

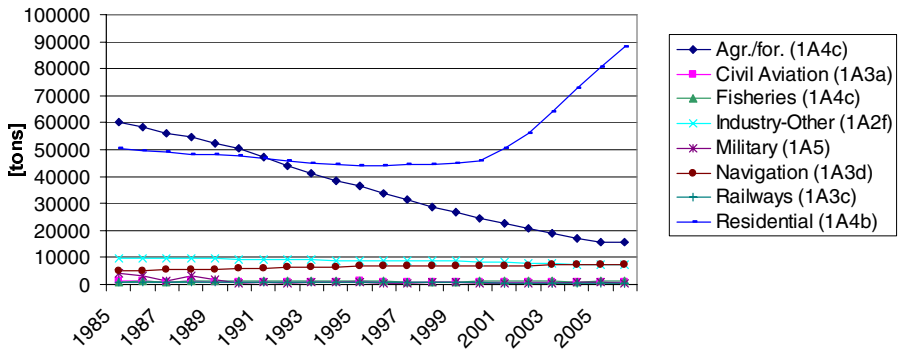


Figure 6.32 CO emissions (tonnes) in NFR sectors for other mobile sources 1985-2006

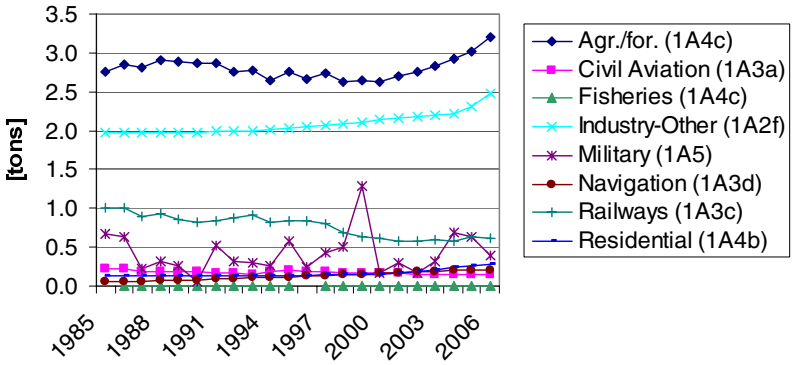


Figure 6.33 NH_3 emissions (tonnes) in NFR sectors for other mobile sources 1985-2006

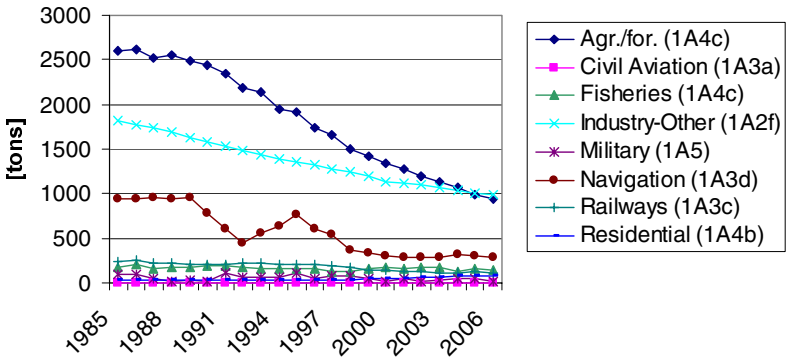


Figure 6.34 TSP emissions (tonnes) in NFR sectors for other mobile sources 1985-2006

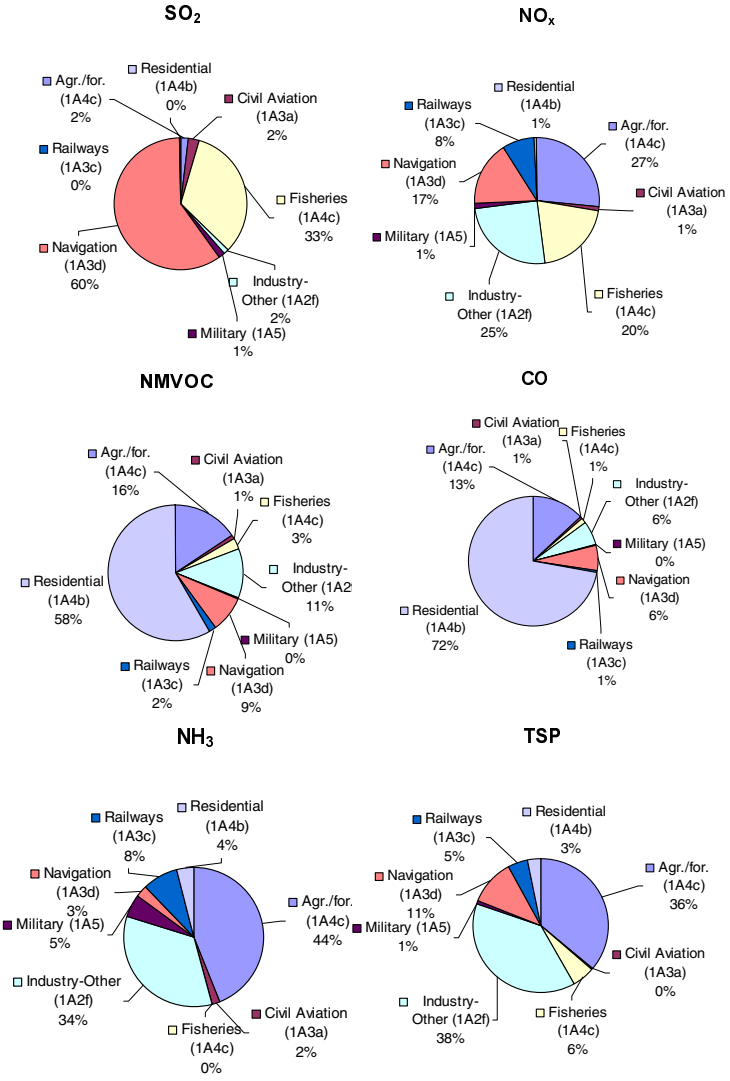


Figure 6.35 SO_2, NO_X, NMVOC, CO, NH_3 and PM emission shares per vehicle type for other mobile sources in 2006

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

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

In Table 6.4, the non-exhaust TSP, PM_{10} and $PM_{2.5}$ emissions for road transport are shown for 2006 in NFR sectors. The activity data, emission factors are also shown in Annex 14.

Table 6.4 Emissions of TSP, PM_{10} and $PM_{2.5}$ in 2006 from road transport and other mobile sources

NFR Sector	TSP [tonnes]	PM_{10} [tonnes]	$PM_{2.5}$ [tonnes]
Road brake wear	623	611	243
Road tyre wear	957	574	402
Road abrasion	1083	542	292
Total Road non-exhaust	2663	1726	937

The respective source category distributions for TSP, PM_{10} and $PM_{2.5}$ emissions are identical for each of the non-exhaust emission type's brake wear, tyre wear and road abrasion, and, hence, only the PM_{10} distributions are shown in Figure 6.36. For brake and tyre wear, passenger cars caused the highest emissions in 2006, followed by light-duty vehicles, trucks, buses and 2-wheelers. Trucks cause higher road abrasion emissions than light-duty vehicles, but apart from this, the size order of emission sources is the same as for brake and tyre wear.

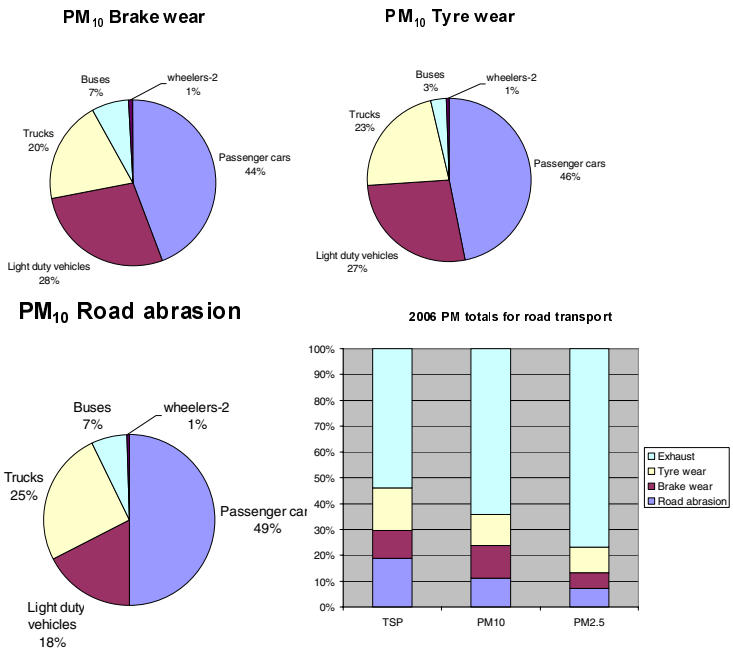


Figure 6.36 Brake and tyre wear and road abrasion PM_{10} emission shares and PM exhaust/non-exhaust distributions for road traffic in 2006

Figure 6.36 also shows the exhaust/non-exhaust distribution of the total particulate emissions from road transport, for each of the size classes TSP, PM_{10} and $PM_{2.5}$. The exhaust emission shares of total road transport TSP, PM_{10} and $PM_{2.5}$ are 54, 64 and 77 %, respectively, in 2006. For brake and tyre wear and road abrasion the TSP shares are 11, 17 and 19 %, respectively. The same three sources have PM_{10} shares of 13, 12 and 11 %, respectively, and $PM_{2.5}$ shares of 6, 10 and 7 %, 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.

6.5 Heavy metals

In Table 6.5, the heavy metal emissions for road transport and other mobile sources are shown for 2006 in NFR sectors. The emission figures in the time-series 1990-2006 are given in Annex 15 (NFR format) and are shown for 1990 and 2006 in Annex 14 (CollectER format).

Table 6.5 Heavy metal emissions in 2006 for road transport and other mobile sources

NFR Sector	As [kg]	Cd [kg]	Cr [kg]	Cu [kg]	Hg [kg]	Ni [kg]	Pb [kg]	Se [kg]	Zn [kg]
Industry-Other (1A2f)		3	15	513		21	0	3	302
Civil Aviation (1A3a)	0	0	2	76	0	3	1245	0	45
Railways (1A3c)		1	4	122		5		1	72
Navigation (1A3d)	13	2	9	67	5	482	13	26	94
Residential (1A4b)		1	4	124		5	2	1	73
Ag./for./fish. (1A4c)	7	5	24	613	7	35	15	33	431
Military (1A5)	0	0	2	68	0	3	47	0	40
Total other mobile	20	12	59	1583	13	555	1322	64	1056
Road (1A3b)		40	199	6750		278	52	40	3971
Total mobile	20	52	257	8334	13	833	1375	104	5027

The road transport emissions of Cd, Cr, Cu and Zn account for around two thirds of the total for all mobile sources in 2006. No road transport emissions occur for As and 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 contributes with a high emission of Ni (from residual oil), whereas the Se emission comes from agriculture/forestry/fisheries, road transport and navigation, in almost equal shares. The Figures 6.37 and 6.38 show the heavy metal emission distributions into vehicle categories and other mobile sectors, respectively.

The heavy metal emission factors are fuel related, and are taken from the EMEP/CORINAIR guidebook. The emission factors are constant throughout the 1990-2006 periods, except for Pb where national data exists. For road transport, the emission factors for Cd, Cu, Ni, Se and Zn are the same for gasoline and diesel, and hence the emission distributions between vehicle categories are the same as for total fuel consumption contribution. The emission distributions for Cr and Pb are caused by higher emission factors for gasoline than for diesel (Cr), and no diesel related emissions (for Pb).

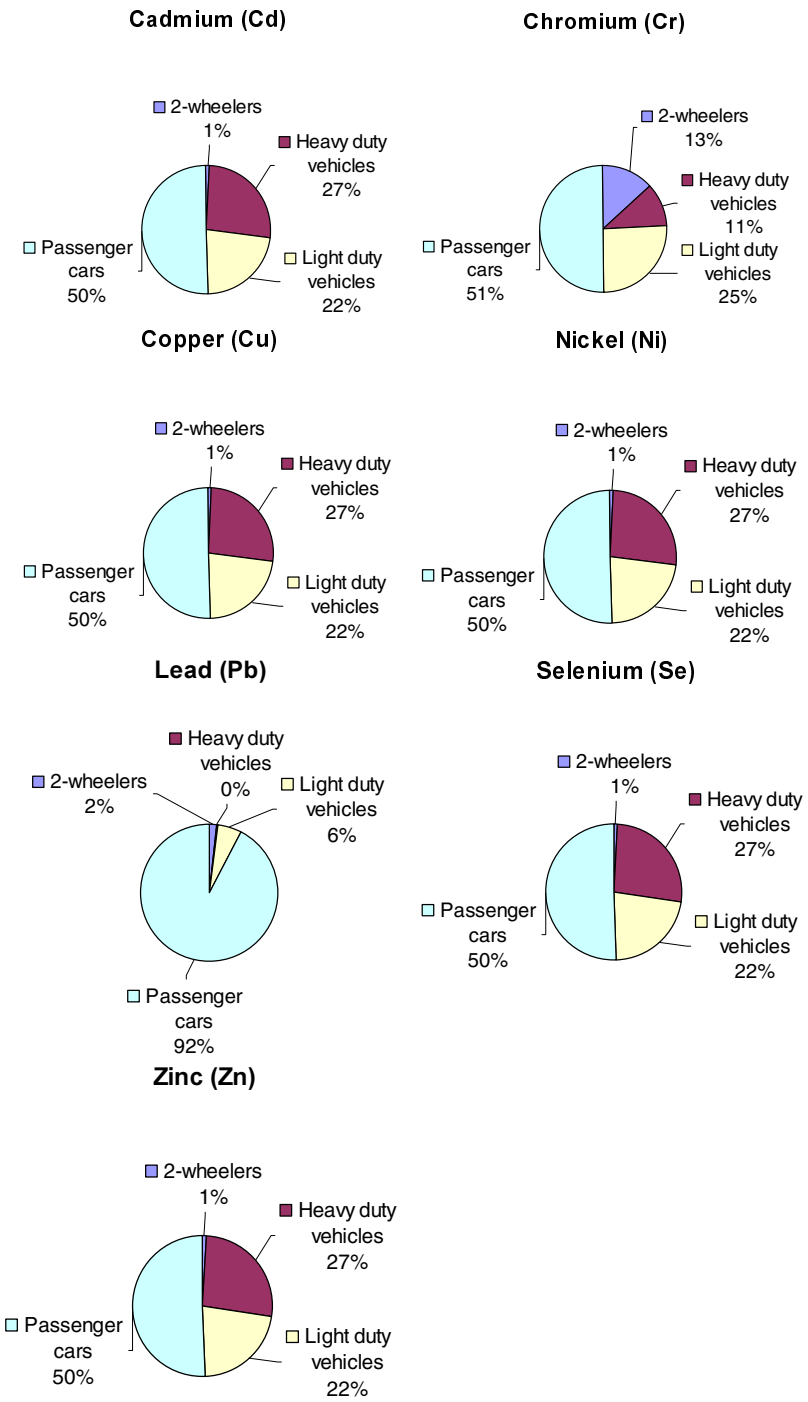


Figure 6.37 Heavy metal emission shares for road transport in 2006

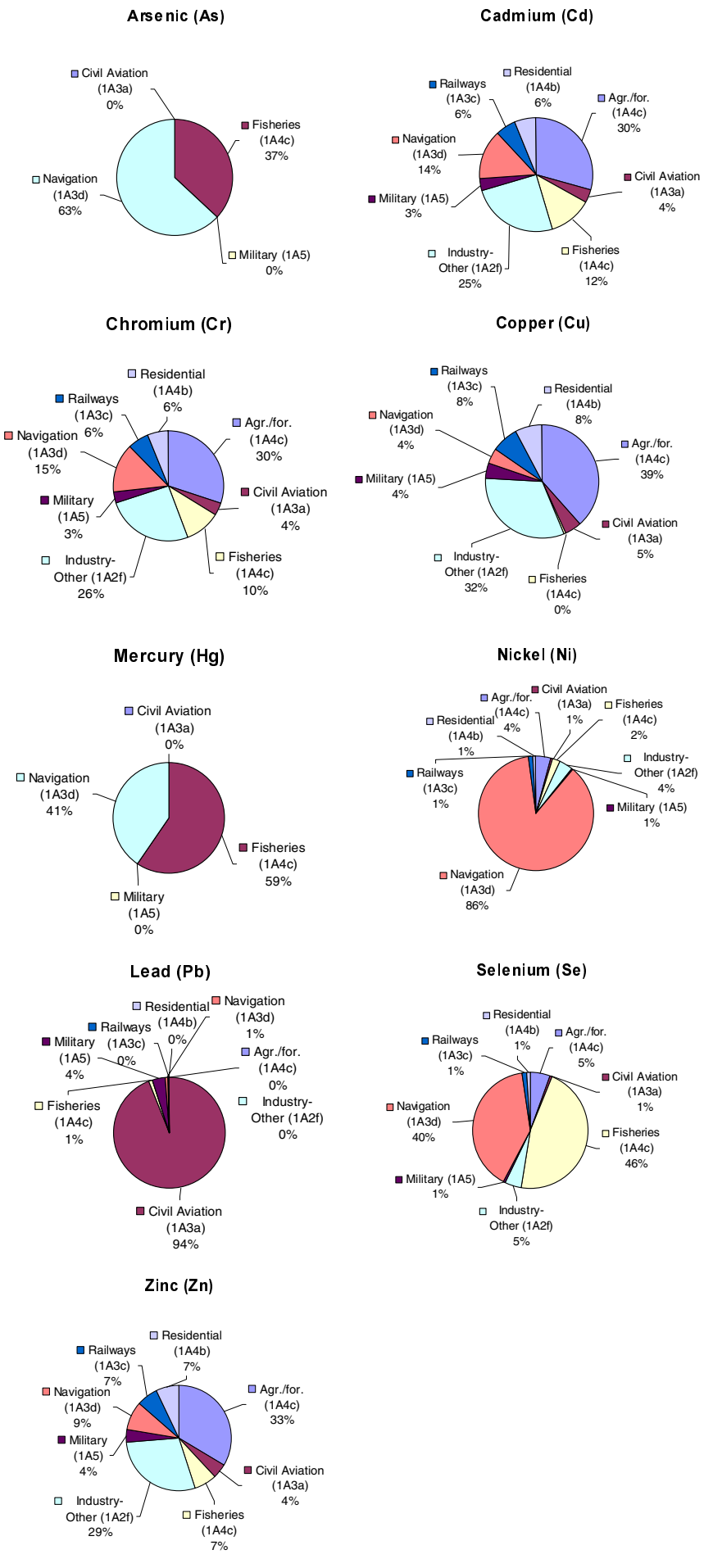


Figure 6.38 Heavy metal emission shares for other mobile sources in 2006

Since the heavy metal emission factors (except Pb) are constant throughout the 1990-2006 periods, as a consequence, the emission development follows the trends in fuel use. The road transport emissions have increased by 36 % from 1990 to 2006. For Pb, however, there has been an almost 100 % emission decline, due to the phasing out of leaded gasoline fuels in 1994 (Figure 6.39).

For other mobile sources, heavy metal emissions generally decrease throughout the time period. The gasoline used by road transportation vehicles and non road engines is the same, and hence a large decrease in Pb emissions (79 %) is calculated for other mobile sources also. In absolute figures, the largest emission declines are noted for the main gasoline fuel consumers, household and gardening equipment and recreational craft. In addition, from 1990 to 2006, gasoline fuel use reached zero for agricultural tractors. Lead is added to aviation gasoline used by piston engine aircraft, causing Civil aviation (1A3a) to be the largest mobile source of Pb emissions (Figure 6.40). The 81 % decline in Ni emissions is due to lower residual fuel use in navigation.

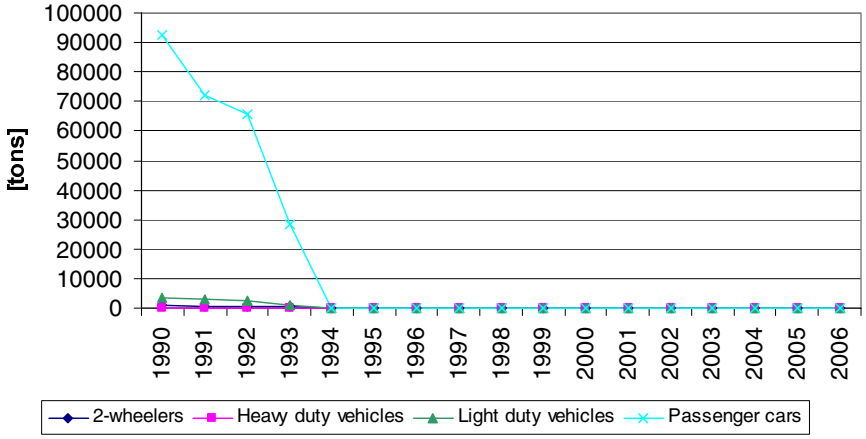


Figure 6.39 Pb emissions (kg) in NFR sectors for road transport 1990-2006

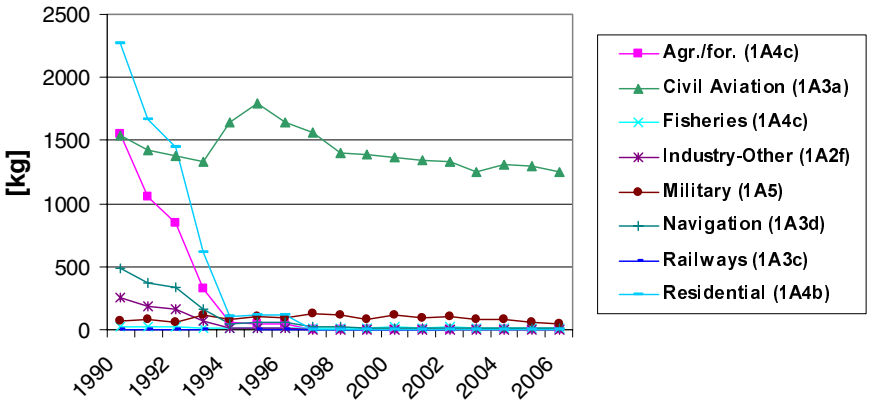


Figure 6.40 Pb emissions (kg) in NFR sectors for other mobile sources 1990-2006

6.6 Dioxin and PAH

In Table 6.6, the dioxin and PAH emissions for road transport and other mobile sources are shown for 2006 in NFR sectors. The emission figures in the time-series 1990-2006 are given in Annex 15 (NFR format) and are shown for 1990 and 2006 in Annex 14 (CollectER format).

Table 6.6 Dioxin and PAH emissions in 2006 for road transport and other mobile sources

NFR ID	Dioxins/ Furans	Flouranthene	Benzo(b) flouranthene	Benzo(k) flouranthene	Benzo(a) pyrene	Benzo(g,h,i) perylene	Indeno (1,2,3-c,d) pyrene
	[g]	[kg]	[kg]	[kg]	[kg]	[kg]	[kg]
Industry-Other (1A2f)	0.01	56	7	6	3	6	3
Civil Aviation (1A3a)	0.00	0	0	0	0	0	0
Railways (1A3c)	0.00	4	1	1	0	0	0
Navigation (1A3d)	0.06	40	3	2	1	7	5
Residential (1A4b)	0.02	14	1	0	0	2	1
Ag./for./fish. (1A4c)	0.09	114	12	9	5	16	12
Military (1A5)	0.00	3	0	0	0	0	0
Total other mobile	0.18	231	24	19	10	32	21
Road (1A3b)	0.19	712	69	78	53	100	58
Total mobile	0.37	942	92	97	63	132	79

For mobile sources, road transport displays the largest emission of dioxins and PAH. The dioxin emission share for road transport is 51 % of all mobile emissions in 2006, whereas Agriculture/forestry/fisheries and Navigation have smaller shares of 24 and 16 %. For the different PAH components, road transport shares are around two thirds or more of total emissions for mobile sources. The remaining emissions almost solely come from Agriculture/forestry-/fisheries, Navigation and Industry with Agriculture/forestry/fisheries as the largest source.

The Figures 6.41 and 6.42 show the dioxin and PAH emission distributions into vehicle categories and other mobile sectors, respectively.

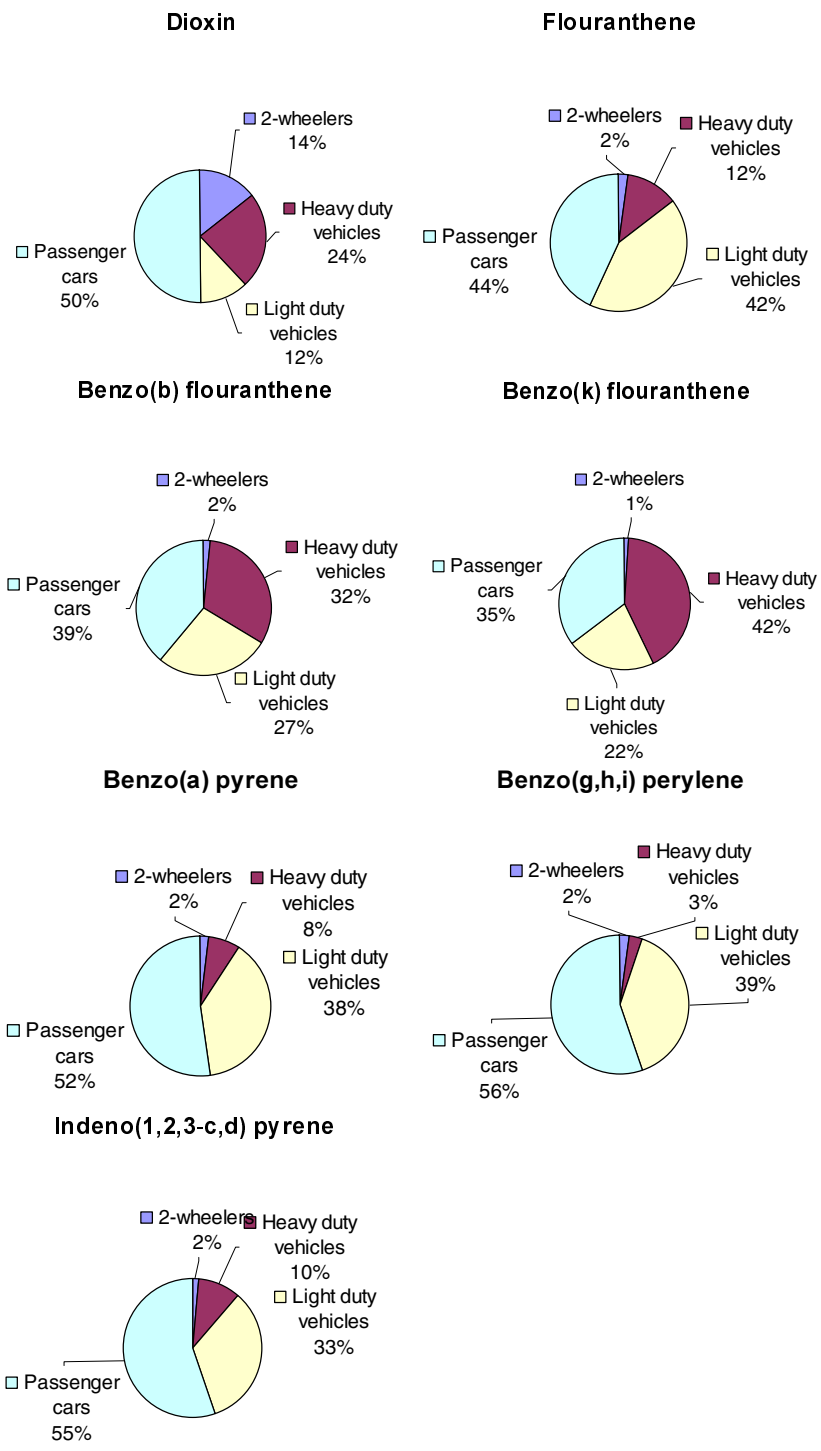


Figure 6.41 Dioxin and PAH emission shares for road transport in 2006

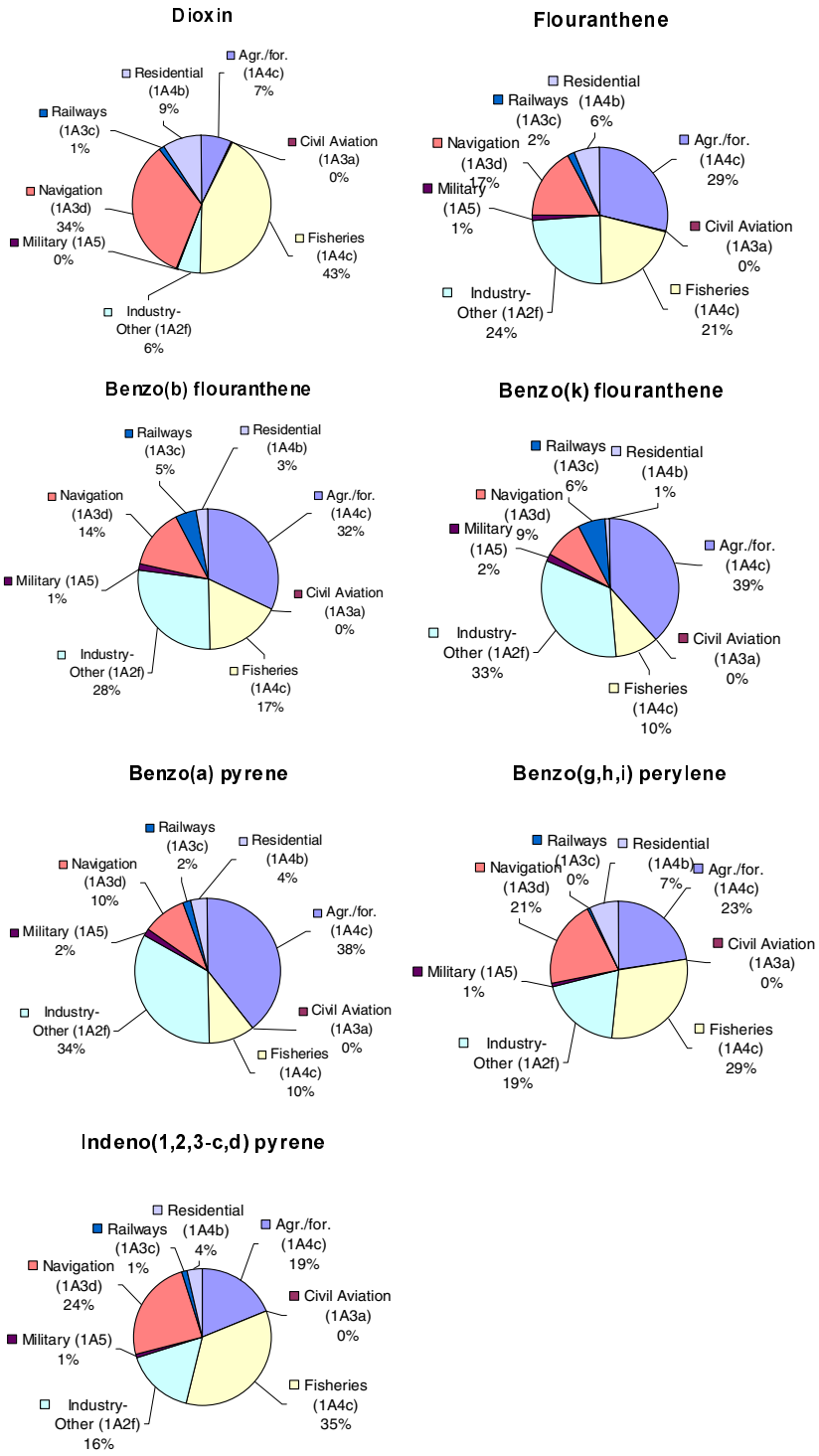


Figure 6.42 Dioxin and PAH emission shares for other mobile sources in 2006

6.7 Bunkers

The most important emissions from bunker fuel use (fuel use for international transport) are SO_2, NO_X and CO_2 (and TSP, not shown). However, compared with the Danish national emission total (all sources), the greenhouse gas emissions from bunkers are small. The bunker emission totals are shown in Table 6.7 for 2006, split into sea transport and civil aviation. All emission figures in the 1985-2006 time-series are given in Annex 16 (NFR format). In Annex 14, the emissions are also given in CollectER format for 2006.

The most important emissions from bunker fuel consumption (fuel consumption for international transport) are SO_2, NO_X and CO_2 (and TSP, not shown). However, compared with the Danish national emission total (all sources), the greenhouse gas emissions from bunkers are small. The bunker emission totals are shown in Table 6.7 for 2006, split into sea transport and civil aviation. All emission figures in the 1990-2006 time-series are given in Annex 15 (CRF format). In Annex 14, the emissions are also given in CollectER format for 2006.

Table 6.7 Emissions in 2006 for international transport and national totals

CRF sector	SO_2 [tonnes]	NO_X [tonnes]	NMVOC [tonnes]	CH_4 [tonnes]	CO [tonnes]	CO_2 [k-tonnes]	N_2O [tonnes]
Navigation int. (1A3d)	52936	84716	2643	82	8719	3433	216
Civil Aviation int. (1A3a)	825	11175	492	52	1871	2583	89
International total	53761	95891	3135	134	10589	6016	305

The differences in emissions between navigation and civil aviation are much larger than the differences in fuel consumption (and derived CO_2 emissions), and display a poor emission performance for international sea transport. In broad terms, the emission trends shown in Figure 6.43 are similar to the fuel-use development.

However, for navigation minor differences occur for the emissions of SO_2, NO_X and CO_2 due to varying amounts of marine gas oil and residual oil, and for SO_2 and NO_X the development in the emission factors also have an impact on the emission trends. For civil aviation, apart from the annual consumption of jet fuel, the development of the NO_X emissions is also due to yearly variations in LTO/aircraft type (earlier than 2001) and city-pair statistics (2001 onwards).

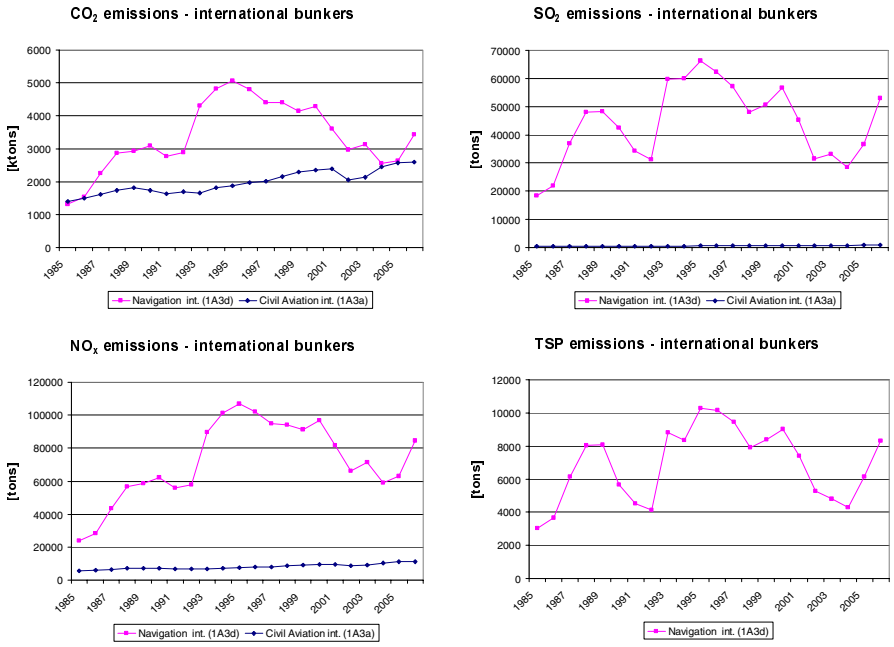


Figure 6.43 CO_2, SO_2, NO_X and TSP emissions for international transport 1985-2006

7 Uncertainties

Uncertainty estimates for greenhouse gases are made for road transport and other mobile sources using the guidelines formulated in the Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories (IPCC, 2000). For road transport, railways and fisheries, these guidelines provide uncertainty factors for activity data that are used in the Danish situation. For non road mobile machinery and recreational craft (Winther et al., 2006), and national navigation (Winther, 2008a), the factors reflect specific national knowledge.

The activity data uncertainty factor for civil aviation is based on own judgement.

Table 7.1 Uncertainties for activity data, emission factors and total emissions in 2006 and as a trend for greenhouse gases

Category	Activity data	CO_2	CH_4	N_2O
	%	%	%	%
Road transport	2	5	40	50
Military	2	5	100	1000
Railways	2	5	100	1000
Navigation (small boats)	21	5	100	1000
Navigation (large vessels)	11	5	100	1000
Fisheries	2	5	100	1000
Agriculture	13	5	100	1000
Forestry	16	5	100	1000
Industry (mobile)	18	5	100	1000
Residential	18	5	100	1000
Civil aviation	10	5	100	1000
Overall uncertainty in 2006		4	34	136
Trend uncertainty		4	6	62

For the emission components reported to the UNECE LRTAP convention, the emission uncertainty estimates are also made using the guidelines formulated in the Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories (IPCC, 2000). The emission factor uncertainties come from Pulles et al. (2001). The latter source only indicates single values for road transport and other mobile sources, respectively, and hence only rough emission uncertainty calculations can be made. For TSP, Pulles et al. (2001) indicates no uncertainty factor and, instead, this factor is based on own judgement.

The activity data uncertainty factor is assumed to be 2 and 10 % for road transport and other mobile sources, respectively, based on own judgement.

Table 7.2 Uncertainties for activity data, emission factors and total emissions in 2006 and as a trend

	Emission factor uncertainties [%]		Emission uncertainties [%]	
Pollutant	Road	Other	Overall 2006	Trend
SO_2	50	50	49	4
NO_X	50	100	50	7
NMVOC	50	100	49	10
CO	50	100	51	12
NH_3	1000	1000	996	2759
TSP	50	100	47	10
PM_{10}	50	100	48	8
$PM_{2.5}$	50	100	50	7
Arsenic	1000	1000	1000	5
Cadmium	1000	1000	803	177
Chromium	1000	1000	804	187
Copper	1000	1000	832	99
Mercury	1000	1000	1000	10
Nickel	1000	1000	745	101
Lead	1000	1000	963	17
Selenium	1000	1000	727	180
Zinc	1000	1000	817	126
Dioxins	1000	1000	707	124
Flouranthene	1000	1000	794	4
Benzo(b) flouranthene	1000	1000	786	52
Benzo(k) flouranthene	1000	1000	827	78
Benzo(a) pyrene	1000	1000	859	54
Benzo(g,h,i) perylene	1000	1000	797	49
indeno(1,2,3-c,d) pyrene	1000	1000	778	150

For all emission components, 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 16 for all emission components.

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Annex Transport

Annex 1: Fleet data 1985-2006 for road transport (No. vehicles)

Sector	Subsector	Tech 2	FYear	LYear	1985	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Passenger Cars	Gasoline <1,4 l	PRE ECE	0	1969	80570	46208	44014	42804	36466	39959	37597	37130	3434	2761	2103
Passenger Cars	Gasoline <1,4 l	ECE 15/00-01	1970	1978	333715	187911	161642	139010	119424	80741	67991	53302	44338	31104	22511
Passenger Cars	Gasoline <1,4 l	ECE 15/02	1979	1980	104223	86056	79240	72588	65797	49614	42976	34748	25889	17458	10806
Passenger Cars	Gasoline <1,4 l	ECE 15/03	1981	1985	345946	301692	295677	288944	280769	262502	250449	233656	215509	183239	147178
Passenger Cars	Gasoline <1,4 l	ECE 15/04	1986	1990		282011	280181	278685	278152	275859	272989	269953	275188	264791	254032
Passenger Cars	Gasoline <1,4 l	Euro I	1991	1996			39608	73527	101489	139813	169133	205235	210861	208281	206803
Passenger Cars	Gasoline <1,4 l	Euro II	1997	2000									38465	74495	108508
Passenger Cars	Gasoline <1,4 l	Euro III	2001	2005											
Passenger Cars	Gasoline <1,4 l	Euro IV	2006	2010											
Passenger Cars	Gasoline 1,4 - 2,0 l	PRE ECE	0	1969	61592	35940	34233	33292	28362	31079	29242	28879	2671	2148	1635
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/00-01	1970	1978	218180	127631	109640	94188	80844	54600	45991	36078	30465	21520	15647
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/02	1979	1980	60836	55062	50674	46402	42040	31712	27445	22173	16509	11141	6870
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/03	1981	1985	210574	174545	170749	166595	161591	150612	143385	133412	122642	103931	83270
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/04	1986	1990		190297	188949	187872	187524	186044	184194	182297	186155	179510	172582
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro I	1991	1996			35647	75763	119562	201007	288096	375253	383870	378063	375137
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro II	1997	2000									95358	196046	274022
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro III	2001	2005											
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro IV	2006	2010											
Passenger Cars	Gasoline >2,0 l	PRE ECE	0	1969	5923	3423	3260	3171	2701	2960	2785	2750	254	205	156
Passenger Cars	Gasoline >2,0 l	ECE 15/00-01	1970	1978	18532	10781	9234	7914	6781	4567	3849	3022	2619	1881	1366
Passenger Cars	Gasoline >2,0 l	ECE 15/02	1979	1980	8730	4392	4043	3702	3354	2531	2191	1770	1318	888	549
Passenger Cars	Gasoline >2,0 l	ECE 15/03	1981	1985	31066	24667	24157	23595	22912	21429	20432	19053	17571	14934	12016
Passenger Cars	Gasoline >2,0 l	ECE 15/04	1986	1990		25679	25524	25389	25338	25120	24844	24546	24977	23975	22975
Passenger Cars	Gasoline >2,0 l	Euro I	1991	1996			3961	8129	12434	20068	27915	35770	36617	36081	35808
Passenger Cars	Gasoline >2,0 l	Euro II	1997	2000									12432	27315	44923
Passenger Cars	Gasoline >2,0 l	Euro III	2001	2005											
Passenger Cars	Gasoline >2,0 l	Euro IV	2006	2010											
Passenger Cars	Diesel <2,0 l	Euro I	1991	1996			4042	8018	11872	18305	24557	31177	31314	31730	35118

Continued

Sector	Subsector	Tech 2	FYear	LYear	1985	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Passenger Cars	Diesel <2,0 l	Euro II	1997	2000									7046	14640	23084
Passenger Cars	Diesel <2,0 l	Euro III	2001	2005											
Passenger Cars	Diesel <2,0 l	Euro IV	2006	2010											
Passenger Cars	Diesel <2,0 l	Conventional	0	1990	75828	79714	75794	72294	68535	62144	58848	55004	48251	43893	43004
Passenger Cars	Diesel >2,0 l	Euro I	1991	1996			213	437	668	1078	1499	1921	1928	1952	2161
Passenger Cars	Diesel >2,0 l	Euro II	1997	2000									655	1478	2711
Passenger Cars	Diesel >2,0 l	Euro III	2001	2005											
Passenger Cars	Diesel >2,0 l	Euro IV	2006	2010											
Passenger Cars	Diesel >2,0 l	Conventional	0	1990	3451	3703	3556	3425	3281	3040	2906	2747	2461	2266	2237
Passenger Cars	LPG	Conventional	0	1990	287	286	286	288	289	289	301	311	172	97	44
Passenger Cars	2-Stroke	Conventional	0	9999	4823	5417	4804	4308	3747	3029	2443	1824	1248	761	400
Light Duty Vehicles	Gasoline <3,5t	Conventional	0	1994	33049	42333	43215	44179	45486	47261	44601	41519	37209	34454	31489
Light Duty Vehicles	Gasoline <3,5t	Euro I	1995	1998							4259	8524	12645	17212	16632
Light Duty Vehicles	Gasoline <3,5t	Euro II	1999	2001											4705
Light Duty Vehicles	Gasoline <3,5t	Euro III	2002	2006											
Light Duty Vehicles	Diesel <3,5 t	Conventional	0	1994	121431	155543	158781	162324	167129	173650	163877	152553	142109	131572	122992
Light Duty Vehicles	Diesel <3,5 t	Euro I	1995	1998							15648	31318	48292	65727	64964
Light Duty Vehicles	Diesel <3,5 t	Euro II	1999	2001											18376
Light Duty Vehicles	Diesel <3,5 t	Euro III	2002	2006											
Heavy Duty Vehicles	Gasoline >3,5 t	Conventional	0	9999	251	250	255	260	268	279	288	295	261	274	253
Heavy Duty Vehicles	Diesel 3,5 - 7,5 t	Conventional	0	1993	5140	5108	5214	5330	5488	5205	4891	4532	3999	3692	3079
Heavy Duty Vehicles	Diesel 3,5 - 7,5 t	Euro I	1994	1996						497	1004	1506	1440	1435	1269
Heavy Duty Vehicles	Diesel 3,5 - 7,5 t	Euro II	1997	2001									529	1087	1487
Heavy Duty Vehicles	Diesel 3,5 - 7,5 t	Euro III	2002	2006											
Heavy Duty Vehicles	Diesel 7,5 - 16 t	Conventional	0	1993	10350	10286	10500	10734	11052	10482	9850	9126	7800	6603	5613
Heavy Duty Vehicles	Diesel 7,5 - 16 t	Euro I	1994	1996						1001	2022	3033	2808	2566	2314
Heavy Duty Vehicles	Diesel 7,5 - 16 t	Euro II	1997	2001									1032	1945	2710
Heavy Duty Vehicles	Diesel 7,5 - 16 t	Euro III	2002	2006											
Heavy Duty Vehicles	Diesel 16 - 32 t	Conventional	0	1993	13115	13034	13306	13602	14005	13283	12481	11564	10720	9832	8982
Heavy Duty Vehicles	Diesel 16 - 32 t	Euro I	1994	1996						1268	2562	3844	3859	3821	3702
Heavy Duty Vehicles	Diesel 16 - 32 t	Euro II	1997	2001									1419	2896	4336
Heavy Duty Vehicles	Diesel 16 - 32 t	Euro III	2002	2006											
Heavy Duty Vehicles	Diesel >32t	Conventional	0	1993	11517	11446	11684	11944	12298	11664	10960	10154	9337	8720	8180
Heavy Duty Vehicles	Diesel >32t	Euro I	1994	1996						1114	2250	3376	3362	3389	3371
Heavy Duty Vehicles	Diesel >32t	Euro II	1997	2001									1236	2568	3949
Heavy Duty Vehicles	Diesel >32t	Euro III	2002	2006											

Continued

Sector	Subsector	Tech 2	FYear	LYear	1985	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Buses	Urban Buses	Conventional	0	1993	4712	4753	4561	4522	4490	4083	3635	3261	2946	2792	2542
Buses	Urban Buses	Euro I	1994	1996						390	746	1084	1060	972	913
Buses	Urban Buses	Euro II	1997	2001									390	729	1053
Buses	Urban Buses	Euro III	2002	2006											
Buses	Coaches	Conventional	0	1993	3298	3327	2868	3007	3086	2927	4507	4156	3662	3369	3007
Buses	Coaches	Euro I	1994	1996						280	925	1381	1318	1173	1080
Buses	Coaches	Euro II	1997	2001									485	879	1246
Buses	Coaches	Euro III	2002	2006											
Mopeds	<50 cm³	Conventional	0	1999	151000	120000	118000	113000	109000	105000	114167	123333	132500	141667	150833
Mopeds	<50 cm³	Euro I	2000	2003											
Mopeds	<50 cm³	Euro II	2004	9999											
Motorcycles	2-stroke >50 cm³	Conventional	0	1999	6209	6617	6804	6904	7111	7406	7672	8214	8980	9598	10385
Motorcycles	4-stroke <250 cm³	Conventional	0	1999	7037	7499	7712	7824	8059	8394	8695	9310	10177	10878	11769
Motorcycles	4-stroke <250 cm³	Euro I	2000	2003											
Motorcycles	4-stroke <250 cm³	Euro II	2004	2006											
Motorcycles	4-stroke 250 - 750 cm³	Conventional	0	1999	19352	20622	21207	21516	22162	23083	23911	25602	27986	29914	32365
Motorcycles	4-stroke 250 - 750 cm³	Euro I	2000	2003											
Motorcycles	4-stroke 250 - 750 cm³	Euro II	2004	2006											
Motorcycles	4-stroke >750 cm³	Conventional	0	1999	8796	9374	9639	9780	10074	10492	10869	11637	12721	13597	14712
Motorcycles	4-stroke >750 cm³	Euro I	2000	2003											
Motorcycles	4-stroke >750 cm³	Euro II	2004	2006											

Continued

Sector	Subsector	Tech 2	FYear	LYear	2000	2001	2002	2003	2004	2005	2006
Passenger Cars	Gasoline <1,4 l	PRE ECE	0	1969	1744	1614	1475	1392	1313	1313	1313
Passenger Cars	Gasoline <1,4 l	ECE 15/00-01	1970	1978	17980	15837	14155	13149	12404	12335	12279
Passenger Cars	Gasoline <1,4 l	ECE 15/02	1979	1980	7298	5510	4178	3128	2433	2882	2869
Passenger Cars	Gasoline <1,4 l	ECE 15/03	1981	1985	118979	97964	79041	60723	45824	25489	14555
Passenger Cars	Gasoline <1,4 l	ECE 15/04	1986	1990	235890	219216	194543	171430	142490	133653	117770
Passenger Cars	Gasoline <1,4 l	Euro I	1991	1996	204184	201708	197423	192152	185488	183896	185747
Passenger Cars	Gasoline <1,4 l	Euro II	1997	2000	135030	132812	130153	128898	126400	133689	129230
Passenger Cars	Gasoline <1,4 l	Euro III	2001	2005		21858	47428	70311	99658	126777	128423
Passenger Cars	Gasoline <1,4 l	Euro IV	2006	2010							31558

Continued

Sector	Subsector	Tech 2	FYear	LYear	2000	2001	2002	2003	2004	2005	2006
Passenger Cars	Gasoline 1,4 - 2,0 l	PRE ECE	0	1969	1356	1255	1147	1083	1021	1021	1021
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/00-01	1970	1978	12537	11077	9923	9230	8707	8852	8964
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/02	1979	1980	4642	3500	2659	1987	1545	1858	1892
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/03	1981	1985	67222	55300	44572	34238	25810	14529	8564
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/04	1986	1990	160800	149915	133745	118448	99092	86463	72814
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro I	1991	1996	370803	367136	359959	351645	340424	286124	227403
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro II	1997	2000	326268	320971	314678	311808	305621	334798	342059
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro III	2001	2005		49700	105323	147067	195430	250309	274132
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro IV	2006	2010							52995
Passenger Cars	Gasoline >2,0 l	PRE ECE	0	1969	129	120	109	103	97	97	97
Passenger Cars	Gasoline >2,0 l	ECE 15/00-01	1970	1978	1110	986	885	825	778	807	836
Passenger Cars	Gasoline >2,0 l	ECE 15/02	1979	1980	371	280	212	159	123	147	148
Passenger Cars	Gasoline >2,0 l	ECE 15/03	1981	1985	9722	8009	6459	4964	3744	2045	1103
Passenger Cars	Gasoline >2,0 l	ECE 15/04	1986	1990	21251	19699	17377	15265	12607	12107	10565
Passenger Cars	Gasoline >2,0 l	Euro I	1991	1996	35388	35024	34329	33516	32431	27636	23084
Passenger Cars	Gasoline >2,0 l	Euro II	1997	2000	61899	60799	59506	58896	57815	48867	39683
Passenger Cars	Gasoline >2,0 l	Euro III	2001	2005		15179	30712	45080	65819	82828	77816
Passenger Cars	Gasoline >2,0 l	Euro IV	2006	2010							22245
Passenger Cars	Diesel <2,0 l	Euro I	1991	1996	39314	43578	48670	53462	59968	62042	63663
Passenger Cars	Diesel <2,0 l	Euro II	1997	2000	31541	34764	38842	43327	49262	61839	72606
Passenger Cars	Diesel <2,0 l	Euro III	2001	2005		5482	13338	21371	33648	49775	62020
Passenger Cars	Diesel <2,0 l	Euro IV	2006	2010							13028
Passenger Cars	Diesel <2,0 l	Conventional	0	1990	42604	42641	42100	40525	38619	38012	37146
Passenger Cars	Diesel >2,0 l	Euro I	1991	1996	2420	2683	2998	3295	3698	3647	3556
Passenger Cars	Diesel >2,0 l	Euro II	1997	2000	4232	4658	5196	5790	6592	6450	6112
Passenger Cars	Diesel >2,0 l	Euro III	2001	2005		1163	2682	4432	7505	10932	11986
Passenger Cars	Diesel >2,0 l	Euro IV	2006	2010							3426
Passenger Cars	Diesel >2,0 l	Conventional	0	1990	2228	2229	2187	2096	1978	2005	1958
Passenger Cars	LPG	Conventional	0	1990	32	63	21	15	15	15	15
Passenger Cars	2-Stroke	Conventional	0	9999	300	200	150	100	50		
Light Duty Vehicles	Gasoline <3,5t	Conventional	0	1994	28488	25423	21615	18838	14576	12300	9827
Light Duty Vehicles	Gasoline <3,5t	Euro I	1995	1998	15979	15527	15049	13949	14793	14462	13766
Light Duty Vehicles	Gasoline <3,5t	Euro II	1999	2001	9299	14017	13917	13805	14126	14061	13667
Light Duty Vehicles	Gasoline <3,5t	Euro III	2002	2006			5140	10719	16724	23033	29145
Light Duty Vehicles	Diesel <3,5 t	Conventional	0	1994	115695	105397	92990	82927	66760	59477	51497
Light Duty Vehicles	Diesel <3,5 t	Euro I	1995	1998	64894	64370	64743	61406	67753	69932	72140

