EEA Technical report | No 8/2012

European Union emission inventory report 1990–2010 under the UNECE Convention on Long-range Transboundary Air Pollution (LRTAP)

ISSN 1725-2237

European Environment Agency

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European Union emission inventory report 1990–2010 under the UNECE Convention on Long-range Transboundary Air Pollution (LRTAP)

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Cover design: EEA
Layout: EEA/Henriette Nilsson
Cover photo: iStockphoto

Luxembourg: Publications Office of the European Union, 2012

ISBN 978-92-9213-321-4
ISSN 1725-2237
doi:10.2800/5219

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Units, abbreviations and acronyms

AD	activity data
As	arsenic
BaP	benzo(a)pyrene
C_6H_6	benzene
CCGT	combined-cycle gas turbine
Cd	cadmium
CDR	Central Data Repository (of the EEA's Eionet Reportnet)
CEIP	Centre on Emission Inventories and Projections
CH_4	methane
CO	carbon monoxide
CO_2	carbon dioxide
CORINAIR	CORe INventory of AIR emissions
Cr	chromium
CRF	(UNFCCC) common reporting format (for greenhouse gases)
CS	country specific
Cu	copper
D	default value
DECC	(UK) Department of Energy and Climate Change
Defra	(UK) Department for Environment, Food and Rural Affairs
EEA	European Environment Agency
EF	emission factor
Eionet	European environmental information and observation network
EMEP	European Monitoring and Evaluation Programme (Cooperative programme for monitoring and evaluation of the long-range transmissions of air pollutants in Europe)
EPER	European Pollutant Emission Register
E-PRTR	European Pollutant Release and Transfer Register
ERT	expert review team
ETC/ACM	European Topic Centre on Air Pollution and Climate Change Mitigation of the EEA
EU	European Union
EU-MM	EU Greenhouse Gas Monitoring Mechanism
GDP	gross domestic product
Gg	1 gigagram = 10^9 g = 1 kilotonne (kt)
HCB	hexachlorobenzene
HCE	hexachloroethane
HCH	hexachlorocyclohexane
HFC(s)	hydrofluorocarbon(s)
Hg	mercury
HM(s)	heavy metal(s)
IE	included elsewhere
IIR	Informative Inventory Report
IPCC	Intergovernmental Panel on Climate Change
I-TEQ	international toxic equivalents
KCA	key category analysis
kg	1 kilogram = 10^3 g (gram)

lindane	gamma-HCH
LPS	large point source
LCP	large combustion plant
LRTAP	Long-range Transboundary Air Pollution
M	method
Mg	1 megagram = 10^6 g = 1 tonne (t)
MoEW	(Bulgarian) Ministry of Environment and Water
N_2O	nitrous oxide
NA	not applicable
NE	not estimated
NEC Directive	EU National Emission Ceilings Directive (2001/81/EC)
NFR	nomenclature for reporting
NH_3	ammonia
Ni	nickel
NMVOC(s)	non-methane volatile organic compound(s)
NO	not occurring
NO_2	nitrogen dioxide
NO_X	nitrogen oxides
NR	not relevant
O_3	ozone
PAH(s)	polycyclic aromatic hydrocarbon(s)
Pb	lead
PCB(s)	polychlorinated biphenyl(s)
PCDD/F(s)	polychlorinated dibenzodioxin(s)/dibenzofuran(s)
PFC(s)	perfluorocarbon(s)
PM	particulate matter
PM_{10}	coarse particulate matter (particles measuring 10 μm or less)
$PM_{2.5}$	fine particulate matter (particles measuring 2.5 μm or less)
POP(s)	persistent organic pollutant(s)
PS	plant specific
QA	quality assurance
QC	quality control
RIVM/PBL	Rijksinstituut voor Volksgezondheid en Milieu (National Institute for Public Health and the Environment)/Netherlands Environmental Assessment Agency
SCR	selective catalytic reduction
Se	selenium
SF_6	sulphur hexafluoride
SMED	Swedish Environmental Emissions Data
SNAP	Selected Nomenclature for reporting of Air Pollutants
SNCR	non-selective catalytic reduction
SO_2	sulphur dioxide
SO_X	sulphur oxides
t	1 tonne (metric) = 1 megagram (Mg) = 10^6 g
T	tier (method)
Tg	1 teragram = 10^{12} g = 1 megatonne (Mt)
TJ	1 terajoule
TSP	total suspended particulates
UNECE	United Nations Economic Commission for Europe
UNFCCC	United Nations Framework Convention on Climate Change
VOC(s)	volatile organic compound(s)
Zn	zinc

Acknowledgements

This report was prepared by the European Environment Agency (EEA) and its European Topic Centre for Air Pollution and Climate Change Mitigation (ETC/ACM, partner Umweltbundesamt Austria). The lead author of the report was Elisabeth Kampel. Other authors were Michael Gager and Melanie Tista. The EEA project managers were Martin Adams and John van Aardenne. The desk officer at the European Commission's Directorate-General for the Environment was André Zuber. The authors gratefully acknowledge the technical support received from Robert Wankmüller (ETC/ACM), the comments from Paul Ruyssenaars (ETC/ACM) in the preparation of this report and the helpful suggestions from Justin Goodwin (Aether) for restructuring the report.

The EEA would like to thank those national European Environment Information and Observation Network (Eionet) representatives who provided comments and corrections on the draft version of this report.

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Executive summary

This document is the annual European Union (EU) emission inventory report under the United Nations Economic Commission for Europe (UNECE) Convention on Long-range Transboundary Air Pollution (LRTAP) (UNECE, 1979). The report and its accompanying data are provided as an official submission to the Executive Secretary of UNECE by the European Commission on behalf of the EU as a Party. The report is compiled by the European Environment Agency (EEA) in cooperation with the EU Member States.

Under the LRTAP Convention, parties (including the European Union) are obliged and invited to report emissions data for a large number of air pollutants, including:

- main pollutants: nitrogen oxides (NO_X), non-methane volatile organic compounds (NMVOC), sulphur oxides (SO_X), ammonia (NH_3) and carbon monoxide (CO);
- particulate matter (PM): primary PM (fine particulate matter ($PM_{2.5}$) and coarse particulate matter (PM_{10})) and total suspended particulates (TSP);
- priority heavy metals (HMs): lead (Pb), cadmium (Cd) and mercury (Hg);
- additional HMs: arsenic (As), chromium (Cr), copper (Cu), nickel (Ni), selenium (Se) and zinc (Zn);
- persistent organic pollutants (POPs): polychlorinated dibenzodioxins/ dibenzofurans (PCDD/Fs), polycyclic aromatic hydrocarbons (PAHs), hexachlorobenzene (HCB), hexachlorocyclohexane (HCH) and polychlorinated biphenyls (PCBs);
- additional reporting of the individual PAHs benzo(a)pyrene, benzo(b)fluoranthene, benzo(k) fluoranthene and indeno(1,2,3-cd)pyrene.

These pollutants each harm human health and the environment. In addition, certain species also contribute to the formation of ozone (O_3) and PM in the atmosphere, and have an indirect and direct effect on radiative forcing and hence on climate (see Box ES.1).

Box ES.1 Main air pollutants and their effects on human health and the environment

Sulphur oxides (SO_X)
SO_X are emitted when fuels containing sulphur are burned. They contribute to acid deposition, the impacts of which can be significant: adverse effects on aquatic ecosystems in rivers and lakes, and damage to forests. Further, the formation of sulphate particles results in reflection of solar radiation, which leads to net cooling of the atmosphere.

Nitrogen oxides (NO_X)
NO_X are emitted during fuel combustion, as practiced by industrial facilities and the road transport sector. As with SO_X, NO_X contribute to acid deposition but also to eutrophication of soil and water. Of the chemical species that NO_X comprises, it is nitrogen dioxide (NO_2) that is associated with adverse affects on health: high concentrations cause inflammation of the airways and reduced lung function. NO_X also contribute to the formation of secondary inorganic particulate matter and tropospheric (ground-level) ozone with associated climate effects.

Ammonia (NH_3)
NH_3, like NO_X, contributes to both eutrophication and acidification. The vast majority of NH_3 emissions — around 94 % in Europe — come from the agricultural sector, in connection with activities such as manure storage, slurry spreading and the use of synthetic nitrogenous fertilisers.

Non-methane volatile organic compounds (NMVOC)
NMVOC, important O_3 precursors, are emitted from a large number of sources including paint application, road transport, dry-cleaning and other solvent uses. Certain NMVOC species, such as benzene (C_6H_6) and 1,3-butadiene, are directly hazardous to human health. Biogenic NMVOC are emitted by vegetation, with amounts dependent on the species and on temperature.

Particulate matter (PM)
In terms of potential to harm human health, PM is one of the most important pollutants as it penetrates into sensitive regions of the respiratory system. PM is emitted from many sources, and is a complex heterogeneous mixture comprising both primary and secondary PM; primary PM is the fraction of PM that is emitted directly into the atmosphere, whereas secondary PM forms in the atmosphere following the oxidation and transformation of precursor gases (mainly SO_x, NO_x, NH_3 and some volatile organic compounds (VOCs)). References to PM in this report are to primary PM.

Carbon monoxide (CO)
CO is produced as a result of fuel combustion. The road transport sector, businesses and households, and industry are important sources. Long-term exposure to low concentrations of CO can result in neurological problems and potential harm to unborn babies. CO can react with other pollutants to produce ground-level ozone. Elevated levels of ozone can cause respiratory health problems and can lead to premature mortality.

Polycyclic aromatic hydrocarbons (PAHs)/Benzo(a)pyrene (BaP)
PAHs are a large group of POPs that contribute to different harmful effects in the environment and to human health. PAHs are released by combustion processes, as well as being emitted via evaporation from materials treated with creosote, mineral oils, pitch, etc. BaP is a specific PAH formed mainly from the burning of organic material such as wood, and from car exhaust fumes, especially from diesel vehicles. It is a known cancer-causing agent in humans. In Europe, BaP pollution is predominantly a problem in central and eastern Europe where domestic coal and wood burning is common.

Dioxins and furans (PCDD/Fs)
PCDDs and PCDFs are formed by the combustion of fuels and wastes, the processing of metals and the production of pulp and paper. Exposure to normal background levels of dioxins and furans is unlikely to cause health problems, although some PCDDs and PCDFs may cause cancer and may affect the unborn child in low concentrations. PCDDs and PCDFs are categorised as POPs, being persistent in the environment. Emissions to air will eventually be deposited on soil and/or waters. Livestock and wildlife can subsequently ingest them from soil and vegetation, with fish being susceptible to uptake from aquatic sediments.

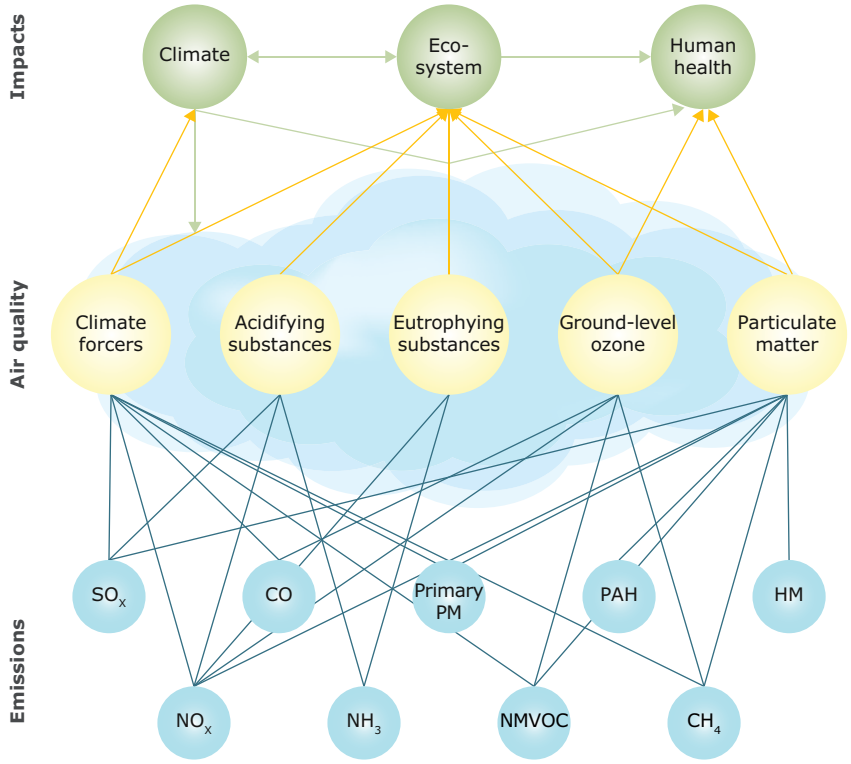
Polychlorinated biphenyls (PCBs)
PCBs are used mainly as electrical insulating material in capacitors and transformers. The main source of releases has been from their manufacture and use, as well as during disposal of PCB-containing equipment. PCBs may cause cancer and can affect the unborn child. PCBs are toxic to wildlife, particularly aquatic organisms and bird predators of fish. They can cause serious reproductive and developmental problems and damage to the immune system. PCBs are categorised as a POP.

Hexachlorobenzene (HCB)
Before being banned, HCB was used as a fungicide on seeds; it is also used in the manufacture of chlorinated organic solvents. It is released to the environment as a by-product of coal burning, waste incineration and some metal processes. It has also been released through its use as a fungicide. The environment levels of HCB are not typically high enough to cause significant health effects. HCB is, however, classed as dangerous to the environment. The main concern for environmental releases is related to its persistence and ability to bioaccumulate in the food chain. High levels can build up in fish and marine mammals as well as in certain plants.

Hexachlorocyclohexane (HCH)
HCH is a family of organic compounds, the most common of which is gamma-HCH (lindane). Lindane has been used mainly as a timber insecticide. Releases of lindane to water damage insects and fish. It also accumulates in fish. Its ability to persist and accumulate in the environment means that lindane can travel long distances and have effects far from the point of emission. Emissions of HCH occur through its manufacture, use, storage and transport.

Heavy metals (HMs)
The HMs arsenic (As), cadmium (Cd), lead (Pb), mercury (Hg), chromium (Cr), copper (Cu), nickel (Ni), selenium (Se) and zinc (Zn) are emitted mainly as a result of various combustion processes and industrial activities, like metals works and smelters. As for BaP, heavy metals can reside in or be attached to PM. As well as polluting the air, HMs can be deposited on terrestrial or water surfaces and subsequently build up in soils or sediments. HMs are persistent in the environment and may bioaccumulate in food chains.

Figure ES.1 **Major air pollutants clustered according to impacts on human health, ecosystems and the climate**



Note: From left to right the pollutants shown as follows: sulphur oxides (SO_x), nitrogen oxides (NO_x), carbon monoxide (CO), ammonia (NH_3), particulate matter (PM), non-methane volatile organic compounds (NMVOC), polycyclic aromatic hydrocarbons (PAH), methane (CH_4), heavy metals (HM).

This report describes:

- the institutional arrangements and preparation processes that underpin the EU's emission inventory, methods and data sources for this report and key category analyses (Chapter 1);
- emission trends and key categories for the EU-27 as a whole ([1]), and individual Member States, and the contribution made by important individual emission sources to emissions (Chapter 2);
- sectoral analysis and emission trends for key pollutants (Chapter 3);
- information on recalculations and future planned improvements (Chapter 4).

Emissions data presented in this report are included as accompanying annexes and are also available for direct download through the EEA's data service ([2]) (EEA, 2012a).

([1]) The EU-27 comprises Austria, Belgium, Bulgaria, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and the United Kingdom.
([2]) The online data viewer for the EU LRTAP Convention data set.

EU-27 emission trends

Figure ES.2 presents the aggregated EU-27 emission trends of the main pollutants, particulates, HMs and POPs for the period from 1990 to 2010 ([3]).

Emission trend of main air pollutants between 1990 and 2010

Across the EU-27, the largest emission reduction of the main pollutants has been achieved for the acidifying pollutant SO_X. Emissions in 2010 were 82 % less than in 1990. This reduction is the result of a combination of measures: fuel switching in energy-related sectors — away from high sulphur-containing solid and liquid fuels to low-sulphur fuels such as natural gas; the fitting of flue-gas desulphurisation abatement techniques in industrial facilities; and the impact of EU directives relating to the sulphur content of certain liquid fuels.

Emissions of the other main air pollutants have dropped significantly since 1990, including emissions of the three air pollutants primarily responsible for the formation of ground-level ozone: CO (62 % reduction), NMVOC (56 % reduction) and NO_X (47 % reduction). These reductions have been achieved in the road transport sector for all three pollutants, primarily through legislative measures requiring abatement of vehicle tailpipe emissions. NO_X emissions have dropped significantly in the electricity/energy generation sectors as a result of technical measures such as the introduction of combustion modification technologies (e.g. use of low NO_X burners), implementation of flue-gas abatement techniques (e.g. NO_X scrubbers and selective catalytic reduction (SCR) and non-selective catalytic reduction (SNCR) techniques), and fuel switching from coal to gas.

NH_3 emissions decreased significantly (– 28 %), with large reductions occurring especially in Poland, the Netherlands and Germany; all other countries (except Cyprus and Spain) also reported decreases. These reductions are mainly a result of improved manure management.

Emission trend of main air pollutants between 2009 and 2010

The strong decreasing trend observed between 2008 and 2009 did not continue between 2009 and 2010. NO_X, SO_X and NH_3 emissions still dropped, but only by 1.4 %, 5.7 % and 2.0 %, respectively. NMVOC and CO emissions increased by 0.5 % and 3.4 %, respectively. These trends are influenced by economic developments, especially for those air pollutants resulting predominantly from energy production, industrial processes and road transport. The EU-27 gross domestic product (GDP) decreased between 2008 and 2009 by 6 %, while in the following year it increased by 4 % (Eurostat, 2012) ([4]). Other air pollutants stemming largely from the residential sector (like NMVOC, PM or CO) are less dependent on the economic situation; NH_3, likewise, is chiefly the result of agricultural activities.

The slight decrease in NO_X emissions is attributable to the 14 Member States that reported emission decreases between 2009 and 2010; the other 13 Member States reported emission increases. The highest emission reductions were reported by Spain, Greece and the United Kingdom; in the latter, lower emissions were reported following adoption of an improved methodology for the road transport sector (Appendix 7, the United Kingdom's Informative Inventory Report (IIR). In Greece, reductions of NO_X emissions are mainly as a consequence of the intense economic crisis (Appendix 7, Greece's IIR).

The decrease in SO_X emissions at EU-27 level is mainly driven by Greece, Romania and Hungary. In Romania and Hungary, the combustion of liquid fuel for energy and heat production was roughly halved between 2009 and 2010 (Romania by 54 % and Hungary by 45 %). SO_X emission reductions in Greece are due to the operation of desulphurisation plants at large power plants, the increasing share of RES technologies for electricity production, reductions of liquid fossil fuels and the introduction of natural gas in the Greek energy system (Appendix 7, Greece's IIR). A significant emission increase of sulphur oxides emissions in

([3]) By 15 February each year, Member States must report emission data for years up until the current year, minus two. Thus by 15 February of 2012, Member States were obliged to report for the years until 2010. Emission inventory data (both for air pollutants and greenhouse gases) can typically only be compiled and reported by countries with around a 12-to-15-month delay. This delay is mainly a result of the time needed for official national and/or trade statistics to become available (typically up to 12 months following a calendar year) together with the time needed for subsequent data processing, calculations and performing QA/QC checks.

([4]) Eurostat data; GDP at market prices.

Poland was due to higher consumption of hard coal in public power plants, use of coal with higher sulphur content, residential coal combustion and higher consumption of coke in the industry sector (Poland's IIR, Appendix 7).

A total of 17 Member States reported a decrease in NMVOC emissions, and 10 Member States an increase. The overall slight increase at EU-27 level was mainly driven by Germany, owing to recovery from the economic slump (Germany's IIR). Italy and the United Kingdom reported the highest decreases; in the latter case, this was due to a change in emission factors for landfills (the United Kingdom's IIR).

Germany, France and Poland reported the highest increases in CO emissions (in total about 900 Gg). In Poland, greater use of coal and wood in non-industrial combustion plants contributed significantly to the increase (Poland's IIR). In Germany, the economic recovery was a driver for increasing CO emissions. The highest decreases are reported by the United Kingdom (due to an update of activity data from refineries burning fuel oil (Appendix 7, the United Kingdom's IIR), and Portugal.

NH_3 emissions decreased further by 2 % between 2009 and 2010 with Germany, Romania and Italy reporting the highest reductions. A decrease in NH_3 emissions was reported by 15 Member States, and an increase by 12 Member States.

The drop in HCB emissions between 1998 and 1999 is due to a significant reduction reported by the United Kingdom.

Emission trends of other air pollutants

Emissions for the main HMs (Pb, Cd, Hg), dioxins and furans, HCB, HCH and PCB have also dropped significantly since 1990 (in the order of 60 % or more). Much progress has been made since the early 1990s in reducing point-source emissions of these substances (in particular from industrial facilities). This has been achieved through improvements in abatement techniques for wastewater treatment and incinerators in metal refining and smelting industries, for instance, and in some countries, thanks to the closure of older industrial facilities as a consequence of economic restructuring. However, the decrease rate in total emissions was higher between 1990 and 2000 than in the following years.

Reductions are also reported for additional HMs (arsenic – 64 %, chromium – 73 %, copper – 0.5 %, selenium – 13 % and zinc – 43 %), and for the PAHs (benzo(a)pyrene – 43 %, benzo(b)fluoranthene – 24 %, benzo(k)fluoranthene – 18 % and indeno(1,2,3-cd)pyrene – 17 %), since 1990. Copper and selenium show a different trend compared to other HMs: copper's trend is rather stable, and selenium shows an increase in 2005 compared with 1990 levels. Total Suspended Particles (TSP) have seen a reduction of 48 % from 1990. For PM_{10} and $PM_{2.5}$, the aggregated EU-27 emission reduction achieved since 2000 is 14 % and 15 %, respectively. The total emissions of PM dropped chiefly thanks to the introduction or improvement of abatement measures across the energy, road transport, and industry sectors, coupled with other developments in industrial sectors, such as fuel switching from high-sulphur-containing fuels to low-sulphur-containing fuels.

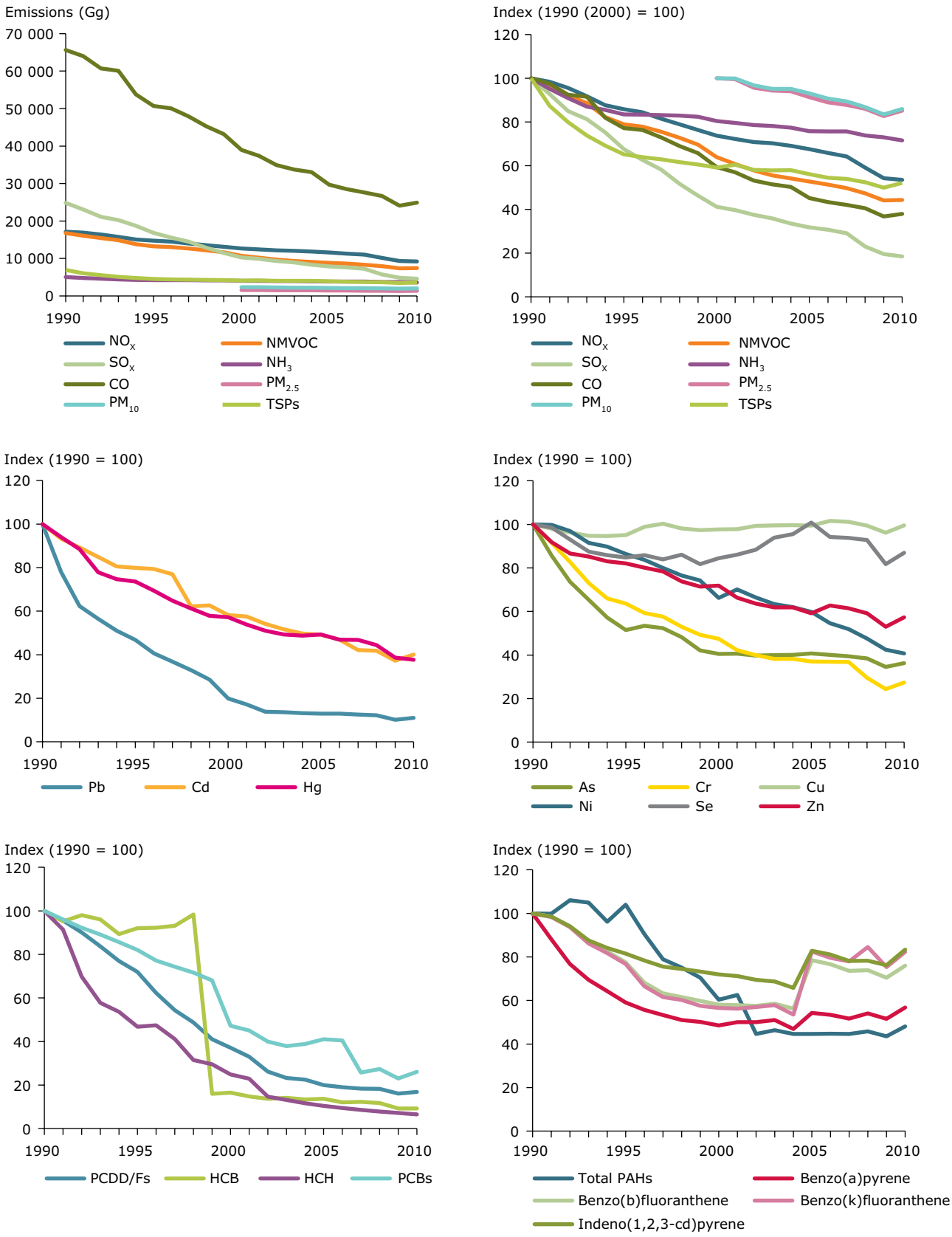
EU-27 key categories and main emission sources

EU-27 key categories are the individual sources that overall contributed most to 2010 emissions of pollutants, determined by a level assessment ([5]) for each of the main air pollutants, PM, HMs and POPs.

From a total of 109 source categories, 49 source categories were identified as being key categories for at least 1 pollutant. A number of source categories were identified as being key categories for more than 1 of the 15 pollutants assessed (Table ES.1).