Continued

Sector	Subsector	Tech 2	FYear	LYear	2000	2001	2002	2003	2004	2005	2006
Light Duty Vehicles	Diesel <3,5 t	Euro II	1999	2001	37766	58112	59870	60771	64697	67990	71620
Light Duty Vehicles	Diesel <3,5 t	Euro III	2002	2006			22112	47186	76596	111375	152728
Heavy Duty Vehicles	Gasoline >3,5 t	Conventional	0	9999	257	249	249	247	233	252	266
Heavy Duty Vehicles	Diesel 3,5 - 7,5 t	Conventional	0	1993	2406	1979	1739	1407	1069	835	628
Heavy Duty Vehicles	Diesel 3,5 - 7,5 t	Euro I	1994	1996	1057	951	956	813	903	837	777
Heavy Duty Vehicles	Diesel 3,5 - 7,5 t	Euro II	1997	2001	1703	1990	2064	1872	2036	1936	1852
Heavy Duty Vehicles	Diesel 3,5 - 7,5 t	Euro III	2002	2006			484	941	1541	2036	2547
Heavy Duty Vehicles	Diesel 7,5 - 16 t	Conventional	0	1993	5085	4210	3136	2571	1639	1281	963
Heavy Duty Vehicles	Diesel 7,5 - 16 t	Euro I	1994	1996	2235	2024	1724	1486	1384	1284	1192
Heavy Duty Vehicles	Diesel 7,5 - 16 t	Euro II	1997	2001	3600	4234	3724	3421	3123	2970	2840
Heavy Duty Vehicles	Diesel 7,5 - 16 t	Euro III	2002	2006			872	1720	2364	3123	3907
Heavy Duty Vehicles	Diesel 16 - 32 t	Conventional	0	1993	7933	6814	5525	4571	3110	2431	1826
Heavy Duty Vehicles	Diesel 16 - 32 t	Euro I	1994	1996	3486	3276	3037	2642	2627	2436	2262
Heavy Duty Vehicles	Diesel 16 - 32 t	Euro II	1997	2001	5616	6853	6560	6082	5926	5634	5388
Heavy Duty Vehicles	Diesel 16 - 32 t	Euro III	2002	2006			1537	3058	4484	5925	7412
Heavy Duty Vehicles	Diesel >32t	Conventional	0	1993	7361	6527	5486	4716	3282	2565	1927
Heavy Duty Vehicles	Diesel >32t	Euro I	1994	1996	3234	3138	3016	2726	2772	2570	2387
Heavy Duty Vehicles	Diesel >32t	Euro II	1997	2001	5211	6564	6514	6275	6253	5946	5686
Heavy Duty Vehicles	Diesel >32t	Euro III	2002	2006			1526	3156	4732	6252	7822
Buses	Urban Buses	Conventional	0	1993	2319	2159	1977	1859	1711	1551	1381
Buses	Urban Buses	Euro I	1994	1996	852	792	752	713	663	643	614
Buses	Urban Buses	Euro II	1997	2001	1345	1596	1525	1447	1345	1317	1273
Buses	Urban Buses	Euro III	2002	2006			346	670	951	1275	1585
Buses	Coaches	Conventional	0	1993	2724	2444	2165	1962	1773	1542	1328
Buses	Coaches	Euro I	1994	1996	1001	896	823	752	687	639	591
Buses	Coaches	Euro II	1997	2001	1579	1807	1670	1527	1394	1309	1224
Buses	Coaches	Euro III	2002	2006			379	706	986	1267	1524
Mopeds	<50 cm³	Conventional	0	1999	143607	136249	128209	120305	112262	98369	82388
Mopeds	<50 cm³	Euro I	2000	2003	16393	28751	42791	48695	46069	45882	50386
Mopeds	<50 cm³	Euro II	2004	9999					10669	24749	36226
Motorcycles	2-stroke >50 cm³	Conventional	0	1999	11054	11367	11582	11850	12326	13158	14241
Motorcycles	4-stroke <250 cm³	Conventional	0	1999	11670	12487	12882	13380	14078	14943	16241
Motorcycles	4-stroke <250 cm³	Euro I	2000	2003	858	918	1348	1806	1816	2292	2766
Motorcycles	4-stroke <250 cm³	Euro II	2004	2006					604	1187	1879
Motorcycles	4-stroke 250 - 750 cm³	Conventional	0	1999	32093	34338	35424	36794	38714	41092	44663
Motorcycles	4-stroke 250 - 750 cm³	Euro I	2000	2003	2360	2525	3707	4967	4993	6302	7606

Continued

Sector	Subsector	Tech 2	FYear	LYear	2000	2001	2002	2003	2004	2005	2006
Motorcycles	4-stroke 250 - 750 cm³	Euro II	2004	2006					1661	3263	5169
Motorcycles	4-stroke >750 cm³	Conventional	0	1999	14588	15608	16102	16725	17597	18678	20301
Motorcycles	4-stroke >750 cm³	Euro I	2000	2003	1073	1148	1685	2258	2270	2865	3457
Motorcycles	4-stroke >750 cm³	Euro II	2004	2006					755	1483	2349

Annex 2: Mileage data 19852006 for road transport (km)

Sector	Subsector	Tech 2	FYear	LYear	1985	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Passenger Cars	Gasoline <1,4 l	PRE ECE	0	1969	9564	10458	11285	12005	12412	12729	12405	12060	12050	11999	11794
Passenger Cars	Gasoline <1,4 l	ECE 15/00-01	1970	1978	12115	10458	11285	12005	12412	12729	12405	12060	12050	11999	11794
Passenger Cars	Gasoline <1,4 l	ECE 15/02	1979	1980	16052	13358	12280	12005	12412	12729	12405	12060	12050	11999	11794
Passenger Cars	Gasoline <1,4 l	ECE 15/03	1981	1985	18800	16553	17094	17157	16720	16142	14571	12958	12050	11999	11794
Passenger Cars	Gasoline <1,4 l	ECE 15/04	1986	1990		20257	20778	21152	20734	20113	18818	17553	16474	14970	13688
Passenger Cars	Gasoline <1,4 l	Euro I	1991	1996			24567	25667	25746	26068	24555	23306	22300	20949	19624
Passenger Cars	Gasoline <1,4 l	Euro II	1997	2000									26232	25674	24561
Passenger Cars	Gasoline <1,4 l	Euro III	2001	2005											
Passenger Cars	Gasoline <1,4 l	Euro IV	2006	2010											
Passenger Cars	Gasoline 1,4 - 2,0 l	PRE ECE	0	1969	9564	10458	11285	12005	12412	12729	12405	12060	12050	11999	11794
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/00-01	1970	1978	12033	10458	11285	12005	12412	12729	12405	12060	12050	11999	11794
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/02	1979	1980	16045	13352	12269	12005	12412	12729	12405	12060	12050	11999	11794
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/03	1981	1985	18883	16515	17059	17121	16659	16068	14525	12940	12050	11999	11794
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/04	1986	1990		20402	20935	21291	20886	20231	18942	17667	16584	15142	13875
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro I	1991	1996			24567	25726	25975	26475	25307	24084	23002	21643	20226
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro II	1997	2000									26232	25700	24547
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro III	2001	2005											
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro IV	2006	2010											
Passenger Cars	Gasoline >2,0 l	PRE ECE	0	1969	9564	10458	11285	12005	12412	12729	12405	12060	12050	11999	11794
Passenger Cars	Gasoline >2,0 l	ECE 15/00-01	1970	1978	12053	10458	11285	12005	12412	12729	12405	12060	12050	11999	11794
Passenger Cars	Gasoline >2,0 l	ECE 15/02	1979	1980	16050	13361	12285	12005	12412	12729	12405	12060	12050	11999	11794
Passenger Cars	Gasoline >2,0 l	ECE 15/03	1981	1985	18834	16582	17121	17200	16793	16180	14593	12966	12050	11999	11794
Passenger Cars	Gasoline >2,0 l	ECE 15/04	1986	1990		20101	20643	21047	20575	20005	18715	17452	16353	14779	13551
Passenger Cars	Gasoline >2,0 l	Euro I	1991	1996			24567	25712	25924	26398	25184	23952	22880	21524	20119
Passenger Cars	Gasoline >2,0 l	Euro II	1997	2000									26232	25727	24744
Passenger Cars	Gasoline >2,0 l	Euro III	2001	2005											
Passenger Cars	Gasoline >2,0 l	Euro IV	2006	2010											
Passenger Cars	Diesel <2,0 l	Euro I	1991	1996			42600	42505	41806	41473	40106	38625	36268	33906	32434
Passenger Cars	Diesel <2,0 l	Euro II	1997	2000									41813	40714	39790
Passenger Cars	Diesel <2,0 l	Euro III	2001	2005											
Passenger Cars	Diesel <2,0 l	Euro IV	2006	2010											
Passenger Cars	Diesel <2,0 l	Conventional	0	1990	25365	28694	28549	27996	27386	26630	25416	24032	22779	21643	21021
Passenger Cars	Diesel >2,0 l	Euro I	1991	1996			42600	42529	41894	41615	40354	38857	36471	34109	32607
Passenger Cars	Diesel >2,0 l	Euro II	1997	2000									41813	40769	40104
Passenger Cars	Diesel >2,0 l	Euro III	2001	2005											

Continued

Sector	Subsector	Tech 2	FYear	LYear	1985	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Passenger Cars	Diesel >2,0 l	Euro IV	2006	2010											
Passenger Cars	Diesel >2,0 l	Conventional	0	1990	26523	29795	29621	28991	28185	27216	25845	24311	22873	21537	20880
Passenger Cars	LPG	Conventional	0	1990	18832	16538	17080	17144	16698	16113	14553	12950	12050	11999	11794
Passenger Cars	2-Stroke	Conventional	0	9999	18832	16538	17080	17144	16698	16113	14553	12950	12050	11999	11794
Light Duty Vehicles	Gasoline <3,5t	Conventional	0	1994	20184	17544	18019	18706	18893	18937	18138	17727	17852	17884	17453
Light Duty Vehicles	Gasoline <3,5t	Euro I	1995	1998							18138	17727	17852	17884	17453
Light Duty Vehicles	Gasoline <3,5t	Euro II	1999	2001											17453
Light Duty Vehicles	Gasoline <3,5t	Euro III	2002	2006											
Light Duty Vehicles	Diesel <3,5 t	Conventional	0	1994	30638	33157	33484	32340	32266	34169	32777	32789	32519	31998	31226
Light Duty Vehicles	Diesel <3,5 t	Euro I	1995	1998							32777	32789	32519	31998	31226
Light Duty Vehicles	Diesel <3,5 t	Euro II	1999	2001											31226
Light Duty Vehicles	Diesel <3,5 t	Euro III	2002	2006											
Heavy Duty Vehicles	Gasoline >3,5 t	Conventional	0	9999	38145	37941	38562	39503	37262	36784	36279	35575	32740	33082	33668
Heavy Duty Vehicles	Diesel 3,5 - 7,5 t	Conventional	0	1993	35978	48034	48003	45749	42629	44460	43917	44077	36397	37104	39868
Heavy Duty Vehicles	Diesel 3,5 - 7,5 t	Euro I	1994	1996						44460	43917	44077	36397	37104	39868
Heavy Duty Vehicles	Diesel 3,5 - 7,5 t	Euro II	1997	2001									36397	37104	39868
Heavy Duty Vehicles	Diesel 3,5 - 7,5 t	Euro III	2002	2006											
Heavy Duty Vehicles	Diesel 7,5 - 16 t	Conventional	0	1993	50129	58064	58026	55301	51529	53743	53086	53280	51043	49398	46486
Heavy Duty Vehicles	Diesel 7,5 - 16 t	Euro I	1994	1996						53743	53086	53280	51043	49398	46486
Heavy Duty Vehicles	Diesel 7,5 - 16 t	Euro II	1997	2001									51043	49398	46486
Heavy Duty Vehicles	Diesel 7,5 - 16 t	Euro III	2002	2006											
Heavy Duty Vehicles	Diesel 16 - 32 t	Conventional	0	1993	69684	80715	80662	76875	71632	74709	73796	74065	76469	76582	79347
Heavy Duty Vehicles	Diesel 16 - 32 t	Euro I	1994	1996						74709	73796	74065	76469	76582	79347
Heavy Duty Vehicles	Diesel 16 - 32 t	Euro II	1997	2001									76469	76582	79347
Heavy Duty Vehicles	Diesel 16 - 32 t	Euro III	2002	2006											
Heavy Duty Vehicles	Diesel >32t	Conventional	0	1993	69684	80715	80662	76875	71632	74709	73796	74065	76469	76582	79347
Heavy Duty Vehicles	Diesel >32t	Euro I	1994	1996						74709	73796	74065	76469	76582	79347
Heavy Duty Vehicles	Diesel >32t	Euro II	1997	2001									76469	76582	79347
Heavy Duty Vehicles	Diesel >32t	Euro III	2002	2006											
Buses	Urban Buses	Conventional	0	1993	92802	112240	117692	113847	116584	127459	126072	125955	123611	120313	118107
Buses	Urban Buses	Euro I	1994	1996						127459	126072	125955	123611	120313	118107
Buses	Urban Buses	Euro II	1997	2001									123611	120313	118107
Buses	Urban Buses	Euro III	2002	2006											
Buses	Coaches	Conventional	0	1993	58168	72330	84745	77381	79571	85908	62394	73915	74429	73035	72648
Buses	Coaches	Euro I	1994	1996						85908	62394	73915	74429	73035	72648
Buses	Coaches	Euro II	1997	2001									74429	73035	72648

Continued

Sector	Subsector	Tech 2	FYear	LYear	1985	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Buses	Coaches	Euro III	2002	2006											
Mopeds	<50 cm³	Conventional	0	1999	2334	2182	2282	2393	2449	2510	2470	2439	2481	2498	2125
Mopeds	<50 cm³	Euro I	2000	2003											
Mopeds	<50 cm³	Euro II	2004	9999											
Motorcycles	2-stroke >50 cm³	Conventional	0	1999	6702	6470	6493	6824	6987	7148	7131	7033	7076	7168	7072
Motorcycles	4-stroke <250 cm³	Conventional	0	1999	6702	6470	6493	6824	6987	7148	7131	7033	7076	7168	7072
Motorcycles	4-stroke <250 cm³	Euro I	2000	2003											
Motorcycles	4-stroke <250 cm³	Euro II	2004	2006											
Motorcycles	4-stroke 250 - 750 cm³	Conventional	0	1999	6702	6470	6493	6824	6987	7148	7131	7033	7076	7168	7072
Motorcycles	4-stroke 250 - 750 cm³	Euro I	2000	2003											
Motorcycles	4-stroke 250 - 750 cm³	Euro II	2004	2006											
Motorcycles	4-stroke >750 cm³	Conventional	0	1999	6702	6470	6493	6824	6987	7148	7131	7033	7076	7168	7072
Motorcycles	4-stroke >750 cm³	Euro I	2000	2003											
Motorcycles	4-stroke >750 cm³	Euro II	2004	2006											

Continued

Sector	Subsector	Tech 2	FYear	LYear	2000	2001	2002	2003	2004	2005	2006
Passenger Cars	Gasoline <1,4 l	PRE ECE	0	1969	11677	11499	11628	11611	11646	11093	10706
Passenger Cars	Gasoline <1,4 l	ECE 15/00-01	1970	1978	11677	11499	11628	11611	11646	11093	10706
Passenger Cars	Gasoline <1,4 l	ECE 15/02	1979	1980	11677	11499	11628	11611	11646	11093	10706
Passenger Cars	Gasoline <1,4 l	ECE 15/03	1981	1985	11677	11499	11628	11611	11646	11093	10706
Passenger Cars	Gasoline <1,4 l	ECE 15/04	1986	1990	12800	11946	11628	11611	11646	11093	10706
Passenger Cars	Gasoline <1,4 l	Euro I	1991	1996	18422	17417	16703	15385	14480	12894	11777
Passenger Cars	Gasoline <1,4 l	Euro II	1997	2000	23828	22155	21228	20262	19167	17555	16242
Passenger Cars	Gasoline <1,4 l	Euro III	2001	2005		25033	24933	25811	23998	22096	20028
Passenger Cars	Gasoline <1,4 l	Euro IV	2006	2010							23306
Passenger Cars	Gasoline 1,4 - 2,0 l	PRE ECE	0	1969	11677	11499	11628	11611	11646	11093	10706
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/00-01	1970	1978	11677	11499	11628	11611	11646	11093	10706
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/02	1979	1980	11677	11499	11628	11611	11646	11093	10706
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/03	1981	1985	11677	11499	11628	11611	11646	11093	10706
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/04	1986	1990	12961	12030	11628	11611	11646	11093	10706
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro I	1991	1996	18954	17934	17241	16099	15270	13761	12393
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro II	1997	2000	23722	22066	21099	20154	19119	17565	16249

Continued

Sector	Subsector	Tech 2	FYear	LYear	2000	2001	2002	2003	2004	2005	2006
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro III	2001	2005		25033	24924	25554	23855	21973	19956
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro IV	2006	2010							23306
Passenger Cars	Gasoline >2,0 l	PRE ECE	0	1969	11677	11499	11628	11611	11646	11093	10706
Passenger Cars	Gasoline >2,0 l	ECE 15/00-01	1970	1978	11677	11499	11628	11611	11646	11093	10706
Passenger Cars	Gasoline >2,0 l	ECE 15/02	1979	1980	11677	11499	11628	11611	11646	11093	10706
Passenger Cars	Gasoline >2,0 l	ECE 15/03	1981	1985	11677	11499	11628	11611	11646	11093	10706
Passenger Cars	Gasoline >2,0 l	ECE 15/04	1986	1990	12691	11875	11628	11611	11646	11093	10706
Passenger Cars	Gasoline >2,0 l	Euro I	1991	1996	18864	17845	17147	15980	15139	13657	12287
Passenger Cars	Gasoline >2,0 l	Euro II	1997	2000	24087	22498	21546	20526	19375	17855	16451
Passenger Cars	Gasoline >2,0 l	Euro III	2001	2005		25033	24906	25737	24025	22152	20130
Passenger Cars	Gasoline >2,0 l	Euro IV	2006	2010							23306
Passenger Cars	Diesel <2,0 l	Euro I	1991	1996	30423	28953	27593	25909	25090	23523	21059
Passenger Cars	Diesel <2,0 l	Euro II	1997	2000	38511	36035	34206	33003	32021	30779	28240
Passenger Cars	Diesel <2,0 l	Euro III	2001	2005		40832	40341	39594	40005	38582	34726
Passenger Cars	Diesel <2,0 l	Euro IV	2006	2010							40509
Passenger Cars	Diesel <2,0 l	Conventional	0	1990	20153	19275	18818	18984	19491	19442	18609
Passenger Cars	Diesel >2,0 l	Euro I	1991	1996	30584	29108	27750	26127	25336	23934	21357
Passenger Cars	Diesel >2,0 l	Euro II	1997	2000	39052	36697	34869	33560	32425	31292	28595
Passenger Cars	Diesel >2,0 l	Euro III	2001	2005		40832	40307	39605	40208	38823	34990
Passenger Cars	Diesel >2,0 l	Euro IV	2006	2010							40509
Passenger Cars	Diesel >2,0 l	Conventional	0	1990	20004	19172	18818	18984	19491	19442	18609
Passenger Cars	LPG	Conventional	0	1990	11677	11499	11628	11611	11646	11093	10706
Passenger Cars	2-Stroke	Conventional	0	9999	11677	11499	11628	11611	11646		
Light Duty Vehicles	Gasoline <3,5t	Conventional	0	1994	17611	17712	17891	17762	17528	16747	16885
Light Duty Vehicles	Gasoline <3,5t	Euro I	1995	1998	17611	17712	17891	17762	17528	16747	16885
Light Duty Vehicles	Gasoline <3,5t	Euro II	1999	2001	17611	17712	17891	17762	17528	16747	16885
Light Duty Vehicles	Gasoline <3,5t	Euro III	2002	2006			17891	17762	17528	16747	16885
Light Duty Vehicles	Diesel <3,5 t	Conventional	0	1994	30415	29837	29971	31946	32471	32844	33098
Light Duty Vehicles	Diesel <3,5 t	Euro I	1995	1998	30415	29837	29971	31946	32471	32844	33098
Light Duty Vehicles	Diesel <3,5 t	Euro II	1999	2001	30415	29837	29971	31946	32471	32844	33098
Light Duty Vehicles	Diesel <3,5 t	Euro III	2002	2006			29971	31946	32471	32844	33098
Heavy Duty Vehicles	Gasoline >3,5 t	Conventional	0	9999	34671	40373	41105	41246	41114	38707	39027
Heavy Duty Vehicles	Diesel 3,5 - 7,5 t	Conventional	0	1993	40778	53031	53758	59444	58769	56318	56753
Heavy Duty Vehicles	Diesel 3,5 - 7,5 t	Euro I	1994	1996	40778	53031	53758	59444	58769	56318	56753
Heavy Duty Vehicles	Diesel 3,5 - 7,5 t	Euro II	1997	2001	40778	53031	53758	59444	58769	56318	56753
Heavy Duty Vehicles	Diesel 3,5 - 7,5 t	Euro III	2002	2006			53758	59444	58769	56318	56753

Continued

Sector	Subsector	Tech 2	FYear	LYear	2000	2001	2002	2003	2004	2005	2006
Heavy Duty Vehicles	Diesel 7,5 - 16 t	Conventional	0	1993	44710	25187	21988	24031	24839	23803	23987
Heavy Duty Vehicles	Diesel 7,5 - 16 t	Euro I	1994	1996	44710	25187	21988	24031	24839	23803	23987
Heavy Duty Vehicles	Diesel 7,5 - 16 t	Euro II	1997	2001	44710	25187	21988	24031	24839	23803	23987
Heavy Duty Vehicles	Diesel 7,5 - 16 t	Euro III	2002	2006			21988	24031	24839	23803	23987
Heavy Duty Vehicles	Diesel 16 - 32 t	Conventional	0	1993	76314	82078	82204	87358	91024	87227	87902
Heavy Duty Vehicles	Diesel 16 - 32 t	Euro I	1994	1996	76314	82078	82204	87358	91024	87227	87902
Heavy Duty Vehicles	Diesel 16 - 32 t	Euro II	1997	2001	76314	82078	82204	87358	91024	87227	87902
Heavy Duty Vehicles	Diesel 16 - 32 t	Euro III	2002	2006			82204	87358	91024	87227	87902
Heavy Duty Vehicles	Diesel >32t	Conventional	0	1993	76314	82078	82204	87358	91024	87227	87902
Heavy Duty Vehicles	Diesel >32t	Euro I	1994	1996	76314	82078	82204	87358	91024	87227	87902
Heavy Duty Vehicles	Diesel >32t	Euro II	1997	2001	76314	82078	82204	87358	91024	87227	87902
Heavy Duty Vehicles	Diesel >32t	Euro III	2002	2006			82204	87358	91024	87227	87902
Buses	Urban Buses	Conventional	0	1993	115754	111490	111156	118551	120341	116974	117879
Buses	Urban Buses	Euro I	1994	1996	115754	111490	111156	118551	120341	116974	117879
Buses	Urban Buses	Euro II	1997	2001	115754	111490	111156	118551	120341	116974	117879
Buses	Urban Buses	Euro III	2002	2006			111156	118551	120341	116974	117879
Buses	Coaches	Conventional	0	1993	70600	70379	72342	77550	83860	81513	82144
Buses	Coaches	Euro I	1994	1996	70600	70379	72342	77550	83860	81513	82144
Buses	Coaches	Euro II	1997	2001	70600	70379	72342	77550	83860	81513	82144
Buses	Coaches	Euro III	2002	2006			72342	77550	83860	81513	82144
Mopeds	<50 cm³	Conventional	0	1999	1919	1526	1550	1547	1529	1460	1472
Mopeds	<50 cm³	Euro I	2000	2003	1919	1526	1550	1547	1529	1460	1472
Mopeds	<50 cm³	Euro II	2004	9999					1529	1460	1472
Motorcycles	2-stroke >50 cm³	Conventional	0	1999	7170	7229	7387	7428	7387	7089	7148
Motorcycles	4-stroke <250 cm³	Conventional	0	1999	7170	7229	7387	7428	7387	7089	7148
Motorcycles	4-stroke <250 cm³	Euro I	2000	2003	7170	7229	7387	7428	7387	7089	7148
Motorcycles	4-stroke <250 cm³	Euro II	2004	2006					7387	7089	7148
Motorcycles	4-stroke 250 - 750 cm³	Conventional	0	1999	7170	7229	7387	7428	7387	7089	7148
Motorcycles	4-stroke 250 - 750 cm³	Euro I	2000	2003	7170	7229	7387	7428	7387	7089	7148
Motorcycles	4-stroke 250 - 750 cm³	Euro II	2004	2006					7387	7089	7148
Motorcycles	4-stroke >750 cm³	Conventional	0	1999	7170	7229	7387	7428	7387	7089	7148
Motorcycles	4-stroke >750 cm³	Euro I	2000	2003	7170	7229	7387	7428	7387	7089	7148
Motorcycles	4-stroke >750 cm³	Euro II	2004	2006					7387	7089	7148

Annex 3: EU directive emission limits for road transportation vehicles

Private cars and light duty vehicles I (<1305 kg)

g/km		EURO 1	EURO 2	EURO 3[1]	EURO 4	EURO 5	EURO 6
Normal temp.							
CO	Gasoline	2.72	2.2	2.3	1.0	1.0	1.0
	Diesel	2.72	1.0	0.64	0.5	0.5	0.5
HC	Gasoline	-	-	0.20	0.10	0.1	0.1
NMHC	Gasoline	-	-	-	-	0.068	0.068
NO_X	Gasoline	-	-	0.15	0.08	0.06	0.06
	Diesel	-	-	0.5	0.25	0.18	0.08
$HC+NO_X$	Gasoline	0.97	0.5	-	-		-
	Diesel	0.97	0.7/0.9[2)]	0.56	0.30	0.23	0.17
Particulates	Diesel	0.14	0.08/0.10[2)]	0.05	0.025	0.005	0.005
Low temp.							
CO	Gasoline	-	-	-	15	15	15
HC	Gasoline	-	-	-	1.8	1.8	1.8
Evaporation							
HC[3)]	Gasoline	2.0	2.0	2.0	2.0	2.0	2.0

[1)] Changed test procedure at normal temperatures (40 s warm-up phase omitted) and for evaporation measurements

[2)] Less stringent emission limits for direct injection diesel engines

[3)] Unit: g/test

Light duty vehicles II (1305-1760 kg)

g/km		EURO 1	EURO 2	EURO 3[1)]	EURO 4	EURO 5	EURO 6
Normal temp.							
CO	Gasoline	5.17	4.0	4.17	1.81	1.81	1.81
	Diesel	5.17	1.25	0.80	0.63	0.63	0.63
HC	Gasoline	-	-	0.25	0.13	0.13	0.13
NMHC	Gasoline	-	-	-	-	0.9	0.9
NO_X	Gasoline	-	-	0.18	0.10	0.75	0.75
	Diesel	-	-	0.65	0.33	0.235	0.105
$HC+NO_X$	Gasoline	1.4	0.6	-	-	-	-
	Diesel	1.4	1.0/1.3[2)]	0.72	0.39	0.295	0.195
Particulates	Gasoline					0.005	0.005
	Diesel	0.19	0.12/0.14[2)]	0.07	0.04	0.005	0.005
Low temp.							
CO	Gasoline	-	-	-	24	24	24
HC	Gasoline	-	-		2.7	2.7	2.7
Evaporation							
HC[3)]	Gasoline	2.0	2.0	2.0	2.0	2.0	2.0

[1)] Changed test procedure at normal temperatures (40 s warm-up phase omitted) and for evaporation measurements

[2)] Less stringent emission limits for direct injection diesel engines

[3)] Unit: g/test

Light duty vehicles III (>1760 kg)

g/km		EURO 1	EURO 2	EURO 3[1)]	EURO 4	EURO 5	EURO 6
Normal temp.							
CO	Gasoline	6.9	5.0	5.22	2.27	2.27	2.27
	Diesel	6.9	1.5	0.95	0.74	0.74	0.74
HC	Gasoline	-	-	0.29	0.16	0.16	0.16
NMHC	Gasoline					0.108	0.108
NO_X	Gasoline	-	-	0.21	0.11	0.082	0.082
	Diesel	-	-	0.78	0.39	0.28	0.125
$HC+NO_X$	Gasoline	1.7	0.7	-	-	-	-
	Diesel	1.7	1.2/1.6[2)]	0.86	0.46	0.35	0.215
Particulates	Gasoline					0.005	0.005
	Diesel	0.25	0.17/0.20[2)]	0.10	0.06	0.005	0.005
Low temp.							
CO	Gasoline	-	-	-	30	30	30
HC	Gasoline	-	-	-	3.2	3.2	3.2
Evaporation							
HC[3)]	Gasoline	2.0	2.0	2.0	2.0	2.0	2.0

[1)] Changed test procedure at normal temperatures (40 s warm-up phase omitted) and for evaporation measurements

[2)] Less stringent emission limits for direct injection diesel engines

[3)] Unit: g/test

Heavy duty diesel vehicles

(g/kWh)		EURO 1	EURO 2	EURO 3	EURO 4	EURO 5	EEV[2)]
	Test[1)]	1993	1996	2001	2006	2009	2000
CO	ECE/ESC	4.5	4.0	2.1	1.5	1.5	1.5
	ETC	-	-	(5.45)	4.0	4.0	3.0
HC	ECE/ESC	1.1	1.1	0.66	0.46	0.46	0.25
	ETC	-	-	(0.78)	0.55	0.55	0.40
NO_X	ECE/ESC	8.0	7.0	5.0	3.5	2.0	2.0
	ETC	-	-	(5.0)	3.5	2.0	2.0
Particulates[3)]	ECE/ESC	0.36/0.61	0.15/0.25	0.10/0.13	0.02	0.02	0.02
	ETC	-	-	(0.16/0.21)	0.03	0.03	0.02
	ELR	-	-	0.8	0.5	0.5	0.15

[1)] Test procedure: Euro 1 and Euro 2: ECE (stationary)

Euro 3: ESC (stationary) + ELR (load response)

Euro 4, Euro 5 and EEV: ESC (stationary) + ETC (transient) + ELR (load response)

[2)] EEV: Emission limits for extra environmental friendly vehicles, used as a basis for economical incitements (gas fuelled vehicles).

[3)] For Euro 1, Euro 2 and Euro 3 less stringent emission limits apply for small engines:

Euro 1: <85 kW

Euro 2: <0,7 l

Euro 3: <0,75 l

Annex 4: Basis emission factors (g/km)

Sector	Subsector	Tech 2	FCu	FCr	FCh	COu	COr	COh	PMu	PMr	PMh	NO_xu	NO_xr	NO_xh
Passenger Cars	Gasoline <1,4 l	PRE ECE	67,499	55,000	62,743	27,505	19,333	15,520	0,063	0,044	0,041	1,849	2,062	2,023
Passenger Cars	Gasoline <1,4 l	ECE 15/00-01	58,240	44,460	48,600	18,966	14,480	18,620	0,063	0,044	0,041	1,849	2,062	2,023
Passenger Cars	Gasoline <1,4 l	ECE 15/02	53,248	45,170	51,200	15,859	8,200	8,260	0,063	0,044	0,041	1,619	2,102	2,909
Passenger Cars	Gasoline <1,4 l	ECE 15/03	53,248	45,170	51,200	16,752	8,793	7,620	0,042	0,029	0,029	1,680	2,253	3,276
Passenger Cars	Gasoline <1,4 l	ECE 15/04	51,420	43,440	47,700	9,087	4,956	4,292	0,030	0,020	0,020	1,691	2,089	2,662
Passenger Cars	Gasoline <1,4 l	Euro I	47,399	41,954	46,055	1,765	1,372	1,765	0,003	0,002	0,002	0,273	0,281	0,458
Passenger Cars	Gasoline <1,4 l	Euro II	46,486	39,509	44,016	0,659	0,575	0,749	0,003	0,002	0,002	0,154	0,154	0,181
Passenger Cars	Gasoline <1,4 l	Euro III	48,687	42,255	45,323	0,519	0,691	1,148	0,001	0,001	0,001	0,076	0,060	0,052
Passenger Cars	Gasoline <1,4 l	Euro IV	50,038	44,193	48,285	0,195	0,287	0,529	0,001	0,001	0,001	0,054	0,030	0,019
Passenger Cars	Gasoline 1,4 - 2,0 l	PRE ECE	79,277	67,000	76,386	27,505	19,333	15,520	0,063	0,044	0,041	2,164	2,683	3,130
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/00-01	67,779	51,090	60,300	18,966	14,480	18,620	0,063	0,044	0,041	2,164	2,683	3,130
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/02	61,731	50,686	59,680	15,859	8,200	8,260	0,063	0,044	0,041	1,831	2,377	3,283
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/03	61,731	50,686	59,680	16,752	8,793	7,620	0,042	0,029	0,029	1,917	2,580	3,472
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/04	61,652	49,112	52,052	9,087	4,956	4,292	0,030	0,020	0,020	2,122	2,757	3,524
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro I	57,521	48,522	51,518	1,765	1,372	1,765	0,003	0,002	0,002	0,273	0,281	0,458
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro II	56,324	47,687	48,786	0,659	0,575	0,749	0,003	0,002	0,002	0,154	0,154	0,181
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro III	58,259	49,897	53,092	0,519	0,691	1,148	0,001	0,001	0,001	0,076	0,060	0,052
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro IV	60,486	52,793	55,293	0,195	0,287	0,529	0,001	0,001	0,001	0,054	0,030	0,019
Passenger Cars	Gasoline >2,0 l	PRE ECE	96,536	80,000	88,267	27,505	19,333	15,520	0,063	0,044	0,041	2,860	4,090	5,500
Passenger Cars	Gasoline >2,0 l	ECE 15/00-01	73,798	57,090	66,300	18,966	14,480	18,620	0,063	0,044	0,041	2,860	4,090	5,500
Passenger Cars	Gasoline >2,0 l	ECE 15/02	75,270	63,260	70,700	15,859	8,200	8,260	0,063	0,044	0,041	2,066	2,675	3,680
Passenger Cars	Gasoline >2,0 l	ECE 15/03	75,270	63,260	70,700	16,752	8,793	7,620	0,042	0,029	0,029	2,806	3,441	4,604
Passenger Cars	Gasoline >2,0 l	ECE 15/04	71,055	58,080	69,900	9,087	4,956	4,292	0,030	0,020	0,020	2,293	2,750	3,687
Passenger Cars	Gasoline >2,0 l	Euro I	74,616	61,902	65,020	1,765	1,372	1,765	0,003	0,002	0,002	0,273	0,281	0,458
Passenger Cars	Gasoline >2,0 l	Euro II	76,837	65,226	66,732	0,659	0,575	0,749	0,003	0,002	0,002	0,154	0,154	0,181
Passenger Cars	Gasoline >2,0 l	Euro III	70,798	57,424	56,826	0,519	0,691	1,148	0,001	0,001	0,001	0,076	0,060	0,052
Passenger Cars	Gasoline >2,0 l	Euro IV	86,099	67,877	65,859	0,195	0,287	0,529	0,001	0,001	0,001	0,054	0,030	0,019
Passenger Cars	Diesel <2,0 l	Euro I	47,836	42,807	48,388	0,419	0,215	0,208	0,057	0,062	0,107	0,603	0,562	0,663
Passenger Cars	Diesel <2,0 l	Euro II	50,442	44,117	48,779	0,343	0,110	0,035	0,047	0,039	0,050	0,651	0,555	0,665
Passenger Cars	Diesel <2,0 l	Euro III	48,920	43,427	45,585	0,099	0,041	0,012	0,029	0,030	0,045	0,716	0,665	0,750
Passenger Cars	Diesel <2,0 l	Euro IV	48,920	43,427	45,585	0,083	0,034	0,021	0,029	0,024	0,026	0,539	0,424	0,576
Passenger Cars	Diesel <2,0 l	Conventional	57,529	41,209	50,089	0,651	0,472	0,384	0,199	0,132	0,170	0,520	0,433	0,528
Passenger Cars	Diesel >2,0 l	Euro I	65,267	58,299	64,360	0,419	0,215	0,208	0,057	0,062	0,107	0,603	0,562	0,663

Continued

Sector	Subsector	Tech 2	FCu	FCr	FCh	COu	COr	COh	PMu	PMr	PMh	NO_Xu	NO_Xr	NO_Xh
Passenger Cars	Diesel >2,0 l	Euro II	65,267	58,299	64,360	0,343	0,110	0,035	0,047	0,039	0,050	0,651	0,555	0,665
Passenger Cars	Diesel >2,0 l	Euro III	65,267	58,299	64,360	0,099	0,041	0,012	0,029	0,030	0,045	0,716	0,665	0,750
Passenger Cars	Diesel >2,0 l	Euro IV	65,267	58,299	64,360	0,083	0,034	0,021	0,029	0,024	0,026	0,539	0,424	0,576
Passenger Cars	Diesel >2,0 l	Conventional	57,529	41,209	50,089	0,651	0,472	0,384	0,199	0,132	0,170	0,824	0,723	0,861
Passenger Cars	LPG	Conventional	59,000	45,000	54,000	2,043	2,373	9,723	0,040	0,030	0,025	2,203	2,584	2,861
Light Duty Vehicles	Gasoline <3,5t	Conventional	82,270	59,883	56,470	14,925	6,075	7,389	0,040	0,040	0,040	2,671	3,118	3,387
Light Duty Vehicles	Gasoline <3,5t	Euro I	96,450	70,388	66,450	4,187	0,862	1,087	0,003	0,002	0,002	0,427	0,400	0,429
Light Duty Vehicles	Gasoline <3,5t	Euro II	96,450	70,388	66,450	2,554	0,526	0,663	0,003	0,002	0,002	0,145	0,136	0,146
Light Duty Vehicles	Gasoline <3,5t	Euro III	96,450	70,388	66,450	2,177	0,448	0,565	0,001	0,001	0,001	0,090	0,084	0,090
Light Duty Vehicles	Diesel <3,5 t	Conventional	76,718	65,934	72,142	1,124	1,009	1,060	0,285	0,303	0,322	1,673	0,843	0,834
Light Duty Vehicles	Diesel <3,5 t	Euro I	68,860	58,185	63,660	0,393	0,328	0,423	0,070	0,066	0,090	1,138	0,975	1,022
Light Duty Vehicles	Diesel <3,5 t	Euro II	68,860	58,185	63,660	0,393	0,328	0,423	0,070	0,066	0,090	1,138	0,975	1,022
Light Duty Vehicles	Diesel <3,5 t	Euro III	68,860	58,185	63,660	0,322	0,269	0,347	0,047	0,044	0,061	0,740	0,634	0,664
Heavy Duty Vehicles	Gasoline >3,5 t	Conventional	225,000	150,000	165,000	70,000	55,000	55,000	0,400	0,400	0,400	4,500	7,500	7,500
Heavy Duty Vehicles	Diesel 3,5 - 7,5 t	Conventional	95,822	87,060	109,160	1,612	1,216	1,267	0,288	0,220	0,231	3,363	3,435	4,412
Heavy Duty Vehicles	Diesel 3,5 - 7,5 t	Euro I	77,226	74,990	96,471	0,533	0,417	0,496	0,111	0,085	0,090	2,343	2,497	3,204
Heavy Duty Vehicles	Diesel 3,5 - 7,5 t	Euro II	72,861	72,179	93,536	0,441	0,364	0,416	0,047	0,043	0,053	2,498	2,575	3,216
Heavy Duty Vehicles	Diesel 3,5 - 7,5 t	Euro III	77,798	76,111	97,038	0,528	0,372	0,375	0,051	0,037	0,037	1,955	1,896	2,330
Heavy Duty Vehicles	Diesel 7,5 - 16 t	Conventional	186,796	147,006	169,108	2,513	1,722	1,825	0,396	0,272	0,287	8,575	7,259	8,446
Heavy Duty Vehicles	Diesel 7,5 - 16 t	Euro I	157,382	126,707	149,418	1,190	0,822	0,874	0,235	0,160	0,170	5,118	4,333	5,002
Heavy Duty Vehicles	Diesel 7,5 - 16 t	Euro II	151,150	122,421	145,510	0,969	0,726	0,808	0,099	0,078	0,100	5,465	4,544	5,171
Heavy Duty Vehicles	Diesel 7,5 - 16 t	Euro III	158,817	127,460	150,203	1,163	0,780	0,821	0,104	0,071	0,076	4,431	3,535	3,915
Heavy Duty Vehicles	Diesel 16 - 32 t	Conventional	295,313	227,040	230,740	2,803	1,927	1,895	0,549	0,384	0,376	12,512	10,087	10,251
Heavy Duty Vehicles	Diesel 16 - 32 t	Euro I	255,466	198,864	203,490	1,975	1,387	1,365	0,389	0,264	0,255	8,507	6,835	6,905
Heavy Duty Vehicles	Diesel 16 - 32 t	Euro II	245,791	192,865	197,773	1,588	1,198	1,230	0,168	0,124	0,155	8,916	7,118	7,115
Heavy Duty Vehicles	Diesel 16 - 32 t	Euro III	255,628	198,692	202,461	1,886	1,298	1,279	0,168	0,114	0,111	7,153	5,549	5,512
Heavy Duty Vehicles	Diesel >32t	Conventional	392,838	311,460	297,380	3,143	2,293	2,190	0,683	0,506	0,478	16,482	13,628	12,693
Heavy Duty Vehicles	Diesel >32t	Euro I	346,235	276,687	264,125	2,662	2,009	1,913	0,524	0,373	0,347	11,621	9,581	8,935
Heavy Duty Vehicles	Diesel >32t	Euro II	336,196	270,809	257,607	2,161	1,731	1,720	0,237	0,175	0,223	12,060	9,895	9,161
Heavy Duty Vehicles	Diesel >32t	Euro III	346,156	276,262	262,095	2,497	1,841	1,759	0,219	0,155	0,143	9,625	7,809	7,238
Buses	Urban Buses	Conventional	315,796	253,287	219,035	4,741	3,178	2,375	0,751	0,498	0,374	14,511	12,324	10,937
Buses	Urban Buses	Euro I	268,961	219,461	190,892	2,274	1,532	1,059	0,407	0,290	0,211	8,836	7,474	6,391
Buses	Urban Buses	Euro II	259,715	216,150	190,405	2,004	1,359	0,914	0,187	0,141	0,118	9,441	7,809	6,730
Buses	Urban Buses	Euro III	273,102	224,893	195,747	2,218	1,456	0,988	0,176	0,127	0,101	7,997	6,112	4,916
Buses	Coaches	Conventional	281,771	214,600	198,320	2,640	1,684	1,409	0,538	0,364	0,312	10,938	8,865	8,559

Continued

Sector	Subsector	Tech 2	FCu	FCr	FCh	COu	COr	COh	PMu	PMr	PMh	NO_Xu	NO_Xr	NO_Xh
Buses	Coaches	Euro I	259,336	198,133	182,616	2,140	1,405	1,179	0,425	0,277	0,227	8,372	6,741	6,409
Buses	Coaches	Euro II	258,542	198,791	182,581	1,787	1,213	1,071	0,183	0,134	0,119	9,357	7,401	6,978
Buses	Coaches	Euro III	276,957	213,400	197,945	2,202	1,453	1,231	0,202	0,140	0,117	8,039	6,015	5,526
Mopeds	<50 cm³	Conventional	25,000	25,000	0,000	13,800	13,800	0,000	0,188	0,188	0,000	0,020	0,020	0,000
Mopeds	<50 cm³	Euro I	15,000	15,000	0,000	5,600	5,600	0,000	0,076	0,076	0,000	0,020	0,020	0,000
Mopeds	<50 cm³	Euro II	12,080	12,080	0,000	1,300	1,300	0,000	0,038	0,038	0,000	0,260	0,260	0,000
Motorcycles	2-stroke >50 cm³	Conventional	30,368	32,375	36,950	23,380	25,490	27,500	0,200	0,200	0,200	0,032	0,088	0,133
Motorcycles	4-stroke <250 cm³	Conventional	23,340	26,690	35,600	22,380	26,300	38,600	0,020	0,020	0,020	0,130	0,242	0,362
Motorcycles	4-stroke <250 cm³	Euro I	22,060	29,470	52,000	12,901	14,597	15,450	0,020	0,020	0,020	0,245	0,416	0,725
Motorcycles	4-stroke <250 cm³	Euro II	22,060	29,470	52,000	6,472	5,947	9,309	0,005	0,005	0,005	0,195	0,265	0,531
Motorcycles	4-stroke 250 - 750 cm³	Conventional	28,580	28,640	34,700	20,440	21,517	25,810	0,020	0,020	0,020	0,136	0,251	0,374
Motorcycles	4-stroke 250 - 750 cm³	Euro I	28,964	29,336	41,300	9,538	13,315	19,810	0,020	0,020	0,020	0,292	0,477	0,757
Motorcycles	4-stroke 250 - 750 cm³	Euro II	28,964	29,336	41,300	6,472	5,947	9,309	0,005	0,005	0,005	0,195	0,265	0,531
Motorcycles	4-stroke >750 cm³	Conventional	37,520	34,340	38,600	14,880	18,030	24,300	0,020	0,020	0,020	0,148	0,266	0,392
Motorcycles	4-stroke >750 cm³	Euro I	44,952	36,378	40,800	7,884	6,831	10,800	0,020	0,020	0,020	0,210	0,522	1,092
Motorcycles	4-stroke >750 cm³	Euro II	44,952	36,378	40,800	6,472	5,947	9,309	0,005	0,005	0,005	0,195	0,265	0,531

Sector	Subsector	Tech 2	CH_4u	CH_4r	CH_4h	N_2Ou	N_2Or	N_2Oh	NH_3u	NH_3r	NH_3h	VOCu	VOCr	VOCh
Passenger Cars	Gasoline <1,4 l	PRE ECE	0,092	0,029	0,026	0,010	0,007	0,007	0,002	0,002	0,002	2,354	1,597	1,247
Passenger Cars	Gasoline <1,4 l	ECE 15/00-01	0,092	0,029	0,026	0,010	0,007	0,007	0,002	0,002	0,002	1,862	1,256	1,121
Passenger Cars	Gasoline <1,4 l	ECE 15/02	0,092	0,029	0,026	0,010	0,007	0,007	0,002	0,002	0,002	1,849	1,061	0,950
Passenger Cars	Gasoline <1,4 l	ECE 15/03	0,092	0,029	0,026	0,010	0,007	0,007	0,002	0,002	0,002	1,849	1,061	0,950
Passenger Cars	Gasoline <1,4 l	ECE 15/04	0,092	0,029	0,026	0,010	0,007	0,007	0,002	0,002	0,002	1,480	0,895	0,698
Passenger Cars	Gasoline <1,4 l	Euro I	0,026	0,016	0,014	0,024	0,009	0,005	0,070	0,132	0,074	0,177	0,121	0,111
Passenger Cars	Gasoline <1,4 l	Euro II	0,017	0,013	0,011	0,012	0,005	0,003	0,163	0,149	0,084	0,071	0,047	0,042
Passenger Cars	Gasoline <1,4 l	Euro III	0,003	0,002	0,004	0,001	0,000	0,000	0,002	0,029	0,065	0,015	0,015	0,025
Passenger Cars	Gasoline <1,4 l	Euro IV	0,002	0,002	0,000	0,002	0,000	0,000	0,002	0,029	0,065	0,012	0,014	0,017
Passenger Cars	Gasoline 1,4 - 2,0 l	PRE ECE	0,092	0,029	0,026	0,010	0,007	0,007	0,002	0,002	0,002	2,354	1,597	1,247
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/00-01	0,092	0,029	0,026	0,010	0,007	0,007	0,002	0,002	0,002	1,862	1,256	1,121
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/02	0,092	0,029	0,026	0,010	0,007	0,007	0,002	0,002	0,002	1,849	1,061	0,950
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/03	0,092	0,029	0,026	0,010	0,007	0,007	0,002	0,002	0,002	1,849	1,061	0,950
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/04	0,092	0,029	0,026	0,010	0,007	0,007	0,002	0,002	0,002	1,480	0,895	0,698
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro I	0,026	0,016	0,014	0,024	0,009	0,005	0,070	0,132	0,074	0,177	0,121	0,111
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro II	0,017	0,013	0,011	0,012	0,005	0,003	0,163	0,149	0,084	0,071	0,047	0,042

Continued

Sector	Subsector	Tech 2	CH_4u	CH_4r	CH_4h	N_2Ou	N_2Or	N_2Oh	NH_3u	NH_3r	NH_3h	VOCu	VOCr	VOCh
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro III	0,003	0,002	0,004	0,001	0,000	0,000	0,002	0,029	0,065	0,015	0,015	0,025
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro IV	0,002	0,002	0,000	0,002	0,000	0,000	0,002	0,029	0,065	0,012	0,014	0,017
Passenger Cars	Gasoline >2,0 l	PRE ECE	0,092	0,029	0,026	0,010	0,007	0,007	0,002	0,002	0,002	2,354	1,597	1,247
Passenger Cars	Gasoline >2,0 l	ECE 15/00-01	0,092	0,029	0,026	0,010	0,007	0,007	0,002	0,002	0,002	1,862	1,256	1,121
Passenger Cars	Gasoline >2,0 l	ECE 15/02	0,092	0,029	0,026	0,010	0,007	0,007	0,002	0,002	0,002	1,849	1,061	0,950
Passenger Cars	Gasoline >2,0 l	ECE 15/03	0,092	0,029	0,026	0,010	0,007	0,007	0,002	0,002	0,002	1,849	1,061	0,950
Passenger Cars	Gasoline >2,0 l	ECE 15/04	0,092	0,029	0,026	0,010	0,007	0,007	0,002	0,002	0,002	1,480	0,895	0,698
Passenger Cars	Gasoline >2,0 l	Euro I	0,026	0,016	0,014	0,024	0,009	0,005	0,070	0,132	0,074	0,177	0,121	0,111
Passenger Cars	Gasoline >2,0 l	Euro II	0,017	0,013	0,011	0,012	0,005	0,003	0,163	0,149	0,084	0,071	0,047	0,042
Passenger Cars	Gasoline >2,0 l	Euro III	0,003	0,002	0,004	0,001	0,000	0,000	0,002	0,029	0,065	0,015	0,015	0,025
Passenger Cars	Gasoline >2,0 l	Euro IV	0,002	0,002	0,000	0,002	0,000	0,000	0,002	0,029	0,065	0,012	0,014	0,017
Passenger Cars	Diesel <2,0 l	Euro I	0,011	0,009	0,003	0,002	0,004	0,004	0,001	0,001	0,001	0,053	0,031	0,026
Passenger Cars	Diesel <2,0 l	Euro II	0,007	0,003	0,002	0,004	0,006	0,006	0,001	0,001	0,001	0,034	0,021	0,015
Passenger Cars	Diesel <2,0 l	Euro III	0,003	0,000	0,000	0,009	0,004	0,004	0,001	0,001	0,001	0,018	0,011	0,009
Passenger Cars	Diesel <2,0 l	Euro IV	0,000	0,000	0,000	0,009	0,004	0,004	0,001	0,001	0,001	0,038	0,017	0,012
Passenger Cars	Diesel <2,0 l	Conventional	0,028	0,012	0,008	0,000	0,000	0,000	0,001	0,001	0,001	0,145	0,086	0,062
Passenger Cars	Diesel >2,0 l	Euro I	0,011	0,009	0,003	0,002	0,004	0,004	0,001	0,001	0,001	0,080	0,046	0,034
Passenger Cars	Diesel >2,0 l	Euro II	0,007	0,003	0,002	0,004	0,006	0,006	0,001	0,001	0,001	0,098	0,058	0,038
Passenger Cars	Diesel >2,0 l	Euro III	0,003	0,000	0,000	0,009	0,004	0,004	0,001	0,001	0,001	0,038	0,017	0,012
Passenger Cars	Diesel >2,0 l	Euro IV	0,000	0,000	0,000	0,009	0,004	0,004	0,001	0,001	0,001	0,011	0,006	0,006
Passenger Cars	Diesel >2,0 l	Conventional	0,028	0,012	0,008	0,000	0,000	0,000	0,001	0,001	0,001	0,145	0,086	0,062
Passenger Cars	LPG	Conventional	0,080	0,035	0,025	0,000	0,000	0,000	0,000	0,000	0,000	1,082	0,667	0,490
Light Duty Vehicles	Gasoline <3,5t	Conventional	0,150	0,040	0,025	0,010	0,007	0,007	0,002	0,002	0,002	1,877	0,729	0,446
Light Duty Vehicles	Gasoline <3,5t	Euro I	0,026	0,016	0,014	0,034	0,020	0,010	0,070	0,132	0,074	0,220	0,109	0,078
Light Duty Vehicles	Gasoline <3,5t	Euro II	0,017	0,013	0,011	0,023	0,013	0,008	0,163	0,149	0,084	0,053	0,026	0,019
Light Duty Vehicles	Gasoline <3,5t	Euro III	0,003	0,002	0,004	0,007	0,001	0,001	0,002	0,030	0,065	0,031	0,015	0,011
Light Duty Vehicles	Diesel <3,5 t	Conventional	0,028	0,012	0,008	0,000	0,000	0,000	0,001	0,001	0,001	0,131	0,106	0,101
Light Duty Vehicles	Diesel <3,5 t	Euro I	0,011	0,009	0,003	0,002	0,004	0,004	0,001	0,001	0,001	0,131	0,106	0,101
Light Duty Vehicles	Diesel <3,5 t	Euro II	0,007	0,003	0,002	0,004	0,006	0,006	0,001	0,001	0,001	0,131	0,106	0,101
Light Duty Vehicles	Diesel <3,5 t	Euro III	0,003	0,000	0,000	0,009	0,004	0,004	0,001	0,001	0,001	0,081	0,065	0,063
Heavy Duty Vehicles	Gasoline >3,5 t	Conventional	0,140	0,110	0,070	0,006	0,006	0,006	0,002	0,002	0,002	7,000	5,500	3,500
Heavy Duty Vehicles	Diesel 3,5 - 7,5 t	Conventional	0,085	0,023	0,020	0,030	0,030	0,030	0,003	0,003	0,003	1,432	0,865	0,648
Heavy Duty Vehicles	Diesel 3,5 - 7,5 t	Euro I	0,085	0,023	0,020	0,030	0,030	0,030	0,003	0,003	0,003	0,285	0,185	0,154
Heavy Duty Vehicles	Diesel 3,5 - 7,5 t	Euro II	0,054	0,020	0,019	0,030	0,030	0,030	0,003	0,003	0,003	0,184	0,118	0,096
Heavy Duty Vehicles	Diesel 3,5 - 7,5 t	Euro III	0,048	0,021	0,018	0,030	0,030	0,030	0,003	0,003	0,003	0,166	0,105	0,082

Continued

Sector	Subsector	Tech 2	CH_4u	CH_4r	CH_4h	N_2Ou	N_2Or	N_2Oh	NH_3u	NH_3r	NH_3h	VOCu	VOCr	VOCh
Heavy Duty Vehicles	Diesel 7,5 - 16 t	Conventional	0,085	0,023	0,020	0,030	0,030	0,030	0,003	0,003	0,003	1,317	0,833	0,680
Heavy Duty Vehicles	Diesel 7,5 - 16 t	Euro I	0,085	0,023	0,020	0,030	0,030	0,030	0,003	0,003	0,003	0,551	0,364	0,308
Heavy Duty Vehicles	Diesel 7,5 - 16 t	Euro II	0,054	0,020	0,019	0,030	0,030	0,030	0,003	0,003	0,003	0,355	0,231	0,193
Heavy Duty Vehicles	Diesel 7,5 - 16 t	Euro III	0,048	0,021	0,018	0,030	0,030	0,030	0,003	0,003	0,003	0,315	0,204	0,173
Heavy Duty Vehicles	Diesel 16 - 32 t	Conventional	0,175	0,080	0,070	0,030	0,030	0,030	0,003	0,003	0,003	1,094	0,690	0,561
Heavy Duty Vehicles	Diesel 16 - 32 t	Euro I	0,175	0,080	0,070	0,030	0,030	0,030	0,003	0,003	0,003	0,768	0,503	0,419
Heavy Duty Vehicles	Diesel 16 - 32 t	Euro II	0,112	0,070	0,065	0,030	0,030	0,030	0,003	0,003	0,003	0,492	0,319	0,261
Heavy Duty Vehicles	Diesel 16 - 32 t	Euro III	0,098	0,074	0,064	0,030	0,030	0,030	0,003	0,003	0,003	0,436	0,281	0,234
Heavy Duty Vehicles	Diesel >32t	Conventional	0,175	0,080	0,070	0,030	0,030	0,030	0,003	0,003	0,003	0,958	0,593	0,482
Heavy Duty Vehicles	Diesel >32t	Euro I	0,175	0,080	0,070	0,030	0,030	0,030	0,003	0,003	0,003	0,889	0,574	0,473
Heavy Duty Vehicles	Diesel >32t	Euro II	0,112	0,070	0,065	0,030	0,030	0,030	0,003	0,003	0,003	0,564	0,363	0,290
Heavy Duty Vehicles	Diesel >32t	Euro III	0,098	0,074	0,064	0,030	0,030	0,030	0,003	0,003	0,003	0,493	0,315	0,260
Buses	Urban Buses	Conventional	0,175	0,080	0,070	0,030	0,030	0,030	0,003	0,003	0,003	1,830	1,116	0,865
Buses	Urban Buses	Euro I	0,175	0,080	0,070	0,030	0,030	0,030	0,003	0,003	0,003	0,754	0,488	0,395
Buses	Urban Buses	Euro II	0,114	0,052	0,046	0,030	0,030	0,030	0,003	0,003	0,003	0,491	0,318	0,262
Buses	Urban Buses	Euro III	0,103	0,047	0,041	0,030	0,030	0,030	0,003	0,003	0,003	0,437	0,283	0,231
Buses	Coaches	Conventional	0,175	0,080	0,070	0,030	0,030	0,030	0,003	0,003	0,003	1,008	0,577	0,422
Buses	Coaches	Euro I	0,175	0,080	0,070	0,030	0,030	0,030	0,003	0,003	0,003	0,936	0,563	0,441
Buses	Coaches	Euro II	0,114	0,052	0,046	0,030	0,030	0,030	0,003	0,003	0,003	0,623	0,380	0,290
Buses	Coaches	Euro III	0,103	0,047	0,041	0,030	0,030	0,030	0,003	0,003	0,003	0,575	0,354	0,289
Mopeds	<50 cm^3	Conventional	0,219	0,219	0,000	0,001	0,001	0,001	0,001	0,001	0,001	13,910	13,910	0,000
Mopeds	<50 cm^3	Euro I	0,044	0,044	0,000	0,001	0,001	0,001	0,001	0,001	0,001	2,730	2,730	0,000
Mopeds	<50 cm^3	Euro II	0,024	0,024	0,000	0,001	0,001	0,001	0,001	0,001	0,001	1,560	1,560	0,000
Motorcycles	2-stroke >50 cm^3	Conventional	0,150	0,150	0,150	0,002	0,002	0,002	0,002	0,002	0,002	9,340	8,402	8,360
Motorcycles	4-stroke <250 cm^3	Conventional	0,200	0,200	0,200	0,002	0,002	0,002	0,002	0,002	0,002	1,550	0,960	1,320
Motorcycles	4-stroke <250 cm^3	Euro I	0,142	0,144	0,132	0,002	0,002	0,002	0,002	0,002	0,002	1,103	0,870	0,870
Motorcycles	4-stroke <250 cm^3	Euro II	0,136	0,092	0,092	0,002	0,002	0,002	0,002	0,002	0,002	1,053	0,557	0,612
Motorcycles	4-stroke 250 - 750 cm^3	Conventional	0,200	0,200	0,200	0,002	0,002	0,002	0,002	0,002	0,002	1,350	0,944	1,010
Motorcycles	4-stroke 250 - 750 cm^3	Euro I	0,148	0,174	0,156	0,002	0,002	0,002	0,002	0,002	0,002	1,002	0,753	0,790
Motorcycles	4-stroke 250 - 750 cm^3	Euro II	0,156	0,120	0,122	0,002	0,002	0,002	0,002	0,002	0,002	1,053	0,557	0,612
Motorcycles	4-stroke >750 cm^3	Conventional	0,200	0,200	0,200	0,002	0,002	0,002	0,002	0,002	0,002	2,520	1,610	1,190
Motorcycles	4-stroke >750 cm^3	Euro I	0,092	0,092	0,154	0,002	0,002	0,002	0,002	0,002	0,002	1,170	0,742	0,920
Motorcycles	4-stroke >750 cm^3	Euro II	0,084	0,062	0,102	0,002	0,002	0,002	0,002	0,002	0,002	1,053	0,557	0,612

Annex 5: Reduction factors for road transport emission factors

Sector	Subsector	Tech 2	FCuR	FCrR	FChR	COuR	COrR	COhR	PMuR	PMrR	PMhR	NO_XuR	NO_XrR	NO_XhR	VOCuR	VOCrR	VOChR
Passenger Cars	Gasoline <1,4 l	PRE ECE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Passenger Cars	Gasoline <1,4 l	ECE 15/00-01	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Passenger Cars	Gasoline <1,4 l	ECE 15/02	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Passenger Cars	Gasoline <1,4 l	ECE 15/03	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Passenger Cars	Gasoline <1,4 l	ECE 15/04	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Passenger Cars	Gasoline <1,4 l	Euro I	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Passenger Cars	Gasoline <1,4 l	Euro II	1.9	5.8	4.4	62.6	58.1	57.5	0.0	0.0	0.0	43.6	45.2	60.4	60.2	61.3	62.1
Passenger Cars	Gasoline <1,4 l	Euro III	-2.7	-0.7	1.6	70.6	49.6	34.9	60.2	54.6	37.4	72.2	78.5	88.7	91.7	87.5	77.0
Passenger Cars	Gasoline <1,4 l	Euro IV	-5.6	-5.3	-4.8	89.0	79.1	70.1	60.2	54.6	37.4	80.1	89.2	95.9	93.3	88.7	84.5
Passenger Cars	Gasoline 1,4 - 2,0 l	PRE ECE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/00-01	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/02	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/03	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Passenger Cars	Gasoline 1,4 - 2,0 l	ECE 15/04	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro I	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro II	2.1	1.7	5.3	62.6	58.1	57.5	0.0	0.0	0.0	43.6	45.2	60.4	60.2	61.3	62.1
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro III	-1.3	-2.8	-3.1	70.6	49.6	34.9	60.2	54.6	37.4	72.2	78.5	88.7	91.7	87.5	77.0
Passenger Cars	Gasoline 1,4 - 2,0 l	Euro IV	-5.2	-8.8	-7.3	89.0	79.1	70.1	60.2	54.6	37.4	80.1	89.2	95.9	93.3	88.7	84.5
Passenger Cars	Gasoline >2,0 l	PRE ECE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Passenger Cars	Gasoline >2,0 l	ECE 15/00-01	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Passenger Cars	Gasoline >2,0 l	ECE 15/02	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Passenger Cars	Gasoline >2,0 l	ECE 15/03	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Passenger Cars	Gasoline >2,0 l	ECE 15/04	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Passenger Cars	Gasoline >2,0 l	Euro I	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Passenger Cars	Gasoline >2,0 l	Euro II	-3.0	-5.4	-2.6	62.6	58.1	57.5	0.0	0.0	0.0	43.6	45.2	60.4	60.2	61.3	62.1
Passenger Cars	Gasoline >2,0 l	Euro III	5.1	7.2	12.6	70.6	49.6	34.9	60.2	54.6	37.4	72.2	78.5	88.7	91.7	87.5	77.0
Passenger Cars	Gasoline >2,0 l	Euro IV	-15.4	-9.7	-1.3	89.0	79.1	70.1	60.2	54.6	37.4	80.1	89.2	95.9	93.3	88.7	84.5
Passenger Cars	Diesel <2,0 l	Euro I	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Passenger Cars	Diesel <2,0 l	Euro II	-5.4	-3.1	-0.8	18.1	48.8	83.0	17.9	36.9	53.2	-7.9	1.2	-0.2	34.8	33.4	41.6
Passenger Cars	Diesel <2,0 l	Euro III	-2.3	-1.4	5.8	76.4	81.1	94.3	48.5	51.9	58.3	-18.7	-18.5	-13.0	65.9	63.3	66.2
Passenger Cars	Diesel <2,0 l	Euro IV	-2.3	-1.4	5.8	80.1	84.2	89.7	49.0	60.6	75.8	10.6	24.5	13.2	27.6	44.3	51.9
Passenger Cars	Diesel <2,0 l	Conventional	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Passenger Cars	Diesel >2,0 l	Euro I	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Continued

Sector	Subsector	Tech 2	FCuR	FCrR	FChR	COuR	COrR	COhR	PMuR	PMrR	PMhR	NO_XuR	NO_XrR	NO_XhR	VOCuR	VOCrR	VOChR
Passenger Cars	Diesel >2,0 l	Euro II	0.0	0.0	0.0	18.1	48.8	83.0	17.9	36.9	53.2	-7.9	1.2	-0.2	-22.1	-25.4	-11.5
Passenger Cars	Diesel >2,0 l	Euro III	0.0	0.0	0.0	76.4	81.1	94.3	48.5	51.9	58.3	-18.7	-18.5	-13.0	52.2	62.7	63.9
Passenger Cars	Diesel >2,0 l	Euro IV	0.0	0.0	0.0	80.1	84.2	89.7	49.0	60.6	75.8	10.6	24.5	13.2	86.4	86.1	83.2
Passenger Cars	Diesel >2,0 l	Conventional	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Passenger Cars	LPG	Conventional	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Light Duty Vehicles	Gasoline <3,5t	Conventional	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Light Duty Vehicles	Gasoline <3,5t	Euro I	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Light Duty Vehicles	Gasoline <3,5t	Euro II	0.0	0.0	0.0	39.0	39.0	39.0	0.0	0.0	0.0	66.0	66.0	66.0	76.0	76.0	76.0
Light Duty Vehicles	Gasoline <3,5t	Euro III	0.0	0.0	0.0	48.0	48.0	48.0	60.2	54.6	37.4	79.0	79.0	79.0	86.0	86.0	86.0
Light Duty Vehicles	Diesel <3,5 t	Conventional	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Light Duty Vehicles	Diesel <3,5 t	Euro I	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Light Duty Vehicles	Diesel <3,5 t	Euro II	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Light Duty Vehicles	Diesel <3,5 t	Euro III	0.0	0.0	0.0	18.0	18.0	18.0	33.0	33.0	33.0	35.0	35.0	35.0	38.0	38.0	38.0
Heavy Duty Vehicles	Gasoline >3,5 t	Conventional	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Heavy Duty Vehicles	Diesel 3,5 - 7,5 t	Conventional	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Heavy Duty Vehicles	Diesel 3,5 - 7,5 t	Euro I	19.4	13.9	11.6	67.0	65.7	60.8	61.5	61.4	61.1	30.3	27.3	27.4	80.1	78.6	76.2
Heavy Duty Vehicles	Diesel 3,5 - 7,5 t	Euro II	24.0	17.1	14.3	72.6	70.1	67.1	83.6	80.5	77.2	25.7	25.0	27.1	87.2	86.4	85.1
Heavy Duty Vehicles	Diesel 3,5 - 7,5 t	Euro III	18.8	12.6	11.1	67.3	69.4	70.4	82.2	83.1	84.0	41.9	44.8	47.2	88.4	87.8	87.3
Heavy Duty Vehicles	Diesel 7,5 - 16 t	Conventional	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Heavy Duty Vehicles	Diesel 7,5 - 16 t	Euro I	15.7	13.8	11.6	52.6	52.2	52.1	40.7	40.9	40.8	40.3	40.3	40.8	58.2	56.3	54.7
Heavy Duty Vehicles	Diesel 7,5 - 16 t	Euro II	19.1	16.7	14.0	61.4	57.8	55.7	75.0	71.3	65.3	36.3	37.4	38.8	73.1	72.3	71.6
Heavy Duty Vehicles	Diesel 7,5 - 16 t	Euro III	15.0	13.3	11.2	53.7	54.7	55.0	73.7	73.7	73.6	48.3	51.3	53.6	76.1	75.5	74.6
Heavy Duty Vehicles	Diesel 16 - 32 t	Conventional	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Heavy Duty Vehicles	Diesel 16 - 32 t	Euro I	13.5	12.4	11.8	29.5	28.0	28.0	29.2	31.4	32.1	32.0	32.2	32.6	29.8	27.2	25.4
Heavy Duty Vehicles	Diesel 16 - 32 t	Euro II	16.8	15.1	14.3	43.4	37.9	35.1	69.4	67.6	58.9	28.7	29.4	30.6	55.0	53.7	53.6
Heavy Duty Vehicles	Diesel 16 - 32 t	Euro III	13.4	12.5	12.3	32.7	32.7	32.5	69.4	70.2	70.5	42.8	45.0	46.2	60.2	59.2	58.3
Heavy Duty Vehicles	Diesel >32t	Conventional	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Heavy Duty Vehicles	Diesel >32t	Euro I	11.9	11.2	11.2	15.3	12.4	12.6	23.2	26.4	27.5	29.5	29.7	29.6	7.3	3.2	2.0
Heavy Duty Vehicles	Diesel >32t	Euro II	14.4	13.1	13.4	31.3	24.5	21.4	65.2	65.4	53.4	26.8	27.4	27.8	41.2	38.8	40.0
Heavy Duty Vehicles	Diesel >32t	Euro III	11.9	11.3	11.9	20.6	19.7	19.7	68.0	69.4	70.0	41.6	42.7	43.0	48.6	46.9	46.2
Buses	Urban Buses	Conventional	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Buses	Urban Buses	Euro I	14.8	13.4	12.8	52.0	51.8	55.4	45.7	41.8	43.7	39.1	39.4	41.6	58.8	56.3	54.4
Buses	Urban Buses	Euro II	17.8	14.7	13.1	57.7	57.2	61.5	75.0	71.7	68.5	34.9	36.6	38.5	73.2	71.5	69.7
Buses	Urban Buses	Euro III	13.5	11.2	10.6	53.2	54.2	58.4	76.6	74.5	72.9	44.9	50.4	55.1	76.1	74.6	73.3
Buses	Coaches	Conventional	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Continued

Sector	Subsector	Tech 2	FCuR	FCrR	FChR	COuR	COrR	COhR	PMuR	PMrR	PMhR	NO_XuR	NO_XrR	NO_XhR	VOCuR	VOCrR	VOChR
Buses	Coaches	Euro I	8.0	7.7	7.9	18.9	16.5	16.3	20.9	23.8	27.1	23.5	24.0	25.1	7.2	2.5	-4.4
Buses	Coaches	Euro II	8.2	7.4	7.9	32.3	28.0	24.0	66.0	63.1	61.7	14.5	16.5	18.5	38.2	34.1	31.3
Buses	Coaches	Euro III	1.7	0.6	0.2	16.6	13.7	12.6	62.3	61.6	62.4	26.5	32.1	35.4	43.0	38.7	31.7
Mopeds	<50 cm³	Conventional	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mopeds	<50 cm³	Euro I	40.0	40.0	0.0	59.4	59.4	0.0	59.8	59.8	0.0	0.0	0.0	0.0	80.4	80.4	0.0
Mopeds	<50 cm³	Euro II	51.7	51.7	0.0	90.6	90.6	0.0	80.0	80.0	0.0	-1200.0	-1200.0	0.0	88.8	88.8	0.0
Motorcycles	2-stroke >50 cm³	Conventional	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Motorcycles	4-stroke <250 cm³	Conventional	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Motorcycles	4-stroke <250 cm³	Euro I	5.5	-10.4	-46.1	42.4	44.5	60.0	0.0	0.0	0.0	-88.7	-72.0	-100.3	28.9	9.4	34.1
Motorcycles	4-stroke <250 cm³	Euro II	5.5	-10.4	-46.1	71.1	77.4	75.9	75.0	75.0	75.0	-50.0	-9.5	-46.7	32.1	42.0	53.6
Motorcycles	4-stroke 250 - 750 cm³	Conventional	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Motorcycles	4-stroke 250 - 750 cm³	Euro I	-1.3	-2.4	-19.0	53.3	38.1	23.2	0.0	0.0	0.0	-114.6	-90.2	-102.4	25.7	20.2	21.8
Motorcycles	4-stroke 250 - 750 cm³	Euro II	-1.3	-2.4	-19.0	68.3	72.4	63.9	75.0	75.0	75.0	-43.4	-5.6	-42.0	22.0	41.0	39.4
Motorcycles	4-stroke >750 cm³	Conventional	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Motorcycles	4-stroke >750 cm³	Euro I	-19.8	-5.9	-5.7	47.0	62.1	55.6	0.0	0.0	0.0	-41.9	-96.4	-178.6	53.6	53.9	22.7
Motorcycles	4-stroke >750 cm³	Euro II	-19.8	-5.9	-5.7	56.5	67.0	61.7	75.0	75.0	75.0	-31.8	0.4	-35.5	58.2	65.4	48.6

Annex 6: Fuel use factors (MJ/km) and emission factors (g/km)

Sector	Year	FCu (MJ)	FCr (MJ)	FCh (MJ)	CO_2u	CO_2r	CO_2h	CH_4u	CH_4r	CH_4h	N_2Ou	N_2Or	N_2Oh	SO_2u	SO_2r	SO_2h	NO_Xu	NO_Xr	NO_Xh
Passenger Cars	1985	3.883	2.059	1.651	284	150	121	0.172	0.027	0.017	0.011	0.006	0.004	0.075	0.038	0.032	2.245	2.170	1.942
Passenger Cars	1986	3.844	2.049	1.638	281	150	120	0.171	0.027	0.017	0.011	0.006	0.004	0.049	0.025	0.021	2.236	2.169	1.949
Passenger Cars	1987	3.829	2.038	1.623	280	149	119	0.171	0.027	0.017	0.011	0.006	0.004	0.051	0.026	0.022	2.234	2.162	1.943
Passenger Cars	1988	3.742	2.026	1.606	273	148	117	0.169	0.027	0.017	0.011	0.006	0.004	0.051	0.026	0.022	2.206	2.152	1.937
Passenger Cars	1989	3.707	2.020	1.598	271	148	117	0.168	0.027	0.017	0.011	0.006	0.004	0.037	0.019	0.016	2.194	2.148	1.940
Passenger Cars	1990	3.691	2.018	1.593	270	147	116	0.168	0.027	0.017	0.011	0.006	0.004	0.036	0.019	0.015	2.200	2.159	1.954
Passenger Cars	1991	3.624	2.059	1.584	265	150	116	0.158	0.027	0.016	0.011	0.006	0.004	0.034	0.018	0.015	2.050	2.070	1.838
Passenger Cars	1992	3.440	2.057	1.819	251	150	133	0.145	0.026	0.018	0.012	0.006	0.005	0.023	0.013	0.012	1.856	1.942	1.996
Passenger Cars	1993	3.452	2.054	1.811	252	150	132	0.138	0.025	0.018	0.012	0.006	0.004	0.013	0.008	0.007	1.781	1.825	1.884
Passenger Cars	1994	3.339	2.101	1.802	244	154	132	0.122	0.024	0.017	0.013	0.007	0.004	0.012	0.008	0.007	1.595	1.667	1.697
Passenger Cars	1995	3.198	2.103	2.035	234	154	149	0.109	0.023	0.018	0.013	0.007	0.005	0.012	0.008	0.008	1.427	1.514	1.757
Passenger Cars	1996	3.151	2.059	2.265	230	150	166	0.099	0.022	0.019	0.013	0.007	0.005	0.012	0.008	0.009	1.315	1.341	1.790
Passenger Cars	1997	3.079	2.045	2.232	225	149	163	0.088	0.020	0.018	0.013	0.007	0.005	0.011	0.008	0.009	1.189	1.174	1.584
Passenger Cars	1998	3.076	2.048	2.220	225	150	162	0.080	0.019	0.017	0.013	0.007	0.005	0.011	0.008	0.009	1.089	1.031	1.398
Passenger Cars	1999	3.057	2.049	2.212	223	150	162	0.073	0.018	0.016	0.013	0.006	0.004	0.009	0.006	0.007	1.006	0.915	1.241
Passenger Cars	2000	3.043	2.052	2.208	222	150	161	0.067	0.017	0.015	0.013	0.006	0.004	0.007	0.005	0.005	0.947	0.831	1.127
Passenger Cars	2001	3.072	2.056	2.209	225	150	161	0.062	0.016	0.014	0.012	0.006	0.004	0.007	0.005	0.005	0.900	0.768	1.037
Passenger Cars	2002	3.044	2.060	2.209	223	151	162	0.056	0.014	0.012	0.012	0.006	0.004	0.007	0.005	0.005	0.836	0.697	0.936
Passenger Cars	2003	3.056	2.064	2.209	223	151	162	0.051	0.013	0.011	0.011	0.005	0.003	0.007	0.005	0.005	0.783	0.635	0.846
Passenger Cars	2004	3.009	2.066	2.208	220	151	162	0.045	0.012	0.010	0.010	0.005	0.003	0.007	0.005	0.005	0.725	0.576	0.759
Passenger Cars	2005	3.026	2.059	2.198	221	151	161	0.041	0.010	0.009	0.009	0.004	0.003	0.001	0.001	0.001	0.677	0.520	0.674
Passenger Cars	2006	3.011	2.066	2.200	220	151	161	0.036	0.009	0.008	0.009	0.004	0.003	0.001	0.001	0.001	0.616	0.463	0.592
Light Duty Vehicles	1985	4.614	2.619	2.391	341	193	177	0.056	0.015	0.008	0.002	0.001	0.001	0.895	0.526	0.490	2.387	1.117	0.978
Light Duty Vehicles	1986	4.590	2.621	2.396	339	194	177	0.054	0.015	0.008	0.002	0.001	0.001	0.543	0.320	0.298	2.364	1.093	0.954
Light Duty Vehicles	1987	4.599	2.621	2.397	340	194	177	0.054	0.015	0.008	0.002	0.001	0.001	0.545	0.321	0.299	2.370	1.091	0.952
Light Duty Vehicles	1988	4.540	2.621	2.397	335	194	177	0.054	0.015	0.008	0.002	0.001	0.001	0.539	0.321	0.299	2.332	1.087	0.949
Light Duty Vehicles	1989	4.514	2.623	2.401	333	194	177	0.052	0.015	0.008	0.002	0.001	0.001	0.361	0.216	0.201	2.311	1.072	0.934
Light Duty Vehicles	1990	4.505	2.624	2.403	333	194	178	0.052	0.015	0.008	0.001	0.001	0.001	0.363	0.217	0.202	2.302	1.061	0.924
Light Duty Vehicles	1991	4.541	2.623	2.402	335	194	178	0.052	0.015	0.008	0.001	0.001	0.001	0.365	0.217	0.202	2.326	1.065	0.928
Light Duty Vehicles	1992	4.431	2.622	2.598	327	194	192	0.052	0.015	0.009	0.002	0.001	0.001	0.230	0.140	0.141	2.271	1.083	1.024
Light Duty Vehicles	1993	4.468	2.622	2.597	330	194	192	0.052	0.015	0.009	0.002	0.001	0.001	0.090	0.054	0.055	2.293	1.086	1.027
Light Duty Vehicles	1994	4.059	2.790	2.801	300	206	207	0.046	0.016	0.010	0.001	0.001	0.001	0.082	0.058	0.059	2.066	1.141	1.091
Light Duty Vehicles	1995	4.051	2.770	2.780	299	205	205	0.044	0.015	0.009	0.002	0.001	0.001	0.082	0.058	0.059	2.009	1.123	1.076

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Sector	Year	FCu (MJ)	FCr (MJ)	FCh (MJ)	CO_2u	CO_2r	CO_2h	CH_4u	CH_4r	CH_4h	N_2Ou	N_2Or	N_2Oh	SO_2u	SO_2r	SO_2h	NO_Xu	NO_Xr	NO_Xh
Light Duty Vehicles	1996	3.974	2.752	2.958	293	203	219	0.040	0.015	0.009	0.002	0.002	0.002	0.080	0.057	0.062	1.919	1.102	1.133
Light Duty Vehicles	1997	3.904	2.732	2.938	288	202	217	0.038	0.014	0.009	0.003	0.002	0.002	0.079	0.057	0.062	1.829	1.083	1.114
Light Duty Vehicles	1998	3.888	2.714	2.916	287	200	215	0.036	0.014	0.008	0.003	0.003	0.002	0.078	0.056	0.061	1.773	1.071	1.105
Light Duty Vehicles	1999	3.853	2.698	2.899	284	199	214	0.033	0.013	0.008	0.004	0.003	0.003	0.043	0.031	0.034	1.704	1.049	1.084
Light Duty Vehicles	2000	3.822	2.682	2.881	282	198	213	0.031	0.012	0.007	0.004	0.003	0.003	0.009	0.006	0.007	1.642	1.032	1.067
Light Duty Vehicles	2001	3.840	2.667	2.864	284	197	212	0.028	0.011	0.007	0.005	0.004	0.003	0.009	0.006	0.007	1.604	1.015	1.052
Light Duty Vehicles	2002	3.787	2.648	2.844	280	196	210	0.025	0.010	0.006	0.006	0.004	0.003	0.009	0.006	0.007	1.487	0.965	1.001
Light Duty Vehicles	2003	3.773	2.631	2.829	279	194	209	0.022	0.008	0.005	0.006	0.004	0.004	0.009	0.006	0.007	1.403	0.915	0.950
Light Duty Vehicles	2004	3.694	2.608	2.806	273	193	207	0.018	0.007	0.004	0.007	0.004	0.004	0.009	0.006	0.007	1.276	0.867	0.902
Light Duty Vehicles	2005	3.704	2.591	2.792	274	191	206	0.015	0.006	0.004	0.008	0.004	0.004	0.002	0.001	0.001	1.219	0.830	0.864
Light Duty Vehicles	2006	3.670	2.576	2.778	271	190	205	0.013	0.005	0.003	0.008	0.004	0.004	0.002	0.001	0.001	1.148	0.797	0.831
Heavy Duty Vehicles	1985	13.245	9.672	9.165	980	716	678	0.160	0.063	0.055	0.035	0.030	0.026	3.087	2.259	2.143	13.200	10.127	9.435
Heavy Duty Vehicles	1986	13.246	9.673	9.166	980	716	678	0.160	0.063	0.055	0.035	0.030	0.026	1.853	1.356	1.286	13.204	10.128	9.436
Heavy Duty Vehicles	1987	13.246	9.673	9.166	980	716	678	0.160	0.063	0.055	0.035	0.030	0.026	1.853	1.356	1.286	13.204	10.128	9.436
Heavy Duty Vehicles	1988	13.246	9.673	9.166	980	716	678	0.160	0.063	0.055	0.035	0.030	0.026	1.854	1.356	1.286	13.204	10.128	9.437
Heavy Duty Vehicles	1989	13.247	9.674	9.167	980	716	678	0.160	0.063	0.055	0.035	0.030	0.026	1.236	0.904	0.858	13.207	10.128	9.437
Heavy Duty Vehicles	1990	13.110	9.604	9.122	970	711	675	0.159	0.063	0.054	0.035	0.030	0.026	1.223	0.898	0.853	13.056	10.050	9.389
Heavy Duty Vehicles	1991	13.463	9.815	8.625	996	726	638	0.163	0.064	0.051	0.035	0.031	0.025	1.256	0.917	0.807	13.401	10.270	8.883
Heavy Duty Vehicles	1992	13.462	9.814	8.624	996	726	638	0.163	0.064	0.051	0.035	0.031	0.025	0.816	0.596	0.524	13.398	10.270	8.882
Heavy Duty Vehicles	1993	13.200	9.319	9.493	977	690	702	0.160	0.061	0.056	0.035	0.029	0.027	0.308	0.218	0.222	13.145	9.747	9.780
Heavy Duty Vehicles	1994	10.754	9.711	10.013	796	719	741	0.132	0.064	0.060	0.029	0.031	0.029	0.251	0.227	0.234	10.530	9.982	10.135
Heavy Duty Vehicles	1995	10.631	9.541	10.038	787	706	743	0.132	0.064	0.060	0.029	0.030	0.030	0.248	0.223	0.235	10.234	9.631	9.989
Heavy Duty Vehicles	1996	10.945	9.279	9.945	810	687	736	0.137	0.063	0.060	0.030	0.030	0.030	0.255	0.217	0.233	10.358	9.206	9.721
Heavy Duty Vehicles	1997	11.147	9.392	9.962	825	695	737	0.137	0.064	0.061	0.030	0.030	0.030	0.260	0.220	0.233	10.430	9.182	9.585
Heavy Duty Vehicles	1998	11.114	9.367	9.901	822	693	733	0.134	0.064	0.061	0.030	0.030	0.030	0.259	0.219	0.232	10.268	9.026	9.381
Heavy Duty Vehicles	1999	11.210	9.423	9.892	829	697	732	0.133	0.065	0.062	0.030	0.030	0.030	0.144	0.121	0.127	10.246	8.963	9.244
Heavy Duty Vehicles	2000	11.134	9.363	9.821	824	693	727	0.129	0.064	0.062	0.030	0.030	0.030	0.026	0.022	0.023	10.084	8.809	9.068
Heavy Duty Vehicles	2001	11.399	9.535	9.869	844	706	730	0.131	0.067	0.063	0.030	0.030	0.030	0.027	0.022	0.023	10.181	8.837	8.973
Heavy Duty Vehicles	2002	11.355	9.506	9.815	840	703	726	0.126	0.067	0.063	0.030	0.030	0.030	0.027	0.022	0.023	9.822	8.513	8.617
Heavy Duty Vehicles	2003	11.310	9.475	9.774	837	701	723	0.121	0.067	0.062	0.030	0.030	0.030	0.026	0.022	0.023	9.507	8.225	8.313
Heavy Duty Vehicles	2004	11.173	9.380	9.673	827	694	716	0.115	0.066	0.062	0.030	0.030	0.030	0.026	0.022	0.023	9.043	7.814	7.886
Heavy Duty Vehicles	2005	11.109	9.330	9.619	822	690	712	0.111	0.066	0.062	0.030	0.030	0.030	0.005	0.004	0.005	8.744	7.542	7.605
Heavy Duty Vehicles	2006	11.053	9.286	9.572	818	687	708	0.107	0.066	0.061	0.030	0.030	0.030	0.005	0.004	0.004	8.471	7.293	7.348
Buses	1985	13.991	10.503	5.954	1035	777	441	0.186	0.082	0.047	0.032	0.031	0.020	3.277	2.460	1.394	14.555	11.430	6.449
Buses	1986	13.991	10.501	5.955	1035	777	441	0.186	0.082	0.047	0.032	0.031	0.020	1.966	1.476	0.837	14.552	11.425	6.448

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Sector	Year	FCu (MJ)	FCr (MJ)	FCh (MJ)	CO_2u	CO_2r	CO_2h	CH_4u	CH_4r	CH_4h	N_2Ou	N_2Or	N_2Oh	SO_2u	SO_2r	SO_2h	NO_Xu	NO_Xr	NO_Xh
Buses	1987	13.992	10.509	5.954	1035	778	441	0.186	0.082	0.047	0.032	0.031	0.020	1.966	1.477	0.837	14.561	11.442	6.452
Buses	1988	13.992	10.522	5.952	1035	779	440	0.186	0.082	0.047	0.032	0.031	0.020	1.966	1.479	0.836	14.575	11.469	6.458
Buses	1989	13.992	10.516	5.953	1035	778	440	0.186	0.082	0.047	0.032	0.031	0.020	1.311	0.985	0.558	14.569	11.457	6.455
Buses	1990	13.991	10.493	5.956	1035	776	441	0.186	0.082	0.047	0.032	0.031	0.020	1.311	0.983	0.558	14.544	11.408	6.444
Buses	1991	13.496	10.905	5.956	999	807	441	0.180	0.085	0.047	0.031	0.032	0.020	1.264	1.022	0.558	14.023	11.865	6.443
Buses	1992	13.908	10.558	5.956	1029	781	441	0.185	0.082	0.047	0.032	0.031	0.020	0.847	0.643	0.363	14.467	11.471	6.444
Buses	1993	13.871	10.273	6.927	1026	760	513	0.185	0.080	0.055	0.032	0.030	0.023	0.325	0.241	0.162	14.385	11.178	7.500
Buses	1994	13.194	10.262	7.822	976	759	579	0.178	0.081	0.062	0.030	0.030	0.027	0.309	0.240	0.183	13.459	10.885	8.301
Buses	1995	12.975	9.788	8.658	960	724	641	0.177	0.079	0.070	0.030	0.030	0.030	0.304	0.229	0.203	12.890	10.097	8.947
Buses	1996	12.605	9.778	8.555	933	724	633	0.175	0.080	0.070	0.030	0.030	0.030	0.295	0.229	0.200	12.202	9.832	8.623
Buses	1997	12.445	9.683	8.486	921	717	628	0.170	0.078	0.068	0.030	0.030	0.030	0.291	0.227	0.199	11.889	9.585	8.429
Buses	1998	12.349	9.632	8.447	914	713	625	0.165	0.075	0.066	0.030	0.030	0.030	0.289	0.226	0.198	11.726	9.459	8.328
Buses	1999	12.234	9.566	8.398	905	708	621	0.161	0.073	0.064	0.030	0.030	0.030	0.158	0.123	0.108	11.511	9.289	8.194
Buses	2000	12.134	9.511	8.357	898	704	618	0.157	0.072	0.063	0.030	0.030	0.030	0.028	0.022	0.020	11.327	9.147	8.080
Buses	2001	12.054	9.465	8.324	892	700	616	0.153	0.070	0.061	0.030	0.030	0.030	0.028	0.022	0.019	11.184	9.033	7.991
Buses	2002	12.011	9.449	8.323	889	699	616	0.149	0.068	0.060	0.030	0.030	0.030	0.028	0.022	0.019	10.907	8.781	7.766
Buses	2003	11.991	9.451	8.332	887	699	617	0.146	0.067	0.058	0.030	0.030	0.030	0.028	0.022	0.020	10.698	8.589	7.587
Buses	2004	11.961	9.432	8.332	885	698	617	0.143	0.065	0.057	0.030	0.030	0.030	0.028	0.022	0.020	10.485	8.387	7.413
Buses	2005	11.921	9.423	8.331	882	697	617	0.139	0.064	0.056	0.030	0.030	0.030	0.006	0.004	0.004	10.245	8.175	7.218
Buses	2006	11.882	9.412	8.330	879	697	616	0.136	0.062	0.054	0.030	0.030	0.030	0.006	0.004	0.004	10.015	7.969	7.030
Mopeds	1985	1.095	1.095		80	80		0.219	0.219		0.001	0.001		0.003	0.003		0.020	0.020	
Mopeds	1986	1.095	1.095		80	80		0.219	0.219		0.001	0.001		0.003	0.003		0.020	0.020	
Mopeds	1987	1.095	1.095		80	80		0.219	0.219		0.001	0.001		0.003	0.003		0.020	0.020	
Mopeds	1988	1.095	1.095		80	80		0.219	0.219		0.001	0.001		0.003	0.003		0.020	0.020	
Mopeds	1989	1.095	1.095		80	80		0.219	0.219		0.001	0.001		0.003	0.003		0.020	0.020	
Mopeds	1990	1.095	1.095		80	80		0.219	0.219		0.001	0.001		0.003	0.003		0.020	0.020	
Mopeds	1991	1.095	1.095		80	80		0.219	0.219		0.001	0.001		0.003	0.003		0.020	0.020	
Mopeds	1992	1.095	1.095		80	80		0.219	0.219		0.001	0.001		0.003	0.003		0.020	0.020	
Mopeds	1993	1.095	1.095		80	80		0.219	0.219		0.001	0.001		0.003	0.003		0.020	0.020	
Mopeds	1994	1.095	1.095		80	80		0.219	0.219		0.001	0.001		0.003	0.003		0.020	0.020	
Mopeds	1995	1.095	1.095		80	80		0.219	0.219		0.001	0.001		0.003	0.003		0.020	0.020	
Mopeds	1996	1.095	1.095		80	80		0.219	0.219		0.001	0.001		0.003	0.003		0.020	0.020	
Mopeds	1997	1.095	1.095		80	80		0.219	0.219		0.001	0.001		0.003	0.003		0.020	0.020	
Mopeds	1998	1.095	1.095		80	80		0.219	0.219		0.001	0.001		0.003	0.003		0.020	0.020	
Mopeds	1999	1.095	1.095		80	80		0.219	0.219		0.001	0.001		0.003	0.003		0.020	0.020	

Continued

Sector	Year	FCu (MJ)	FCr (MJ)	FCh (MJ)	CO_2u	CO_2r	CO_2h	CH_4u	CH_4r	CH_4h	N_2Ou	N_2Or	N_2Oh	SO_2u	SO_2r	SO_2h	NO_Xu	NO_Xr	NO_Xh
Mopeds	2000	1.050	1.050		77	77		0.201	0.201		0.001	0.001		0.002	0.002		0.020	0.020	
Mopeds	2001	1.019	1.019		74	74		0.188	0.188		0.001	0.001		0.002	0.002		0.020	0.020	
Mopeds	2002	0.985	0.985		72	72		0.175	0.175		0.001	0.001		0.002	0.002		0.020	0.020	
Mopeds	2003	0.969	0.969		71	71		0.169	0.169		0.001	0.001		0.002	0.002		0.020	0.020	
Mopeds	2004	0.940	0.940		69	69		0.159	0.159		0.001	0.001		0.002	0.002		0.035	0.035	
Mopeds	2005	0.893	0.893		65	65		0.143	0.143		0.001	0.001		0.000	0.000		0.055	0.055	
Mopeds	2006	0.842	0.842		61	61		0.125	0.125		0.001	0.001		0.000	0.000		0.071	0.071	
Motorcycles	1985	1.252	1.284	1.916	91	94	140	0.184	0.188	0.234	0.002	0.002	0.002	0.003	0.003	0.004	0.117	0.222	0.412
Motorcycles	1986	1.252	1.284	1.916	91	94	140	0.184	0.188	0.234	0.002	0.002	0.002	0.003	0.003	0.004	0.117	0.222	0.412
Motorcycles	1987	1.252	1.284	1.916	91	94	140	0.184	0.188	0.234	0.002	0.002	0.002	0.003	0.003	0.004	0.117	0.222	0.412
Motorcycles	1988	1.252	1.284	1.916	91	94	140	0.184	0.188	0.234	0.002	0.002	0.002	0.003	0.003	0.004	0.117	0.222	0.412
Motorcycles	1989	1.252	1.284	1.916	91	94	140	0.184	0.188	0.234	0.002	0.002	0.002	0.003	0.003	0.004	0.117	0.222	0.412
Motorcycles	1990	1.252	1.284	1.916	91	94	140	0.184	0.188	0.234	0.002	0.002	0.002	0.003	0.003	0.004	0.117	0.222	0.412
Motorcycles	1991	1.447	1.149	1.578	106	84	115	0.213	0.168	0.193	0.002	0.002	0.002	0.003	0.003	0.004	0.135	0.199	0.340
Motorcycles	1992	1.252	1.351	1.690	91	99	123	0.184	0.197	0.206	0.002	0.002	0.002	0.003	0.003	0.004	0.117	0.234	0.364
Motorcycles	1993	1.475	1.149	1.465	108	84	107	0.217	0.168	0.179	0.002	0.002	0.002	0.003	0.003	0.003	0.137	0.199	0.315
Motorcycles	1994	1.308	1.318	1.578	95	96	115	0.193	0.193	0.193	0.002	0.002	0.002	0.003	0.003	0.004	0.122	0.228	0.340
Motorcycles	1995	1.224	1.250	2.141	89	91	156	0.180	0.183	0.261	0.002	0.002	0.003	0.003	0.003	0.005	0.114	0.217	0.461
Motorcycles	1996	1.308	1.318	1.578	95	96	115	0.193	0.193	0.193	0.002	0.002	0.002	0.003	0.003	0.004	0.122	0.228	0.340
Motorcycles	1997	1.308	1.318	1.578	95	96	115	0.193	0.193	0.193	0.002	0.002	0.002	0.003	0.003	0.004	0.122	0.228	0.340
Motorcycles	1998	1.308	1.318	1.578	95	96	115	0.193	0.193	0.193	0.002	0.002	0.002	0.003	0.003	0.004	0.122	0.228	0.340
Motorcycles	1999	1.308	1.318	1.578	95	96	115	0.193	0.193	0.193	0.002	0.002	0.002	0.003	0.003	0.004	0.122	0.228	0.340
Motorcycles	2000	1.312	1.321	1.597	96	96	117	0.189	0.189	0.190	0.002	0.002	0.002	0.003	0.003	0.004	0.129	0.241	0.366
Motorcycles	2001	1.312	1.321	1.597	96	96	117	0.189	0.190	0.190	0.002	0.002	0.002	0.003	0.003	0.004	0.130	0.242	0.368
Motorcycles	2002	1.314	1.321	1.604	96	96	117	0.188	0.189	0.189	0.002	0.002	0.002	0.003	0.003	0.004	0.133	0.248	0.379
Motorcycles	2003	1.316	1.322	1.611	96	97	118	0.186	0.188	0.188	0.002	0.002	0.002	0.003	0.003	0.004	0.136	0.254	0.390
Motorcycles	2004	1.317	1.323	1.618	96	97	118	0.185	0.185	0.186	0.002	0.002	0.002	0.003	0.003	0.004	0.138	0.253	0.393
Motorcycles	2005	1.320	1.325	1.630	96	97	119	0.183	0.182	0.183	0.002	0.002	0.002	0.001	0.001	0.001	0.141	0.257	0.404
Motorcycles	2006	1.321	1.325	1.638	96	96	119	0.181	0.180	0.181	0.002	0.002	0.002	0.001	0.001	0.001	0.144	0.260	0.413

Sector	Year	NMVOCu (exh)	NMVOCr (exh)	NMVOCh (exh)	NMVOCu (tot)	NMVOCr (tot)	NMVOCh (tot)	COu	COr	COh	NH_3u	NH_3r	NH_3h	TSPu	TSPr	TSPh
Passenger Cars	1985	3.771	1.039	0.641	6.054	1.425	0.692	44.742	10.034	7.308	0.002	0.002	0.001	0.095	0.044	0.032
Passenger Cars	1986	3.647	1.016	0.623	5.938	1.404	0.675	42.147	9.531	6.866	0.002	0.002	0.001	0.093	0.042	0.031
Passenger Cars	1987	3.594	0.991	0.601	5.854	1.373	0.653	40.275	8.943	6.387	0.002	0.002	0.001	0.092	0.041	0.030
Passenger Cars	1988	3.299	0.958	0.573	5.638	1.353	0.627	35.045	8.169	5.738	0.002	0.002	0.001	0.087	0.040	0.030
Passenger Cars	1989	3.175	0.938	0.558	5.539	1.338	0.612	32.921	7.766	5.367	0.002	0.002	0.001	0.085	0.039	0.029
Passenger Cars	1990	3.125	0.927	0.548	5.491	1.327	0.602	31.831	7.477	5.087	0.002	0.002	0.001	0.082	0.038	0.028
Passenger Cars	1991	3.047	0.884	0.510	5.209	1.249	0.560	31.150	7.128	4.726	0.006	0.011	0.005	0.075	0.036	0.026
Passenger Cars	1992	2.775	0.824	0.549	4.812	1.169	0.595	28.220	6.664	5.092	0.010	0.019	0.009	0.065	0.033	0.028
Passenger Cars	1993	2.761	0.767	0.510	4.580	1.074	0.552	28.020	6.214	4.764	0.013	0.027	0.012	0.062	0.030	0.026
Passenger Cars	1994	2.466	0.692	0.449	4.108	0.969	0.487	24.599	5.641	4.206	0.018	0.040	0.018	0.052	0.027	0.023
Passenger Cars	1995	2.299	0.620	0.457	3.748	0.865	0.490	22.737	5.137	4.389	0.021	0.050	0.025	0.046	0.025	0.024
Passenger Cars	1996	2.248	0.542	0.455	3.478	0.750	0.483	22.063	4.570	4.511	0.024	0.059	0.033	0.041	0.022	0.025
Passenger Cars	1997	1.889	0.453	0.382	2.966	0.635	0.406	17.933	3.774	3.853	0.034	0.072	0.040	0.034	0.018	0.021
Passenger Cars	1998	1.732	0.388	0.328	2.608	0.536	0.348	16.485	3.314	3.426	0.042	0.082	0.046	0.030	0.016	0.018
Passenger Cars	1999	1.517	0.333	0.282	2.276	0.462	0.299	14.324	2.921	3.070	0.049	0.090	0.051	0.028	0.015	0.017
Passenger Cars	2000	1.388	0.294	0.249	1.898	0.381	0.260	13.097	2.649	2.831	0.054	0.095	0.053	0.026	0.014	0.017
Passenger Cars	2001	1.339	0.264	0.224	1.779	0.339	0.234	12.853	2.465	2.693	0.051	0.091	0.054	0.027	0.013	0.017
Passenger Cars	2002	1.167	0.232	0.198	1.551	0.297	0.207	11.308	2.251	2.517	0.049	0.086	0.055	0.025	0.013	0.016
Passenger Cars	2003	1.084	0.204	0.174	1.411	0.259	0.182	10.696	2.046	2.336	0.046	0.081	0.055	0.025	0.013	0.016
Passenger Cars	2004	0.908	0.175	0.151	1.186	0.222	0.157	9.023	1.837	2.147	0.043	0.076	0.054	0.024	0.013	0.017
Passenger Cars	2005	0.860	0.147	0.127	1.109	0.189	0.133	8.885	1.606	1.921	0.039	0.071	0.053	0.026	0.013	0.017
Passenger Cars	2006	0.727	0.122	0.106	0.945	0.159	0.111	7.579	1.385	1.690	0.035	0.064	0.052	0.026	0.013	0.017
Light Duty Veh.	1985	0.814	0.173	0.114	1.130	0.222	0.123	7.660	1.673	1.618	0.001	0.001	0.001	0.544	0.247	0.223
Light Duty Veh.	1986	0.760	0.167	0.111	1.055	0.212	0.120	7.110	1.618	1.560	0.001	0.001	0.001	0.539	0.250	0.226
Light Duty Veh.	1987	0.765	0.166	0.111	1.056	0.211	0.119	7.148	1.614	1.555	0.001	0.001	0.001	0.547	0.251	0.226
Light Duty Veh.	1988	0.712	0.165	0.111	1.012	0.212	0.119	6.685	1.606	1.547	0.001	0.001	0.001	0.507	0.251	0.226
Light Duty Veh.	1989	0.672	0.161	0.109	0.961	0.206	0.117	6.296	1.572	1.511	0.001	0.001	0.001	0.496	0.253	0.228
Light Duty Veh.	1990	0.652	0.158	0.107	0.929	0.202	0.115	6.093	1.548	1.485	0.001	0.001	0.001	0.495	0.254	0.229
Light Duty Veh.	1991	0.684	0.159	0.108	0.961	0.202	0.116	6.381	1.557	1.495	0.001	0.001	0.001	0.519	0.253	0.229
Light Duty Veh.	1992	0.687	0.164	0.119	0.985	0.210	0.128	6.448	1.596	1.665	0.001	0.001	0.001	0.492	0.251	0.246
Light Duty Veh.	1993	0.719	0.165	0.120	1.008	0.210	0.128	6.736	1.603	1.673	0.001	0.001	0.001	0.516	0.251	0.245
Light Duty Veh.	1994	0.643	0.172	0.127	0.929	0.216	0.135	6.014	1.673	1.764	0.001	0.001	0.001	0.474	0.269	0.266
Light Duty Veh.	1995	0.631	0.166	0.124	0.893	0.206	0.131	5.904	1.576	1.668	0.002	0.003	0.002	0.452	0.250	0.249
Light Duty Veh.	1996	0.625	0.159	0.129	0.851	0.194	0.136	5.804	1.473	1.676	0.002	0.004	0.003	0.441	0.233	0.250
Light Duty Veh.	1997	0.563	0.152	0.125	0.773	0.185	0.131	5.250	1.371	1.567	0.003	0.005	0.003	0.383	0.216	0.234
Light Duty Veh.	1998	0.552	0.148	0.123	0.736	0.177	0.128	5.173	1.293	1.486	0.003	0.007	0.004	0.354	0.199	0.217