([5]) A key category level assessment identifies those source categories that have a significant influence on a country's total inventory in terms of their absolute level of emissions. In this report, the categories that are together responsible for 80 % of the total emission of a given pollutant are classified as key categories (EMEP/EEA, 2009).

Figure ES.2 EU-27 emission trends for the main air pollutants, PM, HMs and POPs



Note: Parties to the LRTAP Convention are formally requested to report emissions of PM only for the year 2000 and after. Hence emission trends for these years only are shown, and the indexed emissions are based on emissions in the year 2000 (= 100). The drop in HCB emissions between the years 1998 and 1999 is due to a significant reduction reported by the United Kingdom.

Table ES.1 Most relevant key categories for air emissions

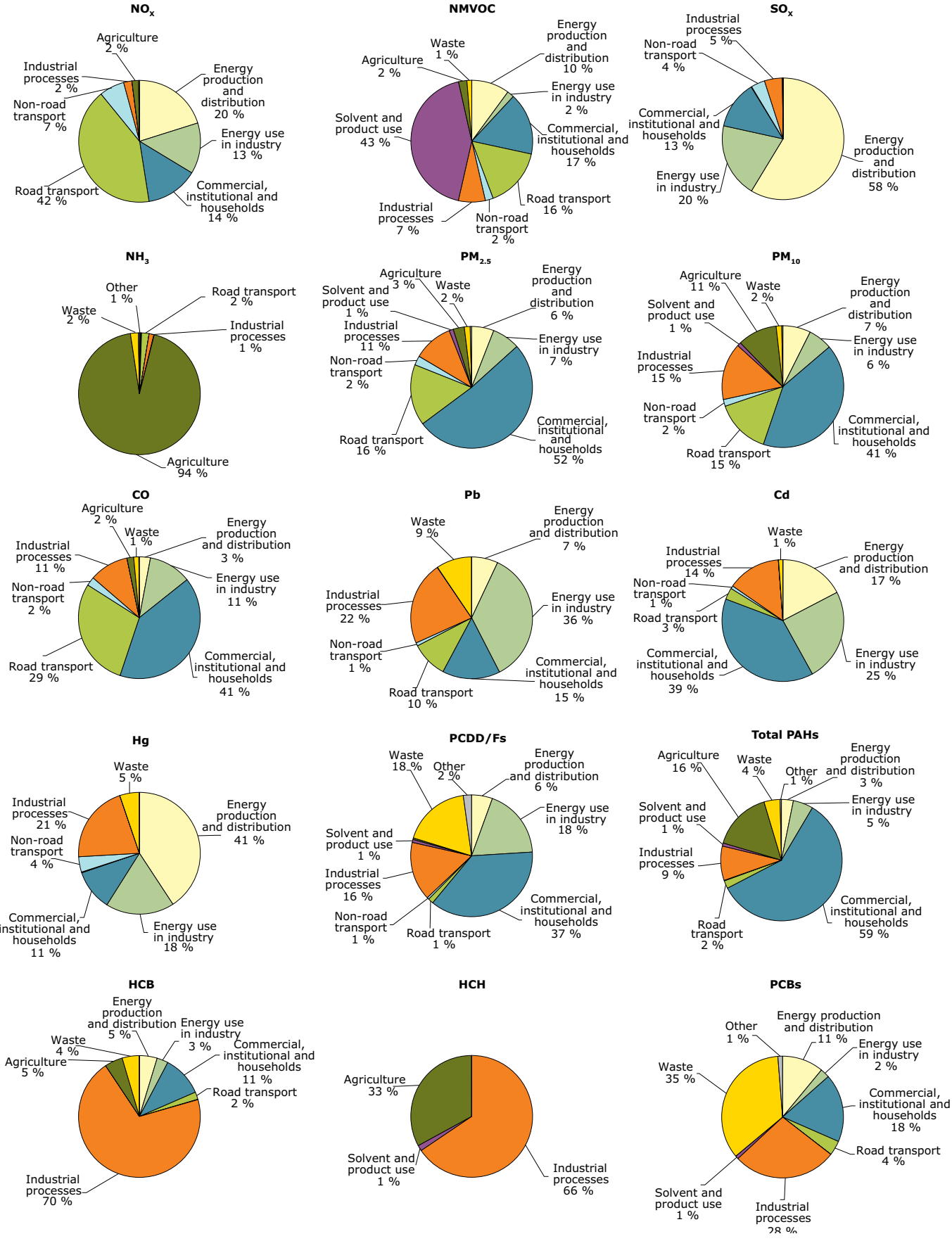
Name of key category	Number of occurances as key category
1 A 4 b i Residential: Stationary plants	13 times (NO_X, SO_X, CO, NMVOC, Cd, Hg, Pb, HCB, PCDD/Fs, PM_{10}, $PM_{2.5}$ Pb, PCBs, PAH)
1 A 1 a Public electricity and heat production	11 times (NO_X, SO_X, CO, Cd, Hg, HCB, PCDD/Fs, PM_{10}, $PM_{2.5}$, Pb, PCBs)
1 A 2 Stationary combustion in manufacturing industries and construction (includes 1 A 2 a — 1 A 2 f)	10 times (NO_X, SO_X, CO, Hg, Pb, Cd, PCDD/Fs, PAHs, PM_{10}, $PM_{2.5}$)
2 C 1 Iron and steel production	10 times (CO, Cd, Hg, Pb, HCB, PCDD/Fs, PM_{10}, $PM_{2.5}$, PCBs, PAHs)
1 A 3 b Road transport (includes 1 A 3 b i — 1 A 3 b vii)	6 times (NO_X, CO, NMVOC, Pb, PM_{10}, $PM_{2.5}$)

Figure ES.3 shows the share of EU-27 emissions of the main pollutants by sector group. As observed in past years, each of the main air pollutants has one major source category: for NO_X this is road transport; for SO_X, energy production; for NH_3, agriculture; for NMVOC, solvent and product use; and for CO, commercial, institutional and households.

NO_X emissions from the road transport sector have decreased by 46 % since 1990, mainly as a result of the introduction of threeway catalytic converters on passenger cars and stricter regulation of emissions from heavy-duty vehicles across Europe. The road transport group is nevertheless a major source of the ozone precursors NO_X and CO in the EU, in 2010 contributing 42 % and 29 % of total EU-27 emissions respectively. It is also a major source of NMVOC, $PM_{2.5}$ and PM_{10} emissions. Passenger cars and heavy-duty vehicles are the principal contributors to NO_X emissions from this sector, while for CO, passenger cars alone contribute around 57 % (in 2010) of the emissions from the road transport sector.

The commercial, institutional and household sector emerged as the most important source for CO, $PM_{2.5}$, PM_{10}, Cd, dioxins and total PAHs. Energy and process-related emissions from industry contribute significantly to the overall emissions of a number of the HMs and POPs.

Figure ES.3 Share of EU-27 emissions of the main pollutants by sector group



The LRTAP Convention emission inventory report: changes in 2012 from 2011

The main changes between the LRTAP Convention emission inventory report of the year 2011 and this year's report are the inclusion of emission data on additional pollutants (see emission trends in Chapter 2): TSP, additional HMs (arsenic, chromium, copper, nickel, selenium and zinc) and PAHs (benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene and indeno(1,2,3-cd)pyrene). Thus, this year's report covers all pollutants of the nomenclature for reporting (NFR) templates.

This year's report also includes information on large point sources (LPSs) and gridded data. According to the revised reporting guidelines (UNECE, 2009), parties within the geographical scope of EMEP should report information on LPSs and gridded data every five years, commencing in 1990. As the last submission occurred in 2007, these data are now required again (Section 1.4.5, Section 1.4.6, Chapter 2, Annex F and Annex G).

Recalculations made by Member States between the data submission in 2011 and this year resulted in emission changes for all pollutants, although for CO, HCH and $PM_{2.5}$, these are negligible. Data for HCH changed most, they decreased 53 %, due to updated information provided by Germany. Lead and mercury changed the most; they increased between by 14 % and 21 % respectively, mostly due to changes in emission data for Greece, Bulgaria and Germany. Last year, no lead and mercury emission data for Greece were included in the inventory; this year, the time series of data for Greece is gap-filled based on one value available for the year 1996. In Germany, the recalculations for mercury are attributable to changes in electricity and heat production (Germany's IIR).

EU progress in meeting its 2010 emission reduction targets under the Gothenburg Protocol to the UNECE LRTAP Convention

The Gothenburg Protocol to the UNECE LRTAP Convention (UNECE, 1999) contains emission ceilings for 2010 that parties to the protocol must meet, for the pollutants NO_X, NMVOC, SO_X and NH_3. In addition to the ceilings for individual countries, the protocol also specifies ceilings for the EU, itself a party to the protocol.

The EEA has recently published its annual update of the *NEC Directive status report* (EEA, 2012b) which analyses the 2010 emission data for EU Member States reported under Directive 2001/81/EC, the EU National Emission Ceilings (NEC) Directive (EC, 2001). For the EU Member States, the NEC Directive contains national emission ceilings that are either equal to or more ambitious than those in the Gothenburg Protocol.

Table ES.2 shows the aggregated emissions for the year 2010 reported by the EU-15 Member States originally listed in the Gothenburg Protocol in comparison to the respective 2010 emission ceilings specified for the EU. NO_X are the only pollutant for which the 2010 emissions exceed the respective ceiling. For the remaining pollutants, the emissions in 2010 were below the respective pollutant ceilings.

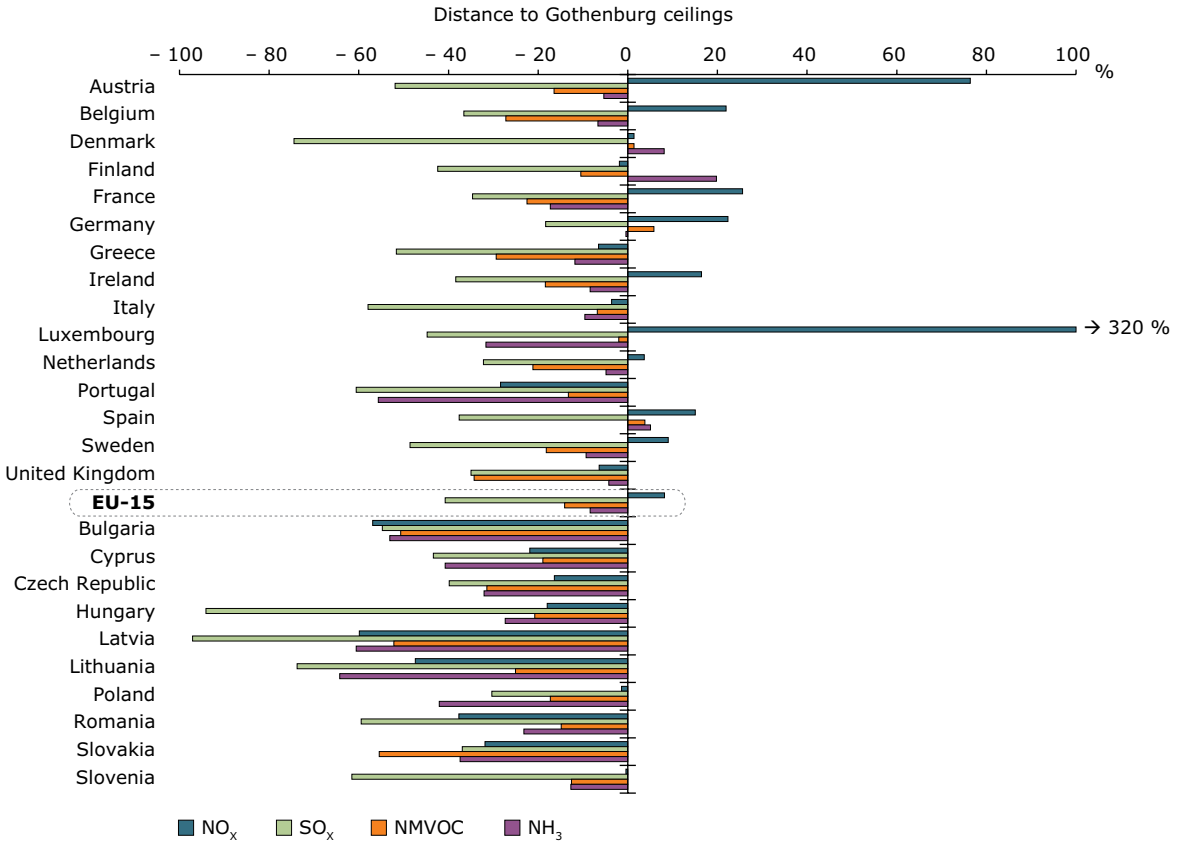
Figure ES.4 shows whether the Gothenburg ceilings were met in 2010, for all EU Member States. Ten EU-15 Member States reported NO_X emissions higher than their ceilings in 2010, which resulted in the non-achievement at EU-15 level. In 2010, three countries exceeded their NMVOC ceiling (Denmark, Germany and Spain), and three (Denmark, Finland and Spain) exceeded their NH_3 ceiling. However, this does not influence the EU achievement in NMVOC and NH_3 ceilings. It should also be noted that all new Member States ('EU-12') have met their emission ceilings for all pollutants.

Table ES.2 Comparison of emissions reported for 2010 by EU-15 Member States, with EU emission ceilings specified in the UNECE Gothenburg Protocol

Pollutant	EU-15 emissions year 2010 (Gg)	European Union (EU-15) Gothenburg Protocol 2010 ceilings (Gg)	Difference (%)	Sum of individual EU-15 ceilings (Gg) (a)
NO_X	7 219	6 671	8 %	6 648
NMVOC	5 670	6 600	– 14 %	6 600
SO_X	2 405	4 059	– 41 %	4 044
NH_3	2 867	3 129	– 8 %	3 128

Note: (a) Emission ceilings are also specified for the individual EU-15 Member States. The sum of these ceilings is, in some instances, different to the ceilings specified for the European Community (EU-15) as a whole.

Figure ES.4 Member State emissions 2010 compared to Gothenburg ceilings 2010



Note: The figure only considers information received before 11 May. Estonia and Malta do not have a Gothenburg ceiling.

Status of reporting by EU-27 Member States

In 2012, Member States were requested to report emission inventory data, gridded data, emissions from LPSs, projections and an IIR. Table ES.3 below indicates which information the parties provided, but does not indicate the completeness of each category. Detailed information on the Member States' submission can be found in Appendix 3.

Methods and data sources

The data source for the EU inventory is the Member States' emission inventories. The data sources for these underlying inventories may vary across the different Member States, but should be in line with the methodologies of the Convention guidelines for emissions' reporting and the EMEP/EEA guidebook (UNECE, 2009). This ensures that although inconsistencies might occur, it is the best available

Table ES.3 Status of reporting by Member States (as of 11 May 2012)

Member State	Air emission inventory	Activity data	Informative inventory report	Gridded data	Large point sources	Projections
Austria	x	x	x	x	x	x
Belgium	x	x	x	x	x	x
Bulgaria	x	x	x	x	x	
Cyprus	x	x	x	x	x	x
Czech Republic	x	x		x	x	x
Denmark	x	x	x	x	x	x
Estonia	x	x	x	x	x	x
Finland	x	x	x	x	x	x
France	x	x	x			x
Germany	x	x	x	x		x
Greece	x		x	x		x
Hungary	x	x				
Ireland	x	x	x	x	x	
Italy	x	x	x			
Latvia	x	x	x		x	
Lithuania	x	x	x	x	x	x
Luxembourg	x	x				
Malta	x	x	x			
Netherlands	x	x	x	x	x	x
Poland	x	x	x	x	x	x
Portugal	x	x	x	x	x	
Romania	x	x	x			x
Slovakia	x	x	x	x	x	x
Slovenia	x	x	x	x	x	x
Spain	x	x	x	x	x	x
Sweden	x	x	x	x		
United Kingdom	x	x	x	x	x	x

Notes: 'x' indicates that the Member States submitted the information, but does not provide an indication of the completeness of the provided information. For example, 'x' marked in the category 'Air emission inventory' only indicates that at least some pollutants for some years have been reported. For detailed information on the completeness of reporting, see Appendix 3.
Slovenia resubmitted an updated air emission inventory on 14 May, which could not be taken into account as the deadline for new data had passed. The accompanying informative inventory report was however taken into account. Otherwise the information only includes that received as of 11 May 2012.

method to compile the EU inventory. The main data sources are national statistics, energy balances, agricultural statistics, etc. or any other reporting according to other national/international reporting requirements (e.g. the Large Combustion Plant Directive (2001/80/EC), the Emissions Trading Scheme legislation (2009/29/EC) and the European Pollutant Release and Transfer Register (E-PRTR) Regulation (EC) No 166/2006).

Detailed information for the data sources used by Member States should be documented in the IIRs, if available. The level of detail containing this information varies widely across Member States, although the main data sources are official national statistics.

The sources for emission factors can differ depending on the tier method used (see Appendix 6). One main source for emission factors is that provided in the *EMEP/EEA air pollutant emission inventory guidebook — 2009* (EMEP/EEA, 2009), but they can also be country or even plant specific. A survey on which emission factors are used by the Member States for all emission sources cannot be provided, as the information is not available: while some countries report details on their methodologies, others do not. Detailed information can be found in the IIRs submitted by Member States; references to these reports are provided in Appendix 7.

Concerning emissions from transport, the reporting guidelines specify (Article IV, paragraph 15) how they should be reported: 'For emissions from transport, parties within the EMEP region should calculate and report emissions consistent with national energy balances reported to Eurostat or the International Energy Agency. Emissions from road vehicle transport should therefore be calculated and reported on the basis of the fuel sold in the Party concerned. […] In addition, parties may report emissions from road vehicles based on fuel used or kilometres driven in the geographic area of the Party. The method for the estimate(s) should be clearly specified in the IIR.'

The difference between transport emissions estimated using the amount of fuel sold within a country and those estimated using the amount of fuel consumed in a country can be significant when 'tank tourism' occurs, i.e. where fuel purchased within a country is actually used outside the country and vice versa. In the EU inventory, emissions from road transport are based on fuel sold except for Belgium, Bulgaria, Luxembourg, the Netherlands and the United Kingdom. From the submissions of Greece and Latvia it is not fully clear, if their road transport emissions are based on fuel sold or fuel used. Belgium is aware of the fact that it should also report transport emissions consistently.

The methods used by Member States should follow the methods described in the EMEP/EEA emission guidebook. On the whole, Member States follow this recommendation, which ensures that best available methods and knowledge are used for estimating national emissions, and inventories are improved continuously. Besides this, the technical review procedures set up by the EMEP Centre on Emission Inventories and Projections (CEIP) check and assess parties' data submissions in accordance with the review guidelines, with a view to improving the quality of emission data and associated information reported to the LRTAP Convention.

Member State submissions contain various data gaps for particular pollutants or years in the time series. Therefore, a gap-filling procedure was developed, and used from 2010 to 2012; it has resulted in a more comprehensive determination of EU emission trends and the most significant emission sources of the various pollutants than in previous years. Gap-filling procedures could not be applied if emission data were not available for any year. In such instances, the EU-27 emission totals for these pollutants are not considered complete (i.e. they are underestimated).

Generally the need for gap-filling of 2010 data is much lower than the need for gap-filling of 1990 data onwards. The need for gap-filling emissions underlying the Gothenburg Protocol is very low compared to other pollutants. In 2010, gapfilling of total EU-27 emissions for NO_X, SO_X, NMVOC and NH_3 was not necessary.

Recommendations for improved data quality

The usage of the more complete gap-filling procedure again led to significant improvements in the completeness of the EU emission inventory, especially for the main pollutants where complete emission trends for the EU-27 can be reported. Despite clear progress in recent years concerning the completeness of reporting, a number of data gaps remain in the official datasets received from Member States. The completeness of Member State submissions can therefore be further improved, particularly for historic 1990-to-2001 data and for certain pollutants such as HMs and POPs.

This report also contains several recommendations to assist in further improving the quality of the EU inventory in the future. First, Member States are encouraged to use the data-reporting format specified in the recently updated 2009 UNECE LRTAP Convention emission reporting guidelines (UNECE, 2009). This allows a comparable aggregation and analysis of the underlying data received from countries, which is necessary for the EU's own inventory. Second, Member States should submit complete inventories and use proper notation keys for instances where estimated values are not available. Third, Member States should recalculate emissions data for past years when new methods or new scientific knowledge become available. In this context, Member States are encouraged to review and apply the information contained in the updated *EMEP/EEA air pollutant emission inventory guidebook — 2009* (EMEP/EEA, 2009) when compiling their emission inventory data sets.

Finally, national emission inventory experts are encouraged to participate as expert reviewers in the joint annual EMEP/EEA inventory review process. Such activities (aimed specifically at supporting and improving the quality of national inventories) are key methods to ensure that high-quality data are available for the EU's own inventory.

1 Introduction

This report and its accompanying data are provided by the European Commission (on behalf of the European Union (EU)) as an official submission to the secretariat for the Executive Body of the Long-range Transboundary Air Pollution (LRTAP) Convention.

The report provides information on the formal institutional arrangements that underpin the EU's emission inventory (Chapter 1); emission trends reported by Member States, and the contribution of key categories to total emissions (Chapter 2); sectoral analysis and emission trends for key pollutants (Chapter 3); and information on recalculations and planned improvements (Chapter 4). EU-27 emission totals are estimated for the pollutants for which data should be reported under the LRTAP Convention (see Appendix 2), i.e. emissions of:

- main pollutants: nitrogen oxides (NO_X), non-methane volatile organic compounds (NMVOC), sulphur oxides (SO_X), ammonia (NH_3), carbon monoxide (CO);
- particulate matter (PM): primary PM (coarse ($PM_{2.5}$) and fine (PM_{10})) and total suspended particulates (TSP);
- priority heavy metals (HMs): lead (Pb), cadmium (Cd) and mercury (Hg);
- additional HMs: arsenic (As), chromium (Cr), copper (Cu), nickel (Ni), selenium (Se) and zinc (Zn);
- persistent organic pollutants (POPs): polychlorinated dibenzodioxin/polychlorinated dibenzofurans (PCDD/Fs), polycyclic aromatic hydrocarbons (PAHs), hexachlorobenzene (HCB), hexachlorocyclohexane (HCH) and polychlorinated biphenyls (PCBs);
- additional reporting of the individual PAHs benzo(a)pyrene, benzo(b)fluoranthene, benzo(k) fluoranthene and indeno(1,2,3-cd)pyrene.

Emission estimates are not always available for all pollutants in each year due to gaps in the data reported by Member States. The more complete gap-filling process that was trialled in 2010 for the compilation of the EU inventory was refined in 2011. Nevertheless, for certain pollutants (i.e. PM and POPs), some Member States did not report data for any year, which meant that gap-filling techniques could not be applied. For these pollutants, the EU-27 total thus remains incomplete. The details of the gap-filling methodology used are provided in Section 1.4 of this chapter.

A number of annexes accompany this inventory report.

- Annex A provides a copy of the formal LRTAP Convention data submission of the EU for the years from 1990 to 2010 for the EU-27 in the required United Nations Economic Commission for Europe (UNECE) reporting format (nomenclature for reporting NFR09).
- Annex B provides the updated EU NO_X emissions data for the period between 1987 and 1989, provided in accordance with the requirements of the 1988 NO_X protocol of the LRTAP Convention.
- Annex C provides results of the key category analysis for the EU-27, showing the main emitting sectors for each pollutant.
- Annex D provides the gap-filled inventory of the EU-27 with colour codes for the different data sources used and the different additional gap-filling methods applied.
- Annex E provides Member States projections for NO_X, NMVOC, SO_X, NH_3, $PM_{2.5}$ and PM_{10} emissions for the years 2015, 2020, 2030 and 2050.
- Annex F provides gridded data for the EU-27.
- Annex G provides data on LPSs.

1.1 Background

1.1.1 Reporting obligations under the Convention on Long-range Transboundary Air Pollution

The EU ratified the UNECE's Convention on LRTAP (UNECE, 1979) in 1982. Article 2 of the Convention states that 'the Contracting Parties, taking due account of the facts and problems involved, are determined to protect man and his environment against air pollution and shall endeavour to limit and, as far as possible, gradually reduce and prevent air pollution including long-range transboundary air pollution'.

The convention has an established process for negotiating measures to control specific pollutants through legally binding protocols. Since 1984, eight protocols have come into force. The most recent, the 1999 Protocol to Abate Acidification, Eutrophication and Ground-level Ozone (UNECE, 1999), came into force on 17 May 2005. Table 1.1 presents the status of ratification of each protocol by the EU. The status differs in the individual Member States.

The UNECE LRTAP Convention Executive Body approved revised Guidelines for reporting emission data under the Convention on Long-range Transboundary Air Pollution at its 26th session in December 2008 (UNECE, 2009). These revised reporting guidelines describe the data that parties should report under the LRTAP Convention and its protocols. A summary of the reporting requirements is provided in Appendix 2 to this report.

In 2012, parties were requested to report emissions data for NO_X, NMVOC, SO_X, NH_3, CO, HMs, POPs and PM, and also associated activity data. This year, for the first time, the EU also includes pollutants that can be reported additionally (arsenic, chromium, copper, nickel, selenium, zinc, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k) fluoranthene, indeno(1,2,3-cd)pyrene) and TSP. The deadline for individual parties to submit data to the LRTAP Convention is 15 February each year, with a separate deadline of 15 March for submitting the accompanying inventory reports. This year, gridded data and information on LPSs should be submitted as well, by 1 March. The EU has separate reporting dates specified in the reporting guidelines, which allow time for the compilation of an aggregated inventory based on the individual submissions from Member States. EU-27 inventory data should be submitted by 30 April and the accompanying inventory report by 30 May, each year.

Table 1.1 The EU status of ratification of the LRTAP Convention and related protocols

LRTAP Convention and its protocols	Status of ratification
Convention on Long-range Transboundary Air Pollution (1979) ([a])	Signed and ratified (approval)
Protocol on Long-term Financing of the Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe (1984) ([b])	Signed and ratified (approval)
Protocol on the Reduction of Sulphur Emissions or their Transboundary Fluxes by at least 30 % (1985) ([c])	Not signed
Protocol concerning the Control of Emissions of Nitrogen Oxides or their Transboundary Fluxes (1988) ([d])	Ratified (accession)
Protocol concerning the Control of Emissions of Volatile Organic Compounds or their Transboundary Fluxes (1991) ([e])	Signed
Protocol on Further Reduction of Sulphur Emissions (1994) ([f])	Signed and ratified (approval)
Protocol on Persistent Organic Pollutants (1998) ([g])	Signed and ratified (approval)
Protocol on Heavy Metals (1998) ([h])	Signed and ratified (approval)
Protocol to Abate Acidification, Eutrophication and Ground-level Ozone (1999) ([i])	Ratified (accession)

Note:
([a]) UNECE, 1979 (Geneva Convention).
([b]) UNECE, 1984.
([c]) UNECE, 1985 (Helsinki Protocol).
([d]) UNECE, 1988 (Sofia Protocol).
([e]) UNECE, 1991 (Geneva Protocol).
([f]) UNECE, 1994 (Oslo Protocol).
([g]) UNECE, 1998a (Aarhus Protocol).
([h]) UNECE, 1998b (Aarhus Protocol).
([i]) UNECE, 1999 (Gothenburg Protocol).

The reporting guidelines also request parties to report emissions inventory data using an updated format — the EMEP Nomenclature For Reporting 2009 (NFR09) format.

1.1.2 Reporting obligations under the NEC Directive and the EU Monitoring Mechanism

EU Member States also report their emissions of NO_X, NMVOC, sulphur dioxide (SO_2) and NH_3 under Directive 2001/81/EC, the National Emission Ceilings (NEC) Directive (EC, 2001) and emissions of NO_X, SO_2, NMVOC and CO under the EU Greenhouse Gas Monitoring Mechanism (EU-MM) (EC, 2004) for the United Nations Framework Convention on Climate Change (UNFCCC) (UNFCCC, 1992). This information should also be copied by Member States to the EEA Eionet Reportnet Central Data Repository (CDR) (Eionet, 2012a).

Table 1.2 provides an overview of these different reporting obligations for EU Member States.

The reporting obligations under the LRTAP Convention and NEC Directive have now largely been harmonised since the adoption of the updated reporting guidelines. As compared with the UNFCCC obligation, they differ in terms of inclusion of domestic and international aviation and navigation in the reported 'national total'. The main differences between the different reporting instruments are summarised in Table 1.3. The overall impact of these differences is small for most Member States.

1.2 Institutional arrangements

1.2.1 Member States

Member States are responsible for choosing activity data, emission factors and other parameters used for their national inventories. Member States should also follow the reporting guidelines (UNECE, 2009) and use the methodologies contained in the latest version of the *EMEP/EEA air pollutant emission inventory guidebook — 2009* (EMEP/EEA, 2009).

Member States are also responsible for establishing quality assurance (QA) and quality control (QC) programmes for their inventories. Where Member States compile an inventory report, a description of the QA and QC activities and recalculations should be included.

In addition to submitting their national LRTAP inventories and inventory reports, Member States through their participation in the Eionet network (see Section 1.2.2 below) take part in the annual review and commenting phase of the draft EU inventory report. The Member States check their national data and information used in the inventory report, and if necessary, send updates. General comments on the inventory report are also provided.

Table 1.2 Overview of air emission reporting obligations in the EU, 2011–2012

Legal obligation	Emission reporting requirements	Annual reporting deadline for EU Member States	Annual international reporting deadline for the EU
LRTAP Convention	Emissions ([a]) of NO_X (as NO_2), NMVOC, SO_X (as SO_2), NH_3, CO, HMs, POPs ([b]) and PM	15 February 2012	30 April 2012
NEC Directive	Emissions of NO_X, NMVOC, SO_2 and NH_3	31 December 2011	–
EU Monitoring Mechanism/UNFCCC	Emissions ([c]) of CO_2, CH_4, N_2O, HFCs, PFCs, SF_6, NO_X, CO, NMVOC and SO_2	15 January 2012 (to the European Commission) 15 April 2012 (to the UNFCCC)	15 April 2012

Note: ([a]) Parties are formally required to report only on the substances and for the years set forth in protocols that they have ratified and that have entered into force.
([b]) Starting with the 2010 reporting round, the list of POPs has been reduced to PCDD/Fs, total PAHs, HCB, HCH and PCBs.
([c]) Greenhouse gases: methane (CH_4); nitrous oxide (N_2O); hydrofluorocarbons (HFCs); perfluorocarbons (PFCs); sulphur hexafluoride (SF_6).

Table 1.3 Major differences between reporting obligations of air pollutants under the LRTAP Convention, NEC Directive and EU Monitoring Mechanism/UNFCCC

	Included in national totals	Not included in national totals: memo item
Domestic aviation (landing and take-off)	NEC, LRTAP, UNFCCC	
Domestic aviation (cruise)	UNFCCC	NEC, LRTAP
International aviation (landing and take-off)	NEC, LRTAP	UNFCCC
International aviation (cruise)		NEC, LRTAP, UNFCCC
National navigation (domestic shipping)	NEC, LRTAP, UNFCCC	
International inland shipping	NEC, LRTAP	UNFCCC
International maritime navigation		NEC, LRTAP, UNFCCC
Road transport (Fuel sold) (*)	NEC, LRTAP, UNFCCC	

Notes: (*) In addition, parties may also report emission estimates based on fuel used as an additional 'memo item'.
NEC: NO_x, NMVOC, SO_2, NH_3.
LRTAP: NO_x, NMVOC, SO_x, NH_3, CO, HMs, POPs, PM.
UNFCCC: NO_x, NMVOC, SO_x, CO.
International inland shipping refers to shipping activity on continental waters, and international maritime navigation to marine water. Air emissions resulting from inland shipping are included, as they are more relevant in terms of air quality for the surrounding environment.

1.2.2 The European Environment Agency, the European Commission, Eionet and the European Topic Centre on Air Pollution and Climate Change Mitigation

European Environment Agency
The EEA assists the European Commission's Directorate-General for the Environment (Environment DG) in compiling the annual EU LRTAP inventory. The activities of the EEA include:

- overall coordination and management of the inventory compilation process;
- coordinating the activities of the EEA European Topic Centre on Air Pollution and Climate Change Mitigation (ETC/ACM), which undertakes the data checking, compilation and draft report writing tasks;
- communication with the European Commission;
- communication with Member States;
- circulation of the draft EU emission inventory and inventory report;
- hosting the official inventory database and web dissemination of data and the inventory report.

Since 2004, the EEA and the European Monitoring and Evaluation Programme (EMEP) have supported a separate annual quality review of emission data submitted by countries. Findings are provided to countries each year with the objective of improving the quality of emission data reported. A joint report summarising the review findings is published each year by EMEP. Section 1.6 below provides further details of the annual data review process.

European Commission
The European Commission formally submits the EU's emission inventory data and inventory report to EMEP through the Executive Secretary of UNECE.

European Topic Centre on Air Pollution and Climate Change Mitigation
With regard to the EU's LRTAP Convention emission inventory, the main ETC/ACM ([6]) activities include:

- initial checks, testing and centralised review of Member State submissions in cooperation with EMEP/CEIP, and compiling results from those checks (status reports, country synthesis and assessment reports, country review reports);
- consulting with Member States (via the EEA) in order to clarify data and other information provided;

([6]) The current ETC/ACM was established by a contract between the lead organisation, National Institute for Public Health and the Environment (RIVM, Rijksinstituut voor Volksgezondheid en Milieu), and the EEA in 2010. It involves 12 organisations and institutions in 10 European countries.

- preparing the gap-filled EU emission inventory and inventory report by 30 April, based on Member State submissions (subsequently submitted by the Commission to UNECE);

- preparing the updated EU emission inventory and inventory report by 30 May.

Eionet
The work of the EEA and the ETC/ACM is facilitated by the European environmental information and observation network (Eionet) (EC, 1999), which consists of the EEA (supported by its European Topic Centres), a supporting network of experts from national environment agencies, and other bodies that deal with environmental information (Eionet, 2012b). Member States are requested to use the CDR of the Eionet Reportnet tools to make their LRTAP Convention submissions available to the EEA.

1.2.3 Planning, preparation and management

Each year, Member States upload their individual emission estimates and inventory reports to the CDR. The EEA (via the ETC-ACM) compiles the data from the CDR and performs QA and QC analysis. Should any clarifications be needed or inconsistencies detected, Member States are contacted directly by the ETC/ACM (via the EEA). Data gaps in Member States' inventories are gap-filled and compiled into an EU total inventory. The European Commission formally submits the EU's emission inventory data and informative inventory report (IIR) to EMEP through the Executive Secretary of UNECE.

Throughout this process, the EEA acts as the main contact point for the European Commission, the ETC/ACM and the Member States. It manages the timely and complete submission under the LRTAP Convention and its protocols.

1.3 Inventory preparation process

No specific EU directive implements the LRTAP Convention's requirements to estimate air emissions and prepare air emission inventories. The basis of reporting for individual Member States and for the EU remains the LRTAP Convention (UNECE, 1979), its protocols (Table 1.1) and subsequent decisions taken by the Executive Body. As noted earlier, the reporting guidelines describe the data that parties should report under the LRTAP Convention and its protocols. Within the EU, Member States are requested each year (under the agreement between Eionet countries and the EEA concerning priority data flows) to post a copy of their official submission to the LRTAP Convention in the CDR, by 15 February. The ETC/ACM subsequently collects the data from the CDR and compiles the gap-filled EU LRTAP Convention emission inventory database, producing a EU LRTAP Convention emission inventory and inventory report.

Within this legal and procedural framework, preparation of the annual LRTAP Convention emission inventory involves the provision of data by Member States, the European Commission and the EEA receiving the data, and finally the EEA and its ETC/ACM compiling the data, gap-filling missing data and preparing the actual inventory. The inventory and accompanying documentation are subsequently made publicly available through the EEA website. Figure 1.1 presents a flowchart diagram illustrating the data flow that is used to compile the EU's LRTAP Convention emission inventory.

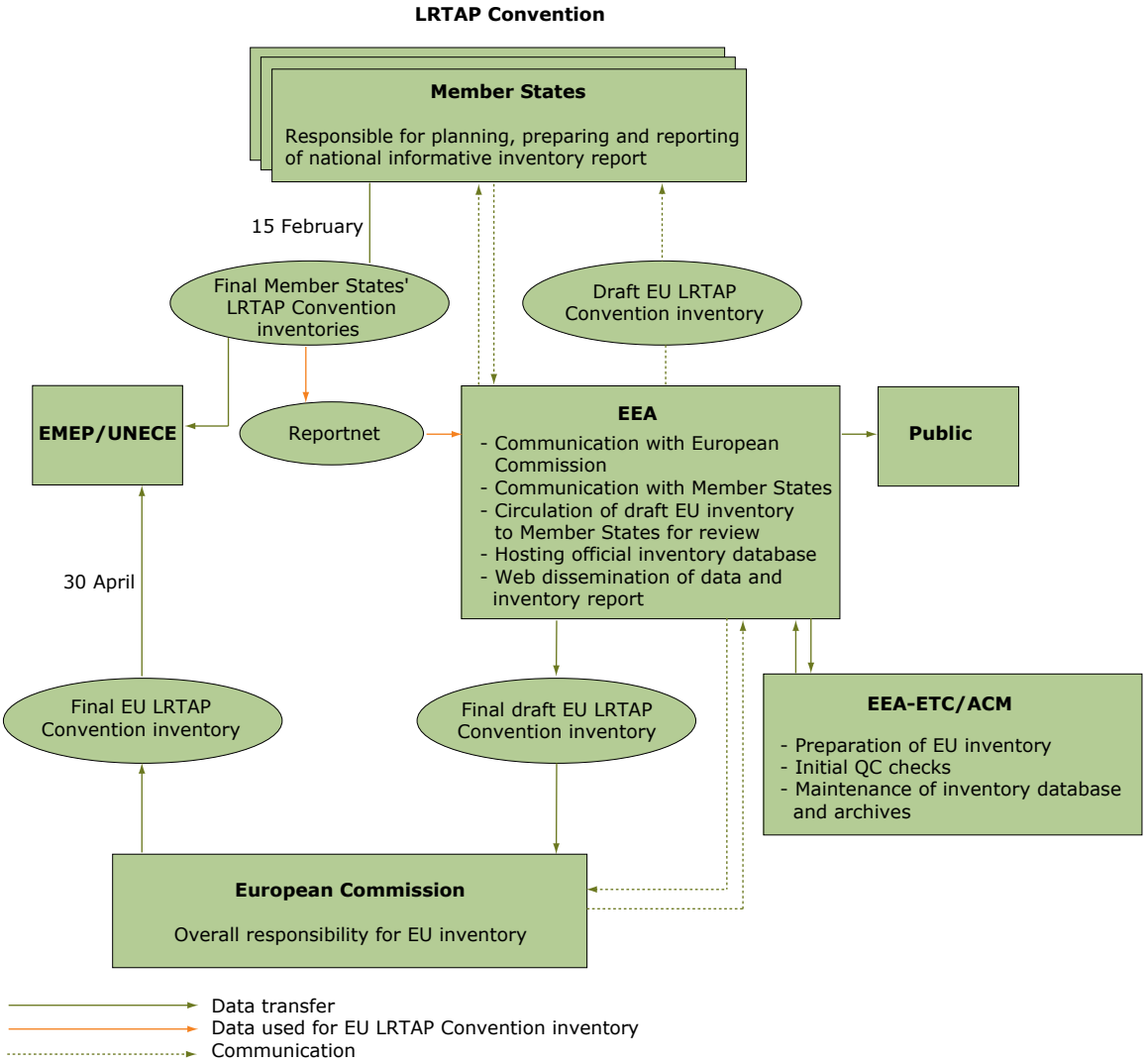
1.4 Methods and data sources

The EU LRTAP Convention emission inventory is based on an aggregation of data reported by Member States. Member States should have reported inventory data to UNECE (and were requested also to provide a copy of this data to the EEA) no later than 15 February 2012.

The updated reporting guidelines (UNECE, 2009) request that emissions data be provided by parties to the Convention using the NFR09 format. All Member States except one (Italy) used the new NFR09 reporting templates. Appendix 3 shows the formats used by Member States to report data. In order to compile the EU-27 inventory, it is necessary to transfer all submissions into a uniform format (see also Appendix 5 for further details).

The recommended structure for an IIR involves a general description of methodologies and data sources used. This includes an overview of what is used in the national inventory in terms of country-specific or default (i.e. EMEP/EEA guidebook) emission factors, specifying what is used for default emission factors and methods, as well as an elaborated description of activity data sources where data differs from national statistics. The following two chapters summarise the information provided by Member States in their IIRs, thereby helping readers understand what the EU inventory is based on. For detailed descriptions

Figure 1.1 Data flow for compiling the EU LRTAP Convention emission inventory



of methodologies and data sources, see the IIRs of Member States (Appendix 8).

1.4.1 Data sources

The data source for the EU inventory is Member States' emission inventories. The data sources for these underlying inventories may vary across the different Member States, but should all follow the recommendations of the EMEP EEA guidebook. This ensures that although inconsistencies might occur, the best available method is used to compile the EU inventory. The main data sources are national statistics, energy balances, agricultural statistics, etc. or any other reporting according to other national/ international reporting requirements (e.g. Large Combustion Plant Directive (2001/80/EC), Emissions Trading Directive (2009/29/EC), European Pollutant Release and Transfer Register (E-PRTR) Regulation No 166/2006).

Detailed information concerning the data sources used by Member States should be documented in the IIRs, if available. The level of detail varies widely across Member States, although the main data sources are official national statistics. Table 1.4 below summarises the commonly used data sources for the various sectors.

The sources for emission factors differ depending on the tier method used (see Appendix 6). One main source for emission factors is that provided in the EMEP/EEA guidebook, but they can also be

Figure 1.2 **Dates of first data submissions received from Member States (as of 11 May 2012)**

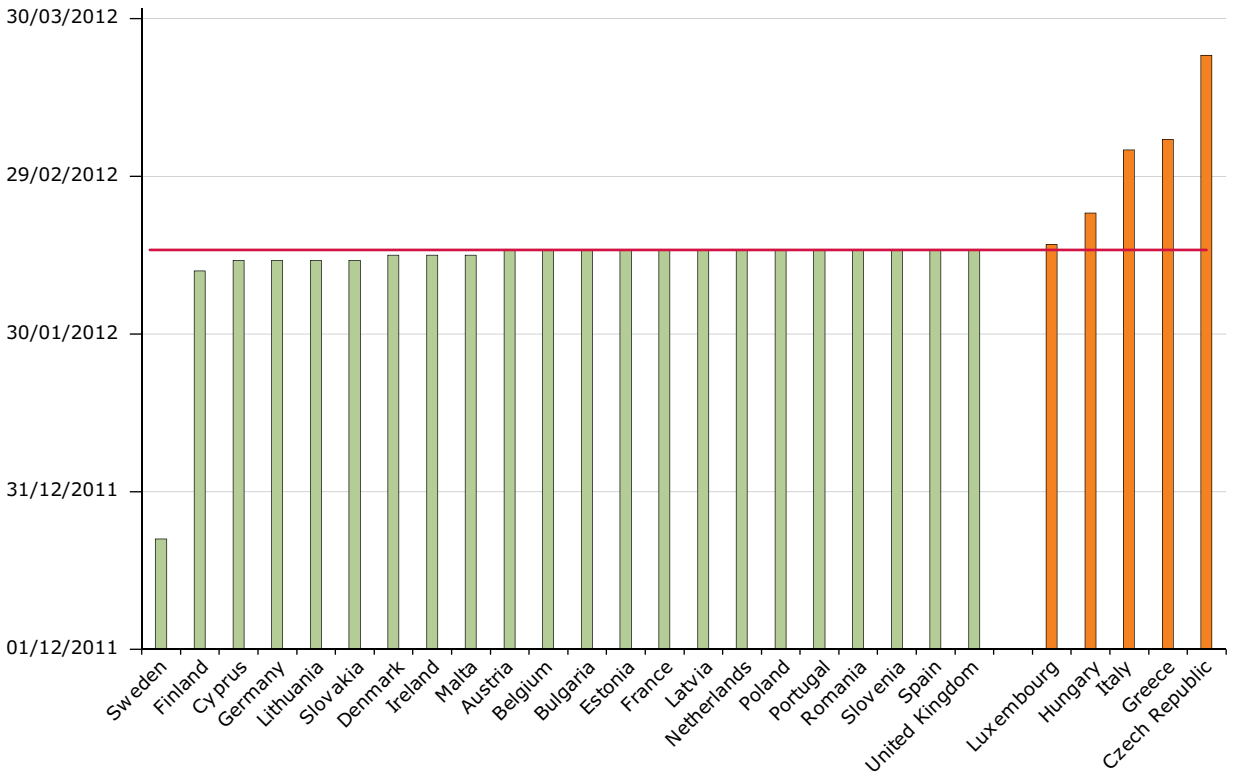


Table 1.4 **Data sources commonly used for inventory sectors**

Energy	Energy balance, ETS data, large combustion plant data and LPS survey
Transport	Energy balance, vehicle fleet statistics
Industry and solvents	National production statistics, trade statistics, data from plant operators (facility reports), reporting under the European Pollutant Emission Register (EPER) and E-PRTR
Agriculture	National agricultural statistics, specific studies
Waste	Landfill database, national studies, national statistics, information from municipalities

country or even plant specific. A survey on which emission factors are used by the Member States for all emission sources cannot be carried out, as this information is not uniformly available: some countries report details on their methodologies, while others do not. Detailed information can be found in the IIRs submitted by Member States; references to these reports are provided in Appendix 7.

1.4.2 Comparison of Member State emissions calculated on the basis of fuel sold v fuel consumed in road transport

The reporting guidelines (UNECE, 2009) specify in Article IV, paragraph 15, how emissions from transport should be reported: 'For emissions from transport, parties within the EMEP region should calculate and report emissions consistent with national energy balances reported to Eurostat or the International Energy Agency. Emissions from road vehicle transport should therefore be calculated and reported on the basis of the fuel sold in the Party concerned. […] In addition, Parties may report emissions from road vehicles based on fuel used or kilometres driven in the geographic area of the Party. The method for the estimate(s) should be clearly specified in the IIR.'

The difference between transport emissions estimated using the amount of fuel sold within a country and those estimated using the amount of fuel consumed in a country can be significant when

Table 1.5 Comparison of Member States' total emissions calculated on the basis of fuel sold and fuel consumed, 2010

Member States		NO_x	NMVOC	SO_x	NH_3	PM_{10}	$PM_{2.5}$	CO	Cd	Hg	Pb	Dioxin	Total PAH	HCB	HCH	PCB
		Gg	Gg	Gg	Gg	Gg	Gg	Gg	Mg	Mg	Mg	g	Mg	kg	kg	kg
Austria	National total	189	133	18.8	62.5	35	20	639	1.14	0.99	14.85	39	8	41.3	NR	NR
	National total (FU)	144	132	18.7	62.2	34	19	606	1.14	0.99	14.85	38	7	41.2	NR	NR
	Difference	– 24 %	– 1.0 %	– 0.2 %	– 0.5 %	– 2.5 %	– 4.4 %	– 5.1 %	– 0.2 %	– 0.1 %	– 0.02 %	– 1.0 %	– 6.3 %	– 0.2 %		
Czech Republic	National total	239	151	170.3	68.61	37.0	19.6	402	0.88	3	26	129.09	17.10	2.69	NE	24.1
	National total (FU)	243	152	170.4	68.61	37.5	20.0	408	0.89	3	26	129.10	17.14	2.68	NE	23.8
	Difference	1.7 %	1.0 %	0.01 %	0.01 %	1.2 %	2.0 %	1.5 %	0.3 %	0 %	0 %	0.005 %	0.2 %	– 0.4 %		– 1.2 %
Ireland	National total	76	45	25.88	106.2	13	8.2	139	0.42	0.42374	14	15.6	2.74	1	NA	17
	National total (FU)	73	44	25.88	106.1	12	8.0	133	0.41	0.42372	13	15.5	2.72	NA	NA	17
	Difference	– 4.0 %	– 1.5 %	– 0.01 %	– 0.1 %	– 1.9 %	– 2.5 %	– 4.3 %	– 1.3 %	– 0.005 %	– 5.1 %	– 0.4 %	– 0.7 %			0 %
Luxembourg	National total	46	9	2.21	4.8	NE	NE	39	NR	NR	NR	1	1	1	0	2
	National total (FU)	18	9	2.19	4.6	0	0	22	0	0	0	1	1	1	0	2
	Difference	– 61 %	0 %	– 1.0 %	– 3.8 %			– 44 %				0 %	0 %	0 %		0 %
Netherlands	National total	295	152	33.8	NE	31	16	590	NE	NE	45	NE	NE	NE	NE	NE
	National total (FU)	276	151	33.9	122	29	15	577	3	1	44	30	4	1	NO	0
	Difference	7 %	1 %	– 0.1 %		5.4 %	6.3 %	2.3 %			2.4 %					

fuel purchased within a country is actually used outside the country, and vice versa.

In the EU inventory, emissions from road transport are based on fuel sold, except for Belgium, Bulgaria, Luxembourg, the Netherlands and the United Kingdom. From the submissions of Greece and Latvia, it is not fully clarified whether their road transport emissions are based on fuel sold or fuel used. Belgium is aware of the fact that it should also report transport emissions based on fuel sold. Only Austria, Czech Republic, Ireland, Luxembourg and the Netherlands reported emissions in the NFR templates based on fuel used that differed from the emissions based on fuel sold. Table 1.5 shows, for these countries, the difference between total emissions for the year 2010 calculated using the two approaches.

The other decisive factor for achieving consistent EU numbers is the method that Member States select to calculate their emissions from road transport. Table 1.6 below indicates that COPERT ([7]) is not used by all countries; moreover, where COPERT is used, different versions may be applied. The impact of these different approaches on EU transport emissions has not been quantified.

1.4.3 General methods

The methods used by Member States should follow the methods described in the EMEP/EEA emissions guidebook. Overall, it can be said that Member States follow this recommendation, which ensures that best available methods are used for estimating national emissions and that inventories are improved continuously. Besides, the technical review procedures set up by the EMEP CEIP check and assess parties' data submissions in accordance with the review guidelines, with a view to improving the quality of emission data and associated information reported to the LRTAP Convention.

An overview of tier methods applied in Member States, based on the information presented in their IIRs, is available in Appendix 6.

([7]) Computer Programme to calculate Emissions from Road Transportation (EMEP/EEA, 2009).

Table 1.6 Overview of methods used to calculate emissions from road transport

	Method used
Austria	ARTEMIS, v2.1 ([a])
Belgium	COPERT IV (from 2007 on for all three regions)
Bulgaria	COPERT IV, v9 ([b])
Cyprus	COPERT IV, v8.1
Czech Republic	country-specific model
Denmark	COPERT IV
Estonia	COPERT IV, v9.0
Finland	LIISA ([c]) (sub-model of LIPASTO) ([d])
France	COPERT IV
Germany	TREMOD, v5.03 ([e])
Greece	COPERT IV, v7.1
Hungary	COPERT IV, v8.1
Ireland	COPERT IV, v8.0
Italy	COPERT IV, v9
Latvia	COPERT IV
Lithuania	COPERT IV, v9
Luxembourg	COPERT IV, v8
Malta	customised model (basic tier 3 methodology)
Netherlands	VERSIT+ ([f])
Poland	country-specific model
Portugal	COPERT IV, v9.0
Romania	COPERT III
Slovakia	COPERT IV, v8.1
Slovenia	COPERT IV, v6.1
Spain	unknown
Sweden	ARTEMIS
United Kingdom	COPERT IV, v8.1

Notes:
([a]) Assessment and Reliability of Transport Emission Models and Inventory Systems (André, 2004).
([b]) Computer Programme to calculate Emissions from Road Transportation (EMEP/EEA, 2009).
([c]) Road traffic exhaust emissions calculation software (Mäkelä et al., 2002).
([d]) Calculation system for traffic exhaust emissions and energy consumption in Finland (VTT, 2009).
([e]) Transport Emission Estimation Model (Knörr et al., 2009).
([f]) 'VERSIT' refers to 'verkeerssituatie', which means 'traffic situation' in Dutch (Smit et al., 2006, 2007).