Continued

Sector	Year	NMVOCu (exh)	NMVOCr (exh)	NMVOCh (exh)	NMVOCu (tot)	NMVOCr (tot)	NMVOCh (tot)	COu	COr	COh	NH_3u	NH_3r	NH_3h	TSPu	TSPr	TSPh
Light Duty Veh.	1999	0.510	0.141	0.119	0.678	0.168	0.124	4.740	1.197	1.381	0.004	0.008	0.005	0.323	0.184	0.203
Light Duty Veh.	2000	0.478	0.136	0.116	0.595	0.154	0.119	4.448	1.115	1.293	0.005	0.009	0.006	0.293	0.170	0.189
Light Duty Veh.	2001	0.478	0.131	0.113	0.580	0.147	0.116	4.404	1.034	1.207	0.006	0.010	0.006	0.284	0.156	0.175
Light Duty Veh.	2002	0.418	0.121	0.106	0.504	0.135	0.108	3.855	0.920	1.080	0.006	0.010	0.007	0.244	0.139	0.158
Light Duty Veh.	2003	0.381	0.112	0.099	0.448	0.122	0.101	3.426	0.809	0.954	0.006	0.009	0.007	0.227	0.126	0.144
Light Duty Veh.	2004	0.316	0.102	0.092	0.365	0.110	0.094	2.801	0.684	0.816	0.005	0.009	0.007	0.180	0.106	0.125
Light Duty Veh.	2005	0.301	0.095	0.087	0.340	0.101	0.088	2.571	0.599	0.719	0.005	0.008	0.007	0.173	0.095	0.113
Light Duty Veh.	2006	0.271	0.089	0.083	0.300	0.094	0.084	2.232	0.529	0.641	0.004	0.007	0.006	0.152	0.084	0.102
Heavy Duty Veh.	1985	1.220	0.666	0.431	1.220	0.666	0.431	3.534	2.176	1.834	0.003	0.003	0.003	0.592	0.388	0.351
Heavy Duty Veh.	1986	1.217	0.664	0.431	1.217	0.664	0.431	3.496	2.157	1.825	0.003	0.003	0.003	0.592	0.388	0.351
Heavy Duty Veh.	1987	1.216	0.664	0.431	1.216	0.664	0.431	3.494	2.155	1.824	0.003	0.003	0.003	0.592	0.388	0.351
Heavy Duty Veh.	1988	1.216	0.664	0.431	1.216	0.664	0.431	3.488	2.152	1.823	0.003	0.003	0.003	0.592	0.388	0.351
Heavy Duty Veh.	1989	1.214	0.663	0.430	1.214	0.663	0.430	3.465	2.141	1.818	0.003	0.003	0.003	0.592	0.388	0.351
Heavy Duty Veh.	1990	1.220	0.665	0.431	1.220	0.665	0.431	3.448	2.134	1.813	0.003	0.003	0.003	0.588	0.386	0.350
Heavy Duty Veh.	1991	1.229	0.680	0.410	1.229	0.680	0.410	3.505	2.184	1.724	0.004	0.003	0.002	0.601	0.395	0.331
Heavy Duty Veh.	1992	1.232	0.681	0.411	1.232	0.681	0.411	3.531	2.198	1.730	0.004	0.003	0.002	0.601	0.395	0.331
Heavy Duty Veh.	1993	1.241	0.641	0.454	1.241	0.641	0.454	3.527	2.078	1.911	0.004	0.003	0.003	0.592	0.374	0.364
Heavy Duty Veh.	1994	0.988	0.659	0.475	0.988	0.659	0.475	2.827	2.140	1.997	0.003	0.003	0.003	0.475	0.383	0.377
Heavy Duty Veh.	1995	0.948	0.628	0.475	0.948	0.628	0.475	2.753	2.064	1.997	0.003	0.003	0.003	0.462	0.370	0.372
Heavy Duty Veh.	1996	0.934	0.601	0.464	0.934	0.601	0.464	2.760	1.985	1.954	0.003	0.003	0.003	0.467	0.354	0.362
Heavy Duty Veh.	1997	0.864	0.559	0.435	0.864	0.559	0.435	2.645	1.914	1.890	0.003	0.003	0.003	0.449	0.338	0.347
Heavy Duty Veh.	1998	0.811	0.527	0.410	0.811	0.527	0.410	2.572	1.872	1.848	0.003	0.003	0.003	0.423	0.319	0.331
Heavy Duty Veh.	1999	0.759	0.496	0.387	0.759	0.496	0.387	2.489	1.824	1.805	0.003	0.003	0.003	0.403	0.304	0.317
Heavy Duty Veh.	2000	0.719	0.471	0.368	0.719	0.471	0.368	2.438	1.793	1.775	0.003	0.003	0.003	0.379	0.286	0.302
Heavy Duty Veh.	2001	0.674	0.444	0.346	0.674	0.444	0.346	2.441	1.795	1.760	0.003	0.003	0.003	0.364	0.275	0.291
Heavy Duty Veh.	2002	0.626	0.412	0.323	0.626	0.412	0.323	2.397	1.764	1.726	0.003	0.003	0.003	0.336	0.254	0.269
Heavy Duty Veh.	2003	0.585	0.385	0.303	0.585	0.385	0.303	2.338	1.726	1.693	0.003	0.003	0.003	0.312	0.236	0.250
Heavy Duty Veh.	2004	0.527	0.349	0.277	0.527	0.349	0.277	2.234	1.661	1.636	0.003	0.003	0.003	0.279	0.211	0.225
Heavy Duty Veh.	2005	0.496	0.328	0.261	0.496	0.328	0.261	2.213	1.642	1.615	0.003	0.003	0.003	0.259	0.195	0.208
Heavy Duty Veh.	2006	0.467	0.309	0.246	0.467	0.309	0.246	2.191	1.623	1.594	0.003	0.003	0.003	0.240	0.181	0.193
Buses	1985	1.557	0.876	0.366	1.557	0.876	0.366	4.522	2.742	1.229	0.003	0.003	0.002	0.746	0.464	0.228
Buses	1986	1.556	0.875	0.365	1.556	0.875	0.365	4.520	2.739	1.228	0.003	0.003	0.002	0.746	0.463	0.228
Buses	1987	1.559	0.878	0.367	1.559	0.878	0.367	4.527	2.747	1.231	0.003	0.003	0.002	0.746	0.464	0.228
Buses	1988	1.563	0.882	0.369	1.563	0.882	0.369	4.537	2.758	1.235	0.003	0.003	0.002	0.747	0.465	0.228
Buses	1989	1.561	0.880	0.368	1.561	0.880	0.368	4.533	2.753	1.233	0.003	0.003	0.002	0.747	0.465	0.228

Continued

Sector	Year	NMVOCu (exh)	NMVOCr (exh)	NMVOCh (exh)	NMVOCu (tot)	NMVOCr (tot)	NMVOCh (tot)	COu	COr	COh	NH_3u	NH_3r	NH_3h	TSPu	TSPr	TSPh
Buses	1990	1.553	0.873	0.364	1.553	0.873	0.364	4.513	2.732	1.226	0.003	0.003	0.002	0.745	0.463	0.228
Buses	1991	1.496	0.909	0.364	1.496	0.909	0.364	4.349	2.845	1.225	0.003	0.003	0.002	0.718	0.481	0.228
Buses	1992	1.547	0.876	0.364	1.547	0.876	0.364	4.494	2.744	1.225	0.003	0.003	0.002	0.741	0.465	0.228
Buses	1993	1.529	0.857	0.425	1.529	0.857	0.425	4.447	2.681	1.428	0.003	0.003	0.002	0.736	0.453	0.265
Buses	1994	1.414	0.816	0.470	1.414	0.816	0.470	4.145	2.570	1.575	0.003	0.003	0.003	0.687	0.441	0.293
Buses	1995	1.312	0.736	0.493	1.312	0.736	0.493	3.891	2.335	1.669	0.003	0.003	0.003	0.654	0.409	0.316
Buses	1996	1.204	0.701	0.465	1.204	0.701	0.465	3.611	2.235	1.587	0.003	0.003	0.003	0.615	0.398	0.305
Buses	1997	1.124	0.660	0.443	1.124	0.660	0.443	3.436	2.137	1.528	0.003	0.003	0.003	0.573	0.373	0.287
Buses	1998	1.073	0.634	0.428	1.073	0.634	0.428	3.332	2.080	1.492	0.003	0.003	0.003	0.544	0.355	0.274
Buses	1999	1.015	0.604	0.411	1.015	0.604	0.411	3.206	2.009	1.450	0.003	0.003	0.003	0.513	0.336	0.260
Buses	2000	0.963	0.578	0.397	0.963	0.578	0.397	3.098	1.949	1.413	0.003	0.003	0.003	0.485	0.319	0.248
Buses	2001	0.922	0.557	0.385	0.922	0.557	0.385	3.011	1.900	1.384	0.003	0.003	0.003	0.462	0.306	0.239
Buses	2002	0.873	0.531	0.371	0.873	0.531	0.371	2.932	1.856	1.359	0.003	0.003	0.003	0.437	0.290	0.227
Buses	2003	0.837	0.512	0.361	0.837	0.512	0.361	2.882	1.830	1.345	0.003	0.003	0.003	0.419	0.279	0.219
Buses	2004	0.800	0.492	0.349	0.800	0.492	0.349	2.822	1.794	1.327	0.003	0.003	0.003	0.400	0.267	0.210
Buses	2005	0.756	0.470	0.338	0.756	0.470	0.338	2.753	1.758	1.305	0.003	0.003	0.003	0.378	0.254	0.200
Buses	2006	0.713	0.448	0.326	0.713	0.448	0.326	2.686	1.721	1.284	0.003	0.003	0.003	0.357	0.241	0.191
Mopeds	1985	13.691	13.691		14.001	14.001		13.800	13.800		0.001	0.001		0.188	0.188	
Mopeds	1986	13.691	13.691		14.008	14.008		13.800	13.800		0.001	0.001		0.188	0.188	
Mopeds	1987	13.691	13.691		14.006	14.006		13.800	13.800		0.001	0.001		0.188	0.188	
Mopeds	1988	13.691	13.691		14.027	14.027		13.800	13.800		0.001	0.001		0.188	0.188	
Mopeds	1989	13.691	13.691		14.041	14.041		13.800	13.800		0.001	0.001		0.188	0.188	
Mopeds	1990	13.691	13.691		14.034	14.034		13.800	13.800		0.001	0.001		0.188	0.188	
Mopeds	1991	13.691	13.691		14.019	14.019		13.800	13.800		0.001	0.001		0.188	0.188	
Mopeds	1992	13.691	13.691		14.022	14.022		13.800	13.800		0.001	0.001		0.188	0.188	
Mopeds	1993	13.691	13.691		14.001	14.001		13.800	13.800		0.001	0.001		0.188	0.188	
Mopeds	1994	13.691	13.691		14.013	14.013		13.800	13.800		0.001	0.001		0.188	0.188	
Mopeds	1995	13.691	13.691		14.014	14.014		13.800	13.800		0.001	0.001		0.188	0.188	
Mopeds	1996	13.691	13.691		14.001	14.001		13.800	13.800		0.001	0.001		0.188	0.188	
Mopeds	1997	13.691	13.691		14.017	14.017		13.800	13.800		0.001	0.001		0.188	0.188	
Mopeds	1998	13.691	13.691		14.002	14.002		13.800	13.800		0.001	0.001		0.188	0.188	
Mopeds	1999	13.691	13.691		14.037	14.037		13.800	13.800		0.001	0.001		0.188	0.188	
Mopeds	2000	12.563	12.563		12.849	12.849		12.960	12.960		0.001	0.001		0.176	0.176	
Mopeds	2001	11.773	11.773		12.084	12.084		12.371	12.371		0.001	0.001		0.168	0.168	
Mopeds	2002	10.937	10.937		11.256	11.256		11.748	11.748		0.001	0.001		0.160	0.160	

Continued

Sector	Year	NMVOCu (exh)	NMVOCr (exh)	NMVOCh (exh)	NMVOCu (tot)	NMVOCr (tot)	NMVOCh (tot)	COu	COr	COh	NH_3u	NH_3r	NH_3h	TSPu	TSPr	TSPh
Mopeds	2003	10.520	10.520		10.837	10.837		11.437	11.437		0.001	0.001		0.156	0.156	
Mopeds	2004	9.924	9.924		10.241	10.241		10.776	10.776		0.001	0.001		0.148	0.148	
Mopeds	2005	8.923	8.923		9.274	9.274		9.743	9.743		0.001	0.001		0.135	0.135	
Mopeds	2006	7.805	7.805		8.166	8.166		8.676	8.676		0.001	0.001		0.122	0.122	
Motorcycles	1985	2.526	1.963	2.442	3.345	2.182	2.476	19.177	21.616	33.899	0.002	0.002	0.002	0.045	0.046	0.057
Motorcycles	1986	2.526	1.963	2.442	3.353	2.184	2.476	19.177	21.616	33.899	0.002	0.002	0.002	0.045	0.046	0.057
Motorcycles	1987	2.526	1.963	2.442	3.348	2.183	2.476	19.177	21.616	33.899	0.002	0.002	0.002	0.045	0.046	0.057
Motorcycles	1988	2.526	1.963	2.442	3.383	2.192	2.477	19.177	21.616	33.899	0.002	0.002	0.002	0.045	0.046	0.057
Motorcycles	1989	2.526	1.963	2.442	3.403	2.198	2.478	19.177	21.616	33.899	0.002	0.002	0.002	0.045	0.046	0.057
Motorcycles	1990	2.526	1.963	2.442	3.396	2.196	2.478	19.177	21.616	33.899	0.002	0.002	0.002	0.045	0.046	0.057
Motorcycles	1991	2.919	1.756	2.011	3.772	1.984	2.046	22.160	19.341	27.917	0.002	0.002	0.002	0.052	0.041	0.047
Motorcycles	1992	2.526	2.066	2.155	3.388	2.297	2.190	19.177	22.754	29.911	0.002	0.002	0.002	0.045	0.048	0.050
Motorcycles	1993	2.975	1.756	1.867	3.797	1.976	1.901	22.586	19.341	25.923	0.002	0.002	0.002	0.053	0.041	0.044
Motorcycles	1994	2.639	2.014	2.011	3.490	2.242	2.046	20.029	22.185	27.917	0.002	0.002	0.002	0.047	0.047	0.047
Motorcycles	1995	2.470	1.911	2.729	3.318	2.138	2.764	18.751	21.047	37.887	0.002	0.002	0.003	0.044	0.045	0.064
Motorcycles	1996	2.639	2.014	2.011	3.459	2.234	2.045	20.029	22.185	27.917	0.002	0.002	0.002	0.047	0.047	0.047
Motorcycles	1997	2.639	2.014	2.011	3.496	2.244	2.047	20.029	22.185	27.917	0.002	0.002	0.002	0.047	0.047	0.047
Motorcycles	1998	2.639	2.014	2.011	3.467	2.236	2.045	20.029	22.185	27.917	0.002	0.002	0.002	0.047	0.047	0.047
Motorcycles	1999	2.639	2.014	2.011	3.496	2.244	2.046	20.029	22.185	27.917	0.002	0.002	0.002	0.047	0.047	0.047
Motorcycles	2000	2.607	1.998	1.998	3.283	2.179	2.026	19.468	21.623	27.259	0.002	0.002	0.002	0.047	0.047	0.047
Motorcycles	2001	2.568	1.961	1.961	3.233	2.139	1.989	19.445	21.600	27.257	0.002	0.002	0.002	0.046	0.046	0.046
Motorcycles	2002	2.517	1.918	1.919	3.195	2.099	1.947	19.204	21.360	27.001	0.002	0.002	0.002	0.045	0.045	0.045
Motorcycles	2003	2.466	1.875	1.878	3.139	2.055	1.906	18.978	21.134	26.761	0.002	0.002	0.002	0.044	0.044	0.044
Motorcycles	2004	2.414	1.826	1.830	3.097	2.009	1.858	18.614	20.684	26.249	0.002	0.002	0.002	0.043	0.043	0.043
Motorcycles	2005	2.354	1.774	1.780	3.084	1.969	1.810	18.150	20.155	25.645	0.002	0.002	0.002	0.042	0.042	0.042
Motorcycles	2006	2.299	1.725	1.733	3.047	1.925	1.764	17.761	19.704	25.135	0.002	0.002	0.002	0.040	0.040	0.040

Annex 7: Fuel use (GJ) and emissions (tons) per vehicle category and as totals

Year	Sector	FC (PJ)	SO_2	NO_X	NMVOC	CH_4	CO	CO_2	N_2O	NH_3	TSP
1985	Passenger Cars	64	1208	52255	70537	1843	525859	4647	177	47	1445
1986	Passenger Cars	64	809	53053	70377	1865	504301	4686	180	47	1428
1987	Passenger Cars	65	843	53628	70105	1888	485508	4723	182	48	1423
1988	Passenger Cars	66	871	54803	69859	1923	440334	4788	187	49	1398
1989	Passenger Cars	65	635	54414	68390	1903	412681	4736	185	49	1363
1990	Passenger Cars	68	650	57926	71825	2021	421933	5004	197	52	1392
1991	Passenger Cars	73	669	58348	72370	2045	435763	5315	218	230	1374
1992	Passenger Cars	76	498	58769	71376	2017	425232	5576	238	422	1320
1993	Passenger Cars	78	296	57113	69068	1983	425670	5724	253	604	1270
1994	Passenger Cars	81	303	53865	64627	1871	392516	5920	277	926	1148
1995	Passenger Cars	82	308	50703	59763	1732	369784	5991	287	1170	1057
1996	Passenger Cars	83	313	47345	55267	1611	356898	6055	296	1393	973
1997	Passenger Cars	85	318	43689	48921	1513	303940	6204	304	1820	836
1998	Passenger Cars	87	327	39819	43527	1419	282165	6333	302	2175	751
1999	Passenger Cars	87	273	36142	38192	1313	248692	6370	298	2432	705
2000	Passenger Cars	87	198	33102	31709	1219	226197	6332	291	2587	670
2001	Passenger Cars	86	196	30435	28938	1109	216041	6274	273	2457	655
2002	Passenger Cars	87	199	28247	25657	1014	195346	6350	260	2390	636
2003	Passenger Cars	88	201	26162	23300	934	184534	6417	244	2293	635
2004	Passenger Cars	88	202	24122	19912	842	160535	6451	232	2192	633
2005	Passenger Cars	87	40	21795	18036	756	151966	6396	212	2035	662
2006	Passenger Cars	87	40	19506	15319	658	130112	6372	193	1860	655
1985	Light Duty Vehicles	14	2852	6760	2304	126	16496	1064	5	5	1526
1986	Light Duty Vehicles	16	1942	7457	2425	136	17360	1190	5	6	1710
1987	Light Duty Vehicles	17	1996	7654	2488	140	17864	1222	6	6	1768
1988	Light Duty Vehicles	17	2059	7846	2497	144	17627	1257	6	6	1759
1989	Light Duty Vehicles	18	1436	8056	2479	146	17447	1303	6	6	1813
1990	Light Duty Vehicles	19	1570	8703	2615	157	18462	1416	6	7	1974
1991	Light Duty Vehicles	20	1624	9057	2773	163	19725	1468	6	7	2088
1992	Light Duty Vehicles	20	1042	9052	2852	164	20080	1459	7	7	2035
1993	Light Duty Vehicles	20	417	9376	2983	170	21319	1507	7	7	2144
1994	Light Duty Vehicles	22	455	9949	3098	174	21892	1632	7	8	2323
1995	Light Duty Vehicles	22	448	9656	2949	164	21020	1610	10	15	2172

Continued

Year	Sector	FC (PJ)	SO_2	NO_X	NMVOC	CH_4	CO	CO_2	N_2O	NH_3	TSP
1996	Light Duty Vehicles	22	456	9633	2872	157	20882	1640	13	22	2135
1997	Light Duty Vehicles	22	462	9550	2709	152	19531	1660	16	29	1964
1998	Light Duty Vehicles	23	467	9566	2644	149	19393	1687	20	37	1853
1999	Light Duty Vehicles	23	263	9454	2502	141	18150	1704	23	46	1735
2000	Light Duty Vehicles	24	55	9489	2303	135	17514	1744	27	55	1639
2001	Light Duty Vehicles	24	56	9533	2283	128	17410	1784	32	65	1585
2002	Light Duty Vehicles	25	59	9432	2128	119	16129	1859	37	68	1459
2003	Light Duty Vehicles	28	65	9902	2116	114	15856	2052	43	68	1489
2004	Light Duty Vehicles	30	71	10165	1967	105	14463	2232	51	73	1348
2005	Light Duty Vehicles	34	16	10886	2048	100	14653	2494	60	73	1399
2006	Light Duty Vehicles	38	18	11690	2080	96	14432	2790	71	76	1398
1985	Heavy Duty Vehicles	32	7559	33484	2451	279	7894	2394	92	9	1381
1986	Heavy Duty Vehicles	36	5110	37712	2749	314	8820	2697	103	10	1554
1987	Heavy Duty Vehicles	36	5006	36951	2695	308	8644	2642	101	10	1523
1988	Heavy Duty Vehicles	35	4926	36371	2660	303	8517	2599	99	10	1501
1989	Heavy Duty Vehicles	37	3415	37815	2760	315	8816	2703	103	10	1560
1990	Heavy Duty Vehicles	38	3546	39243	2898	329	9197	2806	108	11	1625
1991	Heavy Duty Vehicles	39	3609	39943	2944	335	9351	2856	110	11	1652
1992	Heavy Duty Vehicles	37	2279	38795	2866	326	9130	2775	107	11	1606
1993	Heavy Duty Vehicles	37	854	37783	2792	317	8914	2702	104	10	1565
1994	Heavy Duty Vehicles	39	909	39595	2858	332	9249	2878	113	11	1628
1995	Heavy Duty Vehicles	40	924	39449	2803	341	9180	2925	116	12	1618
1996	Heavy Duty Vehicles	41	950	39768	2791	356	9222	3007	120	12	1631
1997	Heavy Duty Vehicles	41	963	39714	2616	357	8918	3046	122	12	1562
1998	Heavy Duty Vehicles	42	971	39572	2501	356	8800	3073	123	12	1499
1999	Heavy Duty Vehicles	43	550	40244	2411	362	8762	3164	127	13	1463
2000	Heavy Duty Vehicles	41	97	38402	2227	345	8325	3051	123	12	1344
2001	Heavy Duty Vehicles	42	98	38394	2098	349	8262	3091	124	12	1291
2002	Heavy Duty Vehicles	41	97	36864	1954	341	8058	3063	123	12	1195
2003	Heavy Duty Vehicles	44	103	38064	1965	357	8414	3254	131	13	1193
2004	Heavy Duty Vehicles	45	106	37752	1878	363	8430	3345	136	14	1127
2005	Heavy Duty Vehicles	44	21	35659	1731	348	8112	3249	133	13	1025
2006	Heavy Duty Vehicles	45	21	35587	1679	352	8234	3332	137	14	983
1985	2-wheelers	1	2	62	5704	131	11021	56	1	1	79
1986	2-wheelers	1	2	61	5168	122	10456	52	1	1	72

Continued

Year	Sector	FC (PJ)	SO_2	NO_X	NMVOC	CH_4	CO	CO_2	N_2O	NH_3	TSP
1987	2-wheelers	1	2	59	4796	115	9928	50	1	1	67
1988	2-wheelers	1	2	59	4577	112	9772	49	1	1	64
1989	2-wheelers	1	1	58	4368	108	9472	47	1	1	61
1990	2-wheelers	1	2	62	4473	112	9946	49	1	1	63
1991	2-wheelers	1	2	61	4610	116	10157	51	1	1	64
1992	2-wheelers	1	2	67	4669	120	10664	53	1	1	66
1993	2-wheelers	1	2	67	4672	122	10901	54	1	1	66
1994	2-wheelers	1	2	74	4683	126	11393	56	1	1	66
1995	2-wheelers	1	2	80	4966	132	12034	59	1	1	70
1996	2-wheelers	1	2	81	5284	140	12615	62	1	1	75
1997	2-wheelers	1	2	89	5796	154	13844	68	1	1	82
1998	2-wheelers	1	2	96	6234	166	14962	73	1	1	88
1999	2-wheelers	1	2	101	5872	164	15182	74	1	1	83
2000	2-wheelers	1	2	115	5360	162	15287	76	1	1	79
2001	2-wheelers	1	2	122	4534	155	15229	75	1	1	69
2002	2-wheelers	1	2	135	4568	161	16032	80	1	1	70
2003	2-wheelers	1	3	147	4491	166	16622	83	2	2	70
2004	2-wheelers	1	3	162	4396	171	17135	87	2	2	68
2005	2-wheelers	1	1	180	4132	172	17315	90	2	2	64
2006	2-wheelers	1	1	210	4092	184	18743	100	2	2	65
1985	Total	111	11621	92561	80996	2378	561271	8160	275	62	4431
1986	Total	117	7862	98284	80718	2437	540938	8625	289	64	4764
1987	Total	118	7847	98292	80084	2450	521944	8636	289	64	4781
1988	Total	118	7857	99080	79593	2481	476251	8694	293	66	4722
1989	Total	120	5488	100344	77996	2472	448416	8789	295	66	4796
1990	Total	126	5767	105933	81811	2619	459539	9275	312	70	5053
1991	Total	132	5903	107409	82697	2658	474997	9690	335	248	5179
1992	Total	134	3820	106683	81762	2627	465106	9863	352	441	5026
1993	Total	136	1569	104339	79515	2592	466804	9987	365	623	5044
1994	Total	143	1669	103482	75265	2502	435050	10487	398	946	5164
1995	Total	144	1682	99888	70480	2370	412018	10585	414	1198	4917
1996	Total	147	1721	96827	66214	2265	399617	10764	430	1428	4814
1997	Total	149	1744	93041	60042	2176	346233	10978	442	1862	4444
1998	Total	152	1768	89052	54906	2090	325320	11166	447	2226	4191
1999	Total	154	1088	85941	48977	1980	290786	11312	450	2492	3986

Continued

Year	Sector	FC (PJ)	SO_2	NO_X	NMVOC	CH_4	CO	CO_2	N_2O	NH_3	TSP
2000	Total	153	352	81108	41599	1861	267325	11202	443	2657	3732
2001	Total	153	353	78485	37854	1740	256942	11223	429	2536	3599
2002	Total	155	357	74679	34307	1636	235566	11352	421	2472	3360
2003	Total	161	371	74275	31872	1572	225428	11806	420	2376	3386
2004	Total	165	381	72201	28154	1480	200562	12115	421	2281	3177
2005	Total	166	77	68519	25947	1376	192046	12229	406	2123	3150
2006	Total	171	79	66993	23171	1290	171521	12594	402	1951	3101

Annex 8: COPERT IV:DEA statistics fuel use ratios and mileage adjustment factors

Sales			1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Fuel ratio	Gasoline	DEA:COPERT IV	1.04	1.00	0.97	0.95	0.92	0.97	1.01	1.06	1.09	1.11	1.10	1.08	1.10	1.11	1.09	1.09	1.09	1.11	1.11	1.10	1.05	1.06
	Diesel (fuel ratio)	DEA:COPERT IV	1.22	1.29	1.25	1.25	1.28	1.39	1.43	1.40	1.41	1.51	1.49	1.51	1.51	1.49	1.46	1.42	1.38	1.38	1.45	1.47	1.43	1.43
Mileage factor	Gasoline	DEA:COPERT IV	1.04	1.00	0.97	0.95	0.92	0.97	1.01	1.06	1.09	1.11	1.10	1.08	1.10	1.11	1.09	1.09	1.09	1.11	1.11	1.10	1.05	1.06
	Diesel (mileage factor)	DEA:COPERT IV	1.25	1.32	1.28	1.28	1.32	1.45	1.49	1.45	1.47	1.59	1.57	1.59	1.59	1.57	1.54	1.50	1.46	1.47	1.57	1.61	1.57	1.58
Consumption																								
Fuel ratio	Gasoline	DEA:COPERT IV	1.08	1.08	1.07	1.08	1.07	1.06	1.06	1.07	1.07	1.08	1.09	1.09	1.11	1.11	1.13	1.15	1.13	1.14	1.13	1.12	1.07	1.08
	Diesel (fuel ratio)	DEA:COPERT IV	1.13	1.16	1.13	1.13	1.17	1.27	1.36	1.34	1.34	1.40	1.37	1.38	1.38	1.36	1.34	1.32	1.29	1.27	1.31	1.32	1.29	1.30
Mileage factor	Gasoline	DEA:COPERT IV	1.08	1.08	1.07	1.08	1.07	1.06	1.06	1.07	1.07	1.08	1.09	1.09	1.11	1.11	1.13	1.15	1.13	1.14	1.13	1.12	1.07	1.08
	Diesel (mileage factor)	DEA:COPERT IV	1.15	1.19	1.15	1.15	1.19	1.31	1.41	1.39	1.40	1.46	1.42	1.43	1.44	1.41	1.40	1.38	1.35	1.34	1.38	1.41	1.38	1.40

Annex 9: Basis fuel use and emission factors, deterioration factors, transient factors and specific operational data for non road working machinery and equipment, and recreational craft

Basis factors for diesel fuelled non road machinery

Engine size [P=kW]	Emission Level	NO_x	VOC	CO	N_2O [g/kWh]	NH_3	TSP	Fuel
P<19	<1981	12.0	5.0	7	0.035	0.002	2.8	300
P<19	1981-1990	11.5	3.8	6	0.035	0.002	2.3	285
P<19	1991-Stage I	11.2	2.5	5	0.035	0.002	1.6	270
P<19	Stage I	11.2	2.5	5	0.035	0.002	1.6	270
P<19	Stage II	11.2	2.5	5	0.035	0.002	1.6	270
P<19	Stage IIIA	11.2	2.5	5	0.035	0.002	1.6	270
P<19	Stage IIIB	11.2	2.5	5	0.035	0.002	1.6	270
P<19	Stage IV	11.2	2.5	5	0.035	0.002	1.6	270
19<=P<37	<1981	18.0	2.5	6.5	0.035	0.002	2	300
19<=P<37	1981-1990	18.0	2.2	5.5	0.035	0.002	1.4	281
19<=P<37	1991-Stage I	9.8	1.8	4.5	0.035	0.002	1.4	262
19<=P<37	Stage I	9.8	1.8	4.5	0.035	0.002	1.4	262
19<=P<37	Stage II	6.5	0.6	2.2	0.035	0.002	0.4	262
19<=P<37	Stage IIIA	6.2	0.6	2.2	0.035	0.002	0.4	262
19<=P<37	Stage IIIB	6.2	0.6	2.2	0.035	0.002	0.4	262
19<=P<37	Stage IV	6.2	0.6	2.2	0.035	0.002	0.4	262
37<=P<56	<1981	7.7	2.4	6	0.035	0.002	1.8	290
37<=P<56	1981-1990	8.6	2.0	5.3	0.035	0.002	1.2	275
37<=P<56	1991-Stage I	11.5	1.5	4.5	0.035	0.002	0.8	260
37<=P<56	Stage I	7.7	0.6	2.2	0.035	0.002	0.4	260
37<=P<56	Stage II	5.5	0.4	2.2	0.035	0.002	0.2	260
37<=P<56	Stage IIIA	3.9	0.4	2.2	0.035	0.002	0.2	260
37<=P<56	Stage IIIB	3.9	0.4	2.2	0.035	0.002	0.0225	260
37<=P<56	Stage IV	3.9	0.4	2.2	0.035	0.002	0.0225	260
56<=P<75	<1981	7.7	2.0	5	0.035	0.002	1.4	290
56<=P<75	1981-1990	8.6	1.6	4.3	0.035	0.002	1	275
56<=P<75	1991-Stage I	11.5	1.2	3.5	0.035	0.002	0.4	260
56<=P<75	Stage I	7.7	0.4	1.5	0.035	0.002	0.2	260
56<=P<75	Stage II	5.5	0.3	1.5	0.035	0.002	0.2	260
56<=P<75	Stage IIIA	4.0	0.3	1.5	0.035	0.002	0.2	260
56<=P<75	Stage IIIB	3.0	0.2	1.5	0.035	0.002	0.0225	260
56<=P<75	Stage IV	0.4	0.2	1.5	0.035	0.002	0.0225	260
75<=P<130	<1981	10.5	2.0	5	0.035	0.002	1.4	280
75<=P<130	1981-1990	11.8	1.6	4.3	0.035	0.002	1	268
75<=P<130	1991-Stage I	13.3	1.2	3.5	0.035	0.002	0.4	255
75<=P<130	Stage I	8.1	0.4	1.5	0.035	0.002	0.2	255
75<=P<130	Stage II	5.2	0.3	1.5	0.035	0.002	0.2	255
75<=P<130	Stage IIIA	3.4	0.3	1.5	0.035	0.002	0.2	255
75<=P<130	Stage IIIB	3.0	0.2	1.5	0.035	0.002	0.0225	255
75<=P<130	Stage IV	0.4	0.2	1.5	0.035	0.002	0.0225	255
130<=P<560	<1981	17.8	1.5	2.5	0.035	0.002	0.9	270
130<=P<560	1981-1990	12.4	1.0	2.5	0.035	0.002	0.8	260
130<=P<560	1991-Stage I	11.2	0.5	2.5	0.035	0.002	0.4	250
130<=P<560	Stage I	7.6	0.3	1.5	0.035	0.002	0.2	250
130<=P<560	Stage II	5.2	0.3	1.5	0.035	0.002	0.1	250
130<=P<560	Stage IIIA	3.4	0.3	1.5	0.035	0.002	0.1	250
130<=P<560	Stage IIIB	3.0	0.2	1.5	0.035	0.002	0.0225	250
130<=P<560	Stage IV	0.4	0.2	1.5	0.035	0.002	0.0225	250

Basis factors for 4-stroke gasoline non road machinery

Engine	Size code	Size classe [S=ccm]	Emission Level	NO_x	VOC	CO	N_2O [g/kWh]	NH_3	TSP	Fuel
4-stroke	SH2	20<=S<50	<1981	2.4	33	198	0.002	0.03	0.08	496
4-stroke	SH2	20<=S<50	1981-1990	3.5	27.5	165	0.002	0.03	0.08	474
4-stroke	SH2	20<=S<50	1991-Stage I	4.7	22	132	0.002	0.03	0.08	451
4-stroke	SH2	20<=S<50	Stage I	4.7	22	132	0.002	0.03	0.08	406
4-stroke	SH2	20<=S<50	Stage II	4.7	22	132	0.002	0.03	0.08	406
4-stroke	SH3	S>=50	<1981	2.4	33	198	0.002	0.03	0.08	496
4-stroke	SH3	S>=50	1981-1990	3.5	27.5	165	0.002	0.03	0.08	474
4-stroke	SH3	S>=50	1991-Stage I	4.7	22	132	0.002	0.03	0.08	451
4-stroke	SH3	S>=50	Stage I	4.7	22	132	0.002	0.03	0.08	406
4-stroke	SH3	S>=50	Stage II	4.7	22	132	0.002	0.03	0.08	406
4-stroke	SN1	S<66	<1981	1.2	26.9	822	0.002	0.03	0.08	603
4-stroke	SN1	S<66	1981-1990	1.8	22.5	685	0.002	0.03	0.08	603
4-stroke	SN1	S<66	1991-Stage I	2.4	18	548	0.002	0.03	0.08	603
4-stroke	SN1	S<66	Stage I	4.3	16.1	411	0.002	0.03	0.08	475
4-stroke	SN1	S<66	Stage II	4.3	16.1	411	0.002	0.03	0.08	475
4-stroke	SN2	66<=S<100	<1981	2.3	10.5	822	0.002	0.03	0.08	627
4-stroke	SN2	66<=S<100	1981-1990	3.5	8.7	685	0.002	0.03	0.08	599
4-stroke	SN2	66<=S<100	1991-Stage I	4.7	7	548	0.002	0.03	0.08	570
4-stroke	SN2	66<=S<100	Stage I	4.7	7	467	0.002	0.03	0.08	450
4-stroke	SN2	66<=S<100	Stage II	4.7	7	467	0.002	0.03	0.08	450
4-stroke	SN3	100<=S<225	<1981	2.6	19.1	525	0.002	0.03	0.08	601
4-stroke	SN3	100<=S<225	1981-1990	3.8	15.9	438	0.002	0.03	0.08	573
4-stroke	SN3	100<=S<225	1991-Stage I	5.1	12.7	350	0.002	0.03	0.08	546
4-stroke	SN3	100<=S<225	Stage I	5.1	11.6	350	0.002	0.03	0.08	546
4-stroke	SN3	100<=S<225	Stage II	5.1	9.4	350	0.002	0.03	0.08	546
4-stroke	SN4	S>=225	<1981	1.3	11.1	657	0.002	0.03	0.08	539
4-stroke	SN4	S>=225	1981-1990	2	9.3	548	0.002	0.03	0.08	514
4-stroke	SN4	S>=225	1991-Stage I	2.6	7.4	438	0.002	0.03	0.08	490
4-stroke	SN4	S>=225	Stage I	2.6	7.4	438	0.002	0.03	0.08	490
4-stroke	SN4	S>=225	Stage II	2.6	7.4	438	0.002	0.03	0.08	490

Basis factors for 2-stroke gasoline non road machinery

Engine	Size code	Size classe [ccm]	Emission Level	NO_x	VOC	CO	N_2O [g/kWh]	NH_3	TSP	Fuel
2-stroke	SH2	20<=S<50	<1981	1	305	695	0.002	0.01	7	882
2-stroke	SH2	20<=S<50	1981-1990	1	300	579	0.002	0.01	5.3	809
2-stroke	SH2	20<=S<50	1991-Stage I	1.1	203	463	0.002	0.01	3.5	735
2-stroke	SH2	20<=S<50	Stage I	1.5	188	379	0.002	0.01	3.5	720
2-stroke	SH2	20<=S<50	Stage II	1.5	44	379	0.002	0.01	3.5	500
2-stroke	SH3	S>=50	<1981	1.1	189	510	0.002	0.01	3.6	665
2-stroke	SH3	S>=50	1981-1990	1.1	158	425	0.002	0.01	2.7	609
2-stroke	SH3	S>=50	1991-Stage I	1.2	126	340	0.002	0.01	1.8	554
2-stroke	SH3	S>=50	Stage I	2	126	340	0.002	0.01	1.8	529
2-stroke	SH3	S>=50	Stage II	1.2	64	340	0.002	0.01	1.8	500
2-stroke	SN1	S<66	<1981	0.5	155	418	0.002	0.01	2.6	652
2-stroke	SN1	S<66	1981-1990	0.5	155	418	0.002	0.01	2.6	652
2-stroke	SN1	S<66	1991-Stage I	0.5	155	418	0.002	0.01	2.6	652
2-stroke	SN1	S<66	Stage I	0.5	155	418	0.002	0.01	2.6	652
2-stroke	SN1	S<66	Stage II	0.5	155	418	0.002	0.01	2.6	652
2-stroke	SN2	66<=S<100	<1981	0.5	155	418	0.002	0.01	2.6	652
2-stroke	SN2	66<=S<100	1981-1990	0.5	155	418	0.002	0.01	2.6	652
2-stroke	SN2	66<=S<100	1991-Stage I	0.5	155	418	0.002	0.01	2.6	652
2-stroke	SN2	66<=S<100	Stage I	0.5	155	418	0.002	0.01	2.6	652
2-stroke	SN2	66<=S<100	Stage II	0.5	155	418	0.002	0.01	2.6	652
2-stroke	SN3	100<=S<225	<1981	0.5	155	418	0.002	0.01	2.6	652
2-stroke	SN3	100<=S<225	1981-1990	0.5	155	418	0.002	0.01	2.6	652
2-stroke	SN3	100<=S<225	1991-Stage I	0.5	155	418	0.002	0.01	2.6	652
2-stroke	SN3	100<=S<225	Stage I	0.5	155	418	0.002	0.01	2.6	652
2-stroke	SN3	100<=S<225	Stage II	0.5	155	418	0.002	0.01	2.6	652
2-stroke	SN4	S>=225	<1981	0.5	155	418	0.002	0.01	2.6	652
2-stroke	SN4	S>=225	1981-1990	0.5	155	418	0.002	0.01	2.6	652
2-stroke	SN4	S>=225	1991-Stage I	0.5	155	418	0.002	0.01	2.6	652
2-stroke	SN4	S>=225	Stage I	0.5	155	418	0.002	0.01	2.6	652
2-stroke	SN4	S>=225	Stage II	0.5	155	418	0.002	0.01	2.6	652

Fuel use and emission factors LPG fork lifts

NO_x [g/kWh]	VOC [g/kWh]	CO [g/kWh]	NH_3 [g/kWh]	N_2O [g/kWh]	TSP [g/kWh]	FC [g/kWh]
19	2.2	1.5	0.003	0.05	0.07	311

Fuel use and emission factors for All Terrain Vehicles (ATV's)

ATV type	NO_x [g/GJ]	VOC [g/GJ]	CO [g/GJ]	NH_3 [g/GJ]	N_2O [g/GJ]	TSP [g/GJ]	Fuel [kg/hour]
Professional	108	1077	16306	2	2	32	1.125
Private	128	1527	22043	2	2	39	0.75

Fuel use and emission factors for recreational craft

Fuel type	Vessel type	Engine	Engine type	Direktiv	Engine size	CO	VOC	N_2O	NH_3	NO_x	TSP	Fuel
					[kW]				[g/kWh]			
Gasoline	Other boats (< 20 ft)	Out board	2-stroke	2003/44	8	202.5	45.9	0.01	0.002	2	10	791
Gasoline	Other boats (< 20 ft)	Out board	2-stroke	Konv.	8	427	257.0	0.01	0.002	2	10	791
Gasoline	Other boats (< 20 ft)	Out board	4-stroke	2003/44	8	202.5	24.0	0.03	0.002	7	0.08	426
Gasoline	Other boats (< 20 ft)	Out board	4-stroke	Konv.	8	520	24.0	0.03	0.002	7	0.08	426
Gasoline	Yawls and cabin boats	Out board	2-stroke	2003/44	20	162	36.5	0.01	0.002	3	10	791
Gasoline	Yawls and cabin boats	Out board	2-stroke	Konv.	20	374	172.0	0.01	0.002	3	10	791
Gasoline	Yawls and cabin boats	Out board	4-stroke	2003/44	20	162	14.0	0.03	0.002	10	0.08	426
Gasoline	Yawls and cabin boats	Out board	4-stroke	Konv.	20	390	14.0	0.03	0.002	10	0.08	426
Gasoline	Sailing boats (< 26 ft)	Out board	2-stroke	2003/44	10	189	43.0	0.01	0.002	2	10	791
Gasoline	Sailing boats (< 26 ft)	Out board	2-stroke	Konv.	10	427	257.0	0.01	0.002	2	10	791
Gasoline	Sailing boats (< 26 ft)	Out board	4-stroke	2003/44	10	189	24.0	0.03	0.002	7	0.08	426
Gasoline	Sailing boats (< 26 ft)	Out board	4-stroke	Konv.	10	520	24.0	0.03	0.002	7	0.08	426
Gasoline	Speed boats	In board	4-stroke	2003/44	90	141	10.0	0.03	0.002	12	0.08	426
Gasoline	Speed boats	In board	4-stroke	Konv.	90	346	10.0	0.03	0.002	12	0.08	426
Gasoline	Speed boats	Out board	2-stroke	2003/44	50	145.8	31.8	0.01	0.002	3	10	791
Gasoline	Speed boats	Out board	2-stroke	Konv.	50	374	172.0	0.01	0.002	3	10	791
Gasoline	Speed boats	Out board	4-stroke	2003/44	50	145.8	14.0	0.03	0.002	10	0.08	426
Gasoline	Speed boats	Out board	4-stroke	Konv.	50	390	14.0	0.03	0.002	10	0.08	426
Gasoline	Water scooters	Built in	2-stroke	2003/44	45	147	32.2	0.01	0.002	3	10	791
Gasoline	Water scooters	Built in	2-stroke	Konv.	45	374	172.0	0.01	0.002	3	10	791
Gasoline	Water scooters	Built in	4-stroke	2003/44	45	147	14.0	0.03	0.002	10	0.08	426
Gasoline	Water scooters	Built in	4-stroke	Konv.	45	390	14.0	0.03	0.002	10	0.08	426
Diesel	Motor boats (27-34 ft)	In board		2003/44	150	5	1.7	0.035	0.002	8.6	1	275
Diesel	Motor boats (27-34 ft)	In board		Konv.	150	5.3	2.0	0.035	0.002	8.6	1.2	275
Diesel	Motor boats (> 34 ft)	In board		2003/44	250	5	1.6	0.035	0.002	8.6	1	275
Diesel	Motor boats (> 34 ft)	In board		Konv.	250	5.3	2.0	0.035	0.002	8.6	1.2	275
Diesel	Motor boats (< 27 ft)	In board		2003/44	40	5	1.8	0.035	0.002	9.8	1	281
Diesel	Motor boats (< 27 ft)	In board		Konv.	40	5.5	2.2	0.035	0.002	18	1.4	281
Diesel	Motor sailors	In board		2003/44	30	5	1.9	0.035	0.002	9.8	1	281
Diesel	Motor sailors	In board		Konv.	30	5.5	2.2	0.035	0.002	18	1.4	281
Diesel	Sailing boats (> 26 ft)	In board		2003/44	30	5	1.9	0.035	0.002	9.8	1	281
Diesel	Sailing boats (> 26 ft)	In board		Konv.	30	5.5	2.2	0.035	0.002	18	1.4	281

CH_4 shares of VOC for diesel, gasoline and LPG

Fuel type	CH_4 share of VOC
Diesel	0.016
Gasoline 4-stroke	0.1
Gasoline 2-stroke	0.009
LPG	0.05

Deterioration factors for diesel machinery

Emission Level	NO_x	VOC	CO	TSP
<1981	0.024	0.047	0.185	0.473
1981-1990	0.024	0.047	0.185	0.473
1991-Stage I	0.024	0.047	0.185	0.473
Stage I	0.024	0.036	0.101	0.473
Stage II	0.009	0.034	0.101	0.473
Stage IIIA	0.008	0.027	0.151	0.473
Stage IIIB	0.008	0.027	0.151	0.473
Stage IV	0.008	0.027	0.151	0.473

Deterioration factors for gasoline 2-stroke machinery

Engine	Size code	Size classe	Emission Level	NO_x	VOC	CO	TSP
2-stroke	SH2	20<=S<50	<1981	0	0.2	0.2	0
2-stroke	SH2	20<=S<50	1981-1990	0	0.2	0.2	0
2-stroke	SH2	20<=S<50	1991-Stage I	0	0.2	0.2	0
2-stroke	SH2	20<=S<50	Stage I	0	0.29	0.24	0
2-stroke	SH2	20<=S<50	Stage II	0	0.29	0.24	0
2-stroke	SH3	S>=50	<1981	-0.031	0.2	0.2	0
2-stroke	SH3	S>=50	1981-1990	-0.031	0.2	0.2	0
2-stroke	SH3	S>=50	1991-Stage I	-0.031	0.2	0.2	0
2-stroke	SH3	S>=50	Stage I	0	0.266	0.231	0
2-stroke	SH3	S>=50	Stage II	0	0.266	0.231	0
2-stroke	SN1	S<66	<1981	-0.6	0.201	0.9	1.1
2-stroke	SN1	S<66	1981-1990	-0.6	0.201	0.9	1.1
2-stroke	SN1	S<66	1991-Stage I	-0.6	0.201	0.9	1.1
2-stroke	SN1	S<66	Stage I	-0.33	0.266	1.109	5.103
2-stroke	SN1	S<66	Stage II	-0.33	0	1.109	5.103
2-stroke	SN2	66<=S<100	<1981	-0.6	0.201	0.9	1.1
2-stroke	SN2	66<=S<100	1981-1990	-0.6	0.201	0.9	1.1
2-stroke	SN2	66<=S<100	1991-Stage I	-0.6	0.201	0.9	1.1
2-stroke	SN2	66<=S<100	Stage I	-0.33	0.266	1.109	5.103
2-stroke	SN2	66<=S<100	Stage II	-0.33	0	1.109	5.103
2-stroke	SN3	100<=S<225	<1981	-0.6	0.201	0.9	1.1
2-stroke	SN3	100<=S<225	1981-1990	-0.6	0.201	0.9	1.1
2-stroke	SN3	100<=S<225	1991-Stage I	-0.6	0.201	0.9	1.1
2-stroke	SN3	100<=S<225	Stage I	-0.33	0.266	1.109	5.103
2-stroke	SN3	100<=S<225	Stage II	-0.33	0	1.109	5.103
2-stroke	SN4	S>=225	<1981	-0.6	0.201	0.9	1.1
2-stroke	SN4	S>=225	1981-1990	-0.6	0.201	0.9	1.1
2-stroke	SN4	S>=225	1991-Stage I	-0.6	0.201	0.9	1.1
2-stroke	SN4	S>=225	Stage I	-0.274	0	0.887	1.935
2-stroke	SN4	S>=225	Stage II	-0.274	0	0.887	1.935

Deterioration factors for gasoline 4-stroke machinery

Engine	Size code	Size classe	Emission Level	NO_x	VOC	CO	TSP
4-stroke	SN1	S<66	<1981	-0.6	1.1	0.9	1.1
4-stroke	SN1	S<66	1981-1990	-0.6	1.1	0.9	1.1
4-stroke	SN1	S<66	1991-Stage I	-0.6	1.1	0.9	1.1
4-stroke	SN1	S<66	Stage I	-0.3	1.753	1.051	1.753
4-stroke	SN1	S<66	Stage II	-0.3	1.753	1.051	1.753
4-stroke	SN2	66<=S<100	<1981	-0.6	1.1	0.9	1.1
4-stroke	SN2	66<=S<100	1981-1990	-0.6	1.1	0.9	1.1
4-stroke	SN2	66<=S<100	1991-Stage I	-0.6	1.1	0.9	1.1
4-stroke	SN2	66<=S<100	Stage I	-0.3	1.753	1.051	1.753
4-stroke	SN2	66<=S<100	Stage II	-0.3	1.753	1.051	1.753
4-stroke	SN3	100<=S<225	<1981	-0.6	1.1	0.9	1.1
4-stroke	SN3	100<=S<225	1981-1990	-0.6	1.1	0.9	1.1
4-stroke	SN3	100<=S<225	1991-Stage I	-0.6	1.1	0.9	1.1
4-stroke	SN3	100<=S<225	Stage I	-0.3	1.753	1.051	1.753
4-stroke	SN3	100<=S<225	Stage II	-0.3	1.753	1.051	1.753
4-stroke	SN4	S>=225	<1981	-0.6	1.1	0.9	1.1
4-stroke	SN4	S>=225	1981-1990	-0.6	1.1	0.9	1.1
4-stroke	SN4	S>=225	1991-Stage I	-0.6	1.1	0.9	1.1
4-stroke	SN4	S>=225	Stage I	-0.599	1.095	1.307	1.095
4-stroke	SN4	S>=225	Stage II	-0.599	1.095	1.307	1.095
4-stroke	SH2	20<=S<50	<1981	0	0	0	0
4-stroke	SH2	20<=S<50	1981-1990	0	0	0	0
4-stroke	SH2	20<=S<50	1991-Stage I	0	0	0	0
4-stroke	SH2	20<=S<50	Stage I	0	0	0	0
4-stroke	SH2	20<=S<50	Stage II	0	0	0	0
4-stroke	SH3	S>=50	<1981	0	0	0	0
4-stroke	SH3	S>=50	1981-1990	0	0	0	0
4-stroke	SH3	S>=50	1991-Stage I	0	0	0	0
4-stroke	SH3	S>=50	Stage I	0	0	0	0
4-stroke	SH3	S>=50	Stage II	0	0	0	0

Transient factors for diesel machinery

Emission Level	Load	NO_x	VOC	CO	TSP	Fuel
<1981	High	0.95	1.05	1.53	1.23	1.01
1981-1990	High	0.95	1.05	1.53	1.23	1.01
1991-Stage I	High	0.95	1.05	1.53	1.23	1.01
Stage I	High	0.95	1.05	1.53	1.23	1.01
Stage II	High	0.95	1.05	1.53	1.23	1.01
Stage IIIA	High	0.95	1.05	1.53	1.23	1.01
Stage IIIB	High	1	1	1	1	1
Stage IV	High	1	1	1	1	1
<1981	Low	1.1	2.29	2.57	1.97	1.18
1981-1990	Low	1.1	2.29	2.57	1.97	1.18
1991-Stage I	Low	1.1	2.29	2.57	1.97	1.18
Stage I	Low	1.1	2.29	2.57	1.97	1.18
Stage II	Low	1.1	2.29	2.57	1.97	1.18
Stage IIIA	Low	1.1	2.29	2.57	1.97	1.18
Stage IIIB	Low	1	1	1	1	1
Stage IV	Low	1	1	1	1	1

Annual working hours, load factors and lifetimes for **agricultural tractors**

Tractor type	Annual working hours	Load factor	Lifetime (yrs)
Diesel	500 (0-7 years) 500-100 (7-16 years) 100 (>16 years)	0.5	30
Gasoline (certified)	100	0.4	37
Gasoline (non certified)	50	0.4	37

Annual working hours, load factors and lifetimes for **harvesters**

Annual working hours	Load factor	Lifetime (yrs)
250-100 (linear decrease 0-24 years)	0.8	25

Annual working hours, load factors and lifetime for **machine pool machinery**

Tractor type	Hours/yr	Load factor	Lifetime (yrs)
Tractors	750	0.5	7
Harvesters	100	0.8	11
Self-propelled vehicles	500	0.75	6

Operational data for **other machinery types in agriculture**

Machinery type	Fuel type	Load factor	Lifetime (yrs)	Hours	Size (kW)
ATV private	Gasoline	-	6	250	-
ATV professional	Gasoline	-	8	400	-
Bedding machines	Gasoline	0.3	10	50	3
Fodder trucks	Gasoline	0.4	10	200	8
Other (gasoline)	Gasoline	0.4	10	50	5
Scrapers	Gasoline	0.3	10	50	3
Self-propelled vehicles	Diesel	0.75	15	150	60
Sweepers	Gasoline	0.3	10	50	3