1.4.4 Data gaps and gap-filling

Ideally, there should be no need to gap-fill the reported inventory data, as it is the role of Member States to submit full and accurate inventory datasets. However, as Table 1.9 and Table 1.10 indicate, Member State submissions contain various data gaps for particular pollutants or years in the time series. The most frequent problems observed are as follows.

- Submissions (whole national inventory) are not provided for the most recent year and/or other years.
- Emissions of some pollutants (e.g. PM, HMs, POPs and NH_3) are not provided, for a single year, several years or the entire time-series.
- Sectoral emissions are missing and only national totals are provided.

The EMEP reporting guidelines (UNECE, 2009) require that submitted emission inventories are complete. Before 2010, the inventory for the European Community was already partially gap-filled, whereby official data reported by Member States under other reporting obligations (e.g. the NEC Directive (EC, 2001) and the EU-MM (EC, 2004) was used to fill gaps. Nevertheless, this process still resulted in the Community's inventory being incomplete for certain pollutants and years.

Reflecting the need to submit a more complete data set, several discussions were held with Member State representatives in both 2008 and 2009 concerning possible approaches to achieve more complete gap-filling of the EU emission inventory. At a meeting in September 2009 ([8]), Member State representatives agreed to trial an improved procedure in 2010. In accordance with this agreement, the gap-filling procedure used during the compilation of the EU's 2010 and 2011 emissions inventory was performed in accordance with a methodology paper developed by the EEA and ETC/ACM (EEA, 2009). These are also consistent with the suggested techniques to fill emission data gaps described in the EMEP/EEA guidebook (EMEP/EEA, 2009).

([8]) Meeting of the Air and Fuels Committee under Directive 96/62/EC: Information on the Member States reporting under the NEC Directive (2001/81/EC), 28.09.2009, Brussels.

Table 1.7 Overview of methods used in Member States

Austria	Details on methodology provided in IIR (Austria's IIR, Table 4, p. 42), mostly country specific (CS). Default and literature only used for some sources and pollutants in agricultural sector.
Belgium	Because the regions are responsible for compiling emission inventories, concomitant methodologies have been developed by the three regions for compiling their inventory from basic data (Belgium's IIR, p. 5). Different institutions are responsible for the emission calculation, but all use EMEP/EEA methodology.
Bulgaria	National common methodology approved by the Ministry of Environment and Water (MoEW) in coordination with other ministries concerned. This national methodology (approved by Order RD 77/03.02.2006 of MoEW) is harmonised with the CORe INventory of AIR emissions (CORINAIR) methodology (third edition of EMEP/EEA guidebook) for calculation of the emissions according to the UNECE/CLRTAP.
Cyprus	For the emission inventory, in general terms, tier 2 methodology was used for key source sectors, and tier 1 for non-key-source sectors. Apart from these, for the estimation of emissions from the transport sector, the COPERT 4 tool was used (tier 3).
Czech Republic	No IIR available.
Denmark	Denmark's air emission inventories are based on the Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories (Intergovernmental Panel on Climate Change (IPCC), 1997), the Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories (IPCC, 2000), the CORINAIR methodology, and the EMEP/EEA guidebook (Denmark's IIR, p. 30).
Estonia	No specific information on methods and data sources.
Finland	The EMEP/CORINAIR guidebook methodology as well as national methods are used in the production of emission inventories. Country-specific emission factors and compliance data reported by the operators or emissions estimated by the industrial associations are used whenever they provide better estimates of the national circumstances than the default values (Finland's IIR, p. 31).
France	General description on emission calculation provided in Section 1.4.
Germany	As a general rule, Germany uses many country-specific process information and emission factors where available. Detailed information available in Germany's IIR.
Greece	The EMEP/EEA guidebook 2009, the Corinair guidebook, as well as the UNFCCC guidelines are used to compile the emission inventory for NO_x and SO_x. No information about methods used to calculate NMVOC and CO emissions.
Hungary	No IIR available.
Ireland	The informative inventory report shows how Ireland follows the guidelines for estimating and reporting of emission data in an attempt to ensure the transparency, accuracy, consistency, comparability and completeness of the reported emissions. /(Irland's IIR, p. 1) Detailed information on methods used are available in Ireland's IIR.
Italy	Methodologies are consistent with the EMEP/EEA Emission Inventory Guidebook, Revised 1996 and 2006 IPCC Guidelines, and IPCC Good Practice Guidance (EMEP/CORINAIR, 2007; EMEP/EEA, 2009; IPCC, 1997; IPCC, 2006; IPCC, 2000); national emission factors are used as well as default emission factors from international guidebooks, when national data are not available. The development of national methodologies is supported by background documents (Italy's IIR, p. 15).
Latvia	Information on methods available in sectoral chapters of Latvia's IIR.
Lithuania	Methodologies are described in subsectors, and references to used emission factors and activity data are given in Lithuania's IIR.
Luxembourg	No IIR available.
Malta	The methodology used in compiling the 2010 emissions was based on the EMEP/EEA air pollutant emission inventory guidebook (Malta's IIR, p. 7).
Netherlands	In general, two emission models are used in the Netherlands: one model for emissions from LPSs (bottom-up method); and one model for emissions from diffuse sources (e.g. road transport, agriculture), which are calculated from activity data and emission factors from sectoral emission inventory studies in the Netherlands (the Netherlands' IIR, p. 13).
Poland	Emission factors for the emission sources are mostly taken from EMEP inventory guidebooks or reports on domestic research. The sources of particular emission factors are given below in the sectoral chapters (Poland's IIR, p. 8).
Portugal	The inventory is compiled, to the extent it is possible, in accordance with the recommended methodologies from the EMEP/CORINAIR guidebook or the IPCC Guidelines. Default methods and emission factors used and the choice between tier 1 and tier 2 approaches were dictated case by case, by the availability of proper background information and by national circumstances (Portugal's IIR, pp. 1-7).
Romania	The methodology for estimating and reporting emissions is consistent with the last version of the guidebook elaborated under the patronage of the Executive Committee of the CLRTAP, EMEP/ EEA air pollutant emission inventory guidebook — 2009 (Romania's IIR, p. 6).
Slovakia	Emission inventory of NMVOC, HMs, POPs, PM and NH_3 is elaborated according to the EMEP/EEA Air Pollutant Emission Inventory Guidebook — 2009 and in accordance with requirements of the respective working group for emission inventory (UNECE Task Force on Emission Inventory) (Slovakia's IIR).
Slovenia	Slovenia's air emission inventories are based on the Revised 1996 Intergovernmental Panel on Climate Change (IPCC) Guidelines for National Greenhouse Gas Inventories (IPCC, 1997), the Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories (IPCC, 2000) and the CORINAIR methodology. The emission factors used for emission calculations in year 2010 were used from EMEP EEA Emission Inventory Guidebook 2009 (Slovenia's IIR, p. 18).
Spain	No information on methods and data sources available.
Sweden	The methodologies used for Sweden's emission inventory are to some extent taken directly from the IPCC guidelines and the good practice guidance, and the EMEP/EEA Air Pollutant Emission Inventory Guidebook — 2009. The methodologies are also in accordance with the diverse IPCC guidelines relevant for greenhouse gas reporting (Sweden's IIR, p. 16).
United Kingdom	Detailed descriptions are available in the country's IIR, The United Kingdom's emission inventories are compiled according to international good practice guidance (EMEP/CORINAIR [now EMEP/EEA] and the IPCC). Methodological changes are made to take account of new data sources, or new guidance from EMEP/EEA, relevant work by the IPCC, new research, or specific research programmes sponsored by the Department for Environment, Food and Rural Affairs (Defra) or the Department of Energy and Climate Change (DECC) (the United Kingdom's IIR, p. 43).

Note: In Table 1.7, only the information of Chapter 1 of the national IIRs, on methods and data sources, was extracted; some countries only provide further information in their sectoral chapters, which is too detailed to be presented here.

A stepwise approach was used to fill gaps in the national data sets.

1. Emission trends of all pollutants were compiled from 1990 onward using the Member State LRTAP Convention emission inventories provided to the EEA in 2011 and 2012.

2. For Member States that did not report complete data, emissions data reported officially by Member States under the EU-MM (NO_X, NMVOC, SO_2, CO) and then the NEC Directive (NO_X, NMVOC, SO_2, NH_3) were used in the first instance to fill gaps. In this step, notation keys were not used.

3. In a further step, notation keys reported officially by Member States under the EU-MM (NO_X, NMVOC, SO_2, CO) and then the NEC Directive (NO_X, NMVOC, SO_2, NH_3) were used to fill any remaining gaps.

4. In the next step, Member State LRTAP Convention emission inventories provided to the EEA in previous years were used to fill gaps still remaining.

5. Older LRTAP Convention data submitted to EMEP/CEIP was the final source of official data used to fill gaps.

6. Finally, for all remaining cases of missing data, further gap-filling procedures were applied in accordance with the procedures described in EEA (2009).

The further gap-filling procedures described in Step 6 are summarised as follows.

- Interpolation was performed if one or several years in the middle of a time series were missing.

- Extrapolation was performed if one or several years at the beginning or at the end of a time series were missing and if at least five consecutive years showing a clear trend ($r2 < 0.6$) were available. Extrapolation 'backwards' was never allowed to result in negative values.

- If fewer than five consecutive years were available as a basis for extrapolation, or if years did not show a clear trend, the value of the previous or next year was used to fill the gaps.

- If the notation keys 'NA' or 'NO' were used as a basis for gap-filling, they were treated as '0' and were not gap-filled.

Further, gap-filling was applied only where either national total and sectoral data were not available or where a national total was available but there were no sectoral data. In the former instance, sectors were first gap-filled and then summed to determine the total. In the latter instance, the sectoral split of the previous or following year was used to fill the gaps. If a national total was available but the sectoral data were incomplete, no gap-filling was applied.

Table 1.8 shows how gap-filling affects the total emissions on EU level. Generally ,the need for gap-filling of 2010 data is much lower than it was for 1990 data. For the main pollutants gapfilling of national totals was not necessary as all MS reported data for 2010. Generally the contribution of gapfilling to the reported EU totals is rather low, except for HCH. HCH emissions are reported by most Member States with a notation key or zero emissions. Only one value for HCH could be gapfilled which contributed with 33 % to total EU-27 emissions.

Still, inventories for many pollutants cannot be considered complete because even if gapfilling with the notation key 'NE', or 0 is done, the respective inventory is still considered incomplete on EU-level.

Table 1.9 and Table 1.10 show how the various officially reported data sets were used to supplement the LRTAP Convention data submissions for those Member States where gap-filling was required. Annex D provides a detailed overview showing, for each Member State, which data were gap-filled (and how).

Compared with previous years, the gap-filling procedure used from 2010 to 2012 has resulted in a more accurate determination of EU emission trends and of the most significant emission sources of the various pollutants. For certain pollutants (PM, HMs and POPs), particular Member States in certain cases lacked data for all years, and gap-filling was thus impossible. In such instances, the EU-27 emission totals for these pollutants are not considered complete (i.e. they are underestimated).

1.4.5 Gridded data

According to the revised reporting guidelines, parties within the geographical scope of EMEP should report gridded data every five years, commencing in 1990. Gridded data for the EU-27 were last submitted in 2007 (EEA, 2007) and are now required again. Gridded data should be provided not only at national level, but also at sectoral level.

Table 1.8 Effect of gap-filling on EU emission data

	Reporting in 2010 of national totals			Gap-filling		
Pollutant	**Number of Member States reporting emission values**	**Number of Member States reporting a notation key**	**Number of Member States not reporting**	**Number of Member States gap-filled with value**	**Number of Member States gap-filled with notation key**	**Difference in national total**
NO_X	27	0	0	0	0	0 %
NMVOC	27	0	0	0	0	0 %
SO_X	27	0	0	0	0	0 %
NH_3	27	0	0	0	0	0 %
TSP	25	0	2	0	1	0 %
$PM_{2.5}$	25	0	2	0	1	0 %
PM_{10}	25	0	2	0	1	0 %
CO	27	0	0	0	0	0 %
Pb	25	0	2	1	1	18 %
Cd	25	0	2	1	1	3 %
Hg	25	0	2	1	1	15 %
As	23	2	2	1	1	2 %
Cr	23	2	2	1	1	3 %
Cu	23	2	2	1	1	0 %
Ni	23	2	2	1	1	9 %
Se	21	3	3	2	1	0 %
Zn	23	2	2	1	1	1 %
PCDD/F	26	0	1	0	0	0 %
Total PAH	26	0	1	0	0	0 %
HCB	25	0	2	0	0	0 %
HCH	7	18	2	1	0	33 %
PCB	21	4	2	1	0	0 %
Benzo(a)pyrene	20	6	1	0	0	0 %
Benzo(b)fluoranthene	20	6	1	0	0	0 %
Benzo(k)fluoranthene	20	6	1	0	0	0 %
Indeno(1,2,3-cd)pyrene	20	6	1	0	0	0 %

Note: The analysis refers only to the national total in 2010 for the entire territory.

Table 1.9 Data sources of the main pollutants NO_x, NMVOC, SO_x, NH_3, CO, $PM_{2.5}$, PM_{10} and TSP emissions used for the 2011 EU-27 inventory compilation (as of 11 May 2012)

Member State	NFR as provided as LRTAP Convention submission via Eionet		CRF as provided under Council Decision 280/2004/EC via Eionet (NO_x, NMVOC, SO_x, CO)	NFR as provided via NEC Directive (NO_x, NMVOC, SO_x, NH_3)	Data submitted via LRTAP Convention to EMEP (CEIP database)
	NO_x, NMVOC, SO_x, NH_3, CO	$PM_{2.5}$, PM_{10} and TSP			
Austria	1980–2010	1990, 1995, 2000–2010			
Belgium	1990, 2000, 2005–2010	2000, 2005–2010	1991–1999, 2001–2004		
Bulgaria	1990–2010	1990–2010			
Cyprus	1990–2010	2000–2010			
Czech Republic	2010	2010	1990–2009	2009 (NH_3)	NH_3: 2001; $PM_{2.5}$: 2009; PM_{10}, TSP: 2001, 2009
Denmark	1985–2010, SO_x: 1980–2010	2000–2010			
Estonia	1990–2010	PM2.5, PM10: 2000–2010; TSP: 1990–2010			
Finland	NO_x, SO_x, NH_3: 1980–2010; NMVOC: 1987–2010; CO: 1990–2010	1990–2010			
France	NO_x, SO_x, NH_3, CO: 1980–2010, NMVOC: 1988–2010	1990–2010			
Germany	1990–2010	1995–2010			
Greece	1990–2010				
Hungary	2010	2010	1990–2009		2002 (NH_3, $PM_{2.5}$, PM_{10}, TSP)
Ireland	NO_x, NMVOC, SO_x: 1987, 1990–2010; NH_3, CO: 1990–2010	1990–2010			
Italy	1980–2010	1990–2010			
Latvia	1990–2010	2000–2010			
Lithuania	2008–2010	2008–2010	1990–2007		NH_3, TSP: 2003–2004; $PM_{2.5}$, PM_{10}: 2004
Luxembourg	1990-2010				
Malta	2000–2010	2000–2010	1990–1999		
Netherlands	1990–2010	1990–2010			
Poland	2004–2005, 2009–2010	2004–2005, 2009–2010	NO_x, NMVOC, SO_x: 1990–2003; 2006–2008, CO: 1990, 1992–2003, 2006–2008		2001 (NH_3, $PM_{2.5}$, PM_{10}, TSP)
Portugal	1990–2010	1990–2010			
Romania	2005–2010	2005–2010	1990–2005 (NO_x, NMVOC, SO_x)		
Slovakia	2000–2010	2000–2010	1990–1999		
Slovenia	NO_x, SO_x, CO: 1980–2010; NMVOC, NH_3: 1990–2010	2000–2010			
Spain	1990–2010	2000–2010			
Sweden	1990–2010	1990–2010			
United Kingdom	1980–2010	1980–2010			

Table 1.10 Data sources of HMs (Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn) and the POPs (PCDD/Fs, total PAHs, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Indeno(1,2,3-cd)pyrene, HCB, HCH and PCBs) emissions used for the 2011 EU-27 inventory compilation (as of 11 May 2012)

Member State	NFR as provided as LRTAP Convention submission via Eionet			Data submitted via LRTAP Convention to EMEP (CEIP database)
	Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn	PCDD/Fs, HCB, HCH, PCBs	PAHs: Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Indeno(1,2,3-cd)pyrene, total PAHs	
Austria	1985–2010 (Pb, Cd, Hg)	1985–2010 (PCDD/Fs, HCB)	1985–2010 (Total PAHs)	
Belgium	1990, 2000, 2005–2010	1990, 2000, 2005–2010 (PCDD/Fs, HCB, HCH)	1990, 2000, 2005–2010 (Total PAHs)	
Bulgaria	1990–2010	1990–2010 (PCDD/Fs, HCB, PCBs)	1990–2010	
Cyprus	1990–2010	1990–2010 (PCDD/Fs, HCB, PCBs)	1990–2010	
Czech Republic	2010	2010 (PCDD/Fs, HCB, PCBs)	2010	HMs, PCDD/Fs, PCBs, total PAHs: 2001–2006, 2009; HCB, other PAHs: 2002–2006, 2009
Denmark	1990–2010	1990–2010 (PCDD/Fs, HCB)	1990–2010	
Estonia	1990–2010	1990–2010 (PCDD/Fs, HCB, PCBs)	1990–2010	
Finland	1990–2010 (Pb, Cd, Hg, As, Cr, Cu, Ni, Zn)	1990–2010 (PCDD/Fs, HCB, PCBs)	1990–2010 (Total PAHs)	
France	1990–2010	1990–2010 (PCDD/Fs, HCB, PCBs)	1990–2010	
Germany	1990–2010	PCDD/Fs, HCB, PCBs: 1990–2010; HCH: 1990–1997	1990–2010 (Benzo(a) pyrene, Benzo(b) fluoranthene, Indeno(1,2,3–cd)pyrene, total PAHs)	
Greece				
Hungary	2010	2010 (PCDD/Fs, HCB, PCBs)	2010	2002–2007 (HMs, PCDD/Fs, HCB, PCBs, PAHs)
Ireland	1990–2010	1990–2010 (PCDD/Fs, HCB, PCBs)	1990–2010	
Italy	1990–2010			
Latvia	1990–2010	1990–2010 (PCDD/Fs, HCB, PCBs)	1990–2010	
Lithuania	2008–2010	PCDD/Fs: 2008–2010; PCBs: 2009–2010	2008–2010	PCDD/Fs, PCBs, PAHs: 1990, 2002–2007; HMs: 2002–2007
Luxembourg		1990, 1993, 1998, 2003, 2008–2010 (PCDD/Fs, HCB, PCBs)	1990, 1993, 1998, 2003, 2008–2010	2007 (HMs)
Malta	2000–2010	2010 (PCDD/Fs, HCB, PCBs)	2010	
Netherlands	1990–2010	PCDD/Fs, HCB: 1990–2010, PCBs: 1995, 1998, 2002, 2004, 2005	1990–2010	
Poland	2005, 2009–2010 (Pb, Cd, Hg, As, Cr, Cu, Ni, Zn)	2004–2005, 2009–2010 (PCDD/Fs, HCB, PCBs)	2004–2005, 2009–2010	2001, 2006 (Pb, Cd, Hg, As, Cr, Cu, Ni, Zn, PCDD/Fs, HCB, PCBs, PAHs)
Portugal	1990–2010	1990–2010 (PCDD/Fs, HCB, PCBs)	1990–2010 (Total PAHs)	
Romania	2005–2010	2005–2010 (PCDD/Fs, HCB, PCBs)	2005–2010	2004 (PCDD/Fs, HCB, PCBs, PAHs)
Slovakia	2000–2010	2000–2010 (PCDD/Fs, HCB, PCBs)	2000–2010	
Slovenia	1990–2010 (Pb, Cd, Hg)	1990–2010 (PCDD/Fs, HCB, PCBs)	1990–2010	
Spain	1990–2010	PCDD/Fs, HCB: 1990–2010; HCH: 1990–2002	1990–2010 (Total PAHs)	
Sweden	1990–2010	1990–2010 (PCDD/Fs, HCB, PCBs)	1990–2010	
United Kingdom	1980–2010	1990–2010	1990–2010	

Note: Slovenia resubmitted an updated air emission inventory on 14 May, which could not be taken into account as the deadline for new data had passed. But the therewith submitted informative inventory report was taken into account.

NFR codes should be aggregated to a predefined sector, the so-called NFR Aggregation for Gridded and LPS data (GNFR) in Annex III of the reporting guidelines (UNECE, 2009). Greece, Lithuania and Slovakia only reported national total grids — but no sectoral grid. Eight Member States did not report gridded data for 2010: France, Hungary, Italy, Latvia, Luxembourg, Malta, Romania and the United Kingdom. Further details are provided in Appendix 3. In Chapter 2, the gridded data are located in each pollutant section.

The received data are subsequently compiled and processed into the format required for reporting in the EMEP reporting template file Table IV 3A. The final Table IV 3A results are available in Annex F of this report and comprise spatially disaggregated national totals for the pollutants SO_X, NO_X, NH_3, NMVOC, CO, PM, POPs and HMs.

1.4.6 Large point sources

Parties within the geographical scope of EMEP are also required to provide data on LPSs every five years, commencing in 2000. In the reporting year 2012, parties are required to report on their LPSs. The data requested include the following: type of source, geographical coordinates (latitude, longitude), emission quantities of the pollutants and, where appropriate, effective chimney height.

Ten parties (France, Germany, Greece, Hungary, Italy, Luxembourg, Malta, Romania, Sweden and the United Kingdom) did not report LPS data for 2010. The United Kingdom only reported data for 2005 and 2009. Poland's individual emission data are available, but without coordinates and names due to publication restrictions, and therefore cannot be used.

The data available are compiled into one table (NFR IV 3A), and are available in Annex G to this report.

1.5 Key category analyses

1.5.1 EU-27 key category analysis

It is good practice to identify key inventory categories in a systematic and objective manner by performing a quantitative analysis of the magnitude of emissions (a 'level' assessment) or of the change in emissions from year to year (a 'trend' assessment), relative to total national emissions. A key category is defined as an emission-source category that has significant influence on a country's total inventory in terms of the absolute level of emissions, the trend in emissions, or both. In this report, the categories that are jointly responsible for 80 % of the national total emission of a given pollutant are classified as key categories (as per the EMEP/EEA guidebook (EMEP/EEA, 2009)).

EU-27 key categories were determined using a level analysis of 2010 emissions for each pollutant (after any necessary gap-filling had been applied). It should be noted that when the notation 'IE' (included elsewhere) was used by a Member State for a particular source/pollutant combination, the key category analysis is likely to have underestimated the category concerned and overestimated that in which emissions were reported instead. In addition, as described earlier, PM, HMs and POPs data from some Member States could not be gap-filled, as no data were reported for any years. To enable presentation of a provisional key category analysis (KCA) for these pollutants, in these instances emissions were aggregated without including data for all the EU-27 Member States. The trend tables in Chapter 2 presenting Member State emissions show the instances where data were not reported.

Chapter 2 provides a summary of the top five EU-27 key categories in 2010, for each pollutant. A complete list of all EU-27 key categories for NO_X, NMVOC, SO_X, NH_3, $PM_{2.5}$, PM_{10}, TSP and CO, HMs (Pb, Cd, Hg, As, Cr, Cu, Ni, Se and Zn) and POPs (PCDD/Fs, total PAHs, benzo(a)pyrene, benzo(b) fluoranthene, benzo(k)fluoranthene, indeno(1,2,3-cd) pyrene, HCB, HCH and PCBs) emissions is also given in Chapter 2. Detailed KCA calculations are provided in Annex C to this report.

1.5.2 Main emission sources

Table 1.11 presents the EU-27 key categories, i.e. the individual sources that overall contributed most to 2010 emissions of pollutants, determined by a level assessment ([9]) for each of the main air pollutants, PM, HMs and POPs.

([9]) A key category level assessment identifies those source categories that have a significant influence on a country's total inventory in terms of their absolute level of emissions. In this report, the categories that are jointly responsible for 80 % of the total emission of a given pollutant are classified as key categories (EMEP/EEA, 2009).

A total of 49 different emission inventory source categories were identified as being key categories for at least 1 pollutant. A number of emission categories were identified as being key categories for more than 1 of the 15 pollutants assessed. '1 A 4 b i — Residential: Stationary plants' and '1 A 1 a — Public electricity and heat production' were identified as being important emission sources for 13 and 11 pollutants, respectively. Similarly, '2 C 1 — Iron and steel production' and '1 A 2 f i — Stationary combustion in manufacturing industries and construction: Other' were key categories for 10 and 9 pollutants, respectively.

For NO_X and CO, nine and eight key categories respectively were identified and, as would be expected for both these pollutants, all key categories are sectors involving fuel combustion or thermal processes. Six key categories were identified for SO_X (again energy related) and NH_3 (five, all from the 'agriculture' sector). PM_{10}, $PM_{2.5}$ and NMVOC emission sources are more diverse, and thus larger numbers of source categories make up the key category threshold of 80 % of total emissions. For the PM pollutants, more than half of the key categories were energy related, while for NMVOC a high amount of the key categories involve activities associated with solvents and product use.

Seven key categories were identified for the HM Cd, eight for Hg and also for Pb. Emissions from these key categories were all energy or industry related, resulting particularly from processes associated with metal production.

For the POPs, source categories from all sectors have been identified as key categories. Generally, metal production was an important source of POP emissions. However, emissions from residential households also contributed significantly to emissions of many of the POPs.

Several factors may influence the determination of key categories at the EU-27 level. A Member State's use of the emission inventory notation 'IE' ('included elsewhere' — see Appendix 1) means that emission estimates for one NFR sector can be included in those of a different sector. Also, the allocation of emissions to the (sub)sector 'Other' is applied differently among Member States, which might lead to inconsistencies. Due to such issues, the EU-27 KCA may not always accurately reflect the share of all main emission sources. It is also important to note that the results of a similar analysis of individual Member States will differ from the key sources determined for the EU-27.

1.6 Quality assurance, quality control and verification methods

Member States are encouraged to use appropriate QA and QC procedures to ensure data quality and to verify and validate their emissions data. These procedures should be consistent with those described in the EMEP/EEA emission inventory guidebook (EMEP/EEA, 2009).

The main activities improving the quality of the inventory are the checks performed by the EEA-ETC/ACM on the status of each Member State's submission. In addition, the internal consistency of data tables submitted by Member States is checked prior to compiling the EU-27 tables. External checks are also provided by Member States through an Eionet review before the EU-27 inventory is submitted to the secretariat of the LRTAP Convention.

The agreed gap-filling procedures are one instrument to assure and improve the quality of the EU inventory, as gaps for sectoral emissions and total emissions for any year, are analysed and gap-filled, if possible. This improves completeness, comparability and consistency over the years, and motivates Member States to report their data in the following reporting cycle (further details on gap-filling are available in Section 1.4.4).

All inventory documents (submissions, inventory master file, inventory report, status reports and related correspondence) are archived electronically at the EEA–ETC/ACM Forum data portal. Revisions of data sets are recorded.

More detailed QA activities are performed by the EEA-ETC/ACM and the EMEP CEIP in an annual review process (EMEP CEIP, 2012c). The review of Member State LRTAP Convention emission inventories is performed jointly with the review of those reported under the NEC Directive (EC, 2001). The technical review of inventories is carried out in three stages. Review stages 1 and 2 include checks on timeliness, formats, consistency, accuracy, completeness and comparability of actual Member State inventory submissions. Test results are provided to Member States and used to improve the quality of the national emission inventories.

Table 1.11 Results of key category analysis for the EU-27 for the year 2010: cumulative contribution of emission sources to total emissions of NO_x, NMVOC, SO_x, NH_3, CO, $PM_{2.5}$ and PM_{10}, the HMs Cd, Pb, Hg, and the POPs PCBs, HCB, total PAHs, PCDD/Fs and HCH (in descending order)

NO_x key categories	(%)	(%) cumul.
1 A 3 b iii Road transport: Heavy duty vehicles	20 %	20 %
1 A 3 b i Road transport: Passenger cars	17 %	37 %
1 A 1 a Public Electricity and Heat Production	17 %	53 %
1 A 2 f i Stationary combustion in manufacturing industries and construction: Other	7 %	61 %
1 A 4 c ii Agriculture/Forestry/Fishing: Off-road vehicles and other machinery	5 %	66 %
1 A 3 b ii Road transport: Light duty vehicles	5 %	71 %
1 A 4 b i Residential: Stationary plants	5 %	75 %
1 A 3 d ii National navigation (Shipping)	4 %	79 %
1 A 2 f ii Mobile Combustion in manufacturing industries and construction	3 %	81 %

SO_x key categories	(%)	(%) cumul.
1 A 1 a Public Electricity and Heat Production	47 %	47 %
1 A 2 f i Stationary combustion in manufacturing industries and construction: Other	12 %	59 %
1 A 4 b i Residential: Stationary plants	9 %	68 %
1 A 1 b Petroleum refining	7 %	75 %
1 A 2 a Stationary combustion in manufacturing industries and construction: Iron and steel	3 %	78 %
1 A 3 d ii National navigation (Shipping)	3 %	82 %

NMVOC key categories	(%)	(%) cumul.
1 A 4 b i Residential: Stationary plants	13 %	13 %
3 D 2 Domestic solvent use including fungicides	10 %	23 %
3 A 2 Industrial coating application	7 %	31 %
1 A 3 b i Road transport: Passenger cars	7 %	38 %
3 D 3 Other product use	7 %	45 %
3 A 1 Decorative coating application	7 %	51 %
3 C Chemical products	5 %	56 %
1 A 3 b iv Road transport: Mopeds & motorcycles	4 %	60 %
2 D 2 Food and drink	4 %	64 %
3 D 1 Printing	4 %	67 %
1 B 2 a iv Refining/storage	3 %	71 %
3 B 1 Degreasing	2 %	73 %
1 A 3 b v Road transport: Gasoline evaporation	2 %	75 %
1 B 2 a v Distribution of oil products	2 %	77 %
2 B 5 a Other chemical industry	2 %	79 %
1 A 3 d ii National navigation (Shipping)	2 %	80 %

CO key categories	(%)	(%) cumul.
1 A 4 b i Residential: Stationary plants	34 %	34 %
1 A 3 b i Road transport: Passenger cars	21 %	55 %
2 C 1 Iron and steel production	8 %	63 %
1 A 2 a Stationary combustion in manufacturing industries and construction: Iron and steel	5 %	68 %
1 A 3 b iv Road transport: Mopeds & motorcycles	4 %	72 %
1 A 2 f i Stationary combustion in manufacturing industries and construction: Other	4 %	76 %
1 A 1 a Public Electricity and Heat Production	2 %	78 %
1 A 3 b iii Road transport: Heavy duty vehicles	2 %	80 %

NH_3 key categories	(%)	(%) cumul.
4 D 1 a Synthetic N-fertilizers	20 %	20 %
4 B 1 b Cattle non-dairy	20 %	40 %
4 B 1 a Cattle dairy	20 %	61 %
4 B 8 Swine	16 %	76 %
4 B 9 a Laying hens	4 %	81 %

Table 1.11 Results of key category analysis for the EU-27 for the year 2010: cumulative contribution of emission sources to total emissions of NO_X, NMVOC, SO_X, NH_3, CO, $PM_{2.5}$ and PM_{10}, the HMs Cd, Pb, Hg, and the POPs PCBs, HCB, total PAHs, PCDD/Fs and HCH (in descending order) (cont.)

$PM_{2.5}$ key categories	(%)	(%) cumul.
1 A 4 b i Residential: Stationary plants	45 %	45 %
1 A 3 b i Road transport: Passenger cars	5 %	50 %
1 A 1 a Public Electricity and Heat Production	4 %	54 %
1 A 2 f i Stationary combustion in manufacturing industries and construction: Other	4 %	58 %
1 A 4 c ii Agriculture/Forestry/Fishing: Off-road vehicles and other machinery	4 %	62 %
1 A 3 b vi Road transport: Automobile tyre and brake wear	4 %	65 %
1 A 3 b iii Road transport: Heavy duty vehicles	3 %	69 %
2 A 7 a Quarrying and mining of minerals other than coal	3 %	72 %
1 A 3 b ii Road transport: Light duty vehicles	2 %	74 %
2 C 1 Iron and steel production	2 %	76 %
1 A 3 d ii National navigation (Shipping)	2 %	78 %
1 A 3 b vii Road transport: Automobile road abrasion	2 %	79 %
1 A 4 c i Agriculture/Forestry/Fishing: Stationary	1 %	81 %

PM_{10} key categories	(%)	(%) cumul.
1 A 4 b i Residential: Stationary plants	36 %	36 %
1 A 1 a Public Electricity and Heat Production	5 %	41 %
1 A 3 b vi Road transport: Automobile tyre and brake wear	4 %	45 %
1 A 3 b i Road transport: Passenger cars	3 %	48 %
1 A 2 f i Stationary combustion in manufacturing industries and construction: Other	3 %	52 %
2 A 7 a Quarrying and mining of minerals other than coal	3 %	55 %
4 D 2 a Farm-level agricultural operations including storage, handling and transport of agricultural products	3 %	58 %
1 A 4 c ii Agriculture/Forestry/Fishing: Off-road vehicles and other machinery	3 %	61 %
1 A 3 b iii Road transport: Heavy duty vehicles	3 %	64 %
4 B 8 Swine	2 %	66 %
1 A 3 b vii Road transport: Automobile road abrasion	2 %	68 %
2 G Other production, consumption, storage, transportation or handling of bulk products	2 %	71 %
4 B 9 b Broilers	2 %	72 %
2 A 6 Road paving with asphalt	2 %	74 %
2 A 7 b Construction and demolition	2 %	76 %
2 C 1 Iron and steel production	2 %	78 %
1 A 4 c i Agriculture/Forestry/Fishing: Stationary	2 %	80 %

Cd key categories	(%)	(%) cumul.
1 A 4 b i Residential: Stationary plants	28 %	28 %
1 A 2 f i Stationary combustion in manufacturing industries and construction: Other	12 %	40 %
1 A 1 a Public Electricity and Heat Production	12 %	52 %
2 C 1 Iron and steel production	10 %	62 %
1 A 2 b Stationary combustion in manufacturing industries and construction: Non-ferrous metals	8 %	70 %
1 A 4 a i Commercial/institutional: Stationary	6 %	76 %
1 A 4 c i Agriculture/Forestry/Fishing: Stationary	5 %	81 %

Pb key categories	(%)	(%) cumul.
2 C 1 Iron and steel production	18 %	18 %
1 A 2 b Stationary combustion in manufacturing industries and construction: Non-ferrous metals	17 %	35 %
1 A 2 f i Stationary combustion in manufacturing industries and construction: Other	12 %	47 %
1 A 4 b i Residential: Stationary plants	10 %	57 %
6 C b Industrial waste incineration	9 %	66 %
1 A 3 b vi Road transport: Automobile tyre and brake wear	6 %	71 %
1 A 1 a Public Electricity and Heat Production	5 %	77 %
1 A 2 a Stationary combustion in manufacturing industries and construction: Iron and steel	5 %	82 %

Table 1.11 Results of key category analysis for the EU-27 for the year 2010: cumulative contribution of emission sources to total emissions of NO_x, NMVOC, SO_x, NH_3, CO, $PM_{2.5}$ and PM_{10}, the HMs Cd, Pb, Hg, and the POPs PCBs, HCB, total PAHs, PCDD/Fs and HCH (in descending order) (cont.)

Hg key categories	(%)	(%) cumul.
1 A 1 a Public Electricity and Heat Production	36 %	36 %
2 C 1 Iron and steel production	12 %	49 %
1 A 2 f i Stationary combustion in manufacturing industries and construction: Other	11 %	60 %
1 A 4 b i Residential: Stationary plants	5 %	65 %
1 A 4 a i Commercial/institutional: Stationary	5 %	70 %
1 A 3 d ii National navigation (Shipping)	4 %	74 %
2 A 1 Cement production	3 %	77 %
1 A 1 b Petroleum refining	3 %	81 %

PCBs key categories	(%)	(%) cumul.
6 C b Industrial waste incineration	30 %	30 %
1 A 4 b i Residential: Stationary plants	17 %	47 %
2 F Consumption of POPs and heavy metals (e.g. electrical and scientific equipment)	14 %	60 %
2 C 1 Iron and steel production	13 %	73 %
1 A 1 a Public Electricity and Heat Production	10 %	84 %

HCB key categories	(%)	(%) cumul.
2 C 1 Iron and steel production	67 %	67 %
1 A 4 b i Residential: Stationary plants	8 %	75 %
4 G Agriculture other	5 %	80 %
1 A 1 a Public Electricity and Heat Production	5 %	85 %

Total PAH key categories	(%)	(%) cumul.
1 A 4 b i Residential: Stationary plants	55 %	55 %
4 F Field burning of agricultural wastes	16 %	71 %
2 C 1 Iron and steel production	4 %	74 %
2 C 3 Aluminum production	3 %	78 %
1 A 2 b Stationary combustion in manufacturing industries and construction: Non-ferrous metals	3 %	81 %

Dioxins/furans key categories	(%)	(%) cumul.
1 A 4 b i Residential: Stationary plants	34 %	34 %
2 C 1 Iron and steel production	15 %	48 %
1 A 2 a Stationary combustion in manufacturing industries and construction: Iron and steel	7 %	56 %
1 A 2 f i Stationary combustion in manufacturing industries and construction: Other	7 %	62 %
6 D Other waste	7 %	69 %
6 C e Small scale waste burning	5 %	74 %
1 A 1 a Public Electricity and Heat Production	4 %	78 %
6 C b Industrial waste incineration	4 %	82 %

HCH key categories	(%)	(%) cumul.
2 F Consumption of POPs and heavy metals (e.g. electrical and scientific equipment)	66 %	66 %
4 G Agriculture other	33 %	99 %

Note: The codes and descriptions shown correspond to the UNECE emissions reporting nomenclature — the NFR.
The key category analysis of Pb, Hg, Cd does not take into account emission from Greece, as these are only provided as national totals.

Summary results of the review (stages 1 and 2) are published each year in a joint EMEP/EEA review report ([10]).

In 2008, CEIP in cooperation with the EEA and Member States started centralised reviews ([11]) of national inventories (stage 3). In 2011, Belarus, Croatia, the Czech Republic, Estonia, the former Yugoslav Republic of Macedonia, Greece, Iceland, Luxembourg, Slovenia and Ukraine were reviewed. The results are published in individual country-specific reports (EMEP CEIP, 2012d). The long-term goal of EMEP is to perform a centralised review every year of 10 LRTAP Convention parties, so that each party undergoes a detailed review approximately once every 5 years).

([10]) A summary of the results of the stage one and two review performed in 2012 will be published jointly by EMEP/EEA.
([11]) In cooperation with the EEA and TFEIP, CEIP selects countries to be reviewed and sets up an expert review team (ERT) from inventory experts nominated by countries to the EMEP roster. The ERT performs detailed reviews of submitted inventories and IIRs. The voluntary countries which were reviewed for the first time within a stage 3 review process were France, Norway, Portugal, and Sweden.

1.7 General uncertainty evaluation

Quantifying uncertainty in the EU LRTAP emission inventory calls for Member States to first provide detailed information on emission uncertainties. An analysis (Table 1.12) of the uncertainty evaluation performed in Member States shows that only seven (Cyprus, Denmark, Finland, France, Ireland, Latvia, the Netherlands, Sweden and the United Kingdom) quantify their uncertainty in emissions. Member States use either a tier 1 approach or a Monte Carlo analysis (Finland and the United Kingdom).

As only a few Member States report on their uncertainty, it is not possible to evaluate uncertainty at the overall EU level. The gap-filling procedure also contributes to reduced uncertainty at EU level.

Table 1.12 Information on uncertainty evaluation at Member State level

Austria	To date, no quantitative uncertainty assessment for any of the pollutants or pollutant groups relevant to this report has been carried out. However, the quality of estimates for all relevant pollutants has been rated using qualitative indicators, as suggested in Chapter 5 of the *EMEP/EEA air pollution emission inventory guidebook — 2009*.
Belgium	Not mentioned in Belgium's IIR.
Bulgaria	The overall uncertainty is closely related to the emission sources' data uncertainty (fuels, activities, processes, etc.) and to the emission factor uncertainty. For the UNECE/LRTAP Convention, a quantitative estimate of inventory uncertainty for each source category and for the inventory in total will be presented in the next submission.
Cyprus	The uncertainties of the Cyprus emission inventory were evaluated for the first time in 2012. The uncertainty estimations are in accordance with the tier 1 methodology described in the *EMEP/EEA air pollution emission inventory guidebook — 2009*.
Czech Republic	No IIR available.
Denmark	The uncertainty estimates are based on the simple tier 1 approach in the EMEP/CORINAIR guidebook. The uncertainty estimates are based on emission data for the base year and year 2010, and on uncertainties for activity rates and emission factors for each of the main Selected Nomenclature for reporting of Air Pollutants (SNAP) sectors. For PM, the year 2000 is considered as the base year, but for all other pollutants 1990 is used as the base year.
Estonia	The uncertainty assessment has not yet been carried out in Estonia; a quantitative uncertainty assessment is planned for the next submission.
Finland	The uncertainty analysis for 2009 emission data is carried out at NFR 3 level for the actual emission sources. The method was Monte Carlo simulation (tier 2) using @Risk software. The uncertainties of the input parameters were estimated by experts compiling the inventories and those of the measured emissions by the competent authorities that supervise emission monitoring carried out at the individual plants. The emissions of some pollutants from certain sources are poorly understood, for instance some POP compounds from fuel combustion and industrial processes, and therefore estimation of their uncertainty is found to be very challenging at the moment (Finland's IIR p. 45).
France	Currently only Tier 1 method is applied, as the numeric simulation 'Monte Carlo' requires more computer sciences and especially needs uncertainty data much more extense and detailed, which are often imperfect.
Germany	Germany has not carried out a qualitative or a quantitative uncertainty assessment for any of the relevant pollutants or pollutant groups so far. The first step of accomplishing a substantiated qualitative uncertainty assessment using qualitative indicators — as suggested in the chapter entitled 'GPG for LRTAP emission inventories' of the EMEP/CORINAIR guidebook — is planned for next year's submission.
Greece	No uncertainty analysis undertaken
Hungary	No IIR available.
Ireland	A semi-quantitative uncertainty analysis has been used to determine the overall emissions uncertainty for a number of pollutants for 2010 data. This uses a Tier 1 propogation of errors to obtain an uncertainty for the total emission. The results do provide a good indication as to which sources are contributing the most to the overall uncertainty, and therefore where improvement effort should be targeted (Ireland's IIR, p. 14).
Italy	An overall uncertainty analysis for the Italian inventory related to the pollutants described in this report has not been assessed yet. Nevertheless, different studies on uncertainty have been carried out and a quantitative assessment of the Italian GHG inventory is performed by the Tier 1 method defined in the IPCC Good Practice Guidance (Italian's IIR, p. 22).
Latvia	Uncertainty estimates were calculated according to the tier 1 method presented by the IPCC good practice guidance (GPG) (IPCC, 2000). The tier 1 method is based on emission estimates and uncertainty coefficients for activity data and emission factors.
Lithuania	Not mentioned in Lithuania's IIR.
Luxembourg	No IIR available.
Malta	For this submission, Malta did not perform a quantitative uncertainty assessment for any pollutants in the emission inventory.

Table 1.12 Information on uncertainty evaluation at Member State level (cont.)

Netherlands	Uncertainty estimates on national total emissions have been reported in the Dutch Environmental Balances since 2000 . These estimates were based on uncertainties per source category, using simple error propagation calculations (tier 1). Most uncertainty estimates were determined by the National Institute for Public Health and the Environment/Netherlands Environmental Assessment Agency (RIVM/PBL) emission experts (Dutch IIR, p. 15).
Poland	The Polish inventory team is planning to implement a larger scope of uncertainty analysis for the CLRTAP inventory in the next submission. At the time of writing, information on uncertainties of activity data and emission factors are being collected from sectoral experts and literature.
Portugal	To date, the uncertainty analysis was performed only for the direct greenhouse gases. It is planned to extend the assessment to the other emission estimates in the near future.
Romania	Not mentioned in Romania's IIR.
Slovakia	Not mentioned in Slovakia's IIR.
Slovenia	An uncertainty analysis is not carried out. Checks of uncertainty were not performed in 2009 but are foreseen for 2010 according to the QA/QC plan (Slovenia's IIR, p. 21).
Spain	Not mentioned in Spain's IIR.
Sweden	The uncertainties in the Swedish emission inventory reported to the CLRTAP were for the first time evaluated in 2003, and they covered emissions in 1990 and 2001. In order to prioritise efforts and resources in subsequent years, expert judgements, mainly of the inventory staff, together with IPCC references on uncertainties in activity data and emission factors, have been the basis for the IPCC tier 1 uncertainty evaluation. In 2009, Swedish Environmental Emissions Data (SMED) performed a study to provide transparent uncertainty estimates of national emissions for the Swedish reporting to the LRTAP Convention of the 2010 submission in accordance with the tier 1 methodology described in the *EMEP/EEA air pollution emission inventory guidebook — 2009*.
United Kingdom	Evaluation of uncertainty is carried out by a Monte Carlo uncertainty assessment Quantitative estimates of the uncertainties in emission inventories are based on calculations made using a direct simulation technique, which corresponds to the methodology proposed in draft guidance produced by the UNECE Taskforce on Emission Inventories.

1.8 General assessment of completeness

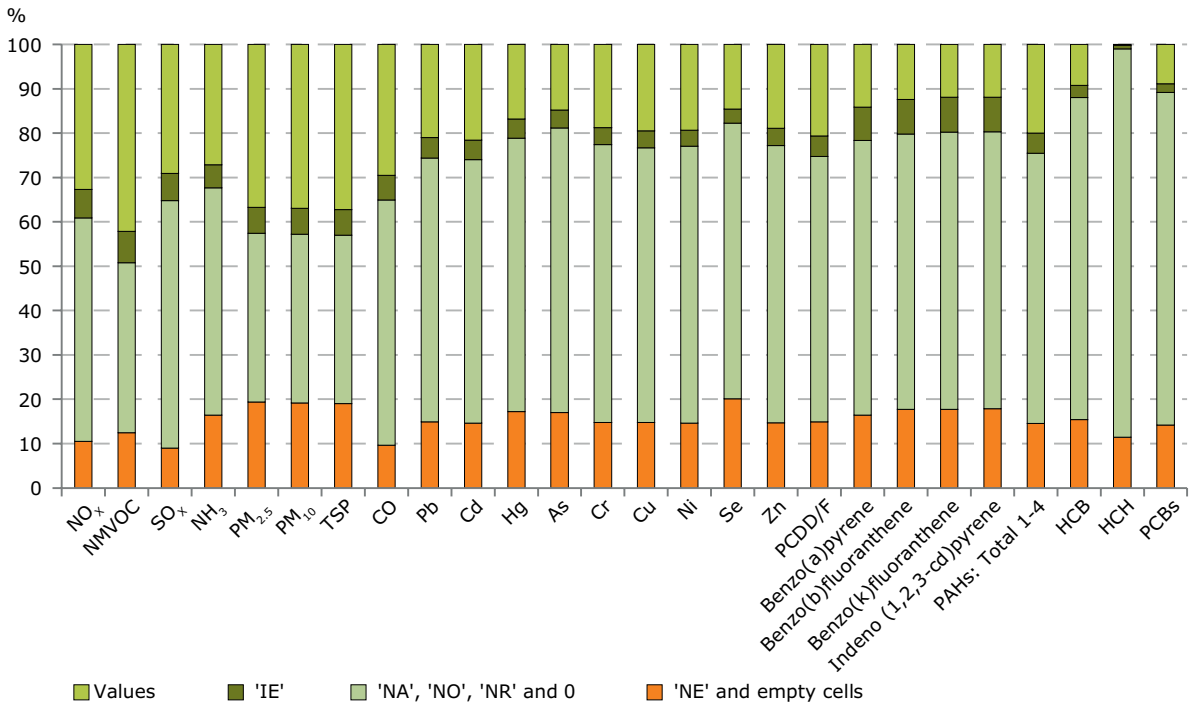
Completeness in this context means that estimates are reported for all pollutants, all relevant source categories, all years, and all territorial areas. The procedure for gap-filling carried out at Member State level is documented in Section 1.4.4. It also describes the quantitative contribution of gap-filling to emissions reported by Member States.

The Czech Republic and Hungary only reported 2010 emission data. As Appendix 3 illustrates, Greece only reported data for the main pollutants, Luxembourg only reported main pollutants and POPs. Slovenia did report all pollutants except the additional HMs. All other countries also submitted inventories for all pollutants for at least several historical years. 17 Member States reported activity data ([12]) for the complete time-series (1990–2010).

Figure 1.3 shows a simple compilation for completeness of reporting by Member States for the inventory year 2010, based on the originally submitted NFR templates, i.e. before gap-filling. The number of notation keys or values used for source categories in the NFR templates was accumulated over all Member States and is shown in percentage values. About 80 % of all sub-sources contain either a value or one of the notation keys 'not applicable' (NA), 'not occurring' (NO), or 'not relevant' (NR). The high number of notation keys is due to the fact that an air pollutant is only relevant for specific emission sources (e.g. NH_3 for agriculture). This makes the use of notation keys for other sources necessary. The use of the notation key 'not estimated' ('NE') and the reporting of empty cells are considered as incomplete reporting.

([12]) Reporting of activity data together with emissions is mandatory from 2009 onwards.

Figure 1.3 Completeness of reporting of NFR templates submitted by Member States



Note: 'NE' — 'not estimated', 'IE' — 'included elsewhere', 'NA' — 'not applicable', 'NO' — not occurring', 'NR' — 'not relevant'. Notation keys are further explained in Appendix 1.

2 Trends and key categories of EU-27 pollutant emissions

The present EU-27 inventory provides emissions for all the main air pollutants, PM, 'priority' HMs and POPs for which inventory reporting is required or recommended under the LRTAP Convention (UNECE, 1979).

The following sections of Chapter 2 provide a summary of the contributions made by each Member State to the EU-27 total emissions of NO_X, NMVOC, SO_X, NH_3, CO, $PM_{2.5}$, PM_{10}, TSP, the HMs Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn and the POPs PCDD/Fs, total PAHs, benzo(a)pyrene, benzo(b) fluoranthene, benzo(k)fluoranthene, indeno(1,2,3-cd)pyrene, HCB, HCH and PCBs. For the five most important key categories, the past emission trend of the EU-27 is given.

2.1 Total EU-27 emission trends and progress toward UNECE Gothenburg Protocol 2010 emission ceilings

Past trends of the main air pollutants are presented in Figure 2.1 and Table 2.1. Emissions of all pollutants were lower in 2010 than in 1990 (or 2000 for PM), although the reduction of copper is marginal (– 0.5 %). For the main air pollutants, the largest reductions across the EU-27 (in percentage terms) since 1990 have been achieved for SO_X emissions (which decreased by 82 %), followed by CO (– 62 %), NMVOC (– 56 %), NO_X (– 47 %) and NH_3 (– 28 %). Substantial decreases in emissions of HMs and POPs have also been recorded since 1990. Emission trends compiled for the period from 2000 to 2010 indicate that $PM_{2.5}$ emissions have fallen by 15 % and PM_{10} emissions by 14 %.