Annual working hours, load factors and lifetimes for **forestry machinery**

Machinery type	Hours	Load factors	Lifetime
Chippers	1200	0.5	6
Tractors (other)	100 (1990) 400 (2004)	0.5	15
Tractors (silvicultural)	800	0.5	6
Harvesters	1200	0.5	8
Forwarders	1200	0.5	8
Chain saws (forestry)	800	0.4	3

Annual working hours, load factors and lifetime for **fork lifts**

Hours/yr	Load factor	Lifetime (yrs)
1200 (>=50 kW and <=10 years old) 650 (>=50 kW and >10 years old) 650 (<50 kW)	0.27	20

Operational data for **construction machinery**

Machinery type	Load factor	Lifetime	Hours	Size
Track type dozers	0.5	10	1100	140
Track type loaders	0.5	10	1100	100 (1990) 150 (2004)
Wheel loaders (0-5 tons)	0.5	10	1200	20
Wheel loaders (> 5,1 tons)	0.5	10	1200	120
Wheel type excavators	0.6	10	1200	100
Track type excavators (0-5 tons)	0.6	10	1100	20
Track type excavators (>5,1 tons)	0.6	10	1100	120
Excavators/Loaders	0.45	10	700	50
Dump trucks	0.4	10	900 (1990) 1200 (2004)	60 (1990) 180 (2004)
Mini loaders	0.5	14	700	30
Telescopic loaders	0.5	14	1000	35

Stock and operational data for **other machinery types in industry**

Sector	Fuel type	Machinery type	Size (kW)	No	Load Factor	Hours
Construction machinery	Diesel	Tampers/Land rollers	30	2800	0.45	600
Construction machinery	Diesel	Generators (diesel)	45	5000	0.5	200
Construction machinery	Diesel	Kompressors (diesel)	45	5000	0.5	500
Construction machinery	Diesel	Pumps (diesel)	75	1000	0.5	5
Construction machinery	Diesel	Asphalt pavers	80	300	0.35	700
Construction machinery	Diesel	Motor graders	100	100	0.4	700
Construction machinery	Diesel	Refuse compressors	160	100	0.25	1300
Construction machinery	Gasoline	Generators (gasoline)	2.5	11000	0.4	80
Construction machinery	Gasoline	Pumps (gasoline)	4	10000	0.4	300
Construction machinery	Gasoline	Kompressors (gasoline)	4	500	0.35	15
Industry	Diesel	Refrigerating units (distribution)	8	3000	0.5	1250
Industry	Diesel	Refrigerating units (long distance)	15	3500	0.5	200
Industry	Diesel	Tractors (transport, industry)	50	3000	0.4	500
Airport GSE and other	Diesel	Airport GSE and other (light duty)	100	500	0.5	400
Airport GSE and other	Diesel	Airport GSE and other (medium duty)	125	350	0.5	300
Airport GSE and other	Diesel	Airport GSE and other (Heavy duty)	175	650	0.5	200
Building and construction	Diesel	Vibratory plates	6	3500	0.6	300
Building and construction	Diesel	Aereal lifts (diesel)	30	150	0.4	400
Building and construction	Diesel	Sweepers (diesel)	30	200	0.4	300
Building and construction	Diesel	High pressure cleaners (diesel)	30	50	0.8	500
Building and construction	Gasoline	Rammers	2.5	3000	0.4	80
Building and construction	Gasoline	Drills	3	100	0.4	10
Building and construction	Gasoline	Vibratory plates (gasoline)	4	2500	0.5	200
Building and construction	Gasoline	Cutters	4	800	0.5	50
Building and construction	Gasoline	Other (gasoline)	5	1000	0.5	40
Building and construction	Gasoline	High pressure cleaners (gasoline)	5	500	0.6	200
Building and construction	Gasoline	Sweepers (gasoline)	10	500	0.4	150
Building and construction	Gasoline	Slicers	10	100	0.7	150
Building and construction	Gasoline	Aereal lifts (gasoline)	20	50	0.4	400

Operational data for the most important types of **household and gardening machinery**

Machinery type	Engine	Size (kW)	Hours	Load factor	Lifetime (yrs)
Chain saws (private)	2-stroke	2	5	0.3	10
Chain saws (professional)	2-stroke	3	270	0.4	3
Cultivators (private-large)	4-stroke	3.7	5	0.6	5
Cultivators (private-small)	4-stroke	1	5	0.6	15
Cultivators (professional)	4-stroke	7	360	0.6	8
Hedge cutters (private)	2-stroke	0.9	10	0.5	10
Hedge cutters (professional)	2-stroke	2	300	0.5	4
Lawn movers (private)	4-stroke	2.5 (2000) 3.5 (2004)	25	0.4	8
Lawn movers (professional)	4-stroke	2.5 (2000) 3.5 (2004)	250	0.4	4
Riders (private)	4-stroke	11	50	0.5	12
Riders (professional)	4-stroke	13	330	0.5	5
Shrub clearers (private)	2-stroke	1	15	0.6	10
Shrub clearers (professional)	2-stroke	2	300	0.6	4
Trimmers (private)	2-stroke	0.9	20	0.5	10
Trimmers (professional)	2-stroke	0.9	200	0.5	4

Stock and operational data for **other machines in household and gardening**

Machinery type	Engine	No.	Size (kW)	Hours	Load factor	Lifetime (yrs)
Chippers	2-stroke	200	10	100	0.7	10
Garden shredders	2-stroke	500	3	20	0.7	10
Other (gasoline)	2-stroke	200	2	20	0.5	10
Suction machines	2-stroke	300	4	80	0.5	10
Wood cutters	4-stroke	100	4	15	0.5	10

Operational data for **recreational craft**

Fuel type	Vessel type	Engine type	Stroke	Hours	Lifetime	Load factor
Gasoline	Other boats (<20 ft)	Out board engine	2-stroke	30	10	0.5
Gasoline	Other boats (<20 ft)	Out board engine	4-stroke	30	10	0.5
Gasoline	Yawls and cabin boats	Out board engine	2-stroke	50	10	0.5
Gasoline	Yawls and cabin boats	Out board engine	4-stroke	50	10	0.5
Gasoline	Sailing boats (<26ft)	Out board engine	2-stroke	5	10	0.5
Gasoline	Sailing boats (<26ft)	Out board engine	4-stroke	5	10	0.5
Gasoline	Speed boats	In board engine	4-stroke	75	10	0.5
Gasoline	Speed boats	Out board engine	2-stroke	50	10	0.5
Gasoline	Speed boats	Out board engine	4-stroke	50	10	0.5
Gasoline	Water scooters	Built in	2-stroke	10	10	0.5
Gasoline	Water scooters	Built in	4-stroke	10	10	0.5
Diesel	Motor boats (27-34 ft)	In board engine		150	15	0.5
Diesel	Motor boats (>34 ft)	In board engine		100	15	0.5
Diesel	Motor boats (<27 ft)	In board engine		75	15	0.5
Diesel	Motor sailors	In board engine		75	15	0.5
Diesel	Sailing boats (<26ft)	In board engine		25	15	0.5

Annex 10: Stock data for non-road working machinery and equipment

Stock data for diesel tractors 1985-2006

Size (kW)	Emission Level	1985	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
37	<1981	3882	3234	3106	2922	2861	2610	2605	2273	2193	1918	1796	1601	1449	1298	1148	993	833	664
37	1981-1990	635	879	889	883	915	887	945	883	918	869	888	871	876	882	892	900	906	903
37	1991-Stage I			25	107	153	201	278	354	445	496	554	568	572	576	582	587	592	590
37	Stage I													33	56	83	84	84	84
37	Stage II																23	53	162
45	<1981	25988	21650	20796	19563	19154	17475	17441	15219	14684	12840	12025	10715	9700	8690	7685	6646	5577	4447
45	1981-1990	5740	8770	8867	8805	9128	8848	9419	8807	9151	8668	8856	8681	8731	8800	8894	8974	9037	9006
45	1991-Stage I			203	202	209	203	216	202	210	199	203	199	200	202	204	206	207	207
49	1991-Stage I				154	281	485	602	618	702	749	765	750	754	760	768	775	780	778
52	1991-Stage I											247	358	360	363	367	370	373	372
52	Stage I													132	242	377	381	383	382
52	Stage II																68	147	241
56	1991-Stage I				201	338	428	747	943	1181	1280	1307	1281	1289	1299	1313	1325	1334	1329
60	<1981	54651	45529	43732	41140	40278	36747	36676	32004	30879	27001	25287	22533	20397	18273	16162	13976	11729	9351
60	1981-1990	11751	20542	20770	20624	21380	20725	22063	20628	21434	20304	20744	20333	20451	20612	20834	21019	21167	21096
60	1991-Stage I			863	857	888	861	917	857	891	844	862	845	850	856	866	873	879	876
63	1991-Stage I				468	855	1325	2014	2384	2837	3011	3076	3015	3033	3057	3090	3117	3139	3128
67	1991-Stage I											671	1343	1351	1361	1376	1388	1398	1393
67	Stage I													533	835	1113	1123	1131	1127
67	Stage II																375	729	1144
71	1991-Stage I				411	715	1179	1949	2507	3344	3594	3672	3600	3620	3649	3688	3721	3747	3735
78	<1981	14558	12128	11649	10959	10729	9789	9770	8525	8226	7192	6736	6002	5433	4868	4305	3723	3124	2491
78	1981-1990	4592	11323	11448	11368	11785	11424	12162	11371	11815	11192	11434	11208	11273	11361	11484	11586	11668	11628
78	1991-Stage I			1233	1503	1713	1945	2429	2561	2946	2994	3287	3436	3727	3756	3797	3830	3857	3844
78	Stage I														325	329	332	334	333
78	Stage II															227	310	400	463
86	1991-Stage I				108	193	333	589	880	1364	1532	1718	1876	2023	2039	2061	2079	2094	2087
86	Stage I														134	136	137	138	137
86	Stage II															91	343	530	760
93	1991-Stage I											149	245	325	327	331	334	336	335
93	Stage I														114	115	116	117	116
93	Stage II															107	186	313	512

Continued

Size (kW)	Emission Level	1985	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
97	1991-Stage I				71	175	443	962	1556	2327	2638	2695	2642	2657	2678	2707	2731	2750	2741
101	<1981	4659	3881	3728	3507	3433	3132	3126	2728	2632	2302	2156	1921	1739	1558	1378	1191	1000	797
101	1981-1990	1158	2377	2403	2387	2474	2398	2553	2387	2480	2350	2400	2353	2367	2385	2411	2432	2449	2441
101	1991-Stage I			266	264	274	266	283	264	275	260	696	1116	1567	1579	1596	1611	1622	1616
101	Stage I														232	234	236	238	237
101	Stage II															136	357	635	776
112	1991-Stage I				63	114	166	252	422	690	790	978	1265	1626	1639	1656	1671	1683	1677
112	Stage I														465	470	474	478	476
112	Stage II															337	732	1170	1763
127	1991-Stage I				12	36	81	193	279	408	457	590	707	847	854	863	871	877	874
127	Stage I														152	154	155	156	156
127	Stage II															78	268	453	591
131	<1981	798	665	639	601	588	537	536	467	451	394	369	329	298	267	236	204	171	137
131	1981-1990	288	887	897	890	923	895	952	890	925	876	895	878	883	890	899	907	914	911
131	1991-Stage I			97	97	100	97	103	97	100	95	97	95	96	96	97	98	99	99
157	1981-1990		15	15	15	16	15	16	15	16	15	15	15	15	15	15	16	16	16
157	1991-Stage I			9	23	39	102	232	357	545	648	784	900	905	912	922	930	937	934
157	Stage I													89	89	90	91	92	91
157	Stage II														149	415	695	1089	1085
157	Stage IIIA																		623
186	1991-Stage I											23	53	54	54	55	55	56	55
186	Stage I													47	48	48	49	49	49
186	Stage II														68	207	320	481	480
186	Stage IIIA																		272

Stock data for gasoline tractors 1985-2005

Size (kW)	Emission Level	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Certified	<1981	13176	12541	11906	11270	10635	10000	9053	8148	7285	6465	5687	4951	4258	3607	2998	2432	1908	1427	987	591	236
Non certified	<1981	26352	25082	23811	22541	21270	20000	19042	18041	16998	15913	14785	13616	12403	11149	9852	8512	7131	5707	4240	2732	1180

Stock data for harvesters 1985-2006

Size Group	Emission Level	1985	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
0<S<=50	<1981	26601	18915	17241	15607	14575	12673	10700	9491	6966	5446	3589	2873	1828	1236	718	251		
0<S<=50	1981-1990	519	591	594	601	635	636	633	683	641	686	672	715	748	754	777	826	840	703
50<S<=60	<1981	2703	2828	2847	2876	3040	3044	3029	3271	3068	2930	2235	1999	1549	1222	854	366		
50<S<=60	1981-1990	853	1333	1341	1355	1432	1434	1427	1541	1446	1548	1516	1612	1687	1702	1752	1863	1894	1675
50<S<=60	1991-Stage I			8	8	8	8	8	9	9	9	9	10	10	10	10	11	11	11
60<S<=70	<1981	1786	1869	1881	1901	2009	2012	2002	2162	2028	2171	2127	2073	1626	1299	934	451		
60<S<=70	1981-1990	1138	2348	2363	2388	2524	2527	2515	2716	2547	2727	2671	2841	2973	2999	3087	3282	3338	3018
60<S<=70	1991-Stage I			8	16	18	21	22	24	23	24	24	25	26	27	27	29	30	29
70<S<=80	<1981	929	972	979	989	1045	1046	1041	1125	1055	1129	1106	1176	1231	1071	699	202		
70<S<=80	1981-1990	383	1493	1502	1518	1604	1606	1598	1726	1619	1733	1698	1806	1890	1906	1963	2086	2122	1953
70<S<=80	1991-Stage I			72	77	83	86	87	96	91	98	96	102	107	108	111	118	120	118
70<S<=80	Stage I											1	1	1	1	1	1	1	1
80<S<=90	<1981	323	338	340	344	363	364	362	391	367	393	385	409	428	432	445	202		
80<S<=90	1981-1990	383	1466	1475	1491	1575	1577	1570	1695	1590	1702	1667	1773	1856	1872	1927	2049	2083	1916
80<S<=90	1991-Stage I			61	158	181	200	200	217	207	222	217	231	242	244	251	267	272	265
80<S<=90	Stage I											1	1	1	1	1	1	1	1
90<S<=100	1981-1990	89	670	674	681	720	721	717	775	726	778	762	810	848	855	881	936	952	930
90<S<=100	1991-Stage I			180	257	320	329	351	382	367	393	385	410	429	433	445	473	481	471
90<S<=100	Stage I											1	1	1	1	1	1	1	1
100<S<=120	1981-1990		589	592	599	633	634	630	681	639	684	670	712	745	752	774	823	837	818
100<S<=120	1991-Stage I			129	253	316	375	440	567	586	673	660	702	734	740	762	811	824	805
100<S<=120	Stage I											2	2	2	2	2	3	3	3
120<S<=140	1981-1990		183	184	186	197	197	196	212	199	213	208	222	232	234	241	256	260	255
120<S<=140	1991-Stage I			70	148	189	215	319	484	626	804	860	918	964	972	1001	1064	1082	1057
120<S<=140	Stage I											21	26	30	31	32	34	34	33
120<S<=140	Stage II																3	3	3
120<S<=140	Stage IIIA																		1
140<S<=160	1991-Stage I				8	36	69	112	271	354	554	632	715	784	791	814	866	880	860
140<S<=160	Stage II														22	38	50	57	56

Continued

Size Group	Emission Level	1985	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
140<S<=160	Stage IIIA																		5
160<S<=180	1991-Stage I							26	69	200	374	440	533	594	599	617	655	666	651
160<S<=180	Stage II														44	76	95	107	105
160<S<=180	Stage IIIA																		8
180<S<=200	1991-Stage I								20	67	117	193	249	296	299	308	327	333	325
180<S<=200	Stage II														66	99	120	132	129
180<S<=200	Stage IIIA																		8
200<S<=220	1991-Stage I										45	92	142	185	186	192	204	207	203
200<S<=220	Stage II														44	76	95	107	105
200<S<=220	Stage IIIA																		8
220<S<=240	1991-Stage I											3	48	149	150	154	164	167	163
220<S<=240	Stage II														78	124	170	220	215
220<S<=240	Stage IIIA																		55
240<S<=260	1991-Stage I											3	71	140	141	145	154	157	153
240<S<=260	Stage II														78	137	207	295	289
240<S<=260	Stage IIIA																		102
260<S<=280	1991-Stage I											14	61	129	130	134	142	145	141
260<S<=280	Stage II														78	137	207	295	289
260<S<=280	Stage IIIA																		102
280<S<=300	1991-Stage I													33	33	34	36	37	36
280<S<=300	Stage II														78	137	207	295	289
280<S<=300	Stage IIIA																		102
300<S<=320	Stage II															28	61	104	102
300<S<=320	Stage IIIA																		51

Stock data for fork lifts 1985-2006

FuelCode	Size (kW)	Emission Level	1985	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Diesel	35	<1981	387	260	234	209	183	158	133	107	84	58	30							
Diesel	35	1981-1990	120	297	297	297	297	297	297	297	297	297	297	297	277	249	232	198	177	135
Diesel	35	1991-Stage I			26	49	65	93	131	168	218	247	275	304	304	304	304	304	304	304
Diesel	35	Stage II													23	53	75	89	117	152
Diesel	45	<1981	1612	1082	976	870	764	658	552	446	349	243	126							
Diesel	45	1981-1990	499	1233	1233	1233	1233	1233	1233	1233	1233	1233	1233	1233	1151	1036	964	820	734	559
Diesel	45	1991-Stage I			108	203	270	386	544	699	905	1063	1063	1063	1063	1063	1063	1063	1063	1063
Diesel	45	Stage I											151	303	422	524	664	664	664	664
Diesel	45	Stage II																104	232	452
Diesel	50	<1981	2173	1459	1316	1174	1031	888	745	602	471	328	170							
Diesel	50	1981-1990	673	1662	1662	1662	1662	1662	1662	1662	1662	1662	1662	1662	1551	1396	1299	1105	989	753
Diesel	50	1991-Stage I			145	273	363	519	732	940	1217	1469	1469	1469	1469	1469	1469	1469	1469	1469
Diesel	50	Stage I											240	461	682	897	1135	1135	1135	1135
Diesel	50	Stage II																187	447	818
Diesel	75	<1981	497	334	301	269	236	203	170	138	108	75	39							
Diesel	75	1981-1990	154	382	382	382	382	382	382	382	382	382	382	382	357	321	299	255	228	174
Diesel	75	1991-Stage I			33	63	84	120	169	217	281	354	354	354	354	354	354	354	354	354
Diesel	75	Stage I											70	162	234	311	311	311	311	311
Diesel	75	Stage II															58	129	208	326
Diesel	120	<1981	111	74	67	60	52	45	38	31	24	17	9							
Diesel	120	1981-1990	34	85	85	85	85	85	85	85	85	85	85	85	80	72	67	57	51	39
Diesel	120	1991-Stage I			7	14	19	27	38	49	63	97	97	97	97	97	97	97	97	97
Diesel	120	Stage I											32	71	89	118	118	118	118	118
Diesel	120	Stage II															16	38	58	112
LPG	33		5420	5215	5156	5068	4947	4863	4835	4792	4732	4765	4712	4718	4677	4655	4595	4494	4345	4220
LPG	40		4917	4730	4676	4596	4486	4410	4384	4344	4289	4295	4223	4218	4214	4244	4224	4166	4116	4048
LPG	50		2149	2067	2044	2008	1960	1926	1915	1897	1874	1926	1941	1897	1938	2003	2020	2018	2029	2061
LPG	78		97	93	92	91	89	88	88	87	86	90	92	88	95	98	99	104	104	114
LPG	120											1	2	2	2	3	3	3	3	3

Stock data for construction machinery 1985-2006

EquipmentName (Eng)	Emission Level	1985	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Track type dozers	<1981	125																	
Track type dozers	1981-1990	125	250	221	193	166	139	114	89	66	43	21							
Track type dozers	1991-Stage I			25	48	71	93	114	134	153	172	189	206	201	177	154	132	128	125.00
Track type dozers	Stage II														20	38	56	86	100.00
Track type dozers	Stage IIIA																		25.00
Track type loaders	<1981	50																	
Track type loaders	1981-1990	50	100	89	79	68	58	48	38	28	19	9							
Track type loaders	1991-Stage I			10	20	29	39	48	57	66	75	83	91	91	81	71	62	61	70.50
Track type loaders	Stage II														9	18	26	40	56.40
Track type loaders	Stage IIIA																		14.10
Wheel loaders (0-5 tons)	1981-1990			186	331	434	496	517	496	434	331	186							
Wheel loaders (0-5 tons)	1991-Stage I			21	83	186	331	517	744	1013	1323	1674	2067	2046	1984	1881	1736	1444	1268.80
Wheel loaders (0-5 tons)	Stage II													227	496	806	1158	1444	1903.20
Wheel loaders (> 5,1 tons)	<1981	1250																	
Wheel loaders (> 5,1 tons)	1981-1990	1250	2500	2228	1960	1698	1441	1188	941	698	460	228							
Wheel loaders (> 5,1 tons)	1991-Stage I			248	490	728	960	1188	1411	1629	1841	1822	1802	1559	1322	1089	861	677	484.60
Wheel loaders (> 5,1 tons)	Stage I											228	450	668	881	871	861	902	969.20
Wheel loaders (> 5,1 tons)	Stage II															218	431	677	969.20
Wheel type excavators	<1981	500																	
Wheel type excavators	1981-1990	500	1000	862	732	611	498	394	298	211	132	62							
Wheel type excavators	1991-Stage I			96	183	262	332	394	447	491	528	493	459	372	293	223	162	118	74.00
Wheel type excavators	Stage I											62	115	160	196	179	162	157	148.00
Wheel type excavators	Stage II															45	81	118	148.00
Track type excavators (0-5 tons)	1981-1990			459	816	1071	1224	1275	1224	1071	816	459							
Track type excavators (0-5 tons)	1991-Stage I			51	204	459	816	1275	1837	2500	3265	4132	5101	5050	4897	4642	4285	3889	3599.20
Track type excavators (0-5 tons)	Stage II													561	1224	1990	2857	3889	5398.80
Track type excavators (>5,1 tons)	<1981	1000																	
Track type excavators (>5,1 tons)	1981-1990	1000	2000	1798	1596	1394	1194	993	794	594	396	198							
Track type excavators (>5,1 tons)	1991-Stage I			200	399	598	796	993	1190	1387	1583	1581	1579	1380	1181	983	785	683	536.40
Track type excavators (>5,1 tons)	Stage I											198	395	591	787	786	785	910	1072.80
Track type excavators (>5,1 tons)	Stage II															197	393	683	1072.80
Excavators/Loaders	<1981	2100																	
Excavators/Loaders	1981-1990	2100	4200	3807	3408	3003	2592	2175	1752	1323	888	447							
Excavators/Loaders	1991-Stage I			423	852	1287	1728	2175	2628	3087	3552	3575	3599	3170	2735	2295	1848	1370	937.60
Excavators/Loaders	Stage I											447	900	1359	1824	2295	2310	2283	2344.00

Continued

EquipmentName (Eng)	Emission Level	1985	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Excavators/Loaders	Stage II																462	913	1406.40
Dump trucks	<1981	250																	
Dump trucks	1981-1990	250	500	489	469	441	404	358	304	241	169	89							
Dump trucks	1991-Stage I			54	117	189	269	358	455	561	676	711	745	682	611	530	442	385	300.80
Dump trucks	Stage I											89	186	292	407	530	552	642	752.00
Dump trucks	Stage II																110	257	451.20
Mini loaders	<1981	1800	800	635	447	235													
Mini loaders	1981-1990	1000	2000	2118	2237	2355	2473	2332	2168	1980	1768	1532	1273	990	684	354			
Mini loaders	1991-Stage I			212	447	706	989	1296	1626	1980	2357	2758	3183	3301	3419	3537	3656	2756	2293.71
Mini loaders	Stage II													330	684	1061	1462	1531	1720.29
Telescopic loaders	1981-1990							149	265	348	398	414	398	348	265	149			
Telescopic loaders	1991-Stage I							83	199	348	530	746	994	1160	1326	1491	1657	1740	1837.14
Telescopic loaders	Stage II													116	265	447	663	966	1377.86

Stock data for machine pools 1985-2006

EquipmentName (Eng)	Emission Level	1985	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Tractors (machine pools)	<1981	1236																	
Tractors (machine pools)	1981-1990	3091	4100	3643	2808	2368	1786	1214	604										
Tractors (machine pools)	1991-Stage I			607	1123	1776	2382	3035	3624	4324	4210	4336	3956	4069	3323	2566	2066	1421	947
Tractors (machine pools)	Stage I														554	513	517	474	474
Tractors (machine pools)	Stage II															513	1033	1421	1895
Harvesters (machine pools)	<1981	969	139																
Harvesters (machine pools)	1981-1990	807	1385	1385	1197	927	794	712	512	421	282	162	78						
Harvesters (machine pools)	1991-Stage I			139	266	348	454	593	615	737	751	729	778	779	651	531	472	300	257
Harvesters (machine pools)	Stage II														65	118	177	171	171
Harvesters (machine pools)	Stage IIIA																		43
Self-propelled vehicles (machine pools)	1981-1990					72	61	38											
Self-propelled vehicles (machine pools)	1991-Stage I					72	122	190	263	278	277	295	289	314	237	203	153	99	50
Self-propelled vehicles (machine pools)	Stage II														47	102	153	199	199
Self-propelled vehicles (machine pools)	Stage IIIA																		50

Stock data for household and gardening 1985-2006

EquipmentName (Eng)	Emission Level	1985	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Lawn movers (private)	<1981	253125																	
Lawn movers (private)	1981-1990	421875	675000	590625	506250	421875	337500	253125	168750	84375									
Lawn movers (private)	1991-Stage I			84375	168750	253125	337500	421875	506250	590625	675000	675000	675000	675000	675000	675000	675000	595000	513750
Lawn movers (private)	Stage I																	85000	171250
Lawn movers (professional)	1981-1990	25000	25000	18750	12500	6250													
Lawn movers (professional)	1991-Stage I			6250	12500	18750	25000	25000	25000	25000	25000	25000	25000	25000	25000	25000	25000	18750	12500
Lawn movers (professional)	Stage I																	6250	12500
Cultivators (private-large)	<1981	73333	36667	29333	22000	14667	7333												
Cultivators (private-large)	1981-1990	36667	73333	73333	73333	73333	73333	73333	66000	58667	51333	44000	36667	29333	22000	14667	7333		
Cultivators (private-large)	1991-Stage I			7333	14667	22000	29333	36667	44000	51333	58667	66000	73333	80667	88000	95333	102667	102667	95333
Cultivators (private-large)	Stage II																	7333	14667
Cultivators (private-small)	1981-1990	10000	10000	8000	6000	4000	2000												
Cultivators (private-small)	1991-Stage I			2000	4000	6000	8000	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000	8000	6000
Cultivators (private-small)	Stage II																	2000	4000
Cultivators (professional)	<1981	3750																	
Cultivators (professional)	1981-1990	6250	10000	8750	7500	6250	5000	3750	2500	1250									
Cultivators (professional)	1991-Stage I			1250	2500	3750	5000	6250	7500	8750	10000	10000	10000	10000	10000	10000	10000	8750	7500
Cultivators (professional)	Stage I																	1250	2500
Chain saws (private)	<1981	125000																	
Chain saws (private)	1981-1990	125000	250000	227250	204000	180250	156000	131250	106000	80250	54000	27250							
Chain saws (private)	1991-Stage I			25250	51000	77250	104000	131250	159000	187250	216000	245250	275000	280750	286500	292250	298000	268200	238400
Chain saws (private)	Stage I																	29800	59600
Chain saws (professional)	1981-1990	10000	10000	7333	4000														
Chain saws (professional)	1991-Stage I			3667	8000	13000	14000	15000	16000	17000	18000	19000	20000	27500	35000	42500	50000	33333	16667
Chain saws (professional)	Stage I																	16667	33333
Chain saws (forestry)	1981-1990	8000	8000	5048	2381														
Chain saws (forestry)	1991-Stage I			2524	4762	6714	6286	5857	5429	5000	4571	4143	3714	3286	2857	2429	2000	1333	667
Chain saws (forestry)	Stage I																	667	1333

Continued

EquipmentName (Eng)	Emission Level	1985	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Riders (private)	<1981	40950	11700	5880															
Riders (private)	1981-1990	29250	58500	58796	59388	54248	49167	44056	38828	33392	27660	21544	14954	7910					
Riders (private)	1991-Stage I			5880	11878	18083	24583	31469	38828	46748	55320	64631	74771	87015	101775	109920	119360	117741	114313
Riders (private)	Stage I																	10704	22863
Riders (professional)	1981-1990	4800	4800	3878	2966	2035	1056												
Riders (professional)	1991-Stage I			970	1978	3053	4224	5520	5760	6000	6240	6480	6720	7802	9726	12492	16100	15728	13398
Riders (professional)	Stage I																	3932	8932
Shrub clearers (private)	<1981	24000																	
Shrub clearers (private)	1981-1990	24000	48000	47520	46080	43680	40320	36000	30720	24480	17280	9120							
Shrub clearers (private)	1991-Stage I			5280	11520	18720	26880	36000	46080	57120	69120	82080	96000	107000	118000	129000	140000	126000	112000
Shrub clearers (private)	Stage I																	14000	28000
Shrub clearers (professional)	1981-1990	2000	2000	1650	1200	650													
Shrub clearers (professional)	1991-Stage I			550	1200	1950	2800	3000	3200	3400	3600	3800	4000	5500	7000	8500	10000	7500	5000
Shrub clearers (professional)	Stage I																	2500	5000
Hedge cutters (private)	<1981	6850																	
Hedge cutters (private)	1981-1990	6850	13700	15237	16128	16373	15972	14925	13232	10893	7908	4277							
Hedge cutters (private)	1991-Stage I			1693	4032	7017	10648	14925	19848	25417	31632	38493	46000	52900	59800	66700	73600	66240	58880
Hedge cutters (private)	Stage I																	7360	14720
Hedge cutters (professional)	1981-1990	1300	1300	1178	920	528													
Hedge cutters (professional)	1991-Stage I			393	920	1583	2380	2650	2920	3190	3460	3730	4000	4600	5200	5800	6400	4800	3200
Hedge cutters (professional)	Stage I																	1600	3200
Trimmers (private)	<1981	25500																	
Trimmers (private)	1981-1990	25500	51000	48086	44686	40800	36429	31571	26229	20400	14086	7286							
Trimmers (private)	1991-Stage I			5343	11171	17486	24286	31571	39343	47600	56343	65571	75286	77714	80143	82571	85000	76500	68000
Trimmers (private)	Stage I																	8500	17000
Trimmers (professional)	1981-1990	9000	9000	7071	4929	2571													
Trimmers (professional)	1991-Stage I			2357	4929	7714	10714	11143	11571	12000	12429	12857	13286	13714	14143	14571	15000	11250	7500
Trimmers (professional)	Stage I																	3750	7500

Stock data for small boats and pleasure crafts 1985-2006

Engine	Boat type	1985	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Diesel	Motor boats (27-34 ft)	1550	2228	2397	2567	2736	2906	3075	3244	3414	3583	3753	3922	4092	4261	4431	4600	4600	4600
Diesel	Motor boats (> 34 ft)	450	661	714	767	819	872	925	978	1031	1083	1136	1189	1242	1294	1347	1400	1400	1400
Diesel	Motor boats <(27 ft)	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000
Diesel	Motor sailors	3500	3833	3917	4000	4083	4167	4250	4333	4417	4500	4583	4667	4750	4833	4917	5000	5000	5000
Diesel	Sailing boats (> 26 ft)	7500	9167	9583	10000	10417	10833	11250	11667	12083	12500	12917	13333	13750	14167	14583	15000	15000	15000
2-stroke	Other boats (< 20 ft)	4000	4222	4278	4333	4389	4444	4500	4556	4565	4527	4439	4300	4108	3862	3560	3200	2750	2250
2-stroke	Yawls and cabin boats	4000	4222	4278	4333	4389	4444	4500	4556	4565	4527	4439	4300	4108	3862	3560	3200	2750	2250
2-stroke	Sailing boats (< 26 ft)	19000	18111	17889	17667	17444	17222	17000	16778	16390	15843	15144	14300	13317	12201	10960	9600	8250	6750
2-stroke	Speed boats	3000	3000	3000	3000	3000	3000	3000	3000	2970	2910	2820	2700	2550	2370	2160	1920	1650	1350
2-stroke	Water scooters	1000	1000	1000	1000	1000	1000	1000	1000	990	970	940	900	850	790	720	640	550	450
4-stroke	Other boats (< 20 ft)									46	140	283	478	725	1027	1384	1800	2250	2750
4-stroke	Yawls and cabin boats									46	140	283	478	725	1027	1384	1800	2250	2750
4-stroke	Sailing boats (< 26 ft)									166	490	967	1589	2350	3243	4262	5400	6750	8250
4-stroke	Speed boats (in board eng.)	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000
4-stroke	Speed boats (out board eng.)									30	90	180	300	450	630	840	1080	1350	1650
4-stroke	Water scooters									10	30	60	100	150	210	280	360	450	550

Engine sizes (kW) for recreational craft 1985-2006

Engine	Boat type	1985	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
2-stroke	Other boats (< 20 ft)	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
2-stroke	Yawls and cabin boats	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
2-stroke	Sailing boats (< 26 ft)	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
2-stroke	Speed boats	25	31	32	33	35	36	38	39	40	42	43	44	46	47	49	50	50	50
2-stroke	Water scooters	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45
4-stroke	Other boats (< 20 ft)									8	8	8	8	8	8	8	8	8	8
4-stroke	Yawls and cabin boats									20	20	20	20	20	20	20	20	20	20
4-stroke	Sailing boats (< 26 ft)									10	10	10	10	10	10	10	10	10	10
4-stroke	Speed boats (in board eng.)	45	55	58	60	63	65	68	70	73	75	78	80	83	85	88	90	90	90
4-stroke	Speed boats (out board eng.)									40	42	43	44	46	47	49	50	50	50
4-stroke	Water scooters									45	45	45	45	45	45	45	45	45	45
Diesel	Motor boats (27-34 ft)	70	88	92	97	101	106	110	114	119	123	128	132	137	141	146	150	150	150
Diesel	Motor boats (> 34 ft)	120	149	156	163	171	178	185	192	199	207	214	221	228	236	243	250	250	250
Diesel	Motor boats <(27 ft)	20	24	26	27	28	29	30	31	32	33	34	36	37	38	39	40	40	40
Diesel	Motor sailors	20	22	23	23	24	24	25	26	26	27	27	28	28	29	29	30	30	30
Diesel	Sailing boats (> 26 ft)	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30

Annex 11: Traffic data and different technical and operational data for Danish domestic ferries

Annual traffic data for ferries (no. of round trips) for Danish domestic ferries

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Korsør-Nyborg, DSB	9305	9167	9237	8959	8813	8789	8746	3258	0	0	0	0	0	0	0	0	0
Korsør-Nyborg, Vognmandsruten	7512	7363	7468	7496	7502	7828	7917	8302	3576	0	0	0	0	0	0	0	0
Halsskov-Knudshoved	10601	10582	11701	11767	12420	12970	13539	13612	5732	0	0	0	0	0	0	0	0
Kalundborg-Juelsminde	0	1326	1733	1542	1541	1508	856	0	0	0	0	0	0	0	0	0	0
Kalundborg-Århus	1907	2400	3162	2921	2913	3540	4962	4888	4483	1454	1870	1804	2037	1800	1750	1725	1724
Sjællands Odde-Ebeltoft	3908	3978	4008	3988	4325	4569	5712	8153	7851	7720	4775	4226	3597	3191	2906	2889	2690
Sjællands Odde-Århus	0	0	0	0	0	0	0	0	0	2339	1799	1817	1825	2359	2863	2795	2853
Hundested-Grenaa	1026	1025	1032	1030	718	602	67	0	0	0	0	0	0	0	0	0	0
København-Rønne	558	545	484	412	427	426	437	465	458	506	491	430	413	397	293	0	0
Køge-Rønne	0	0	0	0	0	0	0	0	0	0	0	0	0	0	154	488	436
Kalundborg-Samsø	873	873	860	881	826	811	813	823	824	850	828	817	833	831	841	867	862
Tårs-Spodsbjerg	7656	8835	9488	9535	9402	9562	9000	9129	7052	6442	6477	6498	6468	6516	6497	6494	6460
Local ferries	176891	179850	181834	178419	202445	209129	182750	197489	200027	202054	201833	200130	208396	208501	206297	205564	203413

Ferry data: Service, name, engine year, main engine MCR (kW), engine type, specific fuel consumption (sfc), aux. engine (kW)

Ferry service	Ferry name	Engine year	Main engine MCR (kW)	Engine type	Sfc (g/kWh)	Aux engine (kW)
Halsskov-Knudshoved	ARVEPRINS KNUD	1963	8238	Slow speed (2-stroke)	220	1666
Halsskov-Knudshoved	DRONNING MARGRETHE II	1973	8826	Medium speed (4-stroke)	230	1692
Halsskov-Knudshoved	HEIMDAL	1983	8309	Medium speed (4-stroke)	220	740
Halsskov-Knudshoved	KNUDSHOVED	1961	6400	Slow speed (2-stroke)	220	1840
Halsskov-Knudshoved	KONG FREDERIK IX	1954	6767	Slow speed (2-stroke)	225	1426
Halsskov-Knudshoved	KRAKA	1982	8309	Medium speed (4-stroke)	220	740
Halsskov-Knudshoved	LODBROG	1982	8309	Medium speed (4-stroke)	220	740
Halsskov-Knudshoved	PRINSESSE ANNE-MARIE	1960	8238	Slow speed (2-stroke)	220	1360
Halsskov-Knudshoved	PRINSESSE ELISABETH	1964	8238	Slow speed (2-stroke)	220	1360
Halsskov-Knudshoved	ROMSØ	1973	8826	Medium speed (4-stroke)	230	1728
Halsskov-Knudshoved	SPROGØ	1962	6400	Slow speed (2-stroke)	220	1840
Hundested-Grenaa	DJURSLAND	1974	9856	Medium speed (4-stroke)	230	900
Hundested-Grenaa	KATTEGAT	1995	23200	High speed (4-stroke)	205	1223
Hundested-Grenaa	KONG FREDERIK IX	1954	6767	Slow speed (2-stroke)	235	1375
Hundested-Grenaa	PRINSESSE ANNE-MARIE	1960	8238	Slow speed (2-stroke)	220	1360
Kalundborg-Juelsminde	Mercandia I	1989	2950	High speed (4-stroke)	220	0
Kalundborg-Juelsminde	Mercandia II	1989	2950	High speed (4-stroke)	220	0
Kalundborg-Juelsminde	Mercandia III	1989	2950	High speed (4-stroke)	220	0
Kalundborg-Juelsminde	Mercandia IV	1989	2950	High speed (4-stroke)	220	0
Kalundborg-Samsø	HOLGER DANSKE	1976	2354	High speed (4-stroke)	225	600
Kalundborg-Samsø	KALUNDBORG	1952	3825	Slow speed (2-stroke)	235	570
Kalundborg-Samsø	KYHOLM	1998	2940	High speed (4-stroke)	195	864
Kalundborg-Samsø	VESBORG	1995	1770	High speed (4-stroke)	200	494
Kalundborg-Århus	ASK	1984	8826	Medium speed (4-stroke)	215	2220
Kalundborg-Århus	ASK	1984	8826	Medium speed (4-stroke)	215	3000
Kalundborg-Århus	ASK	1984	9840	Medium speed (4-stroke)	215	3000
Kalundborg-Århus	CAT-LINK I	1995	17280	High speed (4-stroke)	205	1160
Kalundborg-Århus	CAT-LINK II	1995	17280	High speed (4-stroke)	205	1160
Kalundborg-Århus	CAT-LINK III	1995	22000	High speed (4-stroke)	205	800
Kalundborg-Århus	CAT-LINK III	1995	22000	High speed (4-stroke)	205	801
Kalundborg-Århus	CAT-LINK III	1995	22000	High speed (4-stroke)	205	802
Kalundborg-Århus	CAT-LINK IV	1998	28320	High speed (4-stroke)	205	920
Kalundborg-Århus	CAT-LINK V	1998	28320	High speed (4-stroke)	205	920
Kalundborg-Århus	KATTEGAT SYD	1979	7650	Medium speed (4-stroke)	225	1366
Kalundborg-Århus	KNUDSHOVED	1961	6400	Slow speed (2-stroke)	220	1840
Kalundborg-Århus	KONG FREDERIK IX	1954	6767	Slow speed (2-stroke)	225	1426

Continued

Ferry service	Ferry name	Engine year	Main engine MCR (kW)	Engine type	Sfc (g/kWh)	Aux engine (kW)
Kalundborg-Århus	KRAKA	1982	8309	Medium speed (4-stroke)	220	740
Kalundborg-Århus	MAREN MOLS	1996	11700	Slow speed (2-stroke)	180	2530
Kalundborg-Århus	METTE MOLS	1996	11700	Slow speed (2-stroke)	180	2530
Kalundborg-Århus	NIELS KLIM	1986	12474	Slow speed (2-stroke)	215	4440
Kalundborg-Århus	PEDER PAARS	1985	12474	Slow speed (2-stroke)	215	4440
Kalundborg-Århus	PRINSESSE ELISABETH	1964	8238	Slow speed (2-stroke)	220	1360
Kalundborg-Århus	ROSTOCK LINK	1975	8385	Medium speed (4-stroke)	230	2500
Kalundborg-Århus	SØLØVEN/SØBJØRNEN	1992	4000	High speed (4-stroke)	210	272
Kalundborg-Århus	URD	1981	8826	Medium speed (4-stroke)	215	2220
Kalundborg-Århus	URD	1981	8826	Medium speed (4-stroke)	215	3000
Kalundborg-Århus	URD	1981	9840	Medium speed (4-stroke)	215	3000
Korsør-Nyborg, DSB	ASA-THOR	1965	6472	Slow speed (2-stroke)	220	1305
Korsør-Nyborg, DSB	DRONNING INGRID	1980	18720	Medium speed (4-stroke)	220	2932
Korsør-Nyborg, DSB	DRONNING MARGRETHE II	1973	8826	Medium speed (4-stroke)	230	1692
Korsør-Nyborg, DSB	KONG FREDERIK IX	1954	6767	Slow speed (2-stroke)	225	1426
Korsør-Nyborg, DSB	KRONPRINS FREDERIK	1981	18720	Medium speed (4-stroke)	220	2932
Korsør-Nyborg, DSB	PRINS JOACHIM	1980	18720	Medium speed (4-stroke)	220	2932
Korsør-Nyborg, DSB	SPROGØ/KNUDSHOVED	1962	6400	Slow speed (2-stroke)	220	1840
Korsør-Nyborg, Vognmandsruten	Superflex Alfa	1989	2950	High speed (4-stroke)	220	0
Korsør-Nyborg, Vognmandsruten	Superflex Bravo	1989	2950	High speed (4-stroke)	220	0
Korsør-Nyborg, Vognmandsruten	Superflex Charlie	1988	2950	High speed (4-stroke)	220	0
København-Rønne	JENS KOFOED	1979	12950	Medium speed (4-stroke)	106	2889
København-Rønne	JENS KOFOED	1979	12950	Medium speed (4-stroke)	109	2889
København-Rønne	POVL ANKER	1979	12950	Medium speed (4-stroke)	106	2889
København-Rønne	POVL ANKER	1979	12950	Medium speed (4-stroke)	109	2889
Køge-Rønne	DUEODDE	2005	8640	Medium speed (4-stroke)	183	1545
Køge-Rønne	HAMMERODDE	2005	8640	Medium speed (4-stroke)	183	1545
Køge-Rønne	JENS KOFOED	1979	12950	Medium speed (4-stroke)	108	2889
Køge-Rønne	POVL ANKER	1979	12950	Medium speed (4-stroke)	108	2889
Sjællands Odde-Ebeltoft	MAI MOLS	1996	24800	Gas turbine	240	752
Sjællands Odde-Ebeltoft	MAREN MOLS	1975	12062	Medium speed (4-stroke)	230	1986
Sjællands Odde-Ebeltoft	MAREN MOLS 2	1996	11700	Slow speed (2-stroke)	180	2530
Sjællands Odde-Ebeltoft	METTE MOLS	1975	12062	Medium speed (4-stroke)	230	1986
Sjællands Odde-Ebeltoft	METTE MOLS 2	1996	11700	Slow speed (2-stroke)	180	2530
Sjællands Odde-Ebeltoft	MIE MOLS	1971	5884	Medium speed (4-stroke)	230	

Continued

Ferry service	Ferry name	Engine year	Main engine MCR (kW)	Engine type	Sfc (g/kWh)	Aux engine (kW)
Sjællands Odde-Ebeltoft	MIE MOLS 2	1996	24800	Gas turbine	240	752
Sjællands Odde-Århus	MADS MOLS	1998	28320	High speed (4-stroke)	205	920
Sjællands Odde-Århus	MAI MOLS	1996	24800	Gas turbine	240	752
Sjællands Odde-Århus	MAX MOLS	1998	28320	High speed (4-stroke)	205	920
Sjællands Odde-Århus	MIE MOLS	1996	24800	Gas turbine	240	752
Tårs-Spodsbjerg	FRIGG SYDFYEN	1984	1300	Medium speed (4-stroke)	220	780
Tårs-Spodsbjerg	ODIN SYDFYEN	1982	1180	Medium speed (4-stroke)	220	780
Tårs-Spodsbjerg	SPODSBJERG	1972	1530	Medium speed (4-stroke)	225	300
Tårs-Spodsbjerg	THOR SYDFYEN	1978	1176	Medium speed (4-stroke)	225	300

Ferry data: Sailing time (single trip)

Ferry service	Ferry name	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Halsskov-Knudshoved	ARVEPRINS KNUD	60	60	60	60	60	60	60	60	60							
Halsskov-Knudshoved	DRONNING MARGRETHE II	60	60	60	60	60	60	60	60	60							
Halsskov-Knudshoved	HEIMDAL	60	60	60	60	60	60	60	60	60							
Halsskov-Knudshoved	KNUDSHOVED	60	60	60	60	60	60	60	60	60							
Halsskov-Knudshoved	KONG FREDERIK IX	60	60	60	60	60	60	60	60	60							
Halsskov-Knudshoved	KRAKA	60	60	60	60	60	60	60	60	60							
Halsskov-Knudshoved	LODBROG	60	60	60	60	60	60	60	60	60							
Halsskov-Knudshoved	PRINSESSE ANNE-MARIE	60	60	60	60	60	60	60	60	60							
Halsskov-Knudshoved	PRINSESSE ELISABETH	60	60	60	60	60	60	60	60	60							
Halsskov-Knudshoved	ROMSØ	60	60	60	60	60	60	60	60	60							
Halsskov-Knudshoved	SPROGØ	60	60	60	60	60	60	60	60	60							
Hundested-Grenaa	DJURSLAND	160	160	160	160	160											
Hundested-Grenaa	KATTEGAT						90	90									
Hundested-Grenaa	KONG FREDERIK IX					170											
Hundested-Grenaa	PRINSESSE ANNE-MARIE					165											
Kalundborg-Juelsminde	Mercandia I	160	160	160	160	160	160	160									
Kalundborg-Juelsminde	Mercandia II	160	160	160	160	160	160	160									
Kalundborg-Juelsminde	Mercandia III	160	160	160	160	160	160	160									
Kalundborg-Juelsminde	Mercandia IV	160	160	160	160	160	160	160									
Kalundborg-Samsø	HOLGER DANSKE			120	120	120	120	120	120	120							
Kalundborg-Samsø	KALUNDBORG	120	120	120													
Kalundborg-Samsø	KYHOLM									110	110	110	110	110	110	110	110
Kalundborg-Samsø	VESBORG									120							
Kalundborg-Århus	ASK		195	195	195	195	195	195	195	195	195						
Kalundborg-Århus	CAT-LINK I						80	85	90	95							
Kalundborg-Århus	CAT-LINK II						80	85	90	95							
Kalundborg-Århus	CAT-LINK III							85	90	95							
Kalundborg-Århus	CAT-LINK IV									80	80						
Kalundborg-Århus	CAT-LINK V									80	80						
Kalundborg-Århus	KATTEGAT SYD										195						
Kalundborg-Århus	KNUDSHOVED		190														
Kalundborg-Århus	KONG FREDERIK IX		190	190	190	190	190	190									
Kalundborg-Århus	KRAKA									195							
Kalundborg-Århus	MAREN MOLS											160	160	155	155	155	155
Kalundborg-Århus	METTE MOLS											160	160	155	155	155	155
Kalundborg-Århus	NIELS KLIM	185	185														

Continued

Ferry service	Ferry name	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Kalundborg-Århus	PEDER PAARS	185	185														
Kalundborg-Århus	PRINSESSE ELISABETH		185														
Kalundborg-Århus	ROSTOCK LINK										195						
Kalundborg-Århus	SØLØVEN/SØBJØRNEN		90	90	90	90	90	90									
Kalundborg-Århus	URD		195	195	195	195	195	195	195	195	195						
Korsør-Nyborg, DSB	ASA-THOR	65	65	65	65	65	65	65	65								
Korsør-Nyborg, DSB	DRONNING INGRID	65	65	65	65	65	65	65	65								
Korsør-Nyborg, DSB	DRONNING MARGRETHE II	65	65	65	65	65	65	65	65								
Korsør-Nyborg, DSB	KONG FREDERIK IX	75	75	75	75	75	75	75	75								
Korsør-Nyborg, DSB	KRONPRINS FREDERIK	65	65	65	65	65	65	65	65								
Korsør-Nyborg, DSB	PRINS JOACHIM	65	65	65	65	65	65	65	65								
Korsør-Nyborg, DSB	SPROGØ/KNUDSHOVED	75	75	75	75	75	75	75	75								
Korsør-Nyborg, Vognmandsruten	Superflex Alfa	70	70	70	70	70	70	70	70	70							
Korsør-Nyborg, Vognmandsruten	Superflex Bravo	70	70	70	70	70	70	70	70	70							
Korsør-Nyborg, Vognmandsruten	Superflex Charlie	70	70	70	70	70	70	70	70	70							
København-Rønne	JENS KOFOED	420	420	420	420	420	420	420	420	420	420	420	420	420	420	420	420
København-Rønne	POVL ANKER	420	420	420	420	420	420	420	420	420	420	420	420	420	420	420	420
Køge-Rønne	DUEODDE																375
Køge-Rønne	HAMMERODDE																375
Køge-Rønne	JENS KOFOED															375	375
Køge-Rønne	POVL ANKER															375	375
Sjællands Odde-Ebeltoft	MAI MOLS							45	45	45	45	45	45	45	45	45	45
Sjællands Odde-Ebeltoft	MAREN MOLS	100	100	100	100	100	100	100									
Sjællands Odde-Ebeltoft	MAREN MOLS 2							100	100	100	95						
Sjællands Odde-Ebeltoft	METTE MOLS	100	100	100	100	100	100	100									
Sjællands Odde-Ebeltoft	METTE MOLS 2							100	100	100	95						
Sjællands Odde-Ebeltoft	MIE MOLS	105	105	105	105	105	105	105									
Sjællands Odde-Ebeltoft	MIE MOLS 2							45	45	45	45	45	45	45	45	45	45
Sjællands Odde-Århus	MADS MOLS										60	65	65	65	65	65	65
Sjællands Odde-Århus	MAI MOLS													65	65	65	65
Sjællands Odde-Århus	MAX MOLS										60	65	65	65	65	65	65
Sjællands Odde-Århus	MIE MOLS													65	65	65	65
Tårs-Spodsbjerg	FRIGG SYDFYEN	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45
Tårs-Spodsbjerg	ODIN SYDFYEN	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45
Tårs-Spodsbjerg	SPODSBJERG	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45
Tårs-Spodsbjerg	THOR SYDFYEN	45	45	45	45	45	17	45	45	45	45	45	45	45	45	45	45

Ferry data: Load factor (% MCR)