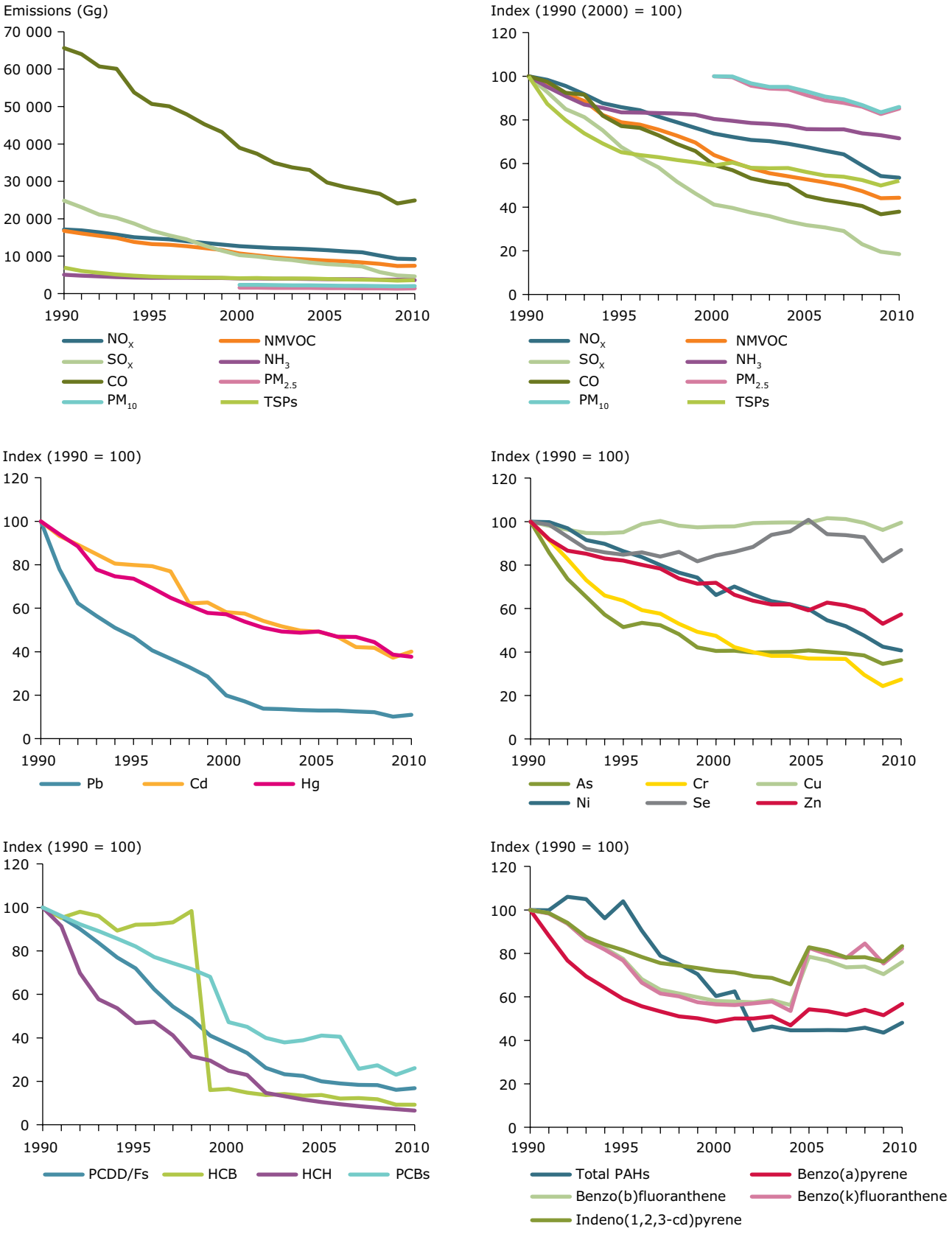
For certain pollutants including PM, HMs and POPs, some Member States did not report data or notation keys for all years. This meant that the data could not be gap-filled, and thus were not included in the EU-27 total. In such instances, the EU-27 emission totals for these pollutants are not considered complete. Data tables later in Chapter 2 show the reported emissions by each Member State, thereby indicating instances where emissions of a certain pollutant are missing across all years.

The Gothenburg Protocol to the UNECE LRTAP Convention (UNECE, 1999) contains emission ceilings for the pollutants NO_X, NMVOC, SO_X and NH_3 that parties to the protocol must meet by 2010. Under the reporting process to the LRTAP Convention, some Member States have submitted emission projections for the year 2015, and up to 2050 in some cases. Submitted data are available in Annex E of this report. This report does not provide further detailed analysis of projections reported by the countries in relation to the emission ceilings for 2010 in the Gothenburg Protocol to the LRTAP Convention. In June 2012, the EEA published its annual NEC Directive status report, which analysed, for the EU Member States, the emission data reported under the EU NEC Directive (EEA, 2012b). The NEC Directive contains national emission ceilings that, for the EU Member States, are either equal to or more ambitious than those set out in the Gothenburg Protocol.

In addition to the ceilings for individual countries, the protocol also specifies ceilings for the EU which itself is a party to the protocol. Table 2.2 and Figure 2.2 show the emissions for the year 2010 reported by the EU-15 Member States in comparison to the respective emission ceilings specified for the EU. Only for NO_X are the 2010 emissions above the level of the ceiling; for the remaining pollutants, the emissions in 2010 were below the respective pollutant ceilings.

Luxembourg's NO_X emission are based on fuel sold, a comparison of emission based on fuel used and the ceiling would result in an exceedance of 63 %.

Figure 2.1 EU-27 emission trends for the main air pollutants, PM, HMs and POPs



Note: Parties to the LRTAP Convention are formally requested to report emissions of PM only for the year 2000 and after. Hence emission trends for these years only are shown, and the indexed emissions are based on emissions in the year 2000 (= 100). The drop in HCB emissions between the years 1998 and 1999 is due to a significant reduction reported by the United Kingdom.

Table 2.1 Total EU-27 emissions of the main air pollutants, HMs, POPs and PM

Pollutant	Unit	1990	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Change 1990–2010	Change 2009–2010
NO_X	Gg	17 143	14 712	12 644	12 382	12 127	12 043	11 841	11 587	11 275	11 006	10 136	9 293	9 162	– 47 %	– 1.4 %
NMVOC	Gg	16 740	13 211	10 698	10 165	9 677	9 297	9 053	8 831	8 591	8 312	7 913	7 378	7 412	– 56 %	0.5 %
SO_X	Gg	24 857	16 793	10 238	9 853	9 320	8 914	8 328	7 884	7 633	7 232	5 715	4 850	4 574	– 82 %	– 5.7 %
NH_3	Gg	5 018	4 190	4 038	3 991	3 945	3 923	3 885	3 801	3 795	3 799	3 705	3 663	3 591	– 28 %	– 2.0 %
TSP	Gg	6 896	4 494	4 072	4 165	4 003	3 987	3 997	3 870	3 759	3 714	3 612	3 445	3 588	– 48 %	4.1 %
CO	Gg	65 670	50 677	38 928	37 388	34 918	33 742	33 012	29 683	28 478	27 576	26 631	24 091	24 908	– 62 %	3.4 %
Pb	Mg	23 156	10 835	4 615	3 981	3 204	3 145	3 043	2 987	3 000	2 904	2 813	2 336	2 549	– 89 %	9.1 %
Cd	Mg	258	206	150	148	140	133	128	127	121	109	108	96	103	– 60 %	7.5 %
Hg	Mg	230	169	131	124	117	113	112	113	108	108	102	89	87	– 62 %	– 2.4 %
As	Mg	566	292	230	230	225	226	227	231	227	223	218	196	205	– 64 %	4.9 %
Cr	Mg	1 388	883	659	586	555	530	531	514	513	511	410	338	380	– 73 %	12.6 %
Cu	Mg	3 798	3 610	3 709	3 716	3 773	3 781	3 783	3 777	3 859	3 841	3 777	3 652	3 779	– 1 %	3.5 %
Ni	Mg	2 617	2 261	1 733	1 835	1 738	1 659	1 622	1 565	1 428	1 358	1 246	1 112	1 066	– 59 %	– 4.2 %
Se	Mg	279	236	235	240	246	262	266	281	263	262	259	228	243	– 13 %	6.4 %
Zn	Mg	11 563	9 489	8 316	7 673	7 355	7 158	7 152	6 844	7 252	7 108	6 846	6 127	6 626	– 43 %	8.1 %
PCDD/Fs	g I-Teq	11 286	8 119	4 190	3 725	2 949	2 625	2 536	2 254	2 149	2 070	2 067	1 820	1 905	– 83 %	4.7 %
Total PAHs	Mg	3 007	3 128	1 814	1 880	1 340	1 395			1 345	1 343	1 377	1 309	1 447	– 52 %	10.6 %
HCB	kg	5 370	4 945	885	797	737	758	716	736	652	660	634	496	500	– 91 %	0.7 %
HCH	kg	179 205	83 838	44 664	41 097	26 325	23 509	20 918	18 674	16 909	15 366	14 008	12 812	11 760	– 93 %	– 8.2 %
PCBs	kg	13 333	10 948	6 294	6 006	5 329	5 060	5 179	5 467	5 398	3 438	3 654	3 067	3 471	– 74 %	13.2 %
Benzo(a) pyrene	Mg	332	196	161	166	166	169			177	171	179	171	189	– 43 %	10.3 %
Benzo(b) fluoranthene	Mg	215	166	125	124	124	126			165	158	159	151	163	– 24 %	7.9 %
Benzo(k) fluoranthene	Mg	98	75	55	55	56	57			78	76	83	74	81	– 18 %	9.2 %
Indeno(1,2,3-cd)pyrene	Mg	144	118	104	103	100	99			117	113	113	110	120	– 17 %	9.4 %
															Change 2000–2010	Change 2009–2010
$PM_{2.5}$	Gg			1 566	1 560	1 498	1 477	1 473	1 431	1 392	1 374	1 348	1 295	1 333	– 15 %	2.9 %
PM_{10}	Gg			2 292	2 290	2 217	2 181	2 180	2 133	2 080	2 048	1 989	1 912	1 969	– 14 %	3.0 %

Notes: Parties to the LRTAP Convention are formally requested to report emissions of PM only for the year 2000 and after. Hence emission trends are only shown for these years.

Negative percentage values indicate that emissions have fallen. Shaded marking means that data for these pollutants are complete (reported and gap-filled data), which means neither 'NE', 0 or empty cells.

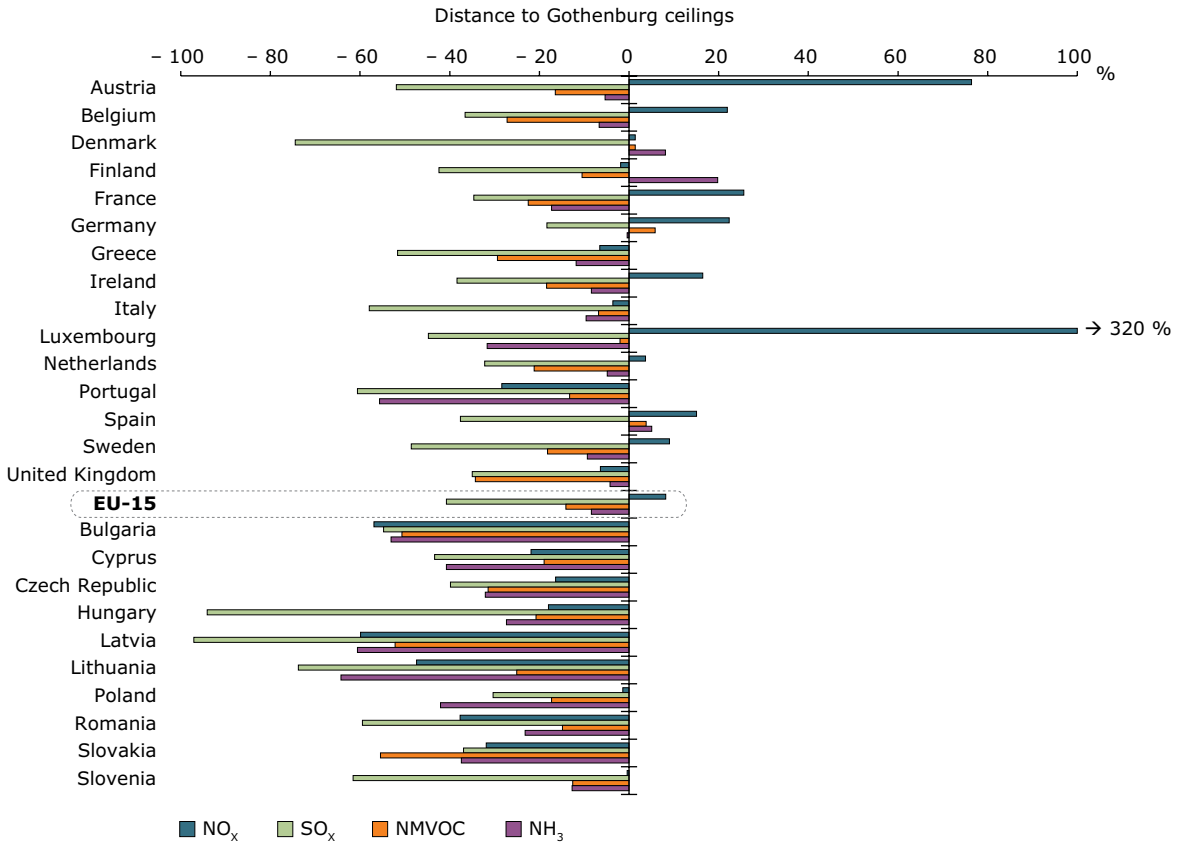
The 1990-to-2010 changes of emissions in Table 2.1 and subsequent tables (Table 2.2 to Table 2.28) are expressed as 100 x (E2010 — E1990)/E1990 (%), where E2010 and E1990 are 2010 and 1990 total emissions, respectively. The 2009-to-2010 changes of emissions are expressed as 100 x (E2010 — E2009)/E2009 (%), where E2010 and E2009 are the 2010 and 2009 total emissions, respectively.

Table 2.2 Comparison of emissions reported for 2010 by EU-15 Member States with emission ceilings for the EU specified in the UNECE Gothenburg Protocol

Pollutant	EU-15 emissions year 2010 (Gg)	European Union (EU-15) Gothenburg Protocol 2010 ceilings (Gg)	Difference (%)	Sum of individual EU-15 ceilings (Gg) (a)
NO_x	7 219	6 671	8 %	6 648
NMVOC	5 670	6 600	– 14 %	6 600
SO_x	2 405	4 059	– 41 %	4 044
NH_3	2 867	3 129	– 8 %	3 128

Note: (a) Emission ceilings are also specified for the individual EU-15 Member States. The sum of these ceilings is, in some instances, different to the ceilings specified for the European Community (EU-15) as a whole.

Figure 2.2 Member State emissions 2010 compared to Gothenburg ceilings 2010



Note: Estonia and Malta do not have a Gothenburg ceiling.

2.2 Nitrogen oxides (NO_X) emission trends and key categories

Between 1990 and 2010, NO_X emissions decreased in the EU-27 by 47 %. Between 2009 and 2010 the decrease was 1.4 %, mainly due to reductions reported in Spain, Greece and the United Kingdom (Table 2.3). The Member States that contributed most (more than 10 %) to the emissions of NO_X in 2010 were Germany, the United Kingdom, France, Spain and Italy.

France, Germany and the United Kingdom reported in their IIRs (Appendix 7), that NO_X emissions dropped from 1990 to 2010 thanks to stricter regulations and emission standards resulting in technical improvements and improved fuels, and a decline in the use of solid fuels in favour of gas and electricity.

Greece reported in its IIR that NO_X reductions are mainly as a consequence of the intense economic crisis in Greece. The highest decrease occurred in the road transport sector, beside the crisis as an effect of the passenger cars withdrawal program. Further, reductions occurred in the public electricity and heat production and navigation sectors as a consequence of the decrease of electricity production and the increase of the share of renewable energy sources (RES) in electricity production (Appendix 7, Greece's IIR).

For Tables 2.3 through 2.28, two EU-27 totals are given. The first corresponds to the sum of national totals officially reported by Member States. The second is a recalculated EU-27 total, following the mapping of emissions reported in the older NFR formats, to NFR09. As described earlier, the national totals in these respective reporting formats

Table 2.3 Member States' contributions to EU emissions of NO_X (Gg)

Member State	NO_X (Gg)													Change		Share in EU-27	
	1990	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	1990–2010 (%)	2009–2010 (%)	1990 (%)	2010 (%)
Austria	195	182	206	216	223	234	232	236	223	217	204	187	189	– 3	0.9	1.1	2.1
Belgium	401	388	332	314	297	296	299	291	265	262	239	207	221	– 45	6.4	2.3	2.4
Bulgaria	249	151	126	129	147	149	150	154	151	141	141	117	115	– 54	– 2.2	1.4	1.3
Cyprus	17	19	22	21	21	22	21	21	21	22	20	20	18	7	– 8.1	0.1	0.2
Czech Republic	741	429	396	332	318	324	332	278	282	284	261	251	239	– 68	– 4.9	4.3	2.6
Denmark	275	264	199	199	197	205	189	181	182	168	150	132	129	– 53	– 2.1	1.6	1.4
Estonia	74	39	38	40	41	42	39	37	35	39	36	30	37	– 50	21.7	0.4	0.4
Finland	323	279	201	211	201	215	195	169	188	187	168	155	167	– 48	7.9	1.9	1.8
France	1 865	1 721	1 602	1 565	1 530	1 496	1 464	1 430	1 358	1 289	1 194	1 106	1 080	– 42	– 2.3	10.9	11.8
Germany	2 882	2 177	1 925	1 848	1 768	1 713	1 650	1 578	1 564	1 491	1 418	1 321	1 323	– 54	0.1	16.8	14.4
Greece	329	331	362	384	385	395	401	419	415	416	394	382	322	– 2	– 15.8	1.9	3.5
Hungary	8	185	185	183	183	210	185	203	202	185	169	154	162	1 890	5.3	0.05	1.8
Ireland	121	122	135	137	128	127	128	127	123	120	110	87	76	– 37	– 13.4	0.7	0.8
Italy	2 014	1 893	1 421	1 395	1 341	1 319	1 280	1 212	1 158	1 127	1 057	973	964	– 52	– 1.0	11.7	10.5
Latvia	65	39	36	39	39	39	39	37	37	38	34	32	34	– 48	5.5	0.4	0.4
Lithuania	220	65	54	48	51	54	56	57	65	71	55	54	58	– 74	8.0	1.3	0.6
Luxembourg	39	37	45	46	46	49	58	62	57	52	50	44	46	19	5.2	0.2	0.5
Malta	7.6	8.8	8.4	9.1	9.2	10	10	9.3	9.3	9.2	9.0	8.9	8.1	7	– 9.3	0.04	0.1
Netherlands	566	472	398	392	379	372	358	346	332	317	309	280	276	– 51	– 1.6	3.3	3.0
Poland	1 280	1 120	838	805	796	805	804	866	865	885	828	822	867	– 32	5.4	7.5	9.5
Portugal	234	266	266	270	276	255	262	261	239	232	211	199	186	– 20	– 6.4	1.4	2.0
Romania	511	380	325	337	347	361	358	309	309	326	287	252	272	– 47	8.0	3.0	3.0
Slovakia	226	179	107	108	100	98	99	102	96	96	94	84	89	– 61	5.2	1.3	1.0
Slovenia	60	58	50	51	51	50	48	47	46	48	53	46	45	– 25	– 2.0	0.3	0.5
Spain	1 287	1 343	1 372	1 344	1 383	1 372	1 413	1 402	1 354	1 355	1 171	1 053	974	– 24	– 7.4	7.5	10.6
Sweden	269	246	205	196	191	187	179	174	173	168	158	153	161	– 40	5.4	1.6	1.8
United Kingdom	2 885	2 317	1 791	1 761	1 678	1 646	1 594	1 580	1 525	1 461	1 317	1 143	1 106	– 62	– 3.3	16.8	12.1
EU-27 (a)	**17 143**	**14 712**	**12 644**	**12 382**	**12 127**	**12 043**	**11 841**	**11 587**	**11 275**	**11 006**	**10 136**	**9 293**	**9 162**	**– 47**	**– 1.4**	**100**	**100**
EU-27 (b)	**17 143**	**14 712**	**12 644**	**12 382**	**12 127**	**12 043**	**11 841**	**11 587**	**11 275**	**11 006**	**10 136**	**9 293**	**9 162**				

Notes: (a) Sum of national totals as reported by Member States.
(b) Sum of sectors: differences are due to reallocation of memo items in line with the new UNECE reporting guidelines (UNECE, 2009) for countries that reported emissions in older NFR formats, and to Member States only providing national total data.
Negative percentage values indicate that emissions have decreased.
Green shaded cells indicate that emissions of these Member States are below the Gothenburg ceilings 2010. There are no Gothenburg ceilings for Estonia and Malta (shaded grey).

differ slightly due to the inclusion of different 'memo items' in the required total (see, for instance, Appendix 3). Hence, following a conversion of inventories in the NFR02 format to NFR09 and subsequent aggregation, the EU-27 total may also change. A further difference between these two EU totals arises when Member States only provide national totals and no sectoral data.

The categories '1 A 3 b iii — Road transport: Heavy-duty vehicles', '1 A 3 b i — Road transport: Passenger cars' and '1 A 1 a — Public electricity and heat production' were the most important key categories for NO_X emissions (Figure 2.3). Of the top five key categories, the highest relative reductions in emissions between 1990 and 2010 were achieved in the second most important key category, '1 A 3 b i — Road transport: Passenger cars' (– 59.6 %) (Figure 2.3).

Figure 2.3 shows the contribution to total EU-27 emissions made by the aggregated sector groups.

For NO_X, common important emission sources are the energy and transport sectors, and the 'commercial, institutional and households' energy use sector. Reduced emissions from the road transport sector have mainly resulted from the introduction of threeway catalytic converters on cars and stricter regulation of emissions from heavy-duty vehicles across Europe (EEA, 2011b). Nevertheless, the road transport sectors together represent the largest source of NO_X emissions, accounting for 42 % of total EU-27 emissions in 2010. In the electricity/energy production sectors, reductions have also occurred, in these instances as a result of measures like the introduction of combustion modification technologies (e.g. the use of low NO_X burners), implementation of flue-gas abatement techniques (e.g. NO_X scrubbers and selective catalytic reduction (SCR) and selective non-catalytic reduction (SNCR) techniques), and fuel switching from coal to gas (EEA, 2011c).

Figure 2.3 **NO_X emissions in the EU-27: (a) trend in NO_X emissions from the five most important key categories, 1990–2010; (b) share of emissions by sector group, 2010; (c) gridded data reported by Member States, 2010**

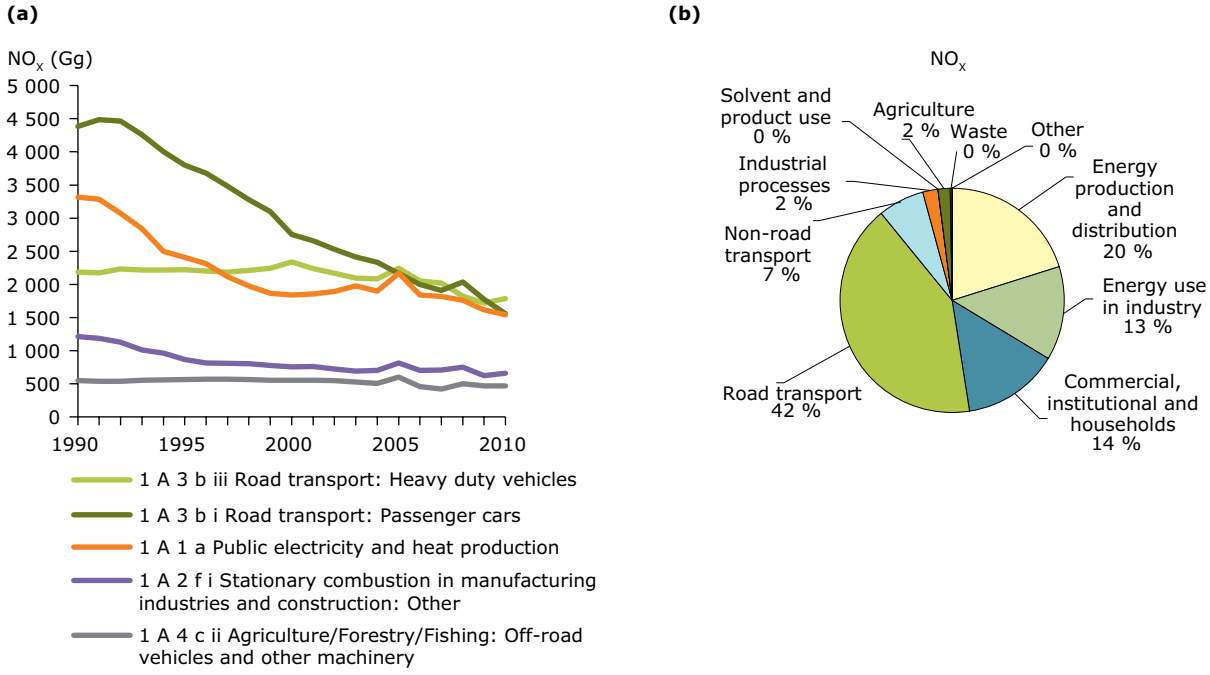
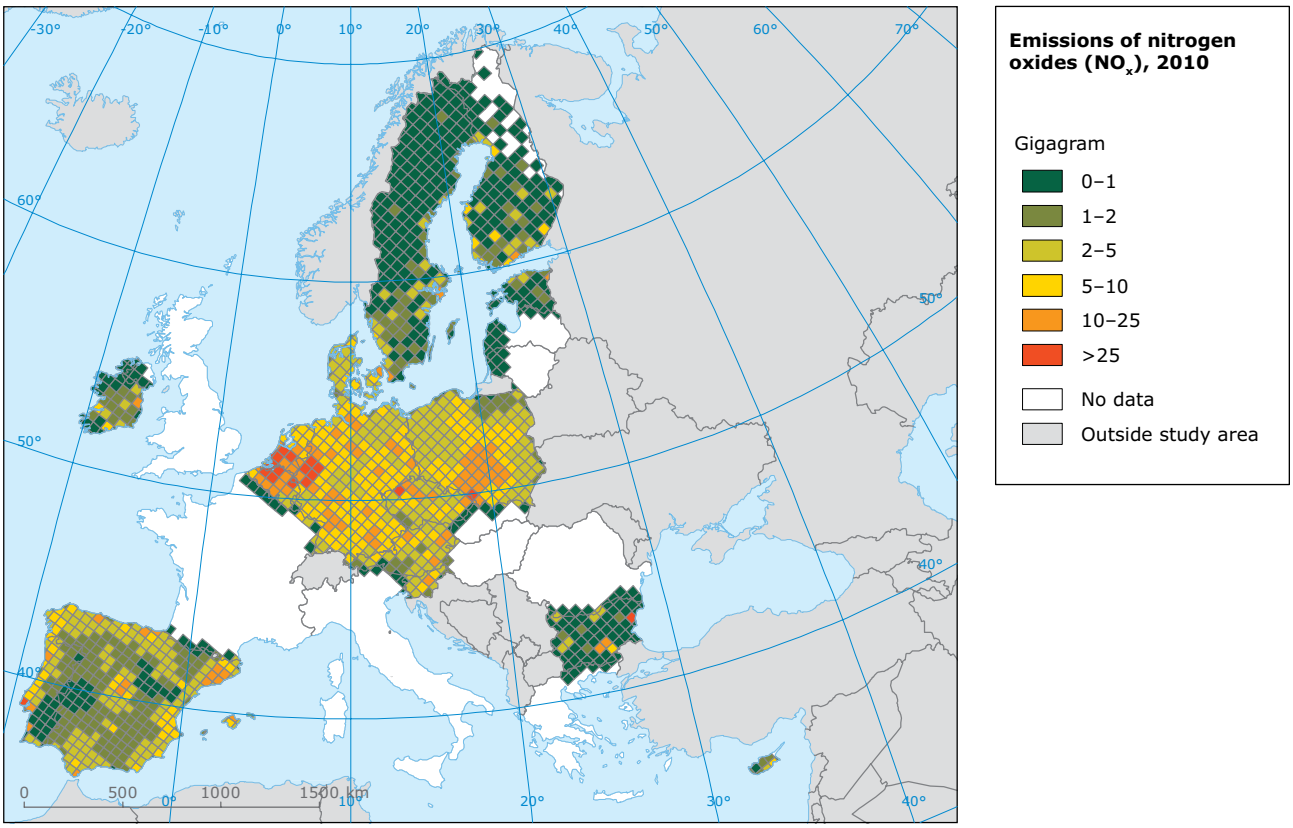


Figure 2.3 **NO_x emissions in the EU-27: (a) trend in NO_x emissions from the five most important key categories, 1990–2010; (b) share of emissions by sector group, 2010; (c) gridded data reported by Member States, 2010 (cont.)**

(c)



2.3 Non-methane volatile organic compound (NMVOC) emission trends and key categories

Between 1990 and 2010, NMVOC emissions decreased in the EU-27 by 56 %. Between 2009 and 2010, an increase of 0.5 % was reported, mainly due to a strong increase of emissions in Germany (+ 13.2 %, 122 Gg). The main reductions were reported by Italy, the United Kingdom and Greece (Table 2.4). The Member States that contributed most (more than 10 %) to emissions of NMVOC in 2010 were Italy, Germany, France and the United Kingdom.