Ferry service	Ferry name	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Halsskov-Knudshoved	ARVEPRINS KNUD	85	85	85	85	85	85	85	85	85							
Halsskov-Knudshoved	DRONNING MARGRETHE II	85	85	85	85	85	85	85	85	85							
Halsskov-Knudshoved	HEIMDAL	85	85	85	85	85	85	85	85	85							
Halsskov-Knudshoved	KNUDSHOVED	85	85	85	85	85	85	85	85	85							
Halsskov-Knudshoved	KONG FREDERIK IX	85	85	85	85	85	85	85	85	85							
Halsskov-Knudshoved	KRAKA	85	85	85	85	85	85	85	85	85							
Halsskov-Knudshoved	LODBROG	85	85	85	85	85	85	85	85	85							
Halsskov-Knudshoved	PRINSESSE ANNE-MARIE	85	85	85	85	85	85	85	85	85							
Halsskov-Knudshoved	PRINSESSE ELISABETH	85	85	85	85	85	85	85	85	85							
Halsskov-Knudshoved	ROMSØ	85	85	85	85	85	85	85	85	85							
Halsskov-Knudshoved	SPROGØ	85	85	85	85	85	85	85	85	85							
Hundested-Grenaa	DJURSLAND	80	80	80	80	80											
Hundested-Grenaa	KATTEGAT						85	85									
Hundested-Grenaa	KONG FREDERIK IX					65											
Hundested-Grenaa	PRINSESSE ANNE-MARIE					85											
Kalundborg-Juelsminde	Mercandia I	75	75	75	75	75	75	75									
Kalundborg-Juelsminde	Mercandia II	70	70	70	70	70	70	70									
Kalundborg-Juelsminde	Mercandia III	70	70	70	70	70	70	70									
Kalundborg-Juelsminde	Mercandia IV	70	70	70	70	70	70	70									
Kalundborg-Samsø	HOLGER DANSKE			85	85	85	85	85	85	85							
Kalundborg-Samsø	KALUNDBORG	80	80	80													
Kalundborg-Samsø	KYHOLM									85	85	85	85	85	85	85	85
Kalundborg-Samsø	VESBORG									95							
Kalundborg-Århus	ASK		85	85	85	80	80	80	80	80	80						
Kalundborg-Århus	CAT-LINK I						95	90	90	85							
Kalundborg-Århus	CAT-LINK II						95	90	90	85							
Kalundborg-Århus	CAT-LINK III							95	95	90							
Kalundborg-Århus	CAT-LINK IV									95	95						
Kalundborg-Århus	CAT-LINK V									95	95						
Kalundborg-Århus	KATTEGAT SYD										85						
Kalundborg-Århus	KNUDSHOVED		85														
Kalundborg-Århus	KONG FREDERIK IX		85	85	85	85	85	85									
Kalundborg-Århus	KRAKA									85							
Kalundborg-Århus	MAREN MOLS											85	85	85	85	85	85
Kalundborg-Århus	METTE MOLS											85	85	85	85	85	85
Kalundborg-Århus	NIELS KLIM	85	85														

Continued

Ferry service	Ferry name	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Kalundborg-Århus	PEDER PAARS	85	85														
Kalundborg-Århus	PRINSESSE ELISABETH		80														
Kalundborg-Århus	ROSTOCK LINK										80						
Kalundborg-Århus	SØLØVEN/SØBJØRNEN		90	90	90	90	90	90									
Kalundborg-Århus	URD		85	85	85	85	85	85	85	80	80						
Korsør-Nyborg, DSB	ASA-THOR	85	85	85	85	85	85	85	85								
Korsør-Nyborg, DSB	DRONNING INGRID	60	60	60	60	60	60	60	60								
Korsør-Nyborg, DSB	DRONNING MARGRETHE II	85	85	85	85	85	85	85	85								
Korsør-Nyborg, DSB	KONG FREDERIK IX	70	70	70	70	70	70	70	70								
Korsør-Nyborg, DSB	KRONPRINS FREDERIK	60	60	60	60	60	60	60	60								
Korsør-Nyborg, DSB	PRINS JOACHIM	60	60	60	60	60	60	60	60								
Korsør-Nyborg, DSB	SPROGØ/KNUDSHOVED	70	70	70	70	70	70	70	70								
Korsør-Nyborg, Vognmandsruten	Superflex Alfa	70	70	70	70	70	70	70	70	70							
Korsør-Nyborg, Vognmandsruten	Superflex Bravo	70	70	70	70	70	70	70	70	70							
Korsør-Nyborg, Vognmandsruten	Superflex Charlie	70	70	70	70	70	70	70	70	70							
København-Rønne	JENS KOFOED	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80
København-Rønne	POVL ANKER	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80
Køge-Rønne	DUEODDE																80
Køge-Rønne	HAMMERODDE																80
Køge-Rønne	JENS KOFOED															80	80
Køge-Rønne	POVL ANKER															80	80
Sjællands Odde-Ebeltoft	MAI MOLS							80	80	80	80	80	80	80	80	80	80
Sjællands Odde-Ebeltoft	MAREN MOLS	75	75	75	75	75	75	75									
Sjællands Odde-Ebeltoft	MAREN MOLS 2							80	80	80	85						
Sjællands Odde-Ebeltoft	METTE MOLS	75	75	75	75	75	75	75									
Sjællands Odde-Ebeltoft	METTE MOLS 2							80	80	80	85						
Sjællands Odde-Ebeltoft	MIE MOLS	85	85	85	85	85	85	85									
Sjællands Odde-Ebeltoft	MIE MOLS 2							80	80	80	80	80	80	80	80	80	80
Sjællands Odde-Århus	MADS MOLS										90	85	85	85	85	85	85
Sjællands Odde-Århus	MAI MOLS													75	75	75	75
Sjællands Odde-Århus	MAX MOLS										90	85	85	85	85	85	85
Sjællands Odde-Århus	MIE MOLS													75	75	75	75
Tårs-Spodsbjerg	FRIGG SYDFYEN	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80
Tårs-Spodsbjerg	ODIN SYDFYEN	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80
Tårs-Spodsbjerg	SPODSBJERG	75	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80
Tårs-Spodsbjerg	THOR SYDFYEN	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80

Ferry data: Round trip shares (%)

Ferry service	Ferry name	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Halsskov-Knudshoved	ARVEPRINS KNUD	21.1	20.2	19.7	19.8	20.6	18.6	18.8	17.6	20.0							
Halsskov-Knudshoved	DRONNING MARGRETHE II	2.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0							
Halsskov-Knudshoved	HEIMDAL	22.5	23.8	22.3	24.3	23.4	21.3	21.1	19.3	21.5							
Halsskov-Knudshoved	KNUDSHOVED	0.0	0.0	0.0	0.0	0.0	0.0	2.4	4.6	0.0							
Halsskov-Knudshoved	KONG FREDERIK IX	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0							
Halsskov-Knudshoved	KRAKA	24.3	25.4	22.7	23.4	21.1	20.4	20.3	19.9	21.0							
Halsskov-Knudshoved	LODBROG	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.1	14.0							
Halsskov-Knudshoved	PRINSESSE ANNE-MARIE	0.0	0.0	0.0	0.0	0.0	5.5	2.4	0.0	0.0							
Halsskov-Knudshoved	PRINSESSE ELISABETH	0.0	0.0	0.0	2.5	0.1	0.0	0.0	0.0	0.0							
Halsskov-Knudshoved	ROMSØ	20.6	21.6	20.5	16.2	20.1	19.0	21.1	20.5	22.9							
Halsskov-Knudshoved	SPROGØ	9.1	9.0	14.8	13.8	14.7	14.9	13.9	11.0	0.6							
Hundested-Grenaa	DJURSLAND	100.0	100.0	100.0	100.0	50.0											
Hundested-Grenaa	KATTEGAT						100.0	100.0									
Hundested-Grenaa	KONG FREDERIK IX					5.0											
Hundested-Grenaa	PRINSESSE ANNE-MARIE					45.0											
Kalundborg-Juelsminde	Mercandia I	25.0	25.0	25.0	25.0	25.0	25.0	25.0									
Kalundborg-Juelsminde	Mercandia II	25.0	25.0	25.0	25.0	25.0	25.0	25.0									
Kalundborg-Juelsminde	Mercandia III	25.0	25.0	25.0	25.0	25.0	25.0	25.0									
Kalundborg-Juelsminde	Mercandia IV	25.0	25.0	25.0	25.0	25.0	25.0	25.0									
Kalundborg-Samsø	HOLGER DANSKE			95.0	100.0	100.0	100.0	100.0	100.0	92.0							
Kalundborg-Samsø	KALUNDBORG	100.0	100.0	5.0													
Kalundborg-Samsø	KYHOLM									6.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Kalundborg-Samsø	VESBORG									2.0							
Kalundborg-Århus	ASK		15.8	31.8	26.3	32.8	26.8	18.5	10.7	11.8	2.4						
Kalundborg-Århus	CAT-LINK I						17.2	25.4	27.5	11.4							
Kalundborg-Århus	CAT-LINK II						0.9	22.6	27.5	7.6							
Kalundborg-Århus	CAT-LINK III							8.5	23.6	19.1							
Kalundborg-Århus	CAT-LINK IV									22.9	25.8						
Kalundborg-Århus	CAT-LINK V									15.3	25.8						
Kalundborg-Århus	KATTEGAT SYD										2.4						
Kalundborg-Århus	KNUDSHOVED		4.0														
Kalundborg-Århus	KONG FREDERIK IX		4.0	0.0	6.6	0.0	0.0	1.5									
Kalundborg-Århus	KRAKA									2.4							
Kalundborg-Århus	MAREN MOLS											50.0	50.0	50.0	50.0	50.0	50.0
Kalundborg-Århus	METTE MOLS											50.0	50.0	50.0	50.0	50.0	50.0
Kalundborg-Århus	NIELS KLIM	50.0	19.8														

Continued

Ferry service	Ferry name	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Kalundborg-Århus	PEDER PAARS	50.0	15.8														
Kalundborg-Århus	PRINSESSE ELISABETH		4.0														
Kalundborg-Århus	ROSTOCK LINK										21.8						
Kalundborg-Århus	SØLØVEN/SØBJØRNEN		20.8	36.4	34.2	34.3	28.2	5.0									
Kalundborg-Århus	URD		15.8	31.8	32.9	32.8	26.8	18.5	10.7	9.5	21.8						
Korsør-Nyborg, DSB	ASA-THOR	12.6	13.4	13.1	11.1	9.3	8.9	9.2	6.3								
Korsør-Nyborg, DSB	DRONNING INGRID	26.2	27.6	25.9	28.3	28.0	28.8	28.2	31.0								
Korsør-Nyborg, DSB	DRONNING MARGRETHE II	3.0	0.0	3.4	0.9	2.8	0.5	2.3	0.0								
Korsør-Nyborg, DSB	KONG FREDERIK IX	0.1	0.0	0.0	0.2	3.4	4.4	0.7	0.0								
Korsør-Nyborg, DSB	KRONPRINS FREDERIK	26.8	28.1	26.9	28.8	28.2	29.3	28.6	31.9								
Korsør-Nyborg, DSB	PRINS JOACHIM	25.2	26.6	25.4	26.9	26.9	27.4	27.1	27.8								
Korsør-Nyborg, DSB	SPROGØ/KNUDSHOVED	6.1	4.3	5.3	3.8	1.4	0.7	3.9	3.0								
Korsør-Nyborg, Vognmandsruten	Superflex Alfa	33.0	33.0	33.0	33.0	33.0	33.0	33.0	33.0	33.0							
Korsør-Nyborg, Vognmandsruten	Superflex Bravo	33.0	33.0	33.0	33.0	33.0	33.0	33.0	33.0	33.0							
Korsør-Nyborg, Vognmandsruten	Superflex Charlie	34.0	34.0	34.0	34.0	34.0	34.0	34.0	34.0	34.0							
København-Rønne	JENS KOFOED	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0
København-Rønne	POVL ANKER	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0
Køge-Rønne	DUEODDE																25.0
Køge-Rønne	HAMMERODDE																35.0
Køge-Rønne	JENS KOFOED															50.0	20.0
Køge-Rønne	POVL ANKER															50.0	20.0
Sjællands Odde-Ebeltoft	MAI MOLS							21.0	35.0	35.0	35.0	50.0	50.0	50.0	50.0	50.0	50.0
Sjællands Odde-Ebeltoft	MAREN MOLS	40.0	40.0	40.0	40.0	40.0	40.0	15.0									
Sjællands Odde-Ebeltoft	MAREN MOLS 2							18.0	15.0	15.0	15.0						
Sjællands Odde-Ebeltoft	METTE MOLS	40.0	40.0	40.0	40.0	40.0	40.0	17.0									
Sjællands Odde-Ebeltoft	METTE MOLS 2							15.0	15.0	15.0	15.0						
Sjællands Odde-Ebeltoft	MIE MOLS	20.0	20.0	20.0	20.0	20.0	20.0	5.0									
Sjællands Odde-Ebeltoft	MIE MOLS 2							9.0	35.0	35.0	35.0	50.0	50.0	50.0	50.0	50.0	50.0
Sjællands Odde-Århus	MADS MOLS										50.0	95.0	90.0	95.0	60.0	60.0	35.0
Sjællands Odde-Århus	MAI MOLS													1.0	10.0	15.0	15.0
Sjællands Odde-Århus	MAX MOLS										50.0	5.0	10.0	3.0	20.0	10.0	35.0
Sjællands Odde-Århus	MIE MOLS													1.0	10.0	15.0	15.0
Tårs-Spodsbjerg	FRIGG SYDFYEN	41.0	40.0	39.0	38.0	36.0	36.0	36.0	32.0	33.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0
Tårs-Spodsbjerg	ODIN SYDFYEN	41.0	40.0	39.0	38.0	36.0	36.0	36.0	32.0	33.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0
Tårs-Spodsbjerg	SPODSBJERG	4.0	2.0	8.0	8.0	9.0	8.0	8.0	19.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
Tårs-Spodsbjerg	THOR SYDFYEN	14.0	18.0	14.0	16.0	19.0	20.0	20.0	17.0	14.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Annex 12: Fuel use and emission factors, engine specific (NO_x, CO, VOC (NMVOC and CH_4)), and fuel type specific (S-%, SO_2, PM) for ship engines

Specific fuel consumption and NO_x emission factors (g/kWh) per engine year for diesel ship engines

Year	High speed 4-stroke sfc (g/kWh)	Medium speed 4-stroke sfc (g/kWh)	Slow speed 2-stroke sfc (g/kWh)	High speed 4-stroke NO_X (g/kWh)	Medium speed 4-stroke NO_X (g/kWh)	Slow speed 2-stroke NO_X (g/kWh)
1949	265.5	255.5	235.5	7.3	8.0	14.5
1950	265.0	255.0	235.0	7.3	8.0	14.5
1951	264.5	254.5	234.5	7.3	8.0	14.5
1952	264.0	254.0	234.0	7.3	8.0	14.5
1953	263.5	253.5	233.5	7.3	8.0	14.5
1954	263.0	253.0	233.0	7.3	8.0	14.5
1955	262.4	252.4	232.4	7.3	8.0	14.5
1956	261.9	251.9	231.9	7.4	8.1	14.6
1957	261.3	251.3	231.3	7.5	8.2	14.7
1958	260.7	250.7	230.7	7.6	8.3	14.8
1959	260.1	250.1	230.1	7.7	8.4	14.9
1960	259.5	249.5	229.5	7.8	8.5	15.0
1961	258.9	248.9	228.9	7.9	8.6	15.1
1962	258.2	248.2	228.2	8.0	8.7	15.1
1963	257.6	247.6	227.6	8.1	8.8	15.2
1964	256.9	246.9	226.9	8.2	8.9	15.3
1965	256.1	246.1	226.1	8.3	9.0	15.4
1966	255.4	245.4	225.4	8.3	9.1	15.5
1967	254.6	244.6	224.6	8.4	9.2	15.6
1968	253.8	243.8	223.8	8.5	9.3	15.7
1969	253.0	243.0	223.0	8.6	9.4	15.8
1970	252.1	242.1	222.1	8.7	9.5	15.9
1971	251.2	241.2	221.2	8.8	9.6	16.0
1972	250.3	240.3	220.3	8.9	9.7	16.1
1973	249.3	239.3	219.3	9.0	9.8	16.2
1974	248.3	238.3	218.3	9.1	9.9	16.3
1975	247.3	237.3	217.3	9.2	10.0	16.4
1976	246.2	236.2	216.2	9.3	10.1	16.4
1977	245.0	235.0	215.0	9.3	10.2	16.5
1978	243.8	233.8	213.8	9.4	10.3	16.6
1979	242.6	232.6	212.6	9.5	10.4	16.7
1980	241.3	231.3	211.3	9.6	10.5	16.8
1981	239.9	229.9	209.9	9.7	10.6	16.9
1982	238.5	228.5	208.5	9.8	10.7	17.0
1983	237.0	227.0	207.0	9.9	10.8	17.4
1984	235.5	225.5	205.5	10.0	10.9	17.8
1985	233.9	223.9	203.9	10.1	11.0	18.2
1986	232.2	222.2	202.2	10.2	11.1	18.6
1987	230.5	220.5	200.5	10.3	11.3	19.0
1988	228.6	218.6	198.6	10.5	11.4	19.3
1989	226.7	216.7	196.7	10.6	11.6	19.5
1990	224.8	214.8	194.8	10.7	11.7	19.8
1991	222.7	212.7	192.7	10.9	11.9	20.0
1992	220.5	210.5	190.5	11.0	12.0	19.8
1993	218.3	208.3	188.3	11.1	12.1	19.6
1994	216.0	206.0	186.0	11.3	12.3	19.4
1995	213.6	203.6	183.6	11.4	12.4	19.3
1996	211.0	201.0	181.0	11.5	12.6	19.1
1997	208.4	198.4	178.4	11.7	12.7	18.9
1998	205.7	195.7	175.7	11.8	12.9	18.7
1999	202.9	192.9	172.9	11.9	13.0	18.5
2000	199.9	189.9	169.9	11.0	12.0	16.0

CO, VOC, NMVOC and CH_4 emission factors (g/kg fuel) for ship engines

Year	High speed 4-stroke CO	Medium speed 4-stroke CO	Slow speed 2-stroke CO	High speed 4-stroke VOC	Medium speed 4-stroke VOC	Slow speed 2-stroke VOC
1949	6.03	6.26	6.79	1.88	1.96	2.12
1950	6.04	6.27	6.81	1.89	1.96	2.13
1951	6.05	6.29	6.82	1.89	1.96	2.13
1952	6.06	6.30	6.84	1.89	1.97	2.14
1953	6.07	6.31	6.85	1.90	1.97	2.14
1954	6.08	6.33	6.87	1.90	1.98	2.15
1955	6.10	6.34	6.88	1.91	1.98	2.15
1956	6.11	6.35	6.90	1.91	1.99	2.16
1957	6.12	6.37	6.92	1.91	1.99	2.16
1958	6.14	6.38	6.93	1.92	1.99	2.17
1959	6.15	6.40	6.95	1.92	2.00	2.17
1960	6.17	6.41	6.97	1.93	2.00	2.18
1961	6.18	6.43	6.99	1.93	2.01	2.18
1962	6.20	6.45	7.01	1.94	2.01	2.19
1963	6.21	6.46	7.03	1.94	2.02	2.20
1964	6.23	6.48	7.05	1.95	2.03	2.20
1965	6.25	6.50	7.08	1.95	2.03	2.21
1966	6.26	6.52	7.10	1.96	2.04	2.22
1967	6.28	6.54	7.12	1.96	2.04	2.23
1968	6.30	6.56	7.15	1.97	2.05	2.23
1969	6.32	6.58	7.17	1.98	2.06	2.24
1970	6.35	6.61	7.20	1.98	2.06	2.25
1971	6.37	6.63	7.23	1.99	2.07	2.26
1972	6.39	6.66	7.26	2.00	2.08	2.27
1973	6.42	6.69	7.29	2.01	2.09	2.28
1974	6.44	6.71	7.33	2.01	2.10	2.29
1975	6.47	6.74	7.36	2.02	2.11	2.30
1976	6.50	6.77	7.40	2.03	2.12	2.31
1977	6.53	6.81	7.44	2.04	2.13	2.33
1978	6.56	6.84	7.48	2.05	2.14	2.34
1979	6.60	6.88	7.53	2.06	2.15	2.35
1980	6.63	6.92	7.57	2.07	2.16	2.37
1981	6.67	6.96	7.62	2.08	2.17	2.38
1982	6.71	7.00	7.67	2.10	2.19	2.40
1983	6.75	7.05	7.73	2.11	2.20	2.42
1984	6.79	7.10	7.79	2.12	2.22	2.43
1985	6.84	7.15	7.85	2.14	2.23	2.45
1986	6.89	7.20	7.91	2.15	2.25	2.47
1987	6.94	7.26	7.98	2.17	2.27	2.49
1988	7.00	7.32	8.05	2.19	2.29	2.52
1989	7.06	7.38	8.13	2.21	2.31	2.54
1990	7.12	7.45	8.22	2.22	2.33	2.57
1991	7.18	7.52	8.30	2.25	2.35	2.59
1992	7.25	7.60	8.40	2.27	2.37	2.62
1993	7.33	7.68	8.50	2.29	2.40	2.66
1994	7.41	7.77	8.60	2.31	2.43	2.69
1995	7.49	7.86	8.72	2.34	2.46	2.72
1996	7.58	7.96	8.84	2.37	2.49	2.76
1997	7.68	8.06	8.97	2.40	2.52	2.80
1998	7.78	8.18	9.11	2.43	2.56	2.85
1999	7.89	8.30	9.26	2.46	2.59	2.89
2000	8.00	8.43	9.42	2.50	2.63	2.94

Continued

Year	High speed 4-stroke NMVOC	Medium speed 4-stroke NMVOC	Slow speed 2-stroke NMVOC	High speed 4-stroke CH_4	Medium speed 4-stroke CH_4	Slow speed 2-stroke CH_4
1949	1.83	1.90	2.06	0.06	0.06	0.06
1950	1.83	1.90	2.06	0.06	0.06	0.06
1951	1.83	1.91	2.07	0.06	0.06	0.06
1952	1.84	1.91	2.07	0.06	0.06	0.06
1953	1.84	1.91	2.08	0.06	0.06	0.06
1954	1.84	1.92	2.08	0.06	0.06	0.06
1955	1.85	1.92	2.09	0.06	0.06	0.06
1956	1.85	1.93	2.09	0.06	0.06	0.06
1957	1.86	1.93	2.10	0.06	0.06	0.06
1958	1.86	1.93	2.10	0.06	0.06	0.07
1959	1.86	1.94	2.11	0.06	0.06	0.07
1960	1.87	1.94	2.11	0.06	0.06	0.07
1961	1.87	1.95	2.12	0.06	0.06	0.07
1962	1.88	1.95	2.13	0.06	0.06	0.07
1963	1.88	1.96	2.13	0.06	0.06	0.07
1964	1.89	1.96	2.14	0.06	0.06	0.07
1965	1.89	1.97	2.14	0.06	0.06	0.07
1966	1.90	1.98	2.15	0.06	0.06	0.07
1967	1.90	1.98	2.16	0.06	0.06	0.07
1968	1.91	1.99	2.17	0.06	0.06	0.07
1969	1.92	2.00	2.17	0.06	0.06	0.07
1970	1.92	2.00	2.18	0.06	0.06	0.07
1971	1.93	2.01	2.19	0.06	0.06	0.07
1972	1.94	2.02	2.20	0.06	0.06	0.07
1973	1.95	2.03	2.21	0.06	0.06	0.07
1974	1.95	2.04	2.22	0.06	0.06	0.07
1975	1.96	2.04	2.23	0.06	0.06	0.07
1976	1.97	2.05	2.24	0.06	0.06	0.07
1977	1.98	2.06	2.26	0.06	0.06	0.07
1978	1.99	2.07	2.27	0.06	0.06	0.07
1979	2.00	2.09	2.28	0.06	0.06	0.07
1980	2.01	2.10	2.30	0.06	0.06	0.07
1981	2.02	2.11	2.31	0.06	0.07	0.07
1982	2.03	2.12	2.33	0.06	0.07	0.07
1983	2.05	2.14	2.34	0.06	0.07	0.07
1984	2.06	2.15	2.36	0.06	0.07	0.07
1985	2.07	2.17	2.38	0.06	0.07	0.07
1986	2.09	2.18	2.40	0.06	0.07	0.07
1987	2.10	2.20	2.42	0.07	0.07	0.07
1988	2.12	2.22	2.44	0.07	0.07	0.08
1989	2.14	2.24	2.47	0.07	0.07	0.08
1990	2.16	2.26	2.49	0.07	0.07	0.08
1991	2.18	2.28	2.52	0.07	0.07	0.08
1992	2.20	2.30	2.55	0.07	0.07	0.08
1993	2.22	2.33	2.58	0.07	0.07	0.08
1994	2.25	2.35	2.61	0.07	0.07	0.08
1995	2.27	2.38	2.64	0.07	0.07	0.08
1996	2.30	2.41	2.68	0.07	0.07	0.08
1997	2.33	2.44	2.72	0.07	0.08	0.08
1998	2.36	2.48	2.76	0.07	0.08	0.09
1999	2.39	2.51	2.81	0.07	0.08	0.09
2000	2.43	2.55	2.85	0.08	0.08	0.09

S-%, SO_2 and PM emission factors (g/kg fuel and g/GJ) per fuel type for diesel ship engines

Fuel type	SNAPCode	Year	S %	SO_2 (g/kg)	TSP (g/kg)	PM_{10} (g/kg)	$PM_{2.5}$ (g/kg)	SO_2 (g/GJ)	TSP (g/GJ)	PM_{10} (g/GJ)	$PM_{2.5}$ (g/GJ)
Fuel	National sea	1990	2.6	52.8	6.1	6.0	6.0	1291.0	149.2	147.8	147.0
Fuel	National sea	1991	2.4	47.0	4.9	4.9	4.8	1149.1	120.2	119.0	118.4
Fuel	National sea	1992	1.8	36.0	3.3	3.2	3.2	880.2	79.8	79.0	78.6
Fuel	National sea	1993	2.4	47.8	5.1	5.0	5.0	1168.7	123.9	122.6	122.0
Fuel	National sea	1994	2.6	52.4	6.0	6.0	5.9	1281.2	147.0	145.6	144.8
Fuel	National sea	1995	3	59.0	7.7	7.6	7.6	1442.5	188.0	186.1	185.2
Fuel	National sea	1996	2.6	51.4	5.8	5.7	5.7	1256.7	141.7	140.2	139.5
Fuel	National sea	1997	2.7	54.8	6.6	6.5	6.5	1339.9	160.8	159.2	158.4
Fuel	National sea	1998	2	39.4	3.7	3.7	3.6	963.3	90.6	89.7	89.2
Fuel	National sea	1999	2	39.4	3.7	3.7	3.6	963.3	90.6	89.7	89.2
Fuel	National sea	2000	1.8	36.2	3.3	3.3	3.2	885.1	80.4	79.6	79.2
Fuel	National sea	2001	1.7	34.0	3.0	3.0	3.0	831.3	74.1	73.4	73.0
Fuel	National sea	2002	1.5	30.2	2.6	2.6	2.6	738.4	64.3	63.7	63.3
Fuel	National sea	2003	1.6	32.4	2.9	2.8	2.8	792.2	69.8	69.1	68.8
Fuel	National sea	2004	2	39.6	3.7	3.7	3.7	968.2	91.3	90.4	89.9
Fuel	National sea	2005	2	40.0	3.8	3.8	3.7	978.0	92.6	91.7	91.3
Fuel	National sea	2006	1.9	38.8	3.6	3.6	3.6	948.7	88.6	87.7	87.3
Fuel	National sea	2007	1.3	25.0	2.2	2.1	2.1	611.2	53.0	52.5	52.2
Fuel	National sea	2008	1.3	25.0	2.2	2.1	2.1	611.2	53.0	52.5	52.2
Fuel	International sea	1990	3	59.2	7.7	7.7	7.6	1447.4	189.4	187.5	186.6
Fuel	International sea	1991	2.9	57.8	7.4	7.3	7.2	1413.2	179.8	178.0	177.1
Fuel	International sea	1992	2.9	57.6	7.3	7.2	7.2	1408.3	178.5	176.7	175.8
Fuel	International sea	1993	3.2	64.0	9.3	9.2	9.1	1564.8	226.5	224.2	223.1
Fuel	International sea	1994	3	60.6	8.2	8.1	8.0	1481.7	199.6	197.6	196.6
Fuel	International sea	1995	3.3	66.0	10.0	9.9	9.8	1613.7	244.0	241.6	240.4
Fuel	International sea	1996	3.4	68.4	10.9	10.8	10.8	1672.4	266.9	264.2	262.9
Fuel	International sea	1997	3.5	69.0	11.2	11.0	11.0	1687.0	272.9	270.2	268.8
Fuel	International sea	1998	3.4	68.4	10.9	10.8	10.8	1672.4	266.9	264.2	262.9
Fuel	International sea	1999	3.5	69.0	11.2	11.0	11.0	1687.0	272.9	270.2	268.8
Fuel	International sea	2000	3.4	67.2	10.4	10.3	10.3	1643.0	255.2	252.6	251.4
Fuel	International sea	2001	3.4	68.4	10.9	10.8	10.8	1672.4	266.9	264.2	262.9
Fuel	International sea	2002	3.4	68.8	11.1	11.0	10.9	1682.2	270.9	268.2	266.8
Fuel	International sea	2003	3.1	62.2	8.7	8.6	8.5	1520.8	211.8	209.7	208.6
Fuel	International sea	2004	3.2	64.0	9.3	9.2	9.1	1564.8	226.5	224.2	223.1
Fuel	International sea	2005	3.5	70.0	11.6	11.5	11.4	1711.5	283.2	280.4	279.0

Continued

Fuel type	SNAPCode	Year	S %	SO_2 (g/kg)	TSP (g/kg)	PM_{10} (g/kg)	$PM_{2.5}$ (g/kg)	SO_2 (g/GJ)	TSP (g/GJ)	PM_{10} (g/GJ)	$PM_{2.5}$ (g/GJ)
Fuel	International sea	2006	3.4	67.0	10.4	10.3	10.2	1638.1	253.3	250.8	249.5
Fuel	International sea	2007	1.5	30.0	2.6	2.6	2.6	733.5	63.8	63.2	62.9
Fuel	International sea	2008	1.5	30.0	2.6	2.6	2.6	733.5	63.8	63.2	62.9
Diesel	-	1990	0.2	4.0	1.0	1.0	1.0	93.7	23.2	23.0	22.9
Diesel	-	1991	0.2	4.0	1.0	1.0	1.0	93.7	23.2	23.0	22.9
Diesel	-	1992	0.2	4.0	1.0	1.0	1.0	93.7	23.2	23.0	22.9
Diesel	-	1993	0.2	4.0	1.0	1.0	1.0	93.7	23.2	23.0	22.9
Diesel	-	1994	0.2	4.0	1.0	1.0	1.0	93.7	23.2	23.0	22.9
Diesel	-	1995	0.2	4.0	1.0	1.0	1.0	93.7	23.2	23.0	22.9
Diesel	-	1996	0.2	4.0	1.0	1.0	1.0	93.7	23.2	23.0	22.9
Diesel	-	1997	0.2	4.0	1.0	1.0	1.0	93.7	23.2	23.0	22.9
Diesel	-	1998	0.2	4.0	1.0	1.0	1.0	93.7	23.2	23.0	22.9
Diesel	-	1999	0.2	4.0	1.0	1.0	1.0	93.7	23.2	23.0	22.9
Diesel	-	2000	0.2	4.0	1.0	1.0	1.0	93.7	23.2	23.0	22.9
Diesel	-	2001	0.2	4.0	1.0	1.0	1.0	93.7	23.2	23.0	22.9
Diesel	-	2002	0.2	4.0	1.0	1.0	1.0	93.7	23.2	23.0	22.9
Diesel	-	2003	0.2	4.0	1.0	1.0	1.0	93.7	23.2	23.0	22.9
Diesel	-	2004	0.2	4.0	1.0	1.0	1.0	93.7	23.2	23.0	22.9
Diesel	-	2005	0.2	4.0	1.0	1.0	1.0	93.7	23.2	23.0	22.9
Diesel	-	2006	0.2	4.0	1.0	1.0	1.0	93.7	23.2	23.0	22.9
Diesel	-	2007	0.2	4.0	1.0	1.0	1.0	93.7	23.2	23.0	22.9
Diesel	-	2008	0.1	2.0	0.9	0.9	0.9	46.8	21.5	21.3	21.2

Annex 13: Fuel sales figures from DEA, and further processed fuel consumption data suited for the Danish inventory

Categories	1985	1990	1995	2000	2001	2002	2003	2004	2005	2006
Agriculture and forestry, DEA statistics										
- LPG	88	438	204	179	190	159	153	138	121	117
- gasoline	425	274	161	38	39	28	42	51	52	20
- gas/diesel oil	9 199	10 528	11 585	13 689	13 437	13 706	13 463	12 934	12 440	12 988
Gartneri, DEA statistics										
- LPG	8	50	23	19	20	17	16	14	12	12
- gasoline	10	10	18	4	4	3	5	6	6	2
- gas/diesel oil	1 705	1 409	1 138	698	581	529	556	488	431	450
Fishery, DEA statistics										
- LPG	-	42	16	13	19	21	20	18	20	20
- gasoline	-	9	8	67	3	3	0	0	0	1
- kerosene	7	26	4	25	1	1	1	1	1	0
- gas/diesel oil	9 152	10 422	8 277	9 347	8 908	8 888	8 428	7 337	7 340	7 762
- fuel oil	27	285	19	-	-	4	84	35	126	86
Manufacturing industry, DEA statistics										
- LPG	2 860	2 032	2 234	1 819	1 526	1 405	1 472	1 488	1 478	1 482
- gasoline	262	177	110	97	69	42	26	30	21	32
- gas/diesel oil	15 576	12 259	10 401	8 635	10 099	9 155	9 964	10 515	10 023	9 130
- fuel oil	29 465	15 989	14 000	8 221	7 395	7 818	6 916	6 940	6 055	8 527
Building and construction, DEA statistics										
- LPG	305	500	501	165	179	236	226	228	224	248
- gasoline	19	34	25	33	24	26	27	27	27	27
- gas/diesel oil	5 313	3 548	5 317	5 950	6 356	6 226	6 226	6 227	6 338	6 187
Housing, DEA statistics										
- gasoline	1 006	1 131	1 233	1 355	1 317	1 313	1 303	1 288	1 250	1 228
Road transport, DEA statistics										
- gasoline	66 037	74 326	80 998	88 975	86 474	86 247	85 611	84 629	82 118	80 631
- gas/diesel oil	45 609	54 746	58 561	64 282	66 254	66 814	70 875	75 422	79 686	86 422
- bioethanol	-	-	-	-	-	-	-	-	-	151
Non-road categories sum, DEA statistics										
- LPG	2 955	2 520	2 461	2 018	1 736	1 581	1 641	1 640	1 612	1 610
- gasoline	1 722	1 626	1 547	1 525	1 453	1 412	1 404	1 402	1 356	1 308

Continued										
- gas/diesel oil	31 793	27 744	28 441	28 972	30 473	29 616	30 209	30 164	29 232	28 755
Non-road, NERI model										
- LPG	1232	1185	1099	1071	1073	1084	1079	1065	1049	1038
- gasoline	2998	2770	2521	2458	2622	2833	3090	3391	3604	3807
- gas/diesel oil	26357	26800	25798	24630	24893	25053	25233	25558	26199	27495
Recreational craft, NERI model										
- gasoline	270	309	358	396	400	403	404	404	393	382
- gas/diesel oil	219	343	537	777	831	886	944	1 002	1 002	1 002
Non-road, added 0203 and 0301										
- gas/diesel oil	5436	944	2642	4342	5580	4563	4976	4606	3033	1260
- LPG	1724	1335	1362	947	662	497	563	575	562	572
Non-road, added 0203										
- gas/diesel oil	1864	406	1182	2156	2567	2193	2309	2050	1335	589
- LPG	56	259	125	93	80	55	58	53	46	46
Non-road, added 0301										
- gas/diesel oil	3572	538	1460	2186	3013	2370	2667	2557	1697	671
- LPG	1668	1076	1237	854	582	442	505	522	516	526
Non-road, added road transport										
- gasoline	-1276	-1145	-975	-932	-1169	-1421	-1686	-1990	-2248	-2499
Fisheries, added national sea transport										
- fuel oil	27	285	19	0	0	4	84	35	126	86
Fisheries, consumed by recreational craft										
- gasoline	0	9	8	67	3	3	0	0	0	1
National sea transport, input NERI model										
- LPG	3	2	2	0	-	-	0	0	0	0
- kerosene	5	0	1	1	1	1	1	1	1	0
- gas/diesel oil	3 074	2 782	6 049	3 367	3 240	3 780	3 828	3 463	4 358	3 699
- fuel oil	2 541	3 845	1 592	1 509	1 513	2 068	1 907	1 704	1 506	1 367

Continued

Fisheries, input NERI model										
- LPG	-	42	16	13	19	21	20	18	20	20
- gasoline	-	-	-	-	-	-	-	-	-	-
- kerosene	7	26	4	25	1	1	1	1	1	0
- gas/diesel oil	8 932	10 080	7 740	8 570	8 077	8 001	7 484	6 335	6 338	6 760
National sea transport, output NERI model										
- gas/diesel oil	4 942	4 942	6 655	4 371	4 173	4 083	4 081	4 182	4 135	4 087
- fuel oil	3 843	3 843	2 653	715	671	659	647	673	679	645
- kerosene	5	0	1	1	1	1	1	1	1	-
- LPG	3	2	2	0	-	-	0	0	0	-
Fisheries, output NERI model										
- gas/diesel oil	7 064	7 920	7 134	7 566	7 145	7 699	7 230	5 616	6 561	6 371
- kerosene	7	26	4	25	1	1	1	1	1	0
- LPG	-	42	16	13	19	21	20	18	20	20
National sea transport, added 0301										
- fuel oil	-1 302	3	-1 061	794	842	1 409	1 260	1 032	826	722
Road transport, NERI excl. traded fuels										
- gasoline	64 492	72 882	79 674	87 713	84 907	84 426	83 521	82 235	79 477	77 751
- gas/diesel oil	45 609	54 746	58 561	64 282	66 254	66 814	70 875	75 422	79 686	86 422
- bioethanol	-	-	-	-	-	-	-	-	-	151
Road transport, input NERI model incl. traded fuels										
- gasoline	62 077	66 279	80 101	83 312	81 852	81 963	81 878	80 593	77 835	76 109
- gas/diesel oil	49 016	59 947	64 013	69 196	70 916	72 552	78 766	84 209	88 474	95 210
- bioethanol	-	-	-	-	-	-	-	-	-	151

Annex 14: Emission factors and total emissions in CollectER format

2006 emission factors for SO_2, NO_x; NMVOC, NH_3 and TSP

SNAP ID	Category	Fuel type	Mode	Fuel [GJ]	SO_2 [g/GJ]	NOX [g/GJ]	NMVOC [g/GJ]	CO [g/GJ]	NH_3 [g/GJ]	TSP [g/GJ]
070101	Passenger cars	Diesel	Highway driving	3047512	0.47	319.73	8.50	43.43	0.47	32.38
070101	Passenger cars	Gasoline 2-stroke	Highway driving	0	2.28	288.90	2357.34	3490.86	0.80	48.15
070101	Passenger cars	Gasoline conventional	Highway driving	1166772	0.46	1343.32	329.92	2679.96	0.89	10.34
070101	Passenger cars	LPG	Highway driving	10850179	0.46	139.28	29.28	765.90	32.76	0.70
070102	Passenger cars	Diesel	Rural driving	76	0.00	1151.70	187.09	3914.25	0.00	10.06
070102	Passenger cars	Gasoline 2-stroke	Rural driving	6706578	0.47	298.46	11.92	70.03	0.52	24.88
070102	Passenger cars	Gasoline conventional	Rural driving	0	2.28	352.84	2476.82	2594.44	0.69	41.51
070102	Passenger cars	LPG	Rural driving	2563993	0.46	1160.25	451.68	3105.49	0.98	11.56
070103	Passenger cars	Diesel	Urban driving	24974459	0.46	108.34	31.59	581.58	42.19	0.65
070103	Passenger cars	Gasoline 2-stroke	Urban driving	153	0.00	1248.46	305.18	1146.38	0.00	14.49
070103	Passenger cars	Gasoline conventional	Urban driving	6925310	0.47	277.96	29.76	153.91	0.38	38.96
070103	Passenger cars	LPG	Urban driving	0	2.28	51.89	4470.04	7400.54	0.33	19.72
070201	Light duty vehicles	Diesel	Highway driving	2993855	0.46	635.40	867.63	7933.84	0.64	11.15
070201	Light duty vehicles	Gasoline conventional	Highway driving	28058644	0.46	140.53	226.74	2522.10	15.58	0.74
070202	Light duty vehicles	Diesel	Rural driving	192	0.00	615.77	445.18	1341.15	0.00	11.72
070202	Light duty vehicles	Gasoline conventional	Rural driving	4788870	0.47	302.09	29.56	174.62	0.36	40.25
070203	Light duty vehicles	Diesel	Urban driving	61484	0.46	1370.99	170.51	2991.20	0.81	16.19
070203	Light duty vehicles	Gasoline conventional	Urban driving	416547	0.46	106.70	12.03	470.62	24.66	0.53
070301	Heavy duty vehicles	Diesel	Highway driving	14589910	0.47	318.07	33.03	159.08	0.39	36.08
070301	Heavy duty vehicles	Gasoline	Highway driving	217332	0.46	1190.37	262.92	2319.12	0.76	15.27
070302	Heavy duty vehicles	Diesel	Rural driving	1470765	0.46	93.87	17.05	352.33	27.04	0.43
070302	Heavy duty vehicles	Gasoline	Rural driving	14197799	0.47	332.66	55.23	189.77	0.28	47.26
070303	Heavy duty vehicles	Diesel	Urban driving	262798	0.46	624.60	724.30	7474.97	0.44	8.84
070303	Heavy duty vehicles	Gasoline	Urban driving	1773812	0.46	107.04	125.85	2939.26	7.88	0.42
0704	Mopeds	Gasoline	Mopeds and Motorcycles < 50 cm3	12661976	0.47	773.65	26.25	156.24	0.32	20.35
070501	Motorcycles	Gasoline	Highway driving	15735	0.46	1039.09	475.21	7620.01	0.28	55.42
070502	Motorcycles	Gasoline	Rural driving	19035878	0.47	797.33	34.88	162.64	0.32	20.65
070503	Motorcycles	Gasoline	Urban driving	32016	0.46	1143.00	821.44	8382.01	0.30	60.96
0801	Military	Diesel		631564	0.47	538.08	35.10	158.94	0.34	30.51
0801	Military	Jet fuel	< 3000 ft	109686	22.99	250.57	24.94	229.89	0.00	1.16
0801	Military	Jet fuel	> 3000 ft	987175	22.99	250.57	24.94	229.89	0.00	1.16
0801	Military	Gasoline		6603	0.46	206.69	260.01	2050.72	25.15	2.58

Continued

SNAP ID	Category	Fuel type	Mode	Fuel [GJ]	SO_2 [g/GJ]	NOX [g/GJ]	NMVOC [g/GJ]	CO [g/GJ]	NH_3 [g/GJ]	TSP [g/GJ]
0801	Military	Aviation gasoline		3638	22.99	859.00	1242.60	6972.00	1.60	10.00
0802	Railways	Diesel		3064383	0.47	1155.92	74.96	204.41	0.20	39.02
0802	Railways	Kerosene		1002148	93.68	868.57	168.09	450.77	0.17	103.58
0802	Railways	Gasoline		381525	0.46	446.85	2050.43	15870.55	0.09	90.85
0803	Inland waterways	Diesel		645303	948.66	1748.91	59.46	196.16		88.60
0803	Inland waterways	Gasoline		4087478	93.68	1288.42	50.25	136.65	0.00	23.21
080402	Maritime activities	Residual oil		0						
080402	Maritime activities	Diesel		0						
080402	Maritime activities	Kerosene		0	1101.71	1393.60	56.90	180.90		139.40
080402	Maritime activities	LPG		6371456	93.68	1355.43	56.36	185.92	0.00	23.21
080403	Maritime activities	Residual oil		313	2.30	50.00	3.00	20.00		5.00
080403	Maritime activities	Diesel		0	2.28	64.34	10809.60	18485.10	0.10	23.25
080403	Maritime activities	Kerosene		20010	0.00	1249.00	384.94	443.00	0.00	0.20
080403	Maritime activities	Gasoline		31564684	1638.14	2053.70	60.73	200.35		253.29
080403	Maritime activities	LPG		13116246	93.68	1516.56	55.34	182.57		23.21
080404	Maritime activities	Residual oil		157817	22.99	287.66	27.15	148.43		1.16
080404	Maritime activities	Diesel		91473	22.83	859.00	1242.60	6972.00	1.60	10.00
080501	Air traffic	Jet fuel	Dom. < 3000 ft	242148	22.99	289.45	33.27	200.52		1.16
080501	Air traffic	Aviation gasoline		1412	22.83	859.00	1242.60	6972.00	1.60	10.00
080502	Air traffic	Jet fuel	Int. < 3000 ft	516295	22.99	279.30	20.57	127.01		1.16
080502	Air traffic	Aviation gasoline		2684753	22.99	238.63	8.64	62.41		1.16
080503	Air traffic	Jet fuel	Dom. > 3000 ft	14611522	2.34	779.40	83.90	420.46	0.18	62.65
080504	Air traffic	Jet fuel	Int. > 3000 ft	382327	0.46	107.59	1143.22	21833.70	1.41	29.26
0806	Agriculture	Diesel		159065	2.34	650.75	50.31	296.03	0.18	34.88
0806	Agriculture	Gasoline		75313	0.46	73.12	6684.07	16521.92	0.08	76.48
0807	Forestry	Diesel		12724048	2.34	738.43	93.38	414.76	0.18	77.29
0807	Forestry	Gasoline		163110	0.46	197.21	1491.92	13052.28	0.10	13.85
0808	Industry	Diesel		1038180	0.00	1328.11	146.09	104.85	0.21	4.89
0808	Industry	Gasoline		3186399	0.46	86.20	2522.22	27536.91	0.09	24.90
0808	Industry	LPG		210424	22.99	275.95	35.84	193.29		1.16
0809	Household and gardening	Gasoline		733	22.83	859.00	1242.60	6972.00	1.60	10.00
80501,00	Air traffic, Copenhagen airport	Jet fuel	Dom. < 3000 ft	2718218	22.99	341.71	44.14	223.20	0.00	1.16
80501,00	Air traffic, Copenhagen airport	Aviation gasoline		206	22.83	859.00	1242.60	6972.00	1.60	10.00
80502,00	Air traffic, Copenhagen airport	Jet fuel	Int. < 3000 ft	983181	22.99	274.14	18.44	66.15	0.00	1.16
80502,00	Air traffic, Copenhagen airport	Aviation gasoline		30232427	22.99	315.36	11.20	34.29	0.00	1.16

Continued

SNAP ID	Category	Fuel type	Mode	Fuel [GJ]	SO_2 [g/GJ]	NOX [g/GJ]	NMVOC [g/GJ]	CO [g/GJ]	NH_3 [g/GJ]	TSP [g/GJ]
80503,00	Air traffic, Copenhagen airport	Jet fuel	Dom. > 3000 ft	631564	0.47	538.08	35.10	158.94	0.34	30.51
80504,00	Air traffic, Copenhagen airport	Jet fuel	Int. > 3000 ft	109686	22.99	250.57	24.94	229.89	0.00	1.16

2006 emissions for SO_2, NO_x; NMVOC, NH_3 and TSP

Category	Mode	Unit	SO_2 [tons]	NO_X [tons]	NMVOC [tons]	CO [tons]	NH_3 [tons]	TSP [tons]
Passenger cars	Highway driving	70101	7	4053	729	11570	358	118
Passenger cars	Rural driving	70102	16	7682	2027	22957	1060	213
Passenger cars	Urban driving	70103	17	7770	9166	95586	442	324
Light duty vehicles	Highway driving	70201	2	1575	157	1216	12	194
Light duty vehicles	Rural driving	70202	8	5037	564	3343	46	530
Light duty vehicles	Urban driving	70203	8	5077	1198	9872	18	674
Heavy duty vehicles	Highway driving	70301	6	9812	340	2098	4	259
Heavy duty vehicles	Rural driving	70302	9	15214	690	3364	6	395
Heavy duty vehicles	Urban driving	70303	6	10561	649	2771	4	330
Mopeds		704	0	18	1941	2158	0	30
Motorcycles	Highway driving	70501	0	49	206	2985	0	5
Motorcycles	Rural driving	70502	0	86	571	6519	1	13
Motorcycles	Urban driving	70503	0	57	916	7081	1	16
Evaporation		706			4017			
Military		801	26	619	56	391	0	21
Railways		802	1	3542	230	626	1	120
Inland waterways		803	94	1041	951	6507	0	138
National sea traffic		80402	995	6395	244	685	0	152
Fishing		80403	597	8661	367	1193	0	148
International sea traffic		80404	52936	84716	2643	8719		8300
Air traffic, Dom. < 3000 ft.		80501	11	183	126	707	0	1
Air traffic, Int. < 3000 ft.		80502	68	1000	130	667	0	3
Air traffic, Dom. > 3000 ft.		80503	34	414	29	131	0	2
Air traffic, Int. > 3000 ft.		80504	757	10175	362	1204	0	38
Agriculture		806	34	11429	1663	14491	3	927
Forestry		807	0	109	511	1291	0	11
Industry		808	30	10807	1583	7515	2	991
Household and gardening		809	1	275	8037	87744	0	79

Non-exhaust emission factors, activity data and total non-exhaust emissions of TSP, PM_{10} and $PM_{2.5}$ in 2006

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]
2006	Brake wear	Passenger cars	36034120	7.6	7.5	3.0	274	269	107
2006	Brake wear	Light duty vehicles	12639008	13.7	13.4	5.3	173	170	68
2006	Brake wear	Heavy duty vehicles	3604488	34.8	34.1	13.6	125	123	49
2006	Brake wear	Buses	955350	47.3	46.4	18.5	45	44	18
2006	Brake wear	Mopeds	248759	6.2	6.1	2.4	2	2	1
2006	Brake wear	Motorcycles	848283	4.2	4.2	1.7	4	4	1
2006	Road abrasion	Passenger cars	36034120	15.0	7.5	4.1	541	270	146
2006	Road abrasion	Light duty vehicles	12639008	15.0	7.5	4.1	190	95	51
2006	Road abrasion	Heavy duty vehicles	3604488	76.0	38.0	20.5	274	137	74
2006	Road abrasion	Buses	955350	76.0	38.0	20.5	73	36	20
2006	Road abrasion	Mopeds	248759	6.0	3.0	1.6	1	1	0
2006	Road abrasion	Motorcycles	848283	6.0	3.0	1.6	5	3	1
2006	Tyre wear	Passenger cars	36034120	12.4	7.5	5.2	448	269	188
2006	Tyre wear	Light duty vehicles	12639008	20.5	12.3	8.6	258	155	109
2006	Tyre wear	Heavy duty vehicles	3604488	59.8	35.9	25.1	215	129	90
2006	Tyre wear	Buses	955350	29.4	17.7	12.4	28	17	12
2006	Tyre wear	Mopeds	248759	6.4	3.8	2.7	2	1	1
2006	Tyre wear	Motorcycles	848283	5.6	3.3	2.3	5	3	2
2006	Total	Passenger cars					1263	808	441
2006	Total	Light duty vehicles					621	420	227
2006	Total	Heavy duty vehicles					615	389	213
2006	Total	Buses					146	97	49
2006	Total	Mopeds					5	3	2
2006	Total	Motorcycles					13	9	5

Heavy metal emission factors and total emissions for 1990 and 2006 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		2	9	315		13	11099	2	185
1990	Passenger cars	Rural driving	70102		6	28	966		40	34269	6	568
1990	Passenger cars	Urban driving	70103		8	40	1350		56	47403	8	794
1990	Light duty vehicles	Highway driving	70201		1	3	87		4	324	1	51
1990	Light duty vehicles	Rural driving	70202		2	9	318		13	1347	2	187
1990	Light duty vehicles	Urban driving	70203		2	11	385		16	1966	2	226
1990	Heavy duty vehicles	Highway driving	70301		2	10	346		14	15	2	203
1990	Heavy duty vehicles	Rural driving	70302		4	19	632		26	44	4	372
1990	Heavy duty vehicles	Urban driving	70303		3	16	533		22	51	3	314
1990	Mopeds		704		0	0	14		1	422	0	9
1990	Motorcycles	Highway driving	70501		0	0	4		0	113	0	2
1990	Motorcycles	Rural driving	70502		0	0	7		0	210	0	4
1990	Motorcycles	Urban driving	70503		0	0	8		0	247	0	5
1990	Evaporation		706									
1990	Military		801		0	2	64		3	64	0	38
1990	Railways		802		1	5	160		7	0	1	94
1990	Inland waterways		803		0	1	26		1	455	0	15
1990	National sea traffic		80402	53	4	23	53	8	2827	30	61	142
1990	Fishing		80403	9	2	7	9	9	13	19	37	93
1990	International sea traffic		80404	363	24	150	363	28	20956	167	334	764
1990	Air traffic, Dom. < 3000 ft.		80501		0	1	40		2	1534	0	24
1990	Air traffic, Int. < 3000 ft.		80502		0	2	84		3	490	0	50
1990	Air traffic, Dom. > 3000 ft.		80503		1	3	90		4		1	53
1990	Air traffic, Int. > 3000 ft.		80504		5	25	852		35		5	501
1990	Agriculture		806		4	20	684		28	1043	4	403
1990	Forestry		807		0	1	19		1	502	0	11
1990	Industry		808		2	12	411		17	258	2	242
1990	Household and gardening		809		0	2	60		2	2273	0	35

Year	Category	Mode	SNAP ID	Arsenic [kg]	Cadmium [kg]	Chromium [kg]	Copper [kg]	Mercury [kg]	Nickel [kg]	Lead [kg]	Selenium [kg]	Zinc [kg]
2006	Passenger cars	Rural driving	70101		3.46	17.29	587.74		24.20	8.23	3.46	345.73
2006	Passenger cars	Urban driving	70102		7.86	39.29	1335.85		55.00	18.86	7.86	785.79
2006	Light duty vehicles	Highway driving	70103		8.71	43.56	1480.95		60.98	21.27	8.71	871.14
2006	Light duty vehicles	Rural driving	70201		1.23	6.15	209.21		8.61	0.33	1.23	123.06
2006	Light duty vehicles	Urban driving	70202		3.80	19.01	646.38		26.61	1.16	3.80	380.22
2006	Heavy duty vehicles	Highway driving	70203		3.79	18.95	644.30		26.53	1.39	3.79	379.00
2006	Heavy duty vehicles	Rural driving	70301		2.97	14.84	504.72		20.78	0.01	2.97	296.89
2006	Heavy duty vehicles	Urban driving	70302		4.46	22.32	759.11		31.25	0.02	4.46	446.53
2006	Mopeds		70303		3.11	15.56	529.03		21.78	0.02	3.11	311.19
2006	Motorcycles	Highway driving	704		0.05	0.24	8.13		0.33	0.14	0.05	4.78
2006	Motorcycles	Rural driving	70501		0.04	0.22	7.55		0.31	0.13	0.04	4.44
2006	Motorcycles	Urban driving	70502		0.10	0.50	17.01		0.70	0.30	0.10	10.01
2006	Evaporation		70503		0.12	0.60	20.44		0.84	0.36	0.12	12.02
2006	Military		706									
2006	Railways		801	0.00	0.40	2.00	68.11	0.00	2.81	46.52	0.40	40.07
2006	Inland waterways		802		0.70	3.59	121.99		5.03		0.70	71.77
2006	National sea traffic		803		0.32	1.61	54.70		2.25	0.26	0.32	32.18
2006	Fishing		80402	12.67	1.41	7.00	12.67	5.10	480.03	12.72	25.44	62.06
2006	International sea traffic		80403	7.45	1.47	5.99	7.45	7.45	10.45	14.91	29.82	74.61
2006	Air traffic, Dom. < 3000 ft.		80404	401.07	26.06	166.68	401.07	30.81	23174.21	185.04	370.09	848.01
2006	Air traffic, Int. < 3000 ft.		80501		0.11	0.53	17.87		0.74	1245.30	0.11	10.51
2006	Air traffic, Dom. > 3000 ft.		80502	0.00	0.68	3.38	114.95	0.00	4.74	21.84	0.68	67.62
2006	Air traffic, Int. > 3000 ft.		80503	0.00	0.34	1.71	58.19	0.00	2.40	0.00	0.34	34.23
2006	Agriculture		80504	0.00	7.57	37.53	1277.52	0.00	52.67	0.00	7.57	751.50
2006	Forestry		806		3.45	17.53	596.52		24.57	0.26	3.45	350.93
2006	Industry		807		0.05	0.27	9.26		0.38	0.05	0.05	5.44
2006	Household and gardening		808		2.96	15.07	512.87		21.13	0.11	2.96	301.72
2006	Passenger cars	Rural driving	809		0.73	3.63	123.66		5.10	2.18	0.73	72.75

PAH emission factors and total emissions for 1990 and 2006 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	2,34E-04	2,34E-02	7,01E-10	1,22E-02	7,48E-04	6,78E-04	8,18E-04
1990	070101	Passenger cars	Gasoline 2-stroke	Highway driving	2,97E-04	2,97E-02					
1990	070101	Passenger cars	Gasoline conventional	Highway driving	2,25E-04	2,25E-02	1,34E-08	8,54E-03	5,55E-04	4,27E-04	4,69E-04
1990	070101	Passenger cars	Gasoline catalyst	Highway driving	0,00E+00	0,00E+00					
1990	070101	Passenger cars	LPG	Highway driving	2,34E-04	2,34E-02	8,52E-10	1,49E-02	9,09E-04	8,24E-04	9,94E-04
1990	070102	Passenger cars	Diesel	Rural driving	2,97E-04	2,97E-02					
1990	070102	Passenger cars	Gasoline 2-stroke	Rural driving	2,24E-04	2,24E-02	1,51E-08	9,58E-03	6,23E-04	4,79E-04	5,27E-04
1990	070102	Passenger cars	Gasoline conventional	Rural driving	0,00E+00	0,00E+00					
1990	070102	Passenger cars	Gasoline catalyst	Rural driving	2,34E-04	2,34E-02	5,33E-10	9,30E-03	5,68E-04	5,15E-04	6,21E-04
1990	070102	Passenger cars	LPG	Rural driving	2,97E-04	2,97E-02					
1990	070103	Passenger cars	Diesel	Urban driving	2,25E-04	2,25E-02	1,02E-08	6,47E-03	4,20E-04	3,23E-04	3,56E-04
1990	070103	Passenger cars	Gasoline 2-stroke	Urban driving	0,00E+00	0,00E+00					
1990	070103	Passenger cars	Gasoline conventional	Urban driving	2,34E-04	2,34E-02	4,87E-10	8,51E-03	5,19E-04	4,70E-04	5,68E-04
1990	070103	Passenger cars	Gasoline catalyst	Urban driving	2,97E-04	2,97E-02	1,27E-08	8,09E-03	5,26E-04	4,04E-04	4,45E-04
1990	070103	Passenger cars	LPG	Urban driving	2,34E-04	2,34E-02	5,33E-10	9,31E-03	5,68E-04	5,15E-04	6,22E-04
1990	070201	Light duty vehicles	Diesel	Highway driving	2,97E-04	2,97E-02	1,20E-08	7,63E-03	4,95E-04	3,81E-04	4,19E-04
1990	070201	Light duty vehicles	Gasoline conventional	Highway driving	2,34E-04	2,34E-02	3,98E-10	6,95E-03	4,25E-04	3,85E-04	4,64E-04
1990	070201	Light duty vehicles	Gasoline catalyst	Highway driving	2,97E-04	2,97E-02	7,18E-09	4,56E-03	2,96E-04	2,28E-04	2,51E-04
1990	070202	Light duty vehicles	Diesel	Rural driving	2,34E-04	2,34E-02	1,06E-09	2,09E-03	5,26E-04	7,80E-04	9,74E-05
1990	070202	Light duty vehicles	Gasoline conventional	Rural driving	2,97E-04	2,97E-02					
1990	070202	Light duty vehicles	Gasoline catalyst	Rural driving	2,34E-04	2,34E-02	1,12E-09	2,21E-03	5,57E-04	8,25E-04	1,03E-04
1990	070203	Light duty vehicles	Diesel	Urban driving	2,97E-04	2,97E-02					
1990	070203	Light duty vehicles	Gasoline conventional	Urban driving	2,34E-04	2,34E-02	9,11E-10	1,79E-03	4,51E-04	6,68E-04	8,34E-05
1990	070203	Light duty vehicles	Gasoline catalyst	Urban driving	2,97E-04	2,97E-02					
1990	070301	Heavy duty vehicles	Diesel	Highway driving	2,97E-04	2,97E-02					
1990	070301	Heavy duty vehicles	Gasoline	Highway driving	2,97E-04	2,97E-02	2,00E-08	1,27E-02	8,24E-04	6,34E-04	6,97E-04
1990	070302	Heavy duty vehicles	Diesel	Rural driving	2,97E-04	2,97E-02	2,39E-08	1,52E-02	9,86E-04	7,59E-04	8,34E-04
1990	070302	Heavy duty vehicles	Gasoline	Rural driving	2,97E-04	2,97E-02	2,41E-08	1,53E-02	9,94E-04	7,65E-04	8,41E-04
1990	070303	Heavy duty vehicles	Diesel	Urban driving	2,34E-04	2,34E-02	7,01E-10	1,22E-02	7,48E-04	6,78E-04	8,18E-04
1990	070303	Heavy duty vehicles	Gasoline	Urban driving	2,97E-04	2,97E-02					
1990	0704	Mopeds	Gasoline		2,25E-04	2,25E-02	1,34E-08	8,54E-03	5,55E-04	4,27E-04	4,69E-04
1990	070501	Motorcycles	Gasoline	Highway driving	0,00E+00	0,00E+00					
1990	070502	Motorcycles	Gasoline	Rural driving	2,34E-04	2,34E-02	8,52E-10	1,49E-02	9,09E-04	8,24E-04	9,94E-04
1990	070503	Motorcycles	Gasoline	Urban driving	2,97E-04	2,97E-02					

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]
2006	070101	Passenger cars	Diesel	Highway driving	0,00E+00	1,28E-02	7,82E-04	7,09E-04	8,56E-04	1,66E-03	8,07E-04
2006	070101	Passenger cars	Gasoline 2-stroke	Highway driving							
2006	070101	Passenger cars	Gasoline conventional	Highway driving	1,39E-08	8,82E-03	5,73E-04	4,41E-04	4,85E-04	1,15E-03	4,41E-04
2006	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
2006	070101	Passenger cars	LPG	Highway driving							
2006	070102	Passenger cars	Diesel	Rural driving	8,35E-10	1,46E-02	8,91E-04	8,07E-04	9,75E-04	1,89E-03	9,19E-04
2006	070102	Passenger cars	Gasoline 2-stroke	Rural driving							
2006	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
2006	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
2006	070102	Passenger cars	LPG	Rural driving							
2006	070103	Passenger cars	Diesel	Urban driving	5,54E-10	9,68E-03	5,91E-04	5,36E-04	6,47E-04	1,26E-03	6,10E-04
2006	070103	Passenger cars	Gasoline 2-stroke	Urban driving							
2006	070103	Passenger cars	Gasoline conventional	Urban driving	9,99E-09	6,34E-03	4,12E-04	3,17E-04	3,49E-04	8,25E-04	3,17E-04
2006	070103	Passenger cars	Gasoline catalyst	Urban driving	0,00E+00	5,38E-04	1,19E-04	1,49E-04	1,19E-04	2,39E-04	1,79E-04
2006	070103	Passenger cars	LPG	Urban driving							
2006	070201	Light duty vehicles	Diesel	Highway driving	5,29E-10	9,23E-03	5,64E-04	5,11E-04	6,17E-04	1,20E-03	5,81E-04
2006	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
2006	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
2006	070202	Light duty vehicles	Diesel	Rural driving	5,78E-10	1,01E-02	6,17E-04	5,59E-04	6,75E-04	1,31E-03	6,36E-04
2006	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
2006	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
2006	070203	Light duty vehicles	Diesel	Urban driving	4,16E-10	7,26E-03	4,43E-04	4,02E-04	4,85E-04	9,42E-04	4,57E-04
2006	070203	Light duty vehicles	Gasoline conventional	Urban driving	6,92E-09	4,39E-03	2,85E-04	2,20E-04	2,42E-04	5,71E-04	2,20E-04
2006	070203	Light duty vehicles	Gasoline catalyst	Urban driving	0,00E+00	3,37E-04	7,49E-05	9,36E-05	7,49E-05	1,50E-04	1,12E-04
2006	070301	Heavy duty vehicles	Diesel	Highway driving	1,03E-09	2,03E-03	5,12E-04	7,59E-04	9,48E-05	7,59E-05	1,33E-04
2006	070301	Heavy duty vehicles	Gasoline	Highway driving							
2006	070302	Heavy duty vehicles	Diesel	Rural driving	1,05E-09	2,07E-03	5,21E-04	7,72E-04	9,65E-05	7,70E-05	1,35E-04
2006	070302	Heavy duty vehicles	Gasoline	Rural driving							
2006	070303	Heavy duty vehicles	Diesel	Urban driving	8,54E-10	1,68E-03	4,23E-04	6,26E-04	7,82E-05	6,25E-05	1,10E-04
2006	070303	Heavy duty vehicles	Gasoline	Urban driving							
2006	0704	Mopeds	Gasoline								
2006	070501	Motorcycles	Gasoline	Highway driving	2,02E-08	1,28E-02	8,32E-04	6,40E-04	7,04E-04	1,66E-03	6,40E-04
2006	070502	Motorcycles	Gasoline	Rural driving	2,41E-08	1,53E-02	9,96E-04	7,66E-04	8,43E-04	1,99E-03	7,66E-04
2006	070503	Motorcycles	Gasoline	Urban driving	2,44E-08	1,55E-02	1,01E-03	7,75E-04	8,52E-04	2,01E-03	7,75E-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		0,23	23,42	0,71	4391,42	570,64	568,31	289,75
1990	0801	Military	Jet fuel	< 3000 ft	0,23	22,83	0,00	0,00	0,00	0,00	0,00
1990	0801	Military	Jet fuel	> 3000 ft	0,23	22,83	0,00	0,00	0,00	0,00	0,00
1990	0801	Military	Gasoline		0,23	22,83	6,27	5257,47	277,33	116,39	141,99
1990	0801	Military	Aviation gasoline		0,23	22,83	5,11	4328,53	209,06	71,27	114,03
1990	0802	Railways	Diesel		0,23	23,42	0,70	1365,92	348,03	388,90	57,47
1990	0802	Railways	Kerosene								
1990	0802	Railways	Gasoline		0,23	22,83	6,27	5257,47	277,33	116,39	141,99
1990	0803	Inland waterways	Diesel		0,23	23,42	0,71	4391,42	570,64	568,31	289,75
1990	0803	Inland waterways	Gasoline		0,23	22,83	5,11	4328,53	209,06	71,27	114,03
1990	080402	National sea traffic	Residual oil		9,78	22,00	13,42	5190,00	270,00	50,00	20,00
1990	080402	National sea traffic	Diesel		4,68	11,71	12,01	7420,00	640,00	300,00	150,00
1990	080402	National sea traffic	Kerosene								
1990	080402	National sea traffic	LPG								
1990	080403	Fishing	Residual oil		9,78	22,00	13,42	5190,00	270,00	50,00	20,00
1990	080403	Fishing	Diesel		4,68	11,71	12,01	7420,00	640,00	300,00	150,00
1990	080403	Fishing	Kerosene								
1990	080403	Fishing	Gasoline		0,23	22,83	11,42	3420,09	342,47	146,12	244,29
1990	080403	Fishing	LPG								
1990	080404	International sea traffic	Residual oil		9,78	22,00	13,42	4120,00	200,00	90,00	70,00
1990	080404	International sea traffic	Diesel		4,68	11,71	12,01	7420,00	640,00	300,00	150,00
1990	080501	Air traffic. other airports	Jet fuel	Dom. < 3000 ft	0,23	22,83	0,00	0,00	0,00	0,00	0,00
1990	080501	Air traffic. other airports	Aviation gasoline		0,23	22,83	5,11	4328,53	209,06	71,27	114,03
1990	080502	Air traffic. other airports	Jet fuel	Int. < 3000 ft	0,23	22,83	0,00	0,00	0,00	0,00	0,00
1990	080502	Air traffic. other airports	Aviation gasoline		0,23	22,83	5,11	4328,53	209,06	71,27	114,03
1990	080503	Air traffic. other airports	Jet fuel	Dom. > 3000 ft	0,23	22,83	0,00	0,00	0,00	0,00	0,00
1990	080504	Air traffic. other airports	Jet fuel	Int. > 3000 ft	0,23	22,83	0,00	0,00	0,00	0,00	0,00
1990	0806	Agriculture	Diesel		0,23	23,42	0,71	4391,42	570,64	568,31	289,75
1990	0806	Agriculture	Gasoline		0,23	22,83	5,11	4328,53	209,06	71,27	114,03
1990	0807	Forestry	Diesel		0,23	23,42	0,71	4391,42	570,64	568,31	289,75
1990	0807	Forestry	Gasoline		0,23	22,83	5,11	4328,53	209,06	71,27	114,03
1990	0808	Industry	Diesel		0,23	23,42	0,71	4391,42	570,64	568,31	289,75
1990	0808	Industry	Gasoline		0,23	22,83	5,11	4328,53	209,06	71,27	114,03
1990	0808	Industry	LPG								
1990	0809	Household and gardening	Gasoline		0,23	22,83	5,11	4328,53	209,06	71,27	114,03
1990	080501	Air traffic. CPH. airport	Jet fuel	Dom. < 3000 ft	0,23	22,83	0,00	0,00	0,00	0,00	0,00
1990	080501	Air traffic. Copenhagen airport	Aviation gasoline		0,23	22,83	5,11	4328,53	209,06	71,27	114,03
1990	080502	Air traffic. Copenhagen airport	Jet fuel	Int. < 3000 ft	0,23	22,83	0,00	0,00	0,00	0,00	0,00
1990	080502	Air traffic. Copenhagen airport	Aviation gasoline		0,23	22,83	5,11	4328,53	209,06	71,27	114,03
1990	080503	Air traffic. Copenhagen airport	Jet fuel	Dom. > 3000 ft	0,23	22,83	0,00	0,00	0,00	0,00	0,00
1990	080504	Air traffic. Copenhagen airport	Jet fuel	Int. > 3000 ft	0,23	22,83	0,00	0,00	0,00	0,00	0,00

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]
2006	801	Military	Diesel		0.71	0,71	4349,86	510,47	495,91	255,72	464,46
2006	801	Military	Jet fuel	< 3000 ft	0.00	0,00	0,00	0,00	0,00	0,00	0,00
2006	801	Military	Jet fuel	> 3000 ft	0.00	0,00	0,00	0,00	0,00	0,00	0,00
2006	801	Military	Gasoline		6.89	6,89	2151,74	179,80	115,04	118,07	357,51
2006	801	Military	Aviation gasoline		5.11	5,11	4328,53	209,06	71,27	114,03	688,95
2006	802	Railways	Diesel		0.72	0,72	1411,28	359,58	401,81	59,38	50,80
2006	803	Inland waterways	Diesel		0.71	0,71	4349,86	510,47	495,91	255,72	464,46
2006	803	Inland waterways	Gasoline		5.11	5,11	4328,53	209,06	71,27	114,03	688,95
2006	80402	National sea traffic	Residual oil		13.42	13,42	5190,00	270,00	50,00	20,00	70,00
2006	80402	National sea traffic	Diesel		12.01	12,01	7420,00	640,00	300,00	150,00	1430,00
2006	80402	National sea traffic	Kerosene								
2006	80402	National sea traffic	LPG								
2006	80403	Fishing	Residual oil		13.42	13,42	5190,00	270,00	50,00	20,00	70,00
2006	80403	Fishing	Diesel		12.01	12,01	7420,00	640,00	300,00	150,00	1430,00
2006	80403	Fishing	Kerosene								
2006	80403	Fishing	Gasoline		11.42	11,42	3420,00	342,00	146,00	244,00	489,00
2006	80403	Fishing	LPG								
2006	80404	International sea traffic	Residual oil		13.42	13,42	4120,00	200,00	90,00	70,00	260,00
2006	80404	International sea traffic	Diesel		12.01	12,01	7420,00	640,00	300,00	150,00	1430,00
2006	80501	Air traffic. other airports	Jet fuel	Dom. < 3000 ft	0.00	0,00	0,00	0,00	0,00	0,00	0,00
2006	80501	Air traffic. other airports	Aviation gasoline		5.11	5,11	4328,53	209,06	71,27	114,03	688,95
2006	80502	Air traffic. other airports	Jet fuel	Int. < 3000 ft	0.00	0,00	0,00	0,00	0,00	0,00	0,00
2006	80502	Air traffic. other airports	Aviation gasoline		5.11	5,11	4328,53	209,06	71,27	114,03	688,95
2006	80503	Air traffic. other airports	Jet fuel	Dom. > 3000 ft	0.00	0,00	0,00	0,00	0,00	0,00	0,00
2006	80504	Air traffic. other airports	Jet fuel	Int. > 3000 ft	0.00	0,00	0,00	0,00	0,00	0,00	0,00
2006	806	Agriculture	Diesel		0.71	0,71	4349,86	510,47	495,91	255,72	464,46
2006	806	Agriculture	Gasoline		5.11	5,11	4328,53	209,06	71,27	114,03	688,95
2006	807	Forestry	Diesel		0.71	0,71	4349,86	510,47	495,91	255,72	464,46
2006	807	Forestry	Gasoline		5.11	5,11	4328,53	209,06	71,27	114,03	688,95
2006	808	Industry	Diesel		0.71	0,71	4349,86	510,47	495,91	255,72	464,46
2006	808	Industry	Gasoline		5.11	5,11	4328,53	209,06	71,27	114,03	688,95
2006	808	Industry	LPG								

2006	809	Household and gardening	Gasoline		5.11	5,11	4328,53	209,06	71,27	114,03	688,95
2006	80501	Air traffic. Copenhagen airport	Jet fuel	Dom. < 3000 ft	0.00	0,00	0,00	0,00	0,00	0,00	0,00
2006	80501	Air traffic. Copenhagen airport	Aviation gasoline		5.11	5,11	4328,53	209,06	71,27	114,03	688,95
2006	80502	Air traffic. Copenhagen airport	Jet fuel	Int. < 3000 ft	0.00	0,00	0,00	0,00	0,00	0,00	0,00
2006	80502	Air traffic. Copenhagen airport	Aviation gasoline		5.11	5,11	4328,53	209,06	71,27	114,03	688,95
2006	80503	Air traffic. Copenhagen airport	Jet fuel	Dom. > 3000 ft	0.00	0,00	0,00	0,00	0,00	0,00	0,00
2006	80504	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	0.10	72.32	4.67	3.66	4.07	9.40	3.72
1990	Passenger cars	Rural driving	70102	0.35	250.39	16.16	1 2.67	14.10	32.54	12.88
1990	Passenger cars	Urban driving	70103	0.33	233.33	15.06	11.80	13.14	30.32	12.01
1990	Light duty vehicles	Highway driving	70201	0.00	18.00	1.11	0.99	1.18	2.34	1.11
1990	Light duty vehicles	Rural driving	70202	0.01	70.49	4.33	3.86	4.63	9.15	4.35
1990	Light duty vehicles	Urban driving	70203	0.01	61.49	3.78	3.37	4.03	7.98	3.79
1990	Heavy duty vehicles	Highway driving	70301	0.01	18.07	4.56	6.76	0.84	0.67	1.18
1990	Heavy duty vehicles	Rural driving	70302	0.02	34.97	8.82	13.07	1.63	1.31	2.28
1990	Heavy duty vehicles	Urban driving	70303	0.01	23.86	6.02	8.92	1.11	0.89	1.56
1990	Mopeds		704							
1990	Motorcycles	Highway driving	70501	0.00	0.97	0.06	0.05	0.05	0.13	0.05
1990	Motorcycles	Rural driving	70502	0.00	2.17	0.14	0.11	0.12	0.28	0.11
1990	Motorcycles	Urban driving	70503	0.00	2.57	0.17	0.13	0.14	0.33	0.13
1990	Evaporation		706							
1990	Military		801	0.00	0.67	0.08	0.08	0.04	0.08	0.04
1990	Railways		802	0.00	5.48	1.40	1.56	0.23	0.20	0.36
1990	Inland waterways		803	0.00	2.84	0.26	0.22	0.13	0.40	0.18
1990	National sea traffic		80402	0.11	56.61	4.20	1.67	0.82	7.34	5.95
1990	Fishing		80403	0.10	58.77	5.07	2.38	1.19	11.33	9.35
1990	International sea traffic		80404	0.52	203.91	13.15	6.06	3.74	24.06	19.44
1990	Air traffic. Dom. < 3000 ft.		80501	0.00	0.49	0.02	0.01	0.01	0.08	0.03
1990	Air traffic. Int. < 3000 ft.		80502	0.00	0.16	0.01	0.00	0.00	0.02	0.01
1990	Air traffic. Dom. > 3000 ft.		80503	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1990	Air traffic. Int. > 3000 ft.		80504	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1990	Agriculture		806	0.02	75.51	9.56	9.43	4.86	9.56	4.96
1990	Forestry		807	0.00	2.12	0.15	0.11	0.08	0.32	0.13
1990	Industry		808	0.01	45.37	5.83	5.79	2.96	5.71	2.99
1990	Household and gardening		809	0.01	6.69	0.32	0.11	0.18	1.06	0.38

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]
2006	Passenger cars	Highway driving	70101	0.02	58.94	5.18	5.34	5.30	10.67	6.17
2006	Passenger cars	Rural driving	70102	0.04	147. 50	13.07	13.51	13.38	26.90	15.62
2006	Passenger cars	Urban driving	70103	0.03	101.15	8.68	8.85	8.87	17.88	10.20
2006	Light duty vehicles	Highway driving	70201	0.00	44.97	2.79	2.54	3.04	5.92	2.90
2006	Light duty vehicles	Rural driving	70202	0.01	149.92	9.30	8.48	10.13	19.72	9.65
2006	Light duty vehicles	Urban driving	70203	0.01	104.84	6.50	5.93	7.08	13.79	6.75
2006	Heavy duty vehicles	Highway driving	70301	0.01	25.71	6.49	9.61	1.20	0.96	1.68
2006	Heavy duty vehicles	Rural driving	70302	0.02	39.33	9.92	14.70	1.84	1.47	2.57
2006	Heavy duty vehicles	Urban driving	70303	0.01	22.21	5.60	8.30	1.04	0.83	1.45
2006	Mopeds		704							
2006	Motorcycles	Highway driving	70501	0.00	2.49	0.16	0.12	0.14	0.32	0.12
2006	Motorcycles	Rural driving	70502	0.01	6.72	0.44	0.34	0.37	0.87	0.34
2006	Motorcycles	Urban driving	70503	0.01	8.16	0.53	0.41	0.45	1.06	0.41
2006	Evaporation		706							
2006	Military		801	0.00	2.78	0.32	0.31	0.16	0.30	0.17
2006	Railways		802	0.00	4.32	1.10	1.23	0.18	0.16	0.28
2006	Inland waterways		803	0.00	6.01	0.59	0.52	0.30	0.73	0.36
2006	National sea traffic		80402	0.06	33.68	2.79	1.26	0.63	5.89	4.84
2006	Fishing		80403	0.08	47.28	4.08	1.91	0.96	9.11	7.52
2006	International sea traffic		80404	0.58	227.37	14.71	6.78	4.18	26.96	21.79
2006	Air traffic. Dom. < 3000 ft.		80501	0.00	0.40	0.02	0.01	0.01	0.06	0.02
2006	Air traffic. Int. < 3000 ft.		80502	0.00	0.01	0.00	0.00	0.00	0.00	0.00
2006	Air traffic. Dom. > 3000 ft.		80503	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2006	Air traffic. Int. > 3000 ft.		80504	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2006	Agriculture		806	0.01	65.21	7.54	7.27	3.78	7.05	3.96
2006	Forestry		807	0.00	1.02	0.10	0.08	0.05	0.13	0.06
2006	Industry		808	0.01	56.05	6.53	6.32	3.27	6.02	3.40
2006	Household and gardening		809	0.02	13.79	0.67	0.23	0.36	2.20	0.78

Annex 15: Fuel use and emissions in CRF format

Fuel

IPCC ID	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Industry-Other (1A2f)	11.7	11.7	11.6	11.6	11.6	11.5	11.5	11.5	11.5	11.5	11.6	11.7	11.7	11.9	11.9	12.0	12.1	12.3	12.4	12.5	13.0	13.9
Civil Aviation (1A3a)	3.6	3.3	3.7	3.8	3.6	3.4	2.8	2.7	2.6	2.7	2.8	2.8	2.9	2.7	2.4	2.1	2.2	1.9	1.9	1.8	1.9	2.0
Road (1A3b)	111.1	117.4	117.6	118.3	119.6	126.2	131.9	134.3	136.0	142.8	144.1	146.6	149.5	152.0	154.0	152.5	152.8	154.5	160.6	164.8	166.3	171.5
Railways (1A3c)	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	3.0	2.9	3.1	3.1
Navigation (1A3d)	9.3	9.3	9.3	9.4	9.4	9.4	9.5	9.7	9.6	9.7	10.2	11.2	10.9	8.8	7.3	6.3	6.1	6.0	6.1	6.3	6.2	6.1
Residential (1A4b)	1.6	1.6	1.6	1.5	1.5	1.5	1.6	1.6	1.6	1.6	1.6	1.6	1.7	1.7	1.7	1.8	2.0	2.2	2.5	2.8	3.0	3.2
Ag./for./fish. (1A4c)	24.4	26.0	23.8	25.5	25.3	25.7	25.7	24.3	23.8	22.9	23.4	22.2	21.2	20.6	21.3	22.0	21.7	22.2	21.8	20.4	21.4	21.6
Military (1A5)	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	1.3	3.3	3.7	1.7
Navigation int. (1A3d)	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	41.2	33.5	34.5	44.7
Civil Aviation int. (1A3a)	19.3	20.9	22.4	24.0	25.1	24.1	22.7	23.5	23.0	25.2	25.9	27.4	27.9	30.0	31.8	32.6	33.1	28.6	29.8	34.0	35.8	35.9

Emissions

pol_name	IPCC ID	Unit	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
SO_2	Industry-Other (1A2f)	[tons]	2402	1441	1440	1438	956	952	955	957	957	959	968
SO_2	Civil Aviation (1A3a)	[tons]	82	77	85	86	83	77	64	62	61	63	63
SO_2	Road (1A3b)	[tons]	11621	7862	7847	7857	5488	5767	5903	3820	1569	1669	1682
SO_2	Railways (1A3c)	[tons]	1152	695	618	641	393	376	382	263	105	95	96
SO_2	Navigation (1A3d)	[tons]	6363	6363	6367	6127	6130	5456	4232	2822	3522	4005	4502
SO_2	Residential (1A4b)	[tons]	4	4	4	4	4	4	4	4	4	4	4
SO_2	Ag./for./fish. (1A4c)	[tons]	4766	3484	3173	3073	2269	2303	2317	2186	2150	2072	2120
SO_2	Military (1A5)	[tons]	408	260	193	72	70	48	206	82	76	80	80
SO_2	Navigation int. (1A3d)	[tons]	18333	22047	36943	48034	48337	42404	34348	31152	59669	60081	66260
SO_2	Civil Aviation int. (1A3a)	[tons]	444	480	515	551	578	554	521	541	530	580	596
NO_X	Industry-Other (1A2f)	[tons]	10903	10964	11011	11044	11065	11081	11282	11440	11558	11677	11882
NO_X	Civil Aviation (1A3a)	[tons]	1203	1132	1237	1252	1208	1123	920	902	900	940	958
NO_X	Road (1A3b)	[tons]	92561	98284	98292	99080	100344	105933	107409	106683	104339	103482	99888
NO_X	Railways (1A3c)	[tons]	6025	6063	5391	5589	5145	4913	4995	5284	5485	4971	5015
NO_X	Navigation (1A3d)	[tons]	11778	11798	11852	11902	11962	12020	11433	11104	11007	11236	11898
NO_X	Residential (1A4b)	[tons]	96	99	101	103	103	104	111	118	125	130	136
NO_X	Ag./for./fish. (1A4c)	[tons]	18159	19915	18153	20143	20342	21066	21722	20824	20763	20524	21442
NO_X	Military (1A5)	[tons]	2340	2020	1625	980	873	494	1861	1011	1293	1273	1764
NO_X	Navigation int. (1A3d)	[tons]	23987	28474	43643	56580	58561	62285	55731	57636	89632	101094	106928
NO_X	Civil Aviation int. (1A3a)	[tons]	5663	6129	6569	7035	7313	7016	6586	6846	6702	7317	7517
NMVOC	Industry-Other (1A2f)	[tons]	2422	2395	2368	2339	2304	2266	2231	2191	2147	2107	2088
NMVOC	Civil Aviation (1A3a)	[tons]	216	213	190	198	193	186	168	164	161	191	206
NMVOC	Road (1A3b)	[tons]	80996	80718	80084	79593	77996	81811	82697	81762	79515	75265	70480
NMVOC	Railways (1A3c)	[tons]	393	396	352	365	336	321	326	345	358	324	327
NMVOC	Navigation (1A3d)	[tons]	1505	1505	1536	1566	1598	1630	1658	1699	1727	1761	1819
NMVOC	Residential (1A4b)	[tons]	4191	4166	4139	4112	4108	4104	4111	4094	4054	4070	4147
NMVOC	Ag./for./fish. (1A4c)	[tons]	6357	6417	6216	6284	6207	6149	5777	5298	4944	4638	4516
NMVOC	Military (1A5)	[tons]	601	469	175	490	315	54	172	94	129	124	159
NMVOC	Navigation int. (1A3d)	[tons]	880	1029	1527	1948	2003	2116	1900	1990	2993	3378	3560
NMVOC	Civil Aviation int. (1A3a)	[tons]	261	288	313	342	361	331	309	316	309	308	343
CH_4	Industry-Other (1A2f)	[tons]	63	63	62	61	61	60	58	57	56	54	53
CH_4	Civil Aviation (1A3a)	[tons]	8	8	8	8	8	7	6	6	6	7	7
CH_4	Road (1A3b)	[tons]	2378	2437	2450	2481	2472	2619	2658	2627	2592	2502	2370
CH_4	Railways (1A3c)	[tons]	15	15	14	14	13	12	13	13	14	12	13

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pol_name	IPCC ID	Unit	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
CH_4	Navigation (1A3d)	[tons]	28	28	29	29	30	31	31	32	33	33	35
CH_4	Residential (1A4b)	[tons]	158	156	153	150	150	150	147	144	140	138	136
CH_4	Ag./for./fish. (1A4c)	[tons]	155	154	147	146	142	139	132	123	116	110	106
CH_4	Military (1A5)	[tons]	31	26	17	18	14	5	19	10	13	13	18
CH_4	Navigation int. (1A3d)	[tons]	27	32	47	60	62	65	59	62	93	104	110
CH_4	Civil Aviation int. (1A3a)	[tons]	25	27	30	32	33	31	29	30	29	31	35
CO	Industry-Other (1A2f)	[tons]	9863	9784	9702	9611	9502	9379	9294	9188	9070	8956	8910
CO	Civil Aviation (1A3a)	[tons]	1256	1241	1118	1167	1140	1098	989	955	930	1098	1180
CO	Road (1A3b)	[tons]	561271	540938	521944	476251	448416	459539	474997	465106	466804	435050	412018
CO	Railways (1A3c)	[tons]	1098	1105	982	1018	937	895	910	963	999	906	914
CO	Navigation (1A3d)	[tons]	5291	5291	5453	5613	5777	5941	6095	6287	6428	6610	6861
CO	Residential (1A4b)	[tons]	50434	49697	48935	48149	47970	47787	46848	45867	45027	44365	43997
CO	Ag./for./fish. (1A4c)	[tons]	61165	59707	57256	55768	53717	51734	48771	45427	42608	39735	37673
CO	Military (1A5)	[tons]	4168	3098	1315	3127	1948	425	1028	525	860	881	905
CO	Navigation int. (1A3d)	[tons]	2903	3396	5038	6427	6608	6981	6268	6566	9873	11143	11745
CO	Civil Aviation int. (1A3a)	[tons]	1103	1207	1289	1416	1564	1442	1357	1399	1388	1342	1421
CO_2	Industry-Other (1A2f)	[ktons]	852	852	851	849	845	842	843	843	842	841	848
CO_2	Civil Aviation (1A3a)	[ktons]	256	241	268	271	262	243	199	193	190	196	199
CO_2	Road (1A3b)	[ktons]	8160	8625	8636	8694	8789	9275	9690	9863	9987	10487	10585
CO_2	Railways (1A3c)	[ktons]	364	366	326	338	311	297	302	319	331	300	303
CO_2	Navigation (1A3d)	[ktons]	702	701	705	707	710	714	713	727	717	729	766
CO_2	Residential (1A4b)	[ktons]	114	114	113	113	113	113	113	114	115	116	118
CO_2	Ag./for./fish. (1A4c)	[ktons]	1806	1922	1758	1887	1874	1899	1903	1794	1760	1695	1728
CO_2	Military (1A5)	[ktons]	402	316	361	196	165	119	287	141	237	252	252
CO_2	Navigation int. (1A3d)	[ktons]	1320	1537	2261	2869	2936	3087	2762	2887	4300	4829	5061
CO_2	Civil Aviation int. (1A3a)	[ktons]	1391	1503	1613	1725	1809	1736	1632	1693	1659	1818	1867
N_2O	Industry-Other (1A2f)	[tons]	34	34	34	34	34	34	34	35	35	35	35
N_2O	Civil Aviation (1A3a)	[tons]	10	10	11	11	11	10	9	9	9	9	10
N_2O	Road (1A3b)	[tons]	275	289	289	293	295	312	335	352	365	398	414
N_2O	Railways (1A3c)	[tons]	10	10	9	9	9	8	8	9	9	8	8
N_2O	Navigation (1A3d)	[tons]	43	43	43	43	43	43	43	44	43	44	46
N_2O	Residential (1A4b)	[tons]	2	2	2	2	2	2	2	2	2	2	2
N_2O	Ag./for./fish. (1A4c)	[tons]	81	87	78	85	85	87	88	83	81	79	81
N_2O	Military (1A5)	[tons]	12	10	11	6	5	4	8	4	7	8	7

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pol_name	IPCC ID	Unit	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
N_2O	Navigation int. (1A3d)	[tons]	83	97	142	180	185	194	174	182	270	304	318
N_2O	Civil Aviation int. (1A3a)	[tons]	47	50	54	58	61	59	56	58	57	63	64
NH_3	Industry-Other (1A2f)	[tons]	2	2	2	2	2	2	2	2	2	2	2
NH_3	Civil Aviation (1A3a)	[tons]	0	0	0	0	0	0	0	0	0	0	0
NH_3	Road (1A3b)	[tons]	62	64	64	66	66	70	248	441	623	946	1198
NH_3	Railways (1A3c)	[tons]	1	1	1	1	1	1	1	1	1	1	1
NH_3	Navigation (1A3d)	[tons]	0	0	0	0	0	0	0	0	0	0	0
NH_3	Residential (1A4b)	[tons]	0	0	0	0	0	0	0	0	0	0	0
NH_3	Ag./for./fish. (1A4c)	[tons]	3	3	3	3	3	3	3	3	3	3	3
NH_3	Military (1A5)	[tons]	1	1	0	0	0	0	1	0	0	0	1
NH_3	Navigation int. (1A3d)	[tons]		0						0	0		
NH_3	Civil Aviation int. (1A3a)	[tons]	0	0	0	0	0	0	0	0	0	0	0
TSP	Industry-Other (1A2f)	[tons]	1823	1778	1733	1686	1634	1577	1533	1484	1433	1383	1349
TSP	Civil Aviation (1A3a)	[tons]	5	5	5	5	5	5	4	4	4	4	4
TSP	Road (1A3b)	[tons]	4431	4764	4781	4722	4796	5053	5179	5026	5044	5164	4917
TSP	Railways (1A3c)	[tons]	247	249	222	229	211	202	205	217	225	204	206
TSP	Navigation (1A3d)	[tons]	948	948	953	948	953	781	612	451	561	646	773
TSP	Residential (1A4b)	[tons]	37	36	36	36	36	35	35	34	33	34	35
TSP	Ag./for./fish. (1A4c)	[tons]	2783	2820	2673	2723	2665	2628	2534	2362	2300	2119	2087
TSP	Military (1A5)	[tons]	103	103	51	18	26	12	116	69	66	57	120
TSP	Navigation int. (1A3d)	[tons]	3047	3663	6129	8024	8081	5677	4512	4139	8822	8348	10262
TSP	Civil Aviation int. (1A3a)	[tons]	23	24	26	28	30	28	27	28	27	29	30
PM_{10}	Industry-Other (1A2f)	[tons]	1823	1778	1733	1686	1634	1577	1533	1484	1433	1383	1349
PM_{10}	Civil Aviation (1A3a)	[tons]	5	5	5	5	5	5	4	4	4	4	4
PM_{10}	Road (1A3b)	[tons]	4431	4764	4781	4722	4796	5053	5179	5026	5044	5164	4917
PM_{10}	Railways (1A3c)	[tons]	247	249	222	229	211	202	205	217	225	204	206
PM_{10}	Navigation (1A3d)	[tons]	940	939	944	939	944	774	607	447	556	641	767
PM_{10}	Residential (1A4b)	[tons]	37	36	36	36	36	35	35	34	33	34	35
PM_{10}	Ag./for./fish. (1A4c)	[tons]	2781	2818	2671	2721	2663	2626	2532	2360	2298	2117	2086
PM_{10}	Military (1A5)	[tons]	103	103	51	18	26	12	116	69	66	57	120
PM_{10}	Navigation int. (1A3d)	[tons]	3016	3626	6068	7944	8000	5620	4467	4098	8734	8264	10160
PM_{10}	Civil Aviation int. (1A3a)	[tons]	23	24	26	28	30	28	27	28	27	29	30
$PM_{2.5}$	Industry-Other (1A2f)	[tons]	1823	1778	1733	1686	1634	1577	1533	1484	1433	1383	1349
$PM_{2.5}$	Civil Aviation (1A3a)	[tons]	5	5	5	5	5	5	4	4	4	4	4

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pol_name	IPCC ID	Unit	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
$PM_{2.5}$	Road (1A3b)	[tons]	4431	4764	4781	4722	4796	5053	5179	5026	5044	5164	4917
$PM_{2.5}$	Railways (1A3c)	[tons]	247	249	222	229	211	202	205	217	225	204	206
$PM_{2.5}$	Navigation (1A3d)	[tons]	935	935	939	935	940	771	604	446	554	638	764
$PM_{2.5}$	Residential (1A4b)	[tons]	37	36	36	36	36	35	35	34	33	34	35
$PM_{2.5}$	Ag./for./fish. (1A4c)	[tons]	2780	2817	2670	2720	2662	2625	2531	2359	2297	2116	2085
$PM_{2.5}$	Military (1A5)	[tons]	103	103	51	18	26	12	116	69	66	57	120
$PM_{2.5}$	Navigation int. (1A3d)	[tons]	3001	3608	6037	7904	7959	5592	4445	4077	8690	8223	10108
$PM_{2.5}$	Civil Aviation int. (1A3a)	[tons]	23	24	26	28	30	28	27	28	27	29	30
Arsenic	Civil Aviation (1A3a)	[kg]											
Arsenic	Navigation (1A3d)	[kg]						53	46	38	38	39	40
Arsenic	Ag./for./fish. (1A4c)	[kg]						9	10	9	8	8	8
Arsenic	Military (1A5)	[kg]										0	
Arsenic	Navigation int. (1A3d)	[kg]						363	302	276	475	505	514
Arsenic	Civil Aviation int. (1A3a)	[kg]											
Cadmium	Industry-Other (1A2f)	[kg]						2	2	2	2	2	2
Cadmium	Civil Aviation (1A3a)	[kg]						1	1	1	1	1	1
Cadmium	Road (1A3b)	[kg]						29	30	31	31	33	33
Cadmium	Railways (1A3c)	[kg]						1	1	1	1	1	1
Cadmium	Navigation (1A3d)	[kg]						4	4	4	3	4	4
Cadmium	Residential (1A4b)	[kg]						0	0	0	0	0	0
Cadmium	Ag./for./fish. (1A4c)	[kg]						6	6	6	6	5	5
Cadmium	Military (1A5)	[kg]						0	1	0	1	1	1
Cadmium	Navigation int. (1A3d)	[kg]						24	20	19	32	34	35
Cadmium	Civil Aviation int. (1A3a)	[kg]						6	5	5	5	6	6
Chromium	Industry-Other (1A2f)	[kg]						12	12	12	12	12	12
Chromium	Civil Aviation (1A3a)	[kg]						4	3	3	3	3	3
Chromium	Road (1A3b)	[kg]						146	152	155	157	165	166
Chromium	Railways (1A3c)	[kg]						5	5	5	5	5	5
Chromium	Navigation (1A3d)	[kg]						24	22	19	19	20	20
Chromium	Residential (1A4b)	[kg]						2	2	2	2	2	2
Chromium	Ag./for./fish. (1A4c)	[kg]						28	28	27	26	25	26
Chromium	Military (1A5)	[kg]						2	5	2	4	4	4
Chromium	Navigation int. (1A3d)	[kg]						150	127	118	199	213	218
Chromium	Civil Aviation int. (1A3a)	[kg]						28	26	27	26	29	30

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pol_name	IPCC ID	Unit	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
Copper	Industry-Other (1A2f)	[kg]						411	413	413	413	414	418
Copper	Civil Aviation (1A3a)	[kg]						131	107	104	102	106	107
Copper	Road (1A3b)	[kg]						4965	5184	5273	5337	5605	5657
Copper	Railways (1A3c)	[kg]						160	162	172	178	162	163
Copper	Navigation (1A3d)	[kg]						78	73	67	69	73	76
Copper	Residential (1A4b)	[kg]						60	60	61	61	62	63
Copper	Ag./for./fish. (1A4c)	[kg]						713	706	674	672	636	653
Copper	Military (1A5)	[kg]						64	154	76	128	136	136
Copper	Navigation int. (1A3d)	[kg]						363	302	276	475	505	514
Copper	Civil Aviation int. (1A3a)	[kg]						936	880	913	894	980	1006
Mercury	Civil Aviation (1A3a)	[kg]											
Mercury	Navigation (1A3d)	[kg]						8	8	9	9	9	9
Mercury	Ag./for./fish. (1A4c)	[kg]						9	10	9	8	8	8
Mercury	Military (1A5)	[kg]										0	
Mercury	Navigation int. (1A3d)	[kg]						28	26	30	40	47	51
Mercury	Civil Aviation int. (1A3a)	[kg]											
Nickel	Industry-Other (1A2f)	[kg]						17	17	17	17	17	17
Nickel	Civil Aviation (1A3a)	[kg]						5	4	4	4	4	4
Nickel	Road (1A3b)	[kg]						204	213	217	220	231	233
Nickel	Railways (1A3c)	[kg]						7	7	7	7	7	7
Nickel	Navigation (1A3d)	[kg]						2828	2355	1826	1825	1943	1958
Nickel	Residential (1A4b)	[kg]						2	2	2	3	3	3
Nickel	Ag./for./fish. (1A4c)	[kg]						42	42	40	39	37	38
Nickel	Military (1A5)	[kg]						3	6	3	5	6	6
Nickel	Navigation int. (1A3d)	[kg]						20956	17236	15429	27162	28664	29023
Nickel	Civil Aviation int. (1A3a)	[kg]						39	36	38	37	40	41
Lead	Industry-Other (1A2f)	[kg]						258	187	160	67	12	12
Lead	Civil Aviation (1A3a)	[kg]						1534	1423	1378	1328	1639	1788
Lead	Road (1A3b)	[kg]						97509	75857	68775	29817	54	55
Lead	Railways (1A3c)	[kg]						0	0	0	0		0
Lead	Navigation (1A3d)	[kg]						485	371	331	159	51	53
Lead	Residential (1A4b)	[kg]						2273	1666	1442	612	109	110
Lead	Ag./for./fish. (1A4c)	[kg]						1564	1069	859	346	71	67
Lead	Military (1A5)	[kg]						64	80	62	120	86	102

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pol_name	IPCC ID	Unit	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
Lead	Navigation int. (1A3d)	[kg]						167	144	142	226	247	256
Lead	Civil Aviation int. (1A3a)	[kg]						490	465	452	456	153	175
Selenium	Industry-Other (1A2f)	[kg]						2	2	2	2	2	2
Selenium	Civil Aviation (1A3a)	[kg]						1	1	1	1	1	1
Selenium	Road (1A3b)	[kg]						29	30	31	31	33	33
Selenium	Railways (1A3c)	[kg]						1	1	1	1	1	1
Selenium	Navigation (1A3d)	[kg]						61	58	55	54	55	57
Selenium	Residential (1A4b)	[kg]						0	0	0	0	0	0
Selenium	Ag./for./fish. (1A4c)	[kg]						41	42	39	37	37	37
Selenium	Military (1A5)	[kg]						0	1	0	1	1	1
Selenium	Navigation int. (1A3d)	[kg]						334	289	284	451	495	512
Selenium	Civil Aviation int. (1A3a)	[kg]						6	5	5	5	6	6
Zinc	Industry-Other (1A2f)	[kg]						242	243	243	243	243	246
Zinc	Civil Aviation (1A3a)	[kg]						77	63	61	60	62	63
Zinc	Road (1A3b)	[kg]						2921	3050	3102	3140	3297	3328
Zinc	Railways (1A3c)	[kg]						94	95	101	105	95	96
Zinc	Navigation (1A3d)	[kg]						158	152	147	146	151	157
Zinc	Residential (1A4b)	[kg]						35	35	36	36	36	37
Zinc	Ag./for./fish. (1A4c)	[kg]						506	505	479	474	453	463
Zinc	Military (1A5)	[kg]						38	91	45	75	80	80
Zinc	Navigation int. (1A3d)	[kg]						764	664	660	1038	1141	1183
Zinc	Civil Aviation int. (1A3a)	[kg]						551	518	537	526	576	592
Dioxins/furans	Industry-Other (1A2f)	[g]						0	0	0	0	0	0
Dioxins/furans	Civil Aviation (1A3a)	[g]						0	0	0	0	0	0
Dioxins/furans	Road (1A3b)	[g]						1	1	1	1	1	1
Dioxins/furans	Railways (1A3c)	[g]						0	0	0	0	0	0
Dioxins/furans	Navigation (1A3d)	[g]						0	0	0	0	0	0
Dioxins/furans	Residential (1A4b)	[g]						0	0	0	0	0	0
Dioxins/furans	Ag./for./fish. (1A4c)	[g]						0	0	0	0	0	0
Dioxins/furans	Military (1A5)	[g]						0	0	0	0	0	0
Dioxins/furans	Navigation int. (1A3d)	[g]						1	0	0	1	1	1
Dioxins/furans	Civil Aviation int. (1A3a)	[g]						0	0	0	0	0	0
Flouranthene	Industry-Other (1A2f)	[kg]						45	44	45	46	45	46
Flouranthene	Civil Aviation (1A3a)	[kg]						0	0	0	0	1	1

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pol_name	IPCC ID	Unit	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
Flouranthene	Road (1A3b)	[kg]						789	795	789	771	757	718
Flouranthene	Railways (1A3c)	[kg]						5	5	6	6	6	6
Flouranthene	Navigation (1A3d)	[kg]						59	61	64	63	64	67
Flouranthene	Residential (1A4b)	[kg]						7	7	7	7	7	7
Flouranthene	Ag./for./fish. (1A4c)	[kg]						136	135	128	127	121	124
Flouranthene	Military (1A5)	[kg]						1	7	4	4	3	8
Flouranthene	Navigation int. (1A3d)	[kg]						204	190	212	294	340	361
Flouranthene	Civil Aviation int. (1A3a)	[kg]						0	0	0	0	0	0
Benzo(b) flouranthene	Industry-Other (1A2f)	[kg]						6	6	6	6	6	6
Benzo(b) flouranthene	Civil Aviation (1A3a)	[kg]						0	0	0	0	0	0
Benzo(b) flouranthene	Road (1A3b)	[kg]						65	66	66	65	66	65
Benzo(b) flouranthene	Railways (1A3c)	[kg]						1	1	1	2	1	1
Benzo(b) flouranthene	Navigation (1A3d)	[kg]						4	5	5	5	5	5
Benzo(b) flouranthene	Residential (1A4b)	[kg]						0	0	0	0	0	0
Benzo(b) flouranthene	Ag./for./fish. (1A4c)	[kg]						15	15	14	14	13	13
Benzo(b) flouranthene	Military (1A5)	[kg]						0	1	1	1	0	1
Benzo(b) flouranthene	Navigation int. (1A3d)	[kg]						13	13	15	20	23	25
Benzo(b) flouranthene	Civil Aviation int. (1A3a)	[kg]						0	0	0	0	0	0
Benzo(k) flouranthene	Industry-Other (1A2f)	[kg]						6	6	6	6	6	6
Benzo(k) flouranthene	Civil Aviation (1A3a)	[kg]						0	0	0	0	0	0
Benzo(k) flouranthene	Road (1A3b)	[kg]						65	67	67	66	69	69
Benzo(k) flouranthene	Railways (1A3c)	[kg]						2	2	2	2	2	2
Benzo(k) flouranthene	Navigation (1A3d)	[kg]						2	2	2	2	2	2
Benzo(k) flouranthene	Residential (1A4b)	[kg]						0	0	0	0	0	0
Benzo(k) flouranthene	Ag./for./fish. (1A4c)	[kg]						12	12	11	11	11	11
Benzo(k) flouranthene	Military (1A5)	[kg]						0	1	1	1	0	1
Benzo(k) flouranthene	Navigation int. (1A3d)	[kg]						6	6	7	9	11	12
Benzo(k) flouranthene	Civil Aviation int. (1A3a)	[kg]						0	0	0	0	0	0
Benzo(a) pyrene	Industry-Other (1A2f)	[kg]						3	3	3	3	3	3
Benzo(a) pyrene	Civil Aviation (1A3a)	[kg]						0	0	0	0	0	0
Benzo(a) pyrene	Road (1A3b)	[kg]						45	46	46	46	47	45
Benzo(a) pyrene	Railways (1A3c)	[kg]						0	0	0	0	0	0
Benzo(a) pyrene	Navigation (1A3d)	[kg]						1	1	1	1	1	1
Benzo(a) pyrene	Residential (1A4b)	[kg]						0	0	0	0	0	0