France, Germany and the United Kingdom reported in their IIRs (Appendix 7) that the decrease of NMVOC emissions from 1990 to 2010 is due to increasingly stricter regulations and controls, resulting in more cars with catalytic converters, and reduced petrol consumption.

The sharp emission increase in Latvia in the years 2003 to 2004 is explained with its accession to the EU in May 2004, whereby financial resources from EU projects became available for national infrastructure projects. Emissions occurred as a result of asphalt roofing and road paving, as the VIA Baltica highway, which connects the capitals of all Baltic states, was constructed. Large amounts of bitumen mixtures were imported and used (Appendix 7, Latvia's IIR).

The increase of NMVOC emissions from Germany between 2009 and 2010 is due to the economic recovery following the slump of 2008 and 2009 (Appendix 7, Germany's IIR).

The three categories '1 A 4 b i — Residential: Stationary plants', '3 D 2 — Domestic solvent use including fungicides' and '3 A 2 — Industrial coating application' were the most important key categories for NMVOC emissions, together making up 31 % of total emissions (Figure 2.4). Among the top five key categories, the highest relative reductions in emissions between 1990 and 2010 were achieved in the fourth most important key category '1 A 3 b i — Road transport: Passenger cars' (– 82.9 %) and, as was the case for NO_X, this largely reflects successful implementation of vehicle emission standards and use of vehicle exhaust catalytic converters (EEA, 2011b). Figure 2.4 shows the contribution to total EU-27 emissions made by the aggregated sector groups. For NMVOC, common important emission sources are the 'solvent and product use', 'commercial, institutional and households' and road transport.

Table 2.4 Member State contributions to EU NMVOC emissions (Gg)

Member State	NMVOC (Gg)													Change		Share in EU– 27	
	1990	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	1990–2010	2009–2010	1990	2010
														(%)	(%)	(%)	(%)
Austria	276	226	178	177	176	173	154	162	172	159	150	121	133	– 52	9.9	1.6	1.8
Belgium	315	268	206	195	180	170	158	143	148	127	118	105	105	– 67	– 0.2	1.9	1.4
Bulgaria	620	144	87	85	87	89	84	86	90	84	84	91	91	– 85	– 0.02	3.7	1.2
Cyprus	17	16	14	14	14	15	14	14	14	13	12	11	11	– 34	– 0.6	0.1	0.2
Czech Republic	311	215	244	220	203	203	198	182	179	174	166	151	151	– 52	– 0.1	1.9	2.0
Denmark	166	163	134	125	122	116	114	110	105	100	96	89	86	– 48	– 3.3	1.0	1.2
Estonia	70	50	46	46	45	44	44	41	40	41	38	37	38	– 46	4.1	0.4	0.5
Finland	239	203	168	164	162	155	150	136	131	129	118	111	116	– 51	4.5	1.4	1.6
France	2 589	2 166	1 712	1 628	1 495	1 410	1 329	1 232	1 123	1 032	957	866	852	– 67	– 1.5	15.5	11.5
Germany	3 128	1 806	1 391	1 290	1 229	1 163	1 175	1 144	1 132	1 070	1 017	931	1 053	– 66	13.2	18.7	14.2
Greece	268	258	264	262	257	245	245	220	230	219	228	212	184	– 31	– 13.1	1.6	2.5
Hungary	57	163	159	159	158	168	156	170	178	157	157	122	109	90	– 10.8	0.3	1.5
Ireland	93	85	73	70	65	62	59	56	55	53	51	48	45	– 52	– 6.0	0.6	0.6
Italy	2 015	2 085	1 607	1 529	1 469	1 399	1 348	1 317	1 286	1 261	1 194	1 131	1 080	– 46	– 4.5	12.0	14.6
Latvia	102	67	65	69	61	65	110	73	75	83	74	61	65	– 36	7.4	0.6	0.9
Lithuania	121	80	75	64	65	78	74	88	85	81	66	66	69	– 43	4.1	0.7	0.9
Luxembourg	19	15	12	12	12	11	13	12	11	11	10	9	8.8	– 54	– 6.5	0.1	0.1
Malta	6.0	7.4	3.1	3.1	3.2	2.9	3.2	3.3	3.5	3.3	3.0	2.6	2.5	– 58	– 3.5	0.04	0.0
Netherlands	477	338	238	212	199	185	173	177	167	164	162	152	151	– 68	– 1.1	2.9	2.0
Poland	831	769	599	576	600	585	597	593	567	596	582	634	662	– 20	4.4	5.0	8.9
Portugal	295	279	254	243	240	225	221	210	203	198	192	180	175	– 40	– 2.5	1.8	2.4
Romania	375	190	254	246	237	262	283	425	434	444	465	433	445	19	2.9	2.2	6.0
Slovakia	134	91	66	69	69	69	71	73	70	67	67	64	62	– 53	– 2.9	0.8	0.8
Slovenia	55	54	44	43	42	40	40	37	36	35	33	34	35	– 37	2.9	0.3	0.5
Spain	1 040	968	995	973	891	896	878	839	822	810	757	696	695	– 33	– 0.2	6.2	9.4
Sweden	359	278	223	212	206	206	201	197	194	197	196	197	197	– 45	0.1	2.1	2.7
United Kingdom	2 762	2 227	1 586	1 481	1 389	1 260	1 163	1 088	1 039	1 002	922	822	789	– 71	– 4.1	16.5	10.6
EU-27 (a)	**16 740**	**13 211**	**10 698**	**10 165**	**9 677**	**9 297**	**9 053**	**8 831**	**8 591**	**8 312**	**7 913**	**7 378**	**7 412**	**– 56**	**0.5**	**100**	**100**
EU-27 (b)	**16 740**	**13 211**	**10 698**	**10 165**	**9 677**	**9 297**	**9 053**	**8 831**	**8 591**	**8 312**	**7 913**	**7 378**	**7 427**				

Notes: (a) Sum of national totals as reported by Member States.

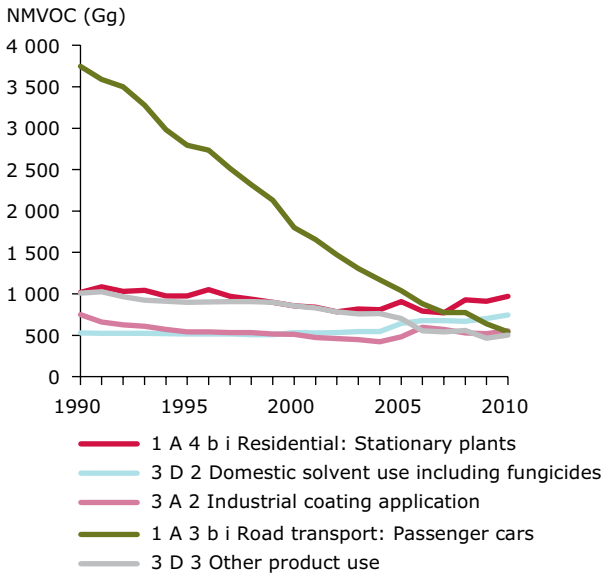
(b) Sum of sectors: differences are due to reallocation of memo items in line with the new UNECE reporting guidelines (UNECE, 2009) for countries that reported emissions in older NFR formats, and to Member States only providing national total data.

Negative percentage values indicate that emissions have decreased.

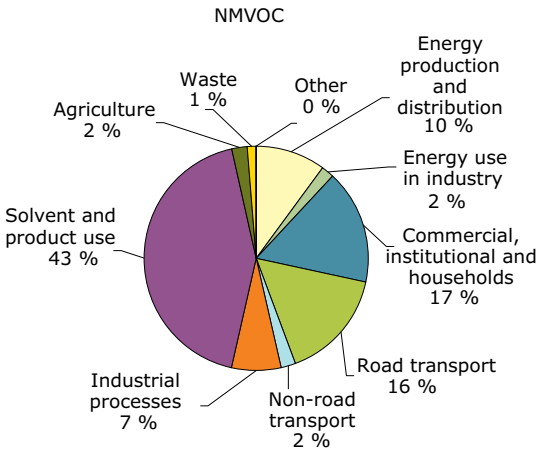
Green-shaded cells indicate that emissions of these Member States are below the Gothenburg ceilings 2010. Please note that there are no Gothenburg ceilings for Estonia and Malta (shaded grey).

Figure 2.4 **NMVOC emissions in the EU-27: (a) trend in NMVOC emissions from the five most important key categories, 1990–2010; (b) share of emissions by sector group, 2010; (c) gridded data reported by Member States, 2010**

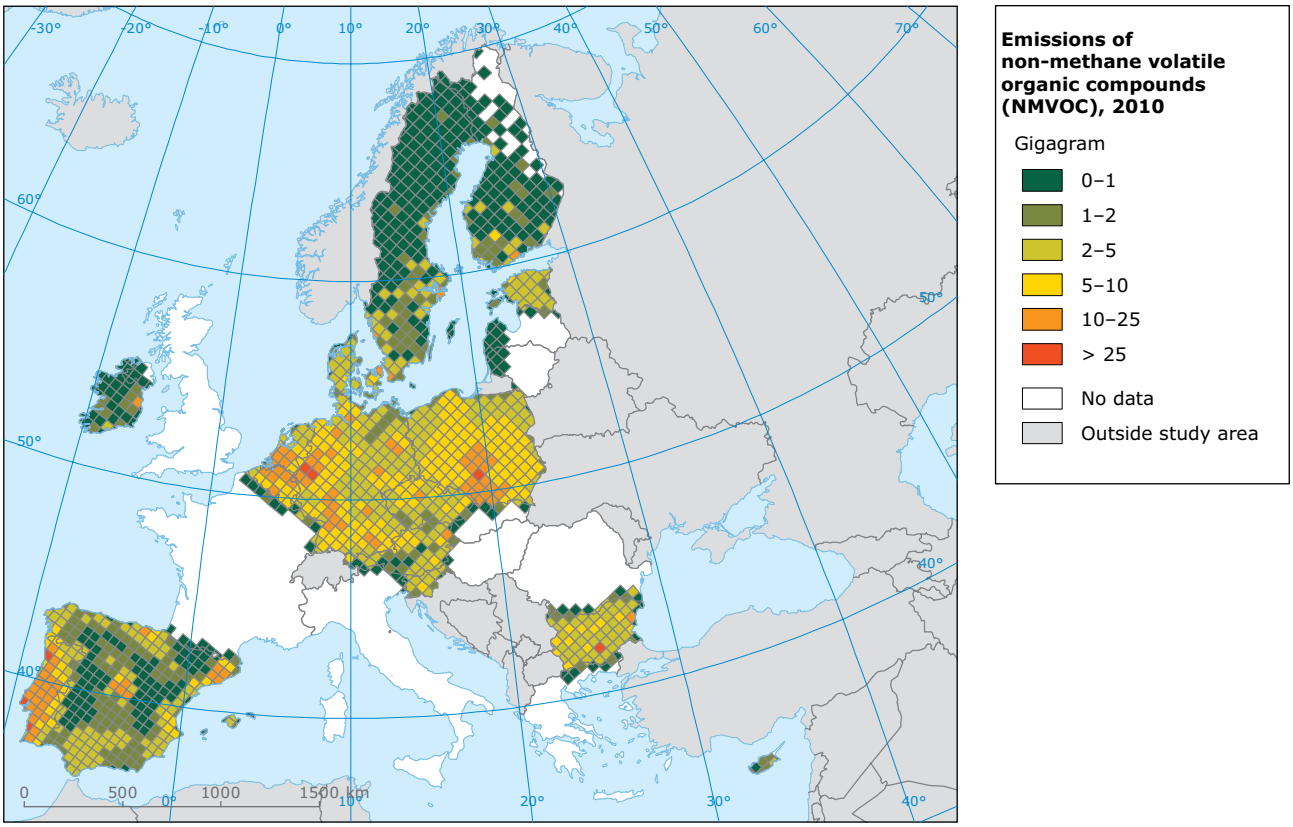
(a)



(b)



(c)



2.4 Sulphur oxides (SO_x) emission trends and key categories

Between 1990 and 2010, SO_X emissions decreased in the EU-27 by 82 %. Between 2009 and 2010, the decrease was 5.7 %, mainly due to reductions in Greece, Romania and Hungary (Table 2.5). The Member States that contributed most (more than 10 %) to the emissions of SO_X in 2010 were Poland and Spain.

Inspection of the time-series trends for some Member States shows some significant changes in emission reductions since 1990. For example, emissions of SO_X in Slovenia fell considerably in 2001 and again in 2006 due to the introduction of flue-gas desulphurisation abatement equipment in thermal power plants (Slovenia's IIR, 2011).

SO_X emission reductions in Greece are due to the operation of desulphurisation plants at large power plants since 1998 and the increasing share of RES technologies for electricity production. Further, reductions with respect to the sulphur content of liquid fossil fuels and the introduction of natural gas in the Greek energy system resulted in a reduction of SO_X emissions from manufacturing industry, transport and residential sectors (Appendix 7, Greece's IIR). As an explanation for the reduction in SO_X emissions from 1990 to 2010, Germany stated in its IIR (Appendix 7, Germany's IIR), that the decrease is due to stricter regulations of the previous West Germany which were applied to the new German Länder following the German reunification, that changed the fuel mix from sulphur-rich solid fuels to liquid and gaseous fuels. Poland explained that SO_X emissions decreased because of a decline

Table 2.5 Member State contributions to EU SO_x emissions (Gg)

Member State	SO_x (Gg)													Change		Share in EU-27	
	1990	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	1990–2010	2009–2010	1990	2010
														(%)	(%)	(%)	(%)
Austria	74	48	32	33	31	32	27	27	28	25	22	17	19	– 75	7.7	0.3	0.4
Belgium	362	261	172	167	157	155	158	145	135	125	97	77	67	– 81	– 12.4	1.5	1.5
Bulgaria	1 100	1 295	861	826	756	824	789	776	763	819	569	440	387	– 65	– 12.1	4.4	8.5
Cyprus	31	39	48	45	45	47	40	38	32	30	23	18	22	– 29	23.1	0.1	0.5
Czech Republic	1 876	1 095	264	251	237	232	227	219	211	217	174	173	170	– 91	– 1.8	7.5	3.7
Denmark	176	139	29	28	26	33	26	23	26	24	19	14	14	– 92	– 1.7	0.7	0.3
Estonia	274	116	97	91	87	100	88	76	70	88	69	55	83	– 70	51.8	1.1	1.8
Finland	263	99	79	86	80	100	84	69	84	83	70	59	67	– 75	12.7	1.1	1.5
France	1 354	979	644	577	523	501	485	467	429	412	344	289	262	– 81	– 9.6	5.4	5.7
Germany	5 292	1 718	653	643	590	573	547	517	520	497	490	435	449	– 92	3.4	21.3	9.8
Greece	473	539	495	503	514	552	546	538	533	537	444	425	264	– 44	– 37.8	1.9	5.8
Hungary	10	707	489	404	365	348	249	148	123	99	106	89	32	235	– 63.9	0.04	0.7
Ireland	182	161	140	134	101	79	72	71	61	55	45	33	26	– 86	– 20.7	0.7	0.6
Italy	1 794	1 320	749	698	617	519	481	403	381	338	283	232	210	– 88	– 9.5	7.2	4.6
Latvia	105	49	16	13	11	8.8	6.8	6.6	5.9	5.7	4.7	4.1	3.2	– 97	– 23.1	0.4	0.1
Lithuania	228	91	51	39	38	38	41	42	42	34	27	30	38	– 83	29.0	0.9	0.8
Luxembourg	15.2	8.8	3.5	4.1	3.0	2.8	2.7	2.6	2.3	2.4	2.3	2.2	2.2	– 85	– 1.4	0.1	0.0
Malta	16	27	24	26	25	27	11	11	11	12	11	8.0	8.1	– 49	1.5	0.1	0.2
Netherlands	192	130	73	75	68	64	66	65	64	61	51	37	34	– 82	– 9.4	0.8	0.7
Poland	3 210	2 376	1 511	1 564	1 455	1 375	1 241	1 224	1 237	1 131	1 018	862	974	– 70	13.0	12.9	21.3
Portugal	295	303	281	262	259	176	177	177	155	149	108	74	67	– 77	– 9.7	1.2	1.5
Romania	821	707	524	525	521	600	572	643	697	577	566	460	372	– 55	– 19.1	3.3	8.1
Slovakia	524	245	127	131	103	105	96	89	88	71	69	64	69	– 87	8.3	2.1	1.5
Slovenia	198	122	92	63	63	61	49	40	16	14	13	11	10	– 95	– 2.2	0.8	0.2
Spain	2 180	1 795	1 513	1 493	1 589	1 329	1 375	1 325	1 217	1 208	566	514	483	– 78	– 6.1	8.8	10.6
Sweden	105	69	42	41	40	41	37	36	36	33	30	30	34	– 67	16.4	0.4	0.8
United Kingdom	3 707	2 356	1 228	1 133	1 014	992	832	706	665	586	491	397	406	– 89	2.3	14.9	8.9
EU-27 (a)	**24 857**	**16 793**	**10 238**	**9 853**	**9 320**	**8 914**	**8 328**	**7 884**	**7 633**	**7 232**	**5 715**	**4 850**	**4 574**	**– 82**	**– 5.7**	**100**	**100**
EU-27 (b)	**24 857**	**16 793**	**10 238**	**9 853**	**9 320**	**8 914**	**8 328**	**7 884**	**7 633**	**7 232**	**5 715**	**4 850**	**4 574**				

Notes: (a) Sum of national totals as reported by Member States.

(b) Sum of sectors: differences are due to reallocation of memo items in line with the new UNECE reporting guidelines (UNECE, 2009) for countries that reported emissions in older NFR formats, and to Member States only providing national total data.

Negative percentage values indicate that emissions have decreased.

Green shaded cells indicate that emissions of these Member States are below the Gothenburg ceilings 2010. Please note that there are no Gothenburg ceilings for Estonia and Malta (shaded grey).

of heavy industry in the late 1980s and early 1990s. In the late 1990s, emissions decreased because of the diminished share of coal (hard and brown) among fuels used for power and heat generation (Appendix 7, Poland's IIR). The United Kingdom reported that the decline of SO_X emissions has been accelerated by the implementation of combined-cycle gas turbine (CCGT) stations, which are more efficient than conventional coal and oil stations and have negligible SO_X emissions. Moreover, installation of flue-gas desulphurisation at the Drax and Ratcliffe power stations has reduced SO_X emissions further (Appendix 7, the United Kingdom's IIR).

A remarkable emission increase of sulphur dioxide emissions in Poland was due to higher consumption of hard coal in public power plants, use of coal with higher sulphur content, residential coal combustion and higher consumption of coke in the industry sector (Poland's IIR, Appendix 7).

The strong decrease of SO_X emissions in Romania from 2006 to 2007 is due to national legislation, which sets a declining maximum for the sulphur content in diesel and gasoline every two years. (Appendix 7, Romania's IIR).

The category '1 A 1 a — Public electricity and heat production' is the most important key category for SO_X emissions, making up 47 % of total SO_X emissions (Figure 2.5).

Among the top five key categories, the highest relative reductions in emissions between 1990 and 2010 were achieved in the second most important key category '1 A 2 f i — Stationary combustion in manufacturing industries and construction: Other' (– 80.8 %), the most important key category '1 A 1 a — Public electricity and heat production' (– 79.8 %) and the third most important key category '1 A 4 b i — Residential: Stationary plants' (– 66.5 %).

For these main emitting sources, the reduction in emissions since 1990 has been achieved as a result of a combination of measures, including switching fuel in energy-related sectors away from high-sulphur solid and liquid fuels to low-sulphur fuels such as natural gas, the fitting of flue-gas desulphurisation abatement technology in industrial facilities, and the impact of European Community directives relating to the sulphur content of certain liquid fuels (EEA, 2011d).

Figure 2.5 shows the contribution to total EU-27 emissions made by the aggregated sector groups. For SO_X, common important emission sources are the energy sectors, and 'commercial, institutional and households' energy use sector.

Figure 2.5 **SO_X emissions in the EU-27: (a) trend in SO_X emissions from the five most important key categories, 1990–2010; (b) share of emissions by sector group, 2010; (c) gridded data reported by Member States, 2010**

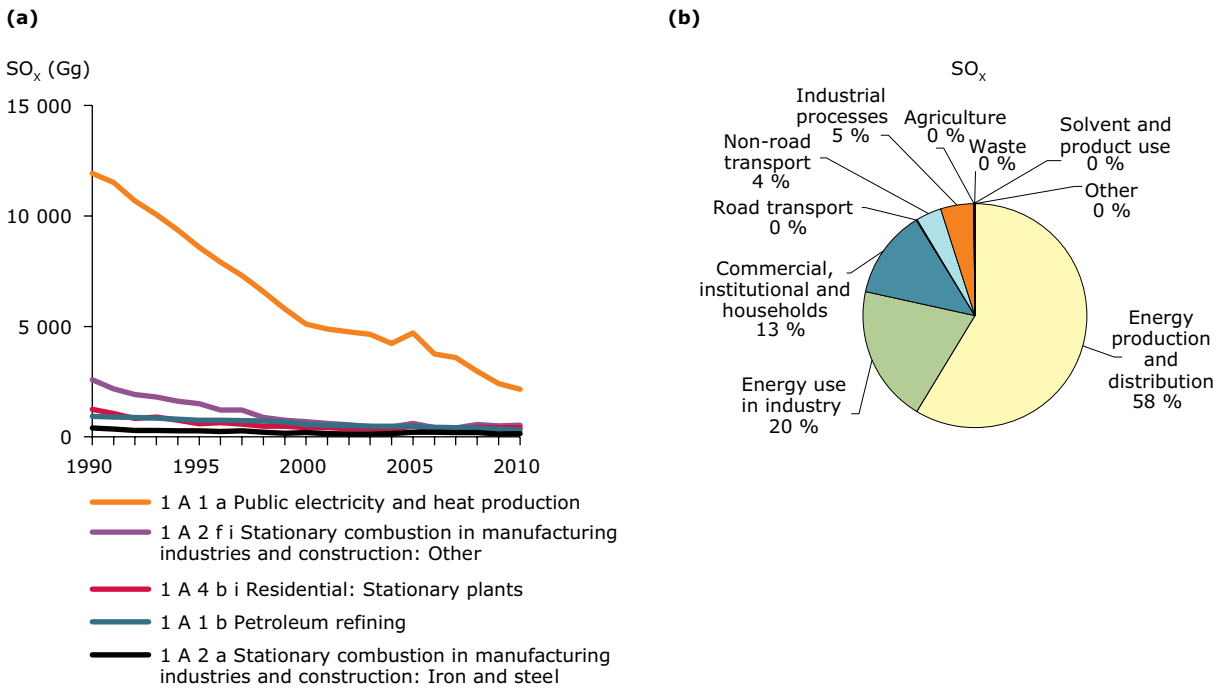
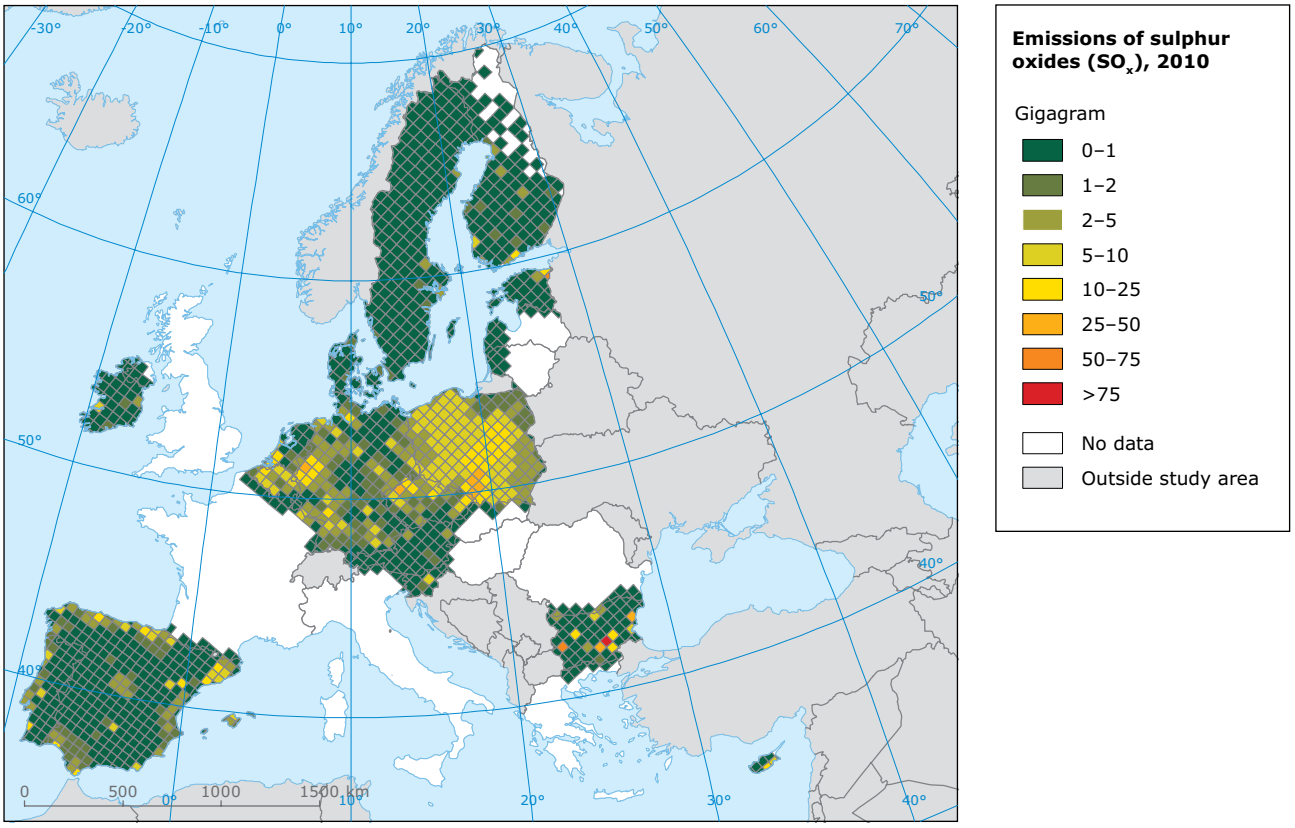


Figure 2.5 **SO_x emissions in the EU-27: (a) trend in SO_x emissions from the five most important key categories, 1990–2010; (b) share of emissions by sector group, 2010; (c) gridded data reported by Member States, 2010 (cont.)**

(c)



2.5 Ammonia (NH_3) emission trends and key categories

Between 1990 and 2010, NH_3 emissions decreased in the EU-27 by 28 %. Between 2009 and 2010, the decrease was 2.0 %, mainly due to reductions in Germany and Romania (Table 2.6). The Member States that contributed most (more than 10 %) to the emissions of NH_3 in 2010 were France, Germany, Italy and Spain.