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pol_name	IPCC ID	Unit	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
Benzo(a) pyrene	Ag./for./fish. (1A4c)	[kg]						6	6	6	6	5	5
Benzo(a) pyrene	Military (1A5)	[kg]						0	0	0	0	0	1
Benzo(a) pyrene	Navigation int. (1A3d)	[kg]						4	4	4	5	6	7
Benzo(a) pyrene	Civil Aviation int. (1A3a)	[kg]						0	0	0	0	0	0
Benzo(g,h,i) perylene	Industry-Other (1A2f)	[kg]						6	6	6	6	5	6
Benzo(g,h,i) perylene	Civil Aviation (1A3a)	[kg]						0	0	0	0	0	0
Benzo(g,h,i) perylene	Road (1A3b)	[kg]						95	97	98	97	97	93
Benzo(g,h,i) perylene	Railways (1A3c)	[kg]						0	0	0	0	0	0
Benzo(g,h,i) perylene	Navigation (1A3d)	[kg]						8	9	10	10	10	10
Benzo(g,h,i) perylene	Residential (1A4b)	[kg]						1	1	1	1	1	1
Benzo(g,h,i) perylene	Ag./for./fish. (1A4c)	[kg]						21	21	20	19	19	19
Benzo(g,h,i) perylene	Military (1A5)	[kg]						0	1	1	1	0	1
Benzo(g,h,i) perylene	Navigation int. (1A3d)	[kg]						24	24	30	37	45	49
Benzo(g,h,i) perylene	Civil Aviation int. (1A3a)	[kg]						0	0	0	0	0	0
indeno(1,2,3-c,d) pyrene	Industry-Other (1A2f)	[kg]						3	3	3	3	3	3
indeno(1,2,3-c,d) pyrene	Civil Aviation (1A3a)	[kg]						0	0	0	0	0	0
indeno(1,2,3-c,d) pyrene	Road (1A3b)	[kg]						43	45	45	46	47	47
indeno(1,2,3-c,d) pyrene	Railways (1A3c)	[kg]						0	0	0	0	0	0
indeno(1,2,3-c,d) pyrene	Navigation (1A3d)	[kg]						6	7	8	8	8	8
indeno(1,2,3-c,d) pyrene	Residential (1A4b)	[kg]						0	0	0	0	0	0
indeno(1,2,3-c,d) pyrene	Ag./for./fish. (1A4c)	[kg]						14	15	14	13	13	13
indeno(1,2,3-c,d) pyrene	Military (1A5)	[kg]						0	0	0	0	0	1
indeno(1,2,3-c,d) pyrene	Navigation int. (1A3d)	[kg]						19	20	24	30	36	39
indeno(1,2,3-c,d) pyrene	Civil Aviation int. (1A3a)	[kg]						0	0	0	0	0	0

pol_name	IPCC ID	Unit	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
SO_2	Industry-Other (1A2f)	[tons]	244	246	249	251	253	256	258	261	263	28	30
SO_2	Civil Aviation (1A3a)	[tons]	65	68	62	56	49	52	45	44	40	43	45
SO_2	Road (1A3b)	[tons]	1721	1744	1768	1088	352	353	357	371	381	77	79
SO_2	Railways (1A3c)	[tons]	95	93	78	40	7	7	7	7	7	1	1
SO_2	Navigation (1A3d)	[tons]	3454	2632	1541	1276	1116	1027	953	984	1138	1146	1089
SO_2	Residential (1A4b)	[tons]	4	4	4	4	4	4	5	6	6	1	1
SO_2	Ag./for./fish. (1A4c)	[tons]	982	867	871	947	1035	998	1051	1008	863	649	632
SO_2	Military (1A5)	[tons]	56	54	65	47	27	12	19	17	46	57	26
SO_2	Navigation int. (1A3d)	[tons]	62320	57078	48000	50568	56634	45358	31538	33060	28581	36544	52936
SO_2	Civil Aviation int. (1A3a)	[tons]	629	642	689	731	750	761	658	684	782	822	825
NO_X	Industry-Other (1A2f)	[tons]	12080	12248	12425	12262	12096	11869	11617	11214	10744	10664	10807
NO_X	Civil Aviation (1A3a)	[tons]	971	998	911	815	723	747	636	590	546	579	596
NO_X	Road (1A3b)	[tons]	96827	93041	89052	85941	81108	78485	74679	74275	72201	68519	66993
NO_X	Railways (1A3c)	[tons]	4977	4846	4089	3730	3727	3396	3396	3540	3478	3724	3542
NO_X	Navigation (1A3d)	[tons]	13458	12388	9973	8095	7284	7172	7372	7261	7407	7465	7436
NO_X	Residential (1A4b)	[tons]	140	144	149	151	153	167	183	202	223	249	275
NO_X	Ag./for./fish. (1A4c)	[tons]	21188	20367	20307	21710	22991	22865	23412	22477	20102	20944	20199
NO_X	Military (1A5)	[tons]	965	1219	1415	1096	551	719	486	542	1318	1335	619
NO_X	Navigation int. (1A3d)	[tons]	102221	94977	94125	91400	96911	81585	66095	71376	58906	62825	84716
NO_X	Civil Aviation int. (1A3a)	[tons]	7904	8058	8662	9204	9446	9610	8737	9097	10481	11037	11175
NMVOC	Industry-Other (1A2f)	[tons]	2095	2083	2074	1997	1926	1873	1815	1754	1676	1620	1583
NMVOC	Civil Aviation (1A3a)	[tons]	194	186	169	162	156	155	151	143	157	165	155
NMVOC	Road (1A3b)	[tons]	66214	60042	54906	48977	41599	37854	34307	31872	28154	25947	23171
NMVOC	Railways (1A3c)	[tons]	325	316	267	276	253	248	243	223	217	235	230
NMVOC	Navigation (1A3d)	[tons]	1899	1882	1787	1701	1636	1600	1559	1501	1436	1324	1195
NMVOC	Residential (1A4b)	[tons]	4231	4314	4395	4499	4602	5328	6082	6869	7685	7859	8037
NMVOC	Ag./for./fish. (1A4c)	[tons]	4210	3974	3699	3572	3421	3253	3085	2864	2593	2575	2541
NMVOC	Military (1A5)	[tons]	95	110	123	112	58	60	48	50	111	116	56
NMVOC	Navigation int. (1A3d)	[tons]	3398	3138	3158	3003	3126	2651	2190	2334	1914	2005	2643
NMVOC	Civil Aviation int. (1A3a)	[tons]	360	365	386	395	407	406	391	399	451	469	492
CH_4	Industry-Other (1A2f)	[tons]	53	53	53	51	50	49	48	47	46	45	44
CH_4	Civil Aviation (1A3a)	[tons]	7	7	7	6	5	5	5	5	6	7	6
CH_4	Road (1A3b)	[tons]	2265	2176	2090	1980	1861	1740	1636	1572	1480	1376	1290
CH_4	Railways (1A3c)	[tons]	12	12	10	11	10	10	9	9	8	9	9
CH_4	Navigation (1A3d)	[tons]	37	36	33	31	30	31	31	32	32	32	32

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pol_name	IPCC ID	Unit	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
CH_4	Residential (1A4b)	[tons]	135	134	134	135	137	149	164	183	204	219	233
CH_4	Ag./for./fish. (1A4c)	[tons]	100	94	89	88	88	86	86	85	82	86	94
CH_4	Military (1A5)	[tons]	10	12	14	11	6	7	5	5	13	13	6
CH_4	Navigation int. (1A3d)	[tons]	105	97	98	93	97	82	68	72	59	62	82
CH_4	Civil Aviation int. (1A3a)	[tons]	37	38	40	41	42	42	41	42	47	49	52
CO	Industry-Other (1A2f)	[tons]	8963	8939	8907	8647	8395	8227	8030	7842	7600	7497	7515
CO	Civil Aviation (1A3a)	[tons]	1117	1085	973	932	895	888	860	832	855	858	838
CO	Road (1A3b)	[tons]	399617	346233	325320	290786	267325	256942	235566	225428	200562	192046	171521
CO	Railways (1A3c)	[tons]	907	883	745	717	694	637	627	611	599	648	626
CO	Navigation (1A3d)	[tons]	7130	7047	6876	6775	6804	6972	7173	7348	7549	7571	7192
CO	Residential (1A4b)	[tons]	44112	44229	44347	45103	45873	50280	56144	63688	72683	80610	87744
CO	Ag./for./fish. (1A4c)	[tons]	34865	32482	29849	27850	25867	24029	22187	20250	18206	17176	16976
CO	Military (1A5)	[tons]	627	617	704	706	407	327	321	315	734	823	391
CO	Navigation int. (1A3d)	[tons]	11211	10351	10417	9905	10313	8745	7225	7701	6316	6615	8719
CO	Civil Aviation int. (1A3a)	[tons]	1502	1564	1662	1743	1790	1797	1610	1670	1845	1914	1871
CO_2	Industry-Other (1A2f)	[ktons]	853	860	867	873	879	888	897	907	912	950	1021
CO_2	Civil Aviation (1A3a)	[ktons]	205	212	194	174	154	161	140	137	127	133	141
CO_2	Road (1A3b)	[ktons]	10764	10978	11166	11312	11202	11223	11352	11806	12115	12229	12594
CO_2	Railways (1A3c)	[ktons]	301	293	247	232	228	211	210	218	216	232	227
CO_2	Navigation (1A3d)	[ktons]	836	809	656	540	466	452	449	452	466	462	455
CO_2	Residential (1A4b)	[ktons]	120	122	124	127	129	143	161	182	205	220	233
CO_2	Ag./for./fish. (1A4c)	[ktons]	1645	1566	1521	1577	1626	1602	1644	1611	1507	1586	1599
CO_2	Military (1A5)	[ktons]	176	171	204	182	111	97	89	92	239	271	126
CO_2	Navigation int. (1A3d)	[ktons]	4803	4403	4414	4155	4279	3605	2966	3130	2545	2636	3433
CO_2	Civil Aviation int. (1A3a)	[ktons]	1971	2010	2159	2290	2350	2385	2059	2142	2449	2575	2583
N_2O	Industry-Other (1A2f)	[tons]	36	36	36	37	37	38	38	38	39	40	43
N_2O	Civil Aviation (1A3a)	[tons]	11	11	9	9	8	8	8	8	8	8	8
N_2O	Road (1A3b)	[tons]	430	442	447	450	443	429	421	420	421	406	402
N_2O	Railways (1A3c)	[tons]	8	8	7	6	6	6	6	6	6	6	6
N_2O	Navigation (1A3d)	[tons]	50	49	39	31	27	26	25	25	26	26	26
N_2O	Residential (1A4b)	[tons]	2	2	2	2	2	2	2	3	3	3	4
N_2O	Ag./for./fish. (1A4c)	[tons]	77	72	71	75	79	77	80	78	72	77	77
N_2O	Military (1A5)	[tons]	5	5	6	6	3	3	3	3	8	9	4
N_2O	Navigation int. (1A3d)	[tons]	302	277	278	262	269	227	187	197	160	166	216

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pol_name	IPCC ID	Unit	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
N_2O	Civil Aviation int. (1A3a)	[tons]	69	70	75	80	82	82	72	75	85	89	89
NH_3	Industry-Other (1A2f)	[tons]	2	2	2	2	2	2	2	2	2	2	2
NH_3	Civil Aviation (1A3a)	[tons]	0	0	0	0	0	0	0	0	0	0	0
NH_3	Road (1A3b)	[tons]	1428	1862	2226	2492	2657	2536	2472	2376	2281	2123	1951
NH_3	Railways (1A3c)	[tons]	1	1	1	1	1	1	1	1	1	1	1
NH_3	Navigation (1A3d)	[tons]	0	0	0	0	0	0	0	0	0	0	0
NH_3	Residential (1A4b)	[tons]	0	0	0	0	0	0	0	0	0	0	0
NH_3	Ag./for./fish. (1A4c)	[tons]	3	3	3	3	3	3	3	3	3	3	3
NH_3	Military (1A5)	[tons]	0	0	0	1	0	0	0	0	1	1	0
NH_3	Navigation int. (1A3d)	[tons]											
NH_3	Civil Aviation int. (1A3a)	[tons]	0	0	0	0	0	0	0	0	0	0	0
TSP	Industry-Other (1A2f)	[tons]	1317	1284	1249	1193	1135	1121	1098	1075	1037	1002	991
TSP	Civil Aviation (1A3a)	[tons]	4	4	4	4	3	3	3	3	3	3	3
TSP	Road (1A3b)	[tons]	4814	4444	4191	3986	3732	3599	3360	3386	3177	3150	3101
TSP	Railways (1A3c)	[tons]	204	199	168	146	141	125	124	119	115	124	120
TSP	Navigation (1A3d)	[tons]	612	542	375	333	304	295	288	293	312	306	291
TSP	Residential (1A4b)	[tons]	36	38	39	40	41	50	58	67	76	78	79
TSP	Ag./for./fish. (1A4c)	[tons]	1893	1786	1637	1580	1510	1443	1377	1294	1194	1149	1086
TSP	Military (1A5)	[tons]	48	78	84	53	19	41	19	24	51	45	21
TSP	Navigation int. (1A3d)	[tons]	10169	9437	7917	8390	8994	7414	5254	4816	4293	6155	8300
TSP	Civil Aviation int. (1A3a)	[tons]	32	32	35	37	38	38	33	35	40	42	42
PM_{10}	Industry-Other (1A2f)	[tons]	1317	1284	1249	1193	1135	1121	1098	1075	1037	1002	991
PM_{10}	Civil Aviation (1A3a)	[tons]	4	4	4	4	3	3	3	3	3	3	3
PM_{10}	Road (1A3b)	[tons]	4814	4444	4191	3986	3732	3599	3360	3386	3177	3150	3101
PM_{10}	Railways (1A3c)	[tons]	204	199	168	146	141	125	124	119	115	124	120
PM_{10}	Navigation (1A3d)	[tons]	607	538	373	331	302	293	287	291	311	305	289
PM_{10}	Residential (1A4b)	[tons]	36	38	39	40	41	50	58	67	76	78	79
PM_{10}	Ag./for./fish. (1A4c)	[tons]	1892	1785	1636	1578	1508	1441	1375	1292	1192	1148	1084
PM_{10}	Military (1A5)	[tons]	48	78	84	53	19	41	19	24	51	45	21
PM_{10}	Navigation int. (1A3d)	[tons]	10068	9342	7838	8306	8904	7340	5201	4767	4250	6094	8217
PM_{10}	Civil Aviation int. (1A3a)	[tons]	32	32	35	37	38	38	33	35	40	42	42
$PM_{2.5}$	Industry-Other (1A2f)	[tons]	1317	1284	1249	1193	1135	1121	1098	1075	1037	1002	991
$PM_{2.5}$	Civil Aviation (1A3a)	[tons]	4	4	4	4	3	3	3	3	3	3	3
$PM_{2.5}$	Road (1A3b)	[tons]	4814	4444	4191	3986	3732	3599	3360	3386	3177	3150	3101

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pol_name	IPCC ID	Unit	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
$PM_{2.5}$	Railways (1A3c)	[tons]	204	199	168	146	141	125	124	119	115	124	120
$PM_{2.5}$	Navigation (1A3d)	[tons]	605	536	371	330	301	293	286	291	310	304	288
$PM_{2.5}$	Residential (1A4b)	[tons]	36	38	39	40	41	50	58	67	76	78	79
$PM_{2.5}$	Ag./for./fish. (1A4c)	[tons]	1891	1785	1635	1578	1507	1441	1374	1292	1192	1147	1084
$PM_{2.5}$	Military (1A5)	[tons]	48	78	84	53	19	41	19	24	51	45	21
$PM_{2.5}$	Navigation int. (1A3d)	[tons]	10017	9295	7799	8264	8859	7303	5175	4743	4229	6063	8175
$PM_{2.5}$	Civil Aviation int. (1A3a)	[tons]	32	32	35	37	38	38	33	35	40	42	42
Arsenic	Civil Aviation (1A3a)	[kg]				0	0	0	0	0	0	0	0
Arsenic	Navigation (1A3d)	[kg]	35	26	19	15	14	13	13	13	13	13	13
Arsenic	Ag./for./fish. (1A4c)	[kg]	8	6	7	8	9	8	9	8	7	8	7
Arsenic	Military (1A5)	[kg]				0	0	0	0	0	0	0	0
Arsenic	Navigation int. (1A3d)	[kg]	332	426	366	379	432	342	240	274	230	268	401
Arsenic	Civil Aviation int. (1A3a)	[kg]				0	0	0	0	0	0	0	0
Cadmium	Industry-Other (1A2f)	[kg]	2	2	3	2	3	3	3	3	3	3	3
Cadmium	Civil Aviation (1A3a)	[kg]	1	1	1	1	0	1	0	0	0	0	0
Cadmium	Road (1A3b)	[kg]	34	34	35	36	35	35	36	37	38	38	40
Cadmium	Railways (1A3c)	[kg]	1	1	1	1	1	1	1	1	1	1	1
Cadmium	Navigation (1A3d)	[kg]	4	3	2	2	2	2	2	2	2	2	2
Cadmium	Residential (1A4b)	[kg]	0	0	0	0	0	0	1	1	1	1	1
Cadmium	Ag./for./fish. (1A4c)	[kg]	5	5	5	5	5	5	5	5	5	5	5
Cadmium	Military (1A5)	[kg]	1	1	1	1	0	0	0	0	1	1	0
Cadmium	Navigation int. (1A3d)	[kg]	20	30	27	27	29	24	18	20	16	18	26
Cadmium	Civil Aviation int. (1A3a)	[kg]	6	6	7	7	8	8	7	7	8	8	8
Chromium	Industry-Other (1A2f)	[kg]	12	12	13	13	13	13	13	13	13	14	15
Chromium	Civil Aviation (1A3a)	[kg]	3	3	3	3	2	3	2	2	2	2	2
Chromium	Road (1A3b)	[kg]	169	173	175	178	176	176	179	186	191	192	199
Chromium	Railways (1A3c)	[kg]	5	5	4	4	4	3	3	3	3	4	4
Chromium	Navigation (1A3d)	[kg]	19	16	12	10	9	9	9	9	9	9	9
Chromium	Residential (1A4b)	[kg]	2	2	2	2	2	2	3	3	3	3	4
Chromium	Ag./for./fish. (1A4c)	[kg]	24	23	23	23	24	24	24	24	23	24	24
Chromium	Military (1A5)	[kg]	3	3	3	3	2	2	1	1	4	4	2
Chromium	Navigation int. (1A3d)	[kg]	133	182	161	164	184	147	106	120	100	114	167
Chromium	Civil Aviation int. (1A3a)	[kg]	31	32	34	36	37	38	33	34	39	41	41
Copper	Industry-Other (1A2f)	[kg]	421	425	429	432	435	440	445	450	454	474	513

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pol_name	IPCC ID	Unit	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Copper	Civil Aviation (1A3a)	[kg]	110	114	104	94	83	87	75	74	68	72	76
Copper	Road (1A3b)	[kg]	5754	5867	5968	6047	5989	6001	6072	6314	6481	6543	6750
Copper	Railways (1A3c)	[kg]	162	157	133	125	123	114	113	117	116	125	122
Copper	Navigation (1A3d)	[kg]	73	66	60	59	60	62	64	66	69	68	67
Copper	Residential (1A4b)	[kg]	64	65	66	67	69	76	86	96	109	117	124
Copper	Ag./for./fish. (1A4c)	[kg]	623	630	597	595	581	585	586	586	593	599	613
Copper	Military (1A5)	[kg]	95	92	110	98	60	52	48	50	129	146	68
Copper	Navigation int. (1A3d)	[kg]	332	426	366	379	432	342	240	274	230	268	401
Copper	Civil Aviation int. (1A3a)	[kg]	1063	1084	1164	1234	1267	1286	1110	1155	1320	1388	1392
Mercury	Civil Aviation (1A3a)	[kg]				0	0	0	0	0	0	0	0
Mercury	Navigation (1A3d)	[kg]	11	11	9	7	5	5	5	5	5	5	5
Mercury	Ag./for./fish. (1A4c)	[kg]	8	6	7	8	9	8	9	8	7	8	7
Mercury	Military (1A5)	[kg]				0	0	0	0	0	0	0	0
Mercury	Navigation int. (1A3d)	[kg]	14	46	50	44	43	38	34	34	27	26	31
Mercury	Civil Aviation int. (1A3a)	[kg]				0	0	0	0	0	0	0	0
Nickel	Industry-Other (1A2f)	[kg]	17	17	18	18	18	18	18	19	19	20	21
Nickel	Civil Aviation (1A3a)	[kg]	5	5	4	4	3	4	3	3	3	3	3
Nickel	Road (1A3b)	[kg]	237	242	246	249	247	247	250	260	267	269	278
Nickel	Railways (1A3c)	[kg]	7	6	5	5	5	5	5	5	5	5	5
Nickel	Navigation (1A3d)	[kg]	1553	986	645	543	534	501	492	483	503	507	482
Nickel	Residential (1A4b)	[kg]	3	3	3	3	3	3	4	4	4	5	5
Nickel	Ag./for./fish. (1A4c)	[kg]	36	35	34	35	36	35	36	36	33	35	35
Nickel	Military (1A5)	[kg]	4	4	5	4	2	2	2	2	5	6	3
Nickel	Navigation int. (1A3d)	[kg]	19856	23826	19820	20967	24364	19050	12906	15043	12715	15126	23174
Nickel	Civil Aviation int. (1A3a)	[kg]	44	45	48	51	52	53	46	48	54	57	57
Lead	Industry-Other (1A2f)	[kg]	12	0	0	0	0	0	0	0	0	0	0
Lead	Civil Aviation (1A3a)	[kg]	1640	1559	1399	1387	1369	1343	1328	1252	1304	1297	1245
Lead	Road (1A3b)	[kg]	55	57	58	58	57	56	56	56	55	53	52
Lead	Railways (1A3c)	[kg]	0	0	0	0	0	0	0				
Lead	Navigation (1A3d)	[kg]	55	27	21	16	14	13	13	13	13	13	13
Lead	Residential (1A4b)	[kg]	112	1	1	1	1	1	2	2	2	2	2
Lead	Ag./for./fish. (1A4c)	[kg]	63	13	14	16	18	17	18	17	13	16	15
Lead	Military (1A5)	[kg]	98	123	116	78	114	88	106	78	82	59	47
Lead	Navigation int. (1A3d)	[kg]	134	218	205	201	216	177	136	149	122	133	185

Continued

pol_name	IPCC ID	Unit	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Lead	Civil Aviation int. (1A3a)	[kg]	126	145	145	124	118	114	113	106	111	117	22
Selenium	Industry-Other (1A2f)	[kg]	2	2	3	2	3	3	3	3	3	3	3
Selenium	Civil Aviation (1A3a)	[kg]	1	1	1	1	0	1	0	0	0	0	0
Selenium	Road (1A3b)	[kg]	34	34	35	36	35	35	36	37	38	38	40
Selenium	Railways (1A3c)	[kg]	1	1	1	1	1	1	1	1	1	1	1
Selenium	Navigation (1A3d)	[kg]	59	53	41	33	28	26	26	26	26	26	26
Selenium	Residential (1A4b)	[kg]	0	0	0	0	0	0	1	1	1	1	1
Selenium	Ag./for./fish. (1A4c)	[kg]	35	29	30	34	39	37	39	37	30	34	33
Selenium	Military (1A5)	[kg]	1	1	1	1	0	0	0	0	1	1	0
Selenium	Navigation int. (1A3d)	[kg]	269	436	410	401	431	354	273	297	245	267	370
Selenium	Civil Aviation int. (1A3a)	[kg]	6	6	7	7	8	8	7	7	8	8	8
Zinc	Industry-Other (1A2f)	[kg]	248	250	252	254	256	259	262	265	267	279	302
Zinc	Civil Aviation (1A3a)	[kg]	65	67	61	55	49	51	44	43	40	42	45
Zinc	Road (1A3b)	[kg]	3384	3451	3511	3557	3523	3530	3572	3714	3812	3849	3971
Zinc	Railways (1A3c)	[kg]	95	93	78	73	72	67	67	69	68	73	72
Zinc	Navigation (1A3d)	[kg]	164	152	124	105	94	92	92	93	96	96	94
Zinc	Residential (1A4b)	[kg]	37	38	39	40	40	45	50	57	64	69	73
Zinc	Ag./for./fish. (1A4c)	[kg]	441	431	414	422	425	423	430	425	411	425	431
Zinc	Military (1A5)	[kg]	56	54	65	58	35	31	28	29	76	86	40
Zinc	Navigation int. (1A3d)	[kg]	607	1010	959	933	997	821	639	693	570	616	848
Zinc	Civil Aviation int. (1A3a)	[kg]	625	638	685	726	745	756	653	679	776	817	819
Dioxins/furans	Industry-Other (1A2f)	[g]	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
Dioxins/furans	Road (1A3b)	[g]	1	1	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
Dioxins/furans	Navigation (1A3d)	[g]	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
Dioxins/furans	Ag./for./fish. (1A4c)	[g]	0	0	0	0	0	0	0	0	0	0	0
Dioxins/furans	Military (1A5)	[g]	0	0	0	0	0	0	0	0	0	0	0
Dioxins/furans	Navigation int. (1A3d)	[g]	1	1	1	1	1	1	0	1	0	0	1
Dioxins/furans	Civil Aviation int. (1A3a)	[g]	0	0	0	0	0	0	0	0	0	0	0
Flouranthene	Industry-Other (1A2f)	[kg]	46	46	46	46	48	48	49	49	50	52	56
Flouranthene	Civil Aviation (1A3a)	[kg]	1	0	0	0	0	0	0	0	0	0	0
Flouranthene	Road (1A3b)	[kg]	683	650	621	599	582	571	575	601	629	666	712

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pol_name	IPCC ID	Unit	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Flouranthene	Railways (1A3c)	[kg]	6	6	5	4	4	4	4	4	4	4	4
Flouranthene	Navigation (1A3d)	[kg]	75	75	60	49	41	40	39	40	41	40	40
Flouranthene	Residential (1A4b)	[kg]	7	7	7	8	8	9	10	11	12	13	14
Flouranthene	Ag./for./fish. (1A4c)	[kg]	117	108	105	112	119	116	120	117	106	113	114
Flouranthene	Military (1A5)	[kg]	3	6	6	4	2	4	2	3	6	6	3
Flouranthene	Navigation int. (1A3d)	[kg]	349	322	343	311	306	266	232	238	191	188	227
Flouranthene	Civil Aviation int. (1A3a)	[kg]	0	0	0	0	0	0	0	0	0	0	0
Benzo(b) flouranthene	Industry-Other (1A2f)	[kg]	6	6	6	6	6	6	6	6	6	6	7
Benzo(b) flouranthene	Civil Aviation (1A3a)	[kg]	0	0	0	0	0	0	0	0	0	0	0
Benzo(b) flouranthene	Road (1A3b)	[kg]	64	62	61	61	59	59	59	62	64	65	69
Benzo(b) flouranthene	Railways (1A3c)	[kg]	1	1	1	1	1	1	1	1	1	1	1
Benzo(b) flouranthene	Navigation (1A3d)	[kg]	6	6	5	4	3	3	3	3	3	3	3
Benzo(b) flouranthene	Residential (1A4b)	[kg]	0	0	0	0	0	0	0	1	1	1	1
Benzo(b) flouranthene	Ag./for./fish. (1A4c)	[kg]	13	12	11	12	12	12	12	12	11	12	12
Benzo(b) flouranthene	Military (1A5)	[kg]	0	1	1	1	0	0	0	0	1	1	0
Benzo(b) flouranthene	Navigation int. (1A3d)	[kg]	25	23	25	22	21	19	17	17	14	13	15
Benzo(b) flouranthene	Civil Aviation int. (1A3a)	[kg]	0	0	0	0	0	0	0	0	0	0	0
Benzo(k) flouranthene	Industry-Other (1A2f)	[kg]	6	6	6	6	6	5	5	6	6	6	6
Benzo(k) flouranthene	Civil Aviation (1A3a)	[kg]	0	0	0	0	0	0	0	0	0	0	0
Benzo(k) flouranthene	Road (1A3b)	[kg]	69	69	69	69	68	67	68	71	74	75	78
Benzo(k) flouranthene	Railways (1A3c)	[kg]	2	2	1	1	1	1	1	1	1	1	1
Benzo(k) flouranthene	Navigation (1A3d)	[kg]	3	3	3	2	2	2	2	2	2	2	2
Benzo(k) flouranthene	Residential (1A4b)	[kg]	0	0	0	0	0	0	0	0	0	0	0
Benzo(k) flouranthene	Ag./for./fish. (1A4c)	[kg]	10	10	9	9	9	9	9	9	9	9	9
Benzo(k) flouranthene	Military (1A5)	[kg]	0	1	1	1	0	0	0	0	1	1	0
Benzo(k) flouranthene	Navigation int. (1A3d)	[kg]	11	11	12	10	10	9	8	8	6	6	7
Benzo(k) flouranthene	Civil Aviation int. (1A3a)	[kg]	0	0	0	0	0	0	0	0	0	0	0
Benzo(a) pyrene	Industry-Other (1A2f)	[kg]	3	3	3	3	3	3	3	3	3	3	3
Benzo(a) pyrene	Civil Aviation (1A3a)	[kg]	0	0	0	0	0	0	0	0	0	0	0
Benzo(a) pyrene	Road (1A3b)	[kg]	44	44	43	43	42	42	43	45	47	50	53
Benzo(a) pyrene	Railways (1A3c)	[kg]	0	0	0	0	0	0	0	0	0	0	0
Benzo(a) pyrene	Navigation (1A3d)	[kg]	1	2	1	1	1	1	1	1	1	1	1
Benzo(a) pyrene	Residential (1A4b)	[kg]	0	0	0	0	0	0	0	0	0	0	0
Benzo(a) pyrene	Ag./for./fish. (1A4c)	[kg]	5	5	5	5	5	5	5	5	5	5	5

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pol_name	IPCC ID	Unit	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Benzo(a) pyrene	Military (1A5)	[kg]	0	0	0	0	0	0	0	0	0	0	0
Benzo(a) pyrene	Navigation int. (1A3d)	[kg]	7	6	7	6	6	5	4	5	4	4	4
Benzo(a) pyrene	Civil Aviation int. (1A3a)	[kg]	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	5	5	6	6
Benzo(g,h,i) perylene	Civil Aviation (1A3a)	[kg]	0	0	0	0	0	0	0	0	0	0	0
Benzo(g,h,i) perylene	Road (1A3b)	[kg]	90	88	86	84	82	81	83	86	90	95	100
Benzo(g,h,i) perylene	Railways (1A3c)	[kg]	0	0	0	0	0	0	0	0	0	0	0
Benzo(g,h,i) perylene	Navigation (1A3d)	[kg]	12	13	11	8	7	7	7	7	7	7	7
Benzo(g,h,i) perylene	Residential (1A4b)	[kg]	1	1	1	1	1	1	2	2	2	2	2
Benzo(g,h,i) perylene	Ag./for./fish. (1A4c)	[kg]	18	16	15	16	18	17	18	17	15	16	16
Benzo(g,h,i) perylene	Military (1A5)	[kg]	0	1	1	0	0	0	0	0	1	1	0
Benzo(g,h,i) perylene	Navigation int. (1A3d)	[kg]	48	45	52	45	41	37	35	35	28	25	27
Benzo(g,h,i) perylene	Civil Aviation int. (1A3a)	[kg]	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	3	3	3	3
indeno(1,2,3-c,d) pyrene	Civil Aviation (1A3a)	[kg]	0	0	0	0	0	0	0	0	0	0	0
indeno(1,2,3-c,d) pyrene	Road (1A3b)	[kg]	46	47	47	47	47	47	48	50	52	55	58
indeno(1,2,3-c,d) pyrene	Railways (1A3c)	[kg]	0	0	0	0	0	0	0	0	0	0	0
indeno(1,2,3-c,d) pyrene	Navigation (1A3d)	[kg]	10	10	8	7	5	5	5	5	5	5	5
indeno(1,2,3-c,d) pyrene	Residential (1A4b)	[kg]	0	0	0	0	0	0	1	1	1	1	1
indeno(1,2,3-c,d) pyrene	Ag./for./fish. (1A4c)	[kg]	12	11	11	12	13	12	13	12	11	12	12
indeno(1,2,3-c,d) pyrene	Military (1A5)	[kg]	0	0	0	0	0	0	0	0	0	0	0
indeno(1,2,3-c,d) pyrene	Navigation int. (1A3d)	[kg]	39	36	42	36	34	30	29	29	23	21	22
indeno(1,2,3-c,d) pyrene	Civil Aviation int. (1A3a)	[kg]	0	0	0	0	0	0	0	0	0	0	0

Annex 16: Uncertainty estimates

Uncertainty estimation, CO_2

	Gas	Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data	Input data	Input data	Input data							
		Gg	Gg	%	%	%	%	%	%	%	%	%
Road transport	CO_2	9275	12594	2	5	5.385	4.136	0.09780304	0.9329	0.4890	2.6386	2.6836
Military	CO_2	119	126	2	5	5.385	0.042	-0.0013398	0.0094	-0.0067	0.0265	0.0273
Railways	CO_2	297	227	2	5	5.385	0.074	-0.0098969	0.0168	-0.0495	0.0475	0.0686
Navigation (small boats)	CO_2	48	102	21	5	21.587	0.134	0.00324491	0.0076	0.0162	0.2244	0.2250
Navigation (large vessels)	CO_2	666	353	11	5	12.083	0.260	-0.0337285	0.0261	-0.1686	0.4065	0.4401
Fisheries	CO_2	591	473	2	5	5.385	0.155	-0.0181093	0.0350	-0.0905	0.0991	0.1342
Agriculture	CO_2	1272	1109	13	5	13.928	0.942	-0.0322864	0.0822	-0.1614	1.5105	1.5191
Forestry	CO_2	36	17	16	5	16.763	0.018	-0.0019307	0.0013	-0.0097	0.0289	0.0305
Industry (mobile)	CO_2	842	1021	18	5	18.682	1.163	-8.08E-05	0.0756	-0.0004	1.9251	1.9251
Residential	CO_2	113	233	18	5	18.682	0.265	0.00708296	0.0172	0.0354	0.4386	0.4400
Civil aviation	CO_2	243	141	10	5	11.180	0.096	-0.0113717	0.0105	-0.0569	0.1479	0.1585
Total		13,500	16397				19.548					13.7026

Total uncertainties	**Overall uncertainty in the year (%):**	**4.421**	**Trend uncertainty (%):**		**3.702**

Uncertainty estimation, CH_4

	Gas	Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data	Input data	Input data	Input data							
		Mg	Mg	%	%	%	%	%	%	%	%	%
Road transport	CH_4	2619	1290	2	40	40.050	30.133	-0.0641412	0.4268	-2.5656	1.2071	2.8354
Military	CH_4	5	6	2	100	100.020	0.354	0.00103084	0.0020	0.1031	0.0057	0.1032
Railways	CH_4	12	9	2	100	100.020	0.515	0.00060875	0.0029	0.0609	0.0083	0.0614
Navigation (small boats)	CH_4	17	25	21	100	102.181	1.470	0.00505615	0.0082	0.5056	0.2423	0.5607
Navigation (large vessels)	CH_4	14	8	11	100	100.603	0.442	-0.0001559	0.0025	-0.0156	0.0388	0.0418
Fisheries	CH_4	13	12	2	100	100.020	0.672	0.00135583	0.0038	0.1356	0.0108	0.1360
Agriculture	CH_4	105	78	13	100	100.841	4.599	0.00621146	0.0259	0.6211	0.4756	0.7823
Forestry	CH_4	21	4	16	100	101.272	0.255	-0.0025101	0.0014	-0.2510	0.0324	0.2531
Industry (mobile)	CH_4	60	44	18	100	101.607	2.628	0.0034696	0.0147	0.3470	0.3734	0.5097
Residential	CH_4	150	233	18	100	101.607	13.793	0.04886841	0.0770	4.8868	1.9601	5.2653
Civil aviation	CH_4	7	6	10	100	100.499	0.371	0.00073466	0.0021	0.0735	0.0296	0.0792
Total		3023	1715				1129.700					37.0540

Total uncertainties	**Overall uncertainty in the year (%):**	**33,611**		**Trend uncertainty (%):**	**6.087**

Uncertainty estimation, N_2O

	Gas	Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data	Input data	Input data	Input data							
		Mg	Mg	%	%	%	%	%	%	%	%	%
Road transport	N_2O	312	402	2	50	50.040	35.314	0.0932025	0.8049	4.6601	2.2765	5.1864
Military	N_2O	4	4	2	1000	1000.002	7.035	-0.0004544	0.0080	-0.4544	0.0227	0.4550
Railways	N_2O	8	6	2	1000	1000.002	10.963	-0.0061511	0.0125	-6.1511	0.0354	6.1512
Navigation (small boats)	N_2O	1	3	21	1000	1000.220	6.026	0.00400657	0.0069	4.0066	0.2041	4.0118
Navigation (large vessels)	N_2O	42	22	11	1000	1000.060	39.113	-0.0510208	0.0446	-51.0208	0.6939	51.0255
Fisheries	N_2O	37	30	2	1000	1000.002	52.338	-0.0249122	0.0597	-24.9122	0.1688	24.9128
Agriculture	N_2O	49	47	13	1000	1000.084	81.671	-0.0191987	0.0931	-19.1987	1.7123	19.2749
Forestry	N_2O	1	1	16	1000	1000.128	0.950	-0.0001941	0.0011	-0.1941	0.0245	0.1956
Industry (mobile)	N_2O	34	43	18	1000	1000.162	75.678	0.00817926	0.0863	8.1793	2.1967	8.4691
Residential	N_2O	2	4	18	1000	1000.162	6.274	0.0032403	0.0072	3.2403	0.1821	3.2454
Civil aviation	N_2O	10	8	10	1000	1000.050	14.264	-0.0072015	0.0163	-7.2015	0.2300	7.2052
Total		500	570				18363.162					3811.0241

Total uncertainties	**Overall uncertainty in the year (%):**	**135.511**	**Trend uncertainty (%):**	**61.733**

Uncertainty estimation, SO_2

Source category	Gas	Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data Gg SO_2	Input data Gg SO_0	Input data %	Input data %	%	%	%	%	%	%	%
Road Transportation	SO_2	5767	79	2	50	50,040	2,086	-0,043434611	0,0053	-2,1717305	0,014978514	2,17178218
Other mobile sources	SO_2	9216	1824	10	50	50,990	48,865	0,043335227	0,1217	2,16676133	1,721764221	2,76754886
Total	SO_2	14983,397	1903,533				2392,110					12,3759646
Total uncertainties					**Year (%):**		**48,909**			**Trend (%):**		**3,518**

Uncertainty estimation, NO_X

Source category	Gas	Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data Gg NO_X	Input data Gg Nox	Input data %	Input data %	%	%	%	%	%	%	%
Road Transportation	NO_X	105933	66993	2	50	50,040	30,347	-0,048606262	0,4274	-2,4303131	1,208959892	2,71440708
Other mobile sources	NO_X	50801	43475	10	100	100,499	39,551	0,048776687	0,2774	4,87766868	3,922715627	6,25934099
Total	NO_X	156734,22	110467,8				2485,229					46,5473554
Total uncertainties					**Year (%):**		**49,852**			**Trend (%):**		**6,823**

Uncertainty estimation, NMVOC

Source category	Gas	Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data Gg NMVOC	Input data Gg NMVOC	Input data %	Input data %	%	%	%	%	%	%	%
Road Transportation	NMVOC	81811	23171	2	50	50,040	31,365	-0,083857371	0,2401	-4,1928686	0,678987322	4,24748991
Other mobile sources	NMVOC	14710	13796	10	100	100,499	37,507	0,084439458	0,1429	8,44394583	2,021436914	8,68253582
Total	NMVOC	96520,537	36966,926				2390,515					93,4275989
Total uncertainties					**Year (%):**		**48,893**			**Trend (%):**		**9,666**

Uncertainty estimation, CO

Source category	Gas	Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data Gg CO	Input data Gg CO	Input data %	Input data %	%	%	%	%	%	%	%
Road Transportation	CO	459539	171521	2	50	50,040	29,313	-0,106222141	0,2974	-5,3111071	0,841081211	5,37729262
Other mobile sources	CO	117260	121282	10	100	100,499	41,628	0,106851197	0,2103	10,6851197	2,973634659	11,0911805
Total	CO	576798,46	292802,99				2592,107					151,929561
Total uncertainties					**Year (%):**		**50,913**			**Trend (%):**		**12,326**

Uncertainty estimation, NH_3

Source category	Gas	Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data Gg NH_3	Input data Gg NH_3	Input data %	Input data %	%	%	%	%	%	%	%
Road Transportation	NH_3	70	1951	2	1000	1000,002	996,269	1,942090776	25,5880	1942,09078	72,37382721	1943,43885
Other mobile sources	NH_3	6	7	10	1000	1000,050	3,733	-1,958389605	0,0959	-1958,3896	1,355785593	1958,39007
Total	NH_3	76,247323	1958,3271				992566,569					7612246,24
Total uncertainties					**Year (%):**		**996,276**			**Trend (%):**		**2759**

Uncertainty estimation, TSP

Source category	Gas	Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data Gg TSP	Input data Gg TSP	Input data %	Input data %	%	%	%	%	%	%	%
Road Transportation	TSP	6929	5764	2	50	50,040	34,528	0,082329955	0,4737	4,11649775	1,339819239	4,32904947
Other mobile sources	TSP	5240	2590	10	100	100,499	31,154	-0,082443734	0,2128	-8,2443734	3,009676808	8,77655098
Total	TSP	12169,131	8354,278				2162,752					95,7685164
Total uncertainties					**Year (%):**		**46,505**			**Trend (%):**		**9,786**

Uncertainty estimation, Arsenic

Source category	Gas	Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data	Input data	Input data	Input data							
		kg	kg	%	%	%	%	%	%	%	%	%
Road Transportation	Arsenic	0	0	2	1000	1000,002	0,000	0	0,0000	0	0	0
Other mobile sources	Arsenic	62	20	10	1000	1000,050	1000,050	0	0,3244	0	4,587284676	4,58728468
Total	Arsenic	62,035802	20,122554				1000100,000					21,0431807
Total uncertainties					**Year (%):**		**1000,050**			**Trend (%):**		**4,587**

Uncertainty estimation, Cadmium

Source category	Gas	Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data	Input data	Input data	Input data							
		kg	kg	%	%	%	%	%	%	%	%	%
Road Transportation	Cadmium	29	40	2	1000	1000,002	768,583	0,125094544	0,8986	125,094544	2,54175505	125,120364
Other mobile sources	Cadmium	15	12	10	1000	1000,050	231,430	-0,125495702	0,2706	-125,4957	3,826581144	125,554028
Total	Cadmium	44,162174	51,635574				644280,167					31418,9194
Total uncertainties					**Year (%):**		**802,671**			**Trend (%):**		**177,254**

Uncertainty estimation, Chromium

Source category	Gas	Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data kg	Input data kg	Input data %	Input data %	%	%	%	%	%	%	%
Road Transportation	Chromium	146	199	2	1000	1000,002	771,120	0,132250025	0,8919	132,250025	2,522584174	132,274081
Other mobile sources	Chromium	77	59	10	1000	1000,050	228,893	-0,132661293	0,2647	-132,66129	3,743733907	132,714107
Total	Chromium	222,58919	257,44446				647018,217					35109,4668
Total uncertainties					**Year (%):**		**804,374**			**Trend (%):**		**187,375**

Uncertainty estimation, Copper

Source category	Gas	Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data kg	Input data kg	Input data %	Input data %	%	%	%	%	%	%	%
Road Transportation	Copper	4965	6750	2	1000	1000,002	810,013	0,069914336	1,0256	69,9143361	2,900726771	69,9744854
Other mobile sources	Copper	1617	1583	10	1000	1000,050	189,998	-0,070269154	0,2405	-70,269154	3,401824735	70,3514495
Total	Copper	6582,1661	8333,7274				692220,943					9845,75506
Total uncertainties					**Year (%):**		**831,998**			**Trend (%):**		**99,226**

Uncertainty estimation, Mercury

Source category	Gas	Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data	Input data	Input data	Input data							
		kg	kg	%	%	%	%	%	%	%	%	%
Road Transportation	Mercury	0	0	2	1000	1000,002	0,000	0	0,0000	0	0	0
Other mobile sources	Mercury	17	13	10	1000	1000,050	1000,050	0	0,7414	0	10,48506129	10,4850613
Total	Mercury	16,931552	12,553151				1000100,000					109,93651
Total uncertainties					**Year (%):**		**1000,050**			**Trend (%):**		**10,485**

Uncertainty estimation, Nickel

Source category	Gas	Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data	Input data	Input data	Input data							
		kg	kg	%	%	%	%	%	%	%	%	%
Road Transportation	Nickel	204	278	2	1000	1000,002	333,728	0,071752112	0,0894	71,7521119	0,252932429	71,7525577
Other mobile sources	Nickel	2904	555	10	1000	1000,050	666,306	-0,071134753	0,1785	-71,134753	2,52484549	71,1795467
Total	Nickel	3108,0274	832,82283				555338,060					10214,9574
Total uncertainties					**Year (%):**		**745,210**			**Trend (%):**		**101,069**

Uncertainty estimation, Lead

Source category	Gas	Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data	Input data	Input data	Input data							
		kg	kg	%	%	%	%	%	%	%	%	%
Road Transportation	Lead	97509	52	2	1000	1000,002	38,000	-0,011851661	0,0005	-11,851661	0,001424831	11,8516615
Other mobile sources	Lead	6178	1322	10	1000	1000,050	962,048	0,011955993	0,0128	11,9559927	0,180354562	11,957353
Total	Lead	103687,19	1374,5549				926980,888					283,440171
Total uncertainties					**Year (%):**		**962,798**			**Trend (%):**		**16,836**

Uncertainty estimation, Selenium

Source category	Gas	Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data	Input data	Input data	Input data							
		kg	kg	%	%	%	%	%	%	%	%	%
Road Transportation	Selenium	29	40	2	1000	1000,002	381,533	0,127441224	0,2915	127,441224	0,824420743	127,443891
Other mobile sources	Selenium	107	64	10	1000	1000,050	618,499	-0,126718851	0,4725	-126,71885	6,681969402	126,894901
Total	Selenium	136,15551	104,01782				528107,987					32344,2611
Total uncertainties					**Year (%):**		**726,710**			**Trend (%):**		**179,845**

Uncertainty estimation, Zinc

Source category	Gas	Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data kg	Input data kg	Input data %	Input data %	%	%	%	%	%	%	%
Road Transportation	Zinc	2921	3971	2	1000	1000,002	789,885	0,088689313	0,9755	88,6893127	2,759143085	88,7322211
Other mobile sources	Zinc	1150	1056	10	1000	1000,050	210,127	-0,089074122	0,2595	-89,074122	3,669787133	89,1496862
Total	Zinc	4070,5212	5027,0836				668072,006					15821,0736
Total uncertainties					**Year (%):**		**817,357**			**Trend (%):**		**125,782**

Uncertainty estimation, Dioxins

Source category	Gas	Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data g dioxins	Input data g dioxins	Input data %	Input data %	%	%	%	%	%	%	%
Road Transportation	Dioxins	1	0	2	1000	1000,002	513,176	-0,087742156	0,1710	-87,742156	0,48361119	87,7434889
Other mobile sources	Dioxins	0	0	10	1000	1000,050	486,849	0,088229921	0,1622	88,2299208	2,293894582	88,2597354
Total	Dioxins	1,1042398	0,3679164				500371,923					15488,7007
Total uncertainties					**Year (%):**		**707,370**			**Trend (%):**		**124,454**

Uncertainty estimation, Flouranthene

Source category	Gas	Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data kg	Input data kg	Input data %	Input data %	%	%	%	%	%	%	%
Road Transportation	Flouranthene	789	712	2	1000	1000,002	755,390	-0,000539727	0,6825	-0,5397274	1,930357761	2,00439186
Other mobile sources	Flouranthene	255	231	10	1000	1000,050	244,624	0,000542484	0,2210	0,54248397	3,12546575	3,17219561
Total	Flouranthene	1043,1634	942,48593				630454,650					14,0804118
Total uncertainties					**Year (%):**		**794,012**			**Trend (%):**		**3,752**

Uncertainty estimation, Benzo(b) flouranthene

Source category	Gas	Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data kg	Input data kg	Input data %	Input data %	%	%	%	%	%	%	%
Road Transportation	Benzo(b) flouranthene	65	69	2	1000	1000,002	743,127	0,036256404	0,7481	36,2564045	2,116048173	36,3181019
Other mobile sources	Benzo(b) flouranthene	27	24	10	1000	1000,050	256,888	-0,036405964	0,2586	-36,405964	3,657254782	36,5892022
Total	Benzo(b) flouranthene	91,783839	92,402735				618228,469					2657,77425
Total uncertainties					**Year (%):**		**786,275**			**Trend (%):**		**51,554**

Uncertainty estimation, Benzo(k) flouranthene

Source category	Gas	Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data	Input data	Input data	Input data							
		kg	kg	%	%	%	%	%	%	%	%	%
Road Transportation	Benzo(k) flouranthene	65	78	2	1000	1000,002	803,116	0,054844109	0,9009	54,8441086	2,548002441	54,9032655
Other mobile sources	Benzo(k) flouranthene	21	19	10	1000	1000,050	196,896	-0,055121871	0,2208	-55,121871	3,123250641	55,2102827
Total	Benzo(k) flouranthene	86,722989	97,277357				683762,935					6062,54388
Total uncertainties					**Year (%):**		**826,900**			**Trend (%):**		**77,862**

Uncertainty estimation, Benzo(a) pyrene

Source category	Gas	Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data	Input data	Input data	Input data							
		kg	kg	%	%	%	%	%	%	%	%	%
Road Transportation	Benzo(a) pyrene	45	53	2	1000	1000,002	844,863	0,037917843	0,9508	37,9178432	2,689218041	38,0130862
Other mobile sources	Benzo(a) pyrene	11	10	10	1000	1000,050	155,146	-0,038153167	0,1746	-38,153167	2,469050388	38,2329751
Total	Benzo(a) pyrene	55,569428	62,536189				737864,227					2906,75511
Total uncertainties					**Year (%):**		**858,990**			**Trend (%):**		**53,914**

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

Source category	Gas	Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data	Input data	Input data	Input data							
		kg	kg	%	%	%	%	%	%	%	%	%
Road Transportation	Benzo(g,h,i) perylene	95	100	2	1000	1000,002	760,366	0,034775432	0,7640	34,7754323	2,160827768	34,8425009
Other mobile sources	Benzo(g,h,i) perylene	36	32	10	1000	1000,050	239,648	-0,034931841	0,2408	-34,931841	3,405022998	35,0974034
Total	Benzo(g,h,i) perylene	131,41153	132,03436				635587,152					2445,8276
Total uncertainties					**Year (%):**		**797,237**			**Trend (%):**		**49,455**

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

Source category	Gas	Base year emission	Year t emission	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions
		Input data	Input data	Input data	Input data							
		kg	kg	%	%	%	%	%	%	%	%	%
Road Transportation	indeno(1,2,3-c,d) pyr.	43	58	2	1000	1000,002	730,077	0,105809243	0,8569	105,809243	2,423756089	105,836999
Other mobile sources	indeno(1,2,3-c,d) pyr.	24	21	10	1000	1000,050	269,938	-0,10610308	0,3168	-106,10308	4,48056546	106,197641
Total	indeno(1,2,3-c,d) pyr.	67,521122	79,252984				605879,149					22479,4095
Total uncertainties					**Year (%):**		**778,382**			**Trend (%):**		**149,931**

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This report explains the parts of the Danish inventories related to road transport and other mobile sources. Emission results are shown for CO_2, CH_4, N_2O, SO_2, NO_X, NMVOC, CO, particulate matter (PM), heavy metals, dioxins and PAH. From 1990-2006 the fuel use and CO_2 emissions for road transport have increased by 36 %, and CH_4 emissions have decreased by 51 %. A N_2O emission increase of 29 % is related to the relatively high emissions from older gasoline catalyst cars. The 1985-2006 emission decreases for PM (exhaust only), CO, NO_X and NMVOC are 39, 63, 37 and 72 % respectively, due to the introduction of vehicles complying with gradually stricter emission standards. For SO_2 the emission drop is 99% (due to reduced sulphur content in the diesel fuel), whereas the NH_3 emissions increase by 2681% (due to the introduction of catalyst cars). For other mobile sources the calculated emission changes for CO_2 (and fuel use), CH_4 and N_2O are -10, 5 and -11%, from 1990 to 2006. The emissions of SO_2, particulates (all size fractions), NO_X and NMVOC have decreased by 80, 51, 14 and 6% from 1985 to 2006. For CO and NH_3 the emissions have increased by 3 and 20% in the same time period. Uncertainties for the emissions and trends have been estimated.

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