The United Kingdom reported that NH_3 emissions dropped after 1999. This was driven by decreasing animal numbers and a decline in fertiliser use (Appendix 7, the United Kingdom's IIR).

Germany explained that the overall emission trend for NH_3 follows the agricultural emissions. The decrease of NH_3 emission in the year 1991 is due to a reduced livestock population following after German reunification, while no explicit trend is discernible for the years since then (Appendix 7, Germany's IIR).

Categories '4 D 1 a — Synthetic N-fertilisers', '4 B 1 b — Cattle non-dairy' and '4 B 1 a — Cattle dairy' are the most important key categories for NH_3 emissions, jointly making up 61 % of total NH_3 emissions (Figure 2.6). Among the top five key categories, the highest relative reduction in emissions between 1990 and 2010 was achieved in the fourth most important key category ,'4 B 8 — Swine' (– 35.2 %).

Table 2.6 Member State contributions to EU NH_3 emissions (Gg)

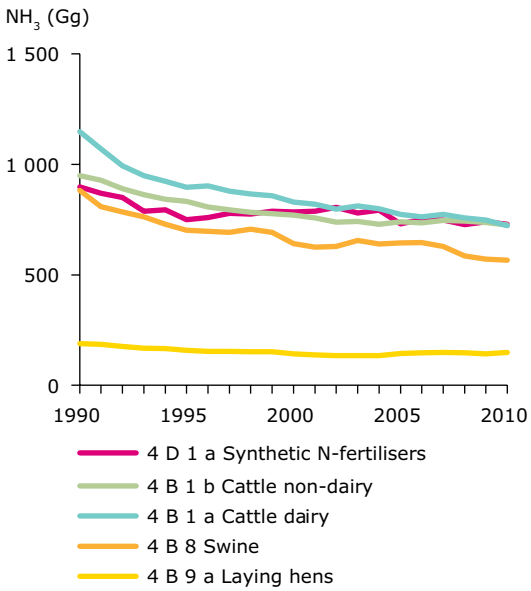
Member State	NH_3 (Gg)													Change		Share in EU-27	
	1990	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	1990–2010 (%)	2009–2010 (%)	1990 (%)	2010 (%)
Austria	65	71	65	65	64	64	63	63	63	63	63	63	62	– 4.6	– 1.5	1.3	1.7
Belgium	120	115	86	82	80	77	72	71	71	68	67	69	69	– 43	0.02	2.4	1.9
Bulgaria	133	76	52	53	56	56	56	58	59	62	62	52	51	– 62	– 3.5	2.6	1.4
Cyprus	5.1	5.9	5.8	6.0	6.1	5.9	5.9	5.8	5.6	5.5	5.3	5.2	5.3	4.5	2.7	0.1	0.1
Czech Republic	156	86	74	77	72	82	70	68	63	60	58	70	69	– 56	– 2.2	3.1	1.9
Denmark	114	99	91	89	88	87	86	83	79	80	78	75	75	– 35	– 0.8	2.3	2.1
Estonia	25	11	10	10	9	10	10	10	10	10	11	10	10	– 58	2.5	0.5	0.3
Finland	38	37	37	36	37	38	38	39	38	38	38	37	37	– 3	– 0.1	0.8	1.0
France	704	678	699	684	688	667	663	661	655	656	672	656	645	– 8	– 1.7	14.0	18.0
Germany	692	599	602	608	596	590	582	573	569	567	568	576	548	– 21	– 4.8	13.8	15.3
Greece	85	74	71	70	69	69	70	68	66	68	65	62	64	– 24	3.8	1.7	1.8
Hungary	124	77	71	66	65	67	74	80	81	71	69	68	65	– 47	– 3.7	2.5	1.8
Ireland	107	111	113	112	112	112	110	109	109	106	107	108	106	– 0.4	– 2.0	2.1	3.0
Italy	468	449	449	452	439	435	428	416	411	420	409	393	379	– 19	– 3.5	9.3	10.6
Latvia	48	16	13	15	14	15	15	16	16	16	16	17	17	– 64	5.0	1.0	0.5
Lithuania	84	37	25	38	51	34	33	39	35	36	29	28	30	– 64	6.0	1.7	0.8
Luxembourg	5.5	6.3	5.8	5.6	5.4	5.1	5.1	5.0	4.8	4.8	4.7	4.7	4.8	– 13	1.0	0.1	0.1
Malta	1.9	1.9	1.8	1.8	1.8	1.7	1.7	1.6	1.6	1.7	1.5	1.5	1.5	– 19	0.8	0.04	0.04
Netherlands	355	208	161	157	149	144	142	140	141	140	127	125	122	– 66	– 2.6	7.1	3.4
Poland	508	380	322	328	325	323	317	270	287	289	285	273	271	– 47	– 0.8	10.1	7.5
Portugal	63	59	61	58	58	52	52	50	48	49	47	47	48	– 24	1.0	1.3	1.3
Romania	300	217	206	164	156	182	191	199	197	203	187	188	161	– 46	– 14.1	6.0	4.5
Slovakia	65	40	32	32	33	32	29	29	27	27	25	25	24	– 62	– 2.9	1.3	0.7
Slovenia	20	18	19	19	20	19	17	18	18	19	18	18	17	– 12	– 1.3	0.4	0.5
Spain	318	311	380	382	378	392	386	368	378	389	357	357	371	17	3.9	6.3	10.3
Sweden	55	64	59	56	55	56	56	55	54	53	52	50	52	– 5.9	3.2	1.1	1.4
United Kingdom	360	343	328	324	317	307	312	307	307	296	283	283	284	– 21	0.5	7.2	7.9
EU-27 (a)	**5 018**	**4 190**	**4 038**	**3 991**	**3 945**	**3 923**	**3 885**	**3 801**	**3 795**	**3 799**	**3 705**	**3 663**	**3 591**	**– 28**	**– 2.0**	**100**	**100**
EU-27 (b)	**5 020**	**4 190**	**4 038**	**3 991**	**3 946**	**3 923**	**3 885**	**3 801**	**3 795**	**3 799**	**3 705**	**3 663**	**3 591**				

Notes: (a) Sum of national totals as reported by Member States.
(b) Sum of sectors: differences are due to reallocation of memo items in line with the new UNECE reporting guidelines (UNECE, 2009) for countries that reported emissions in older NFR formats, and to Member States only providing national total data.
Negative percentage values indicate that emissions have decreased.
Green cshaded cells indicate that emissions of these Member States are below the Gothenburg ceilings 2010. Please note that there are no Gothenburg ceilings for Estonia and Malta (shaded grey).

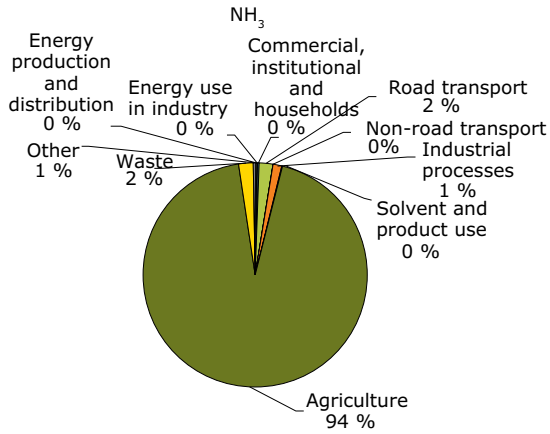
Figure 2.6 shows the contribution to total EU-27 emissions made by the aggregated sector groups. A single sector group, agriculture, is responsible for the vast majority (94 %) of NH_3 emissions in the EU-27. The fall in NH_3 emissions in the agricultural sector is due to the combination of reduced livestock numbers across Europe (especially cattle) and the lower use of nitrogenous fertilisers (EEA, 2011e).

Figure 2.6 **NH_3 emissions in the EU-27: (a) trend in NH_3 emissions from the five most important key categories, 1990–2010; (b) share of emissions by sector group, 2010; (c) gridded data reported by Member States, 2010**

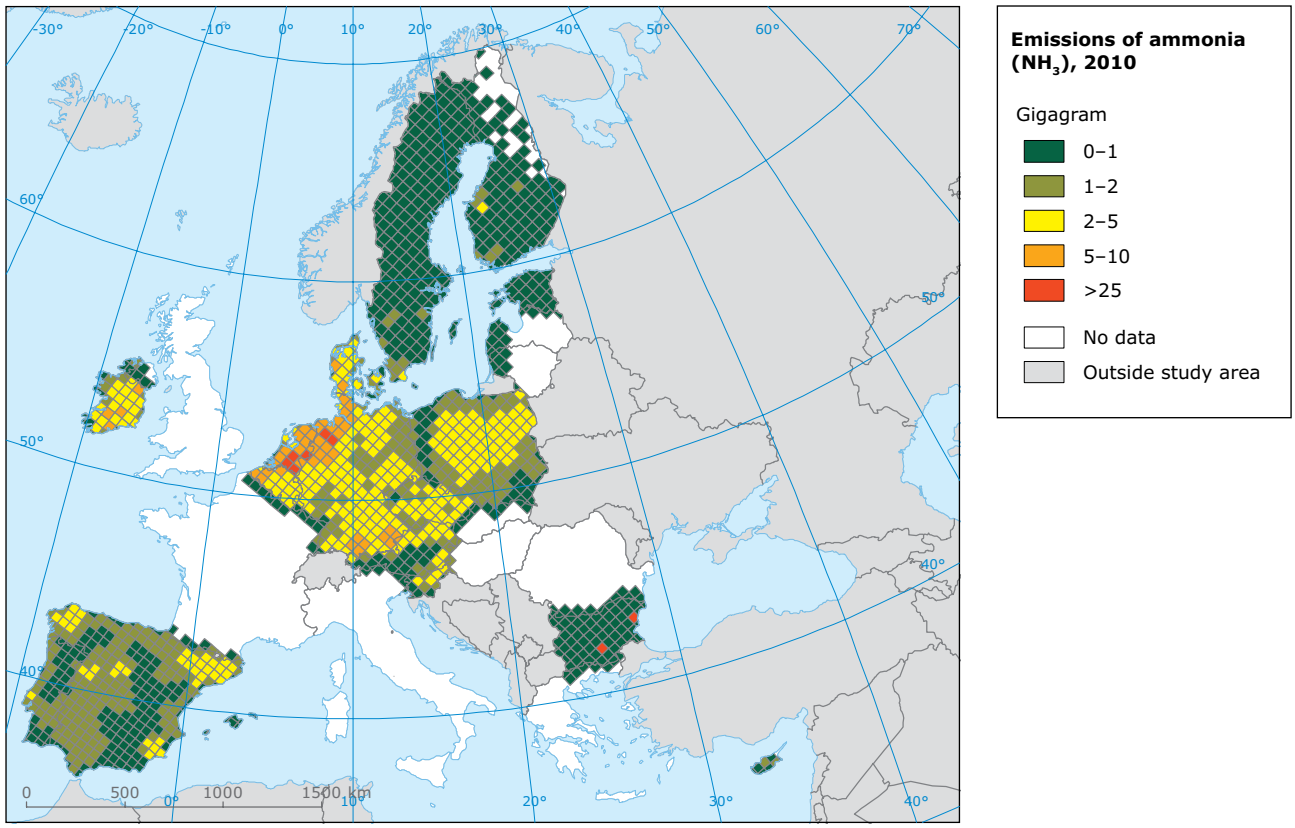
(a)



(b)



(c)



2.6 Fine particulate matter ($PM_{2.5}$) emission trends and key categories

Between 2000 and 2010, $PM_{2.5}$ emissions decreased in the EU-27 by 15 %. Between 2009 and 2010, $PM_{2.5}$ emissions increased by 2.9 %, mainly because of an increase of emissions in Poland (+ 11.2 %, 14 Gg). The main reduction was reported by Portugal (Table 2.7). The Member States that contributed most (more than 10 %) to the emissions of $PM_{2.5}$ in 2010 were France, Italy and Poland. Greece and Luxembourg did not report $PM_{2.5}$ emissions for any year, and thus data for this country could not be gap-filled. The EU-27 total is therefore underestimated.

Domestic fuel use in the residential category '1 A 4 b i — Residential: Stationary plants' is the most important key category for $PM_{2.5}$ emissions, making up 45 % of total $PM_{2.5}$ emissions (Figure 2.7). Among the top five key categories, the highest relative reductions in emissions between 2000 and 2010 were achieved in the third most important key category, '1 A 1 a — Public Electricity and Heat Production' (– 41.5 %), and the fourth most important key category, '1 A 2 f i — Stationary combustion in manufacturing industries and construction: Other' (– 37.8 %).

Figure 2.7 shows the contribution to total EU-27 emissions made by the aggregated sector groups. The 'commercial, institutional and households' sector group is a very significant source of $PM_{2.5}$, as are PM_{10}, total PAHs, PCDD/Fs and PCBs.

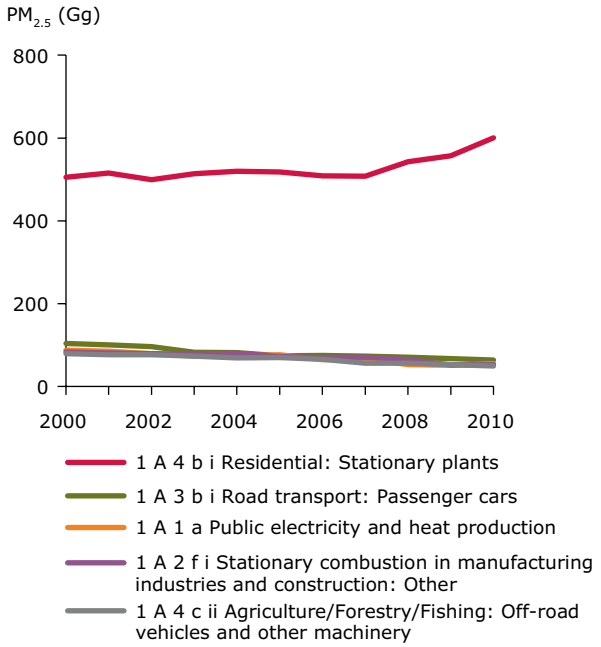
Table 2.7 Member State contributions to EU $PM_{2.5}$ emissions (Gg)

Member State	$PM_{2.5}$ (Gg)											Change		Share in EU-27	
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	1990–2010	2009–2010	1990	2010
												(%)	(%)	(%)	(%)
Austria	23	23	22	22	22	22	21	21	21	19	20	– 12	2.1	1.4	1.5
Belgium	34	30	30	29	28	24	25	21	20	16	17	– 51	5.6	2.2	1.2
Bulgaria	22	21	25	28	27	27	28	26	27	25	27	22	8.6	1.4	2.0
Cyprus	3.9	3.7	3.7	3.7	3.2	2.9	2.8	2.8	2.8	2.3	2.2	– 44	– 5.0	0.3	0.2
Czech Republic	61	53	44	38	35	21	22	21	21	20	20	– 68	– 3.8	3.9	1.5
Denmark	22	23	22	24	24	25	26	30	28	25	26	16	1.0	1.4	1.9
Estonia	21	22	23	21	22	20	15	20	20	19	24	12	28.1	1.4	1.8
Finland	39	40	40	40	40	36	37	34	38	38	41	4.6	6.6	2.5	3.1
France	368	357	333	334	321	304	288	273	267	251	255	– 31	1.2	23.5	19.1
Germany	143	140	134	130	126	121	119	114	110	106	111	– 23	4.8	9.1	8.3
Greece															
Hungary	26	24	25	18	27	31	29	21	23	28	32	24	14.8	1.6	2.4
Ireland	11	11	11	10	11	11	10	10	10	9	8	– 28	– 4.0	0.7	0.6
Italy	178	178	174	172	180	166	165	176	173	169	173	– 2.7	2.7	11.4	13.0
Latvia	23	26	25	26	28	27	27	26	26	28	27	18	– 3.2	1.5	2.1
Lithuania	9.1	9.0	9.0	8.8	8.8	8.7	8.9	9.5	9.5	8.6	10	10	15.4	0.6	0.7
Luxembourg	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE				
Malta	1.0	1.3	1.3	1.3	1.3	1.3	1.4	1.4	1.4	1.4	0.8	– 23	– 45.2	0.1	0.1
Netherlands	24	23	22	21	20	19	19	18	17	16	15	– 37	– 4.2	1.5	1.1
Poland	135	142	142	141	134	133	136	134	122	123	137	1.3	11.2	8.6	10.3
Portugal	74	73	65	63	66	65	61	61	59	57	49	– 33	– 13.9	4.7	3.7
Romania	81	86	91	91	97	106	102	109	123	115	118	47	2.7	5.1	8.9
Slovakia	23	33	29	28	28	37	32	28	28	27	27	18	– 2.3	1.5	2.0
Slovenia	14	14	14	14	14	14	14	14	13	16	17	16	5.6	0.9	1.3
Spain	100	100	100	100	98	98	95	97	87	80	79	– 21	– 1.4	6.4	5.9
Sweden	28	28	28	29	29	29	29	29	28	28	32	13	13.9	1.8	2.4
United Kingdom	100	97	86	84	83	81	79	77	73	67	67	– 33	– 0.5	6.4	5.0
EU-27 (a)	**1 566**	**1 560**	**1 498**	**1 477**	**1 473**	**1 431**	**1 392**	**1 374**	**1 348**	**1 295**	**1 333**	**100**	**100**	**100**	**100**
EU-27 (b)	**1 566**	**1 560**	**1 494**	**1 487**	**1 474**	**1 431**	**1 392**	**1 374**	**1 348**	**1 295**	**1 333**				

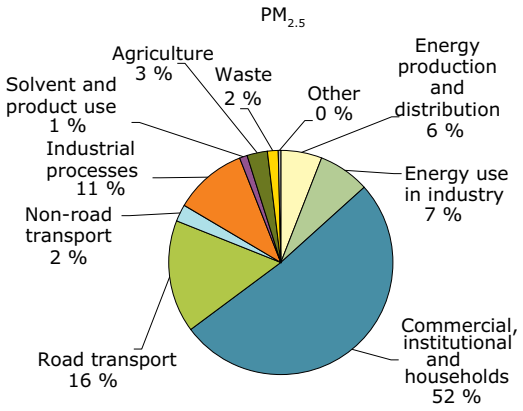
Notes: (a) Sum of national totals as reported by Member States.
(b) Sum of sectors: differences are due to reallocation of memo items in line with the new UNECE reporting guidelines (UNECE, 2009) for countries that reported emissions in older NFR formats, and to Member States only providing national total data.
Parties to the LRTAP Convention are formally requested to report emissions of PM only for the years 2000 and after.
Negative percentage values indicate that emissions have decreased.

Figure 2.7 **$PM_{2.5}$ emissions in the EU-27: (a) trend in $PM_{2.5}$ emissions from the five most important key categories, 1990–2010; (b) share of emissions by sector group, 2010; (c) gridded data reported by Member States, 2010**

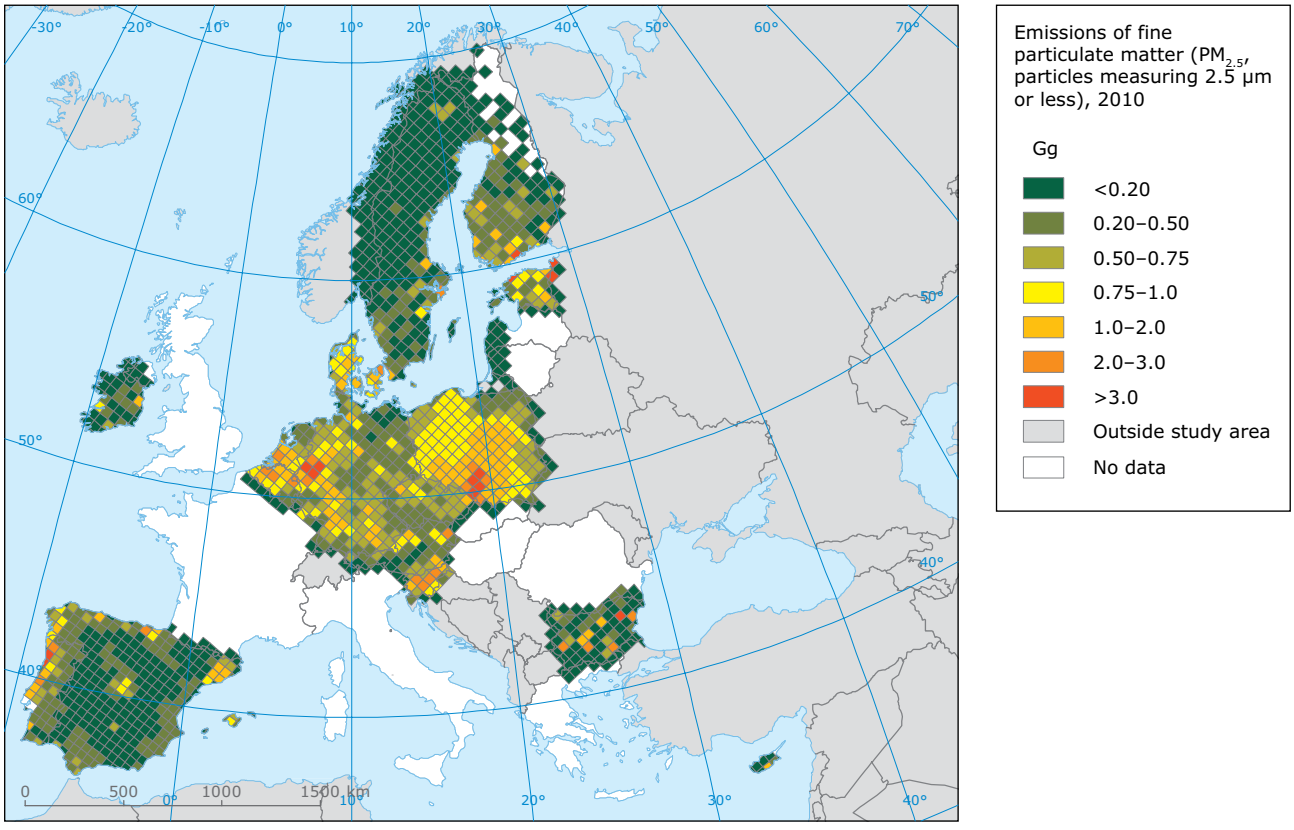
(a)



(b)



(c)



Note: Parties to the LRTAP Convention are formally requested to report emissions of PM only for the year 2000 and after.

2.7 Coarse particulate matter (PM_{10}) emission trends and key categories

Between 2000 and 2010, PM_{10} emissions in the EU-27 decreased by 14 %. Between 2009 and 2010, emissions increased by 3.0 %, mainly as a result of an increase of emissions in Poland (+ 12.4 %, 31 Gg). The main reduction was reported by Portugal (Table 2.8). The Member States that contributed most (more than 10 %) to the emissions of PM_{10} in 2010 were France, Poland and Italy. Greece and Luxembourg did not report PM_{10} emissions for any year, and thus data for this country could not be gap-filled. The EU-27 total is therefore underestimated.

As for $PM_{2.5}$, the residential category '1 A 4 b i — Residential: Stationary plants' is the most important key category for PM_{10} emissions, accounting for 36 % of total PM_{10} emissions (Figure 2.8). Among the top five key categories, the highest relative reductions in emissions between 1990 and 2010 were achieved in the second most important key category, '1 A 1 a — Public electricity and heat production' (– 49.2 %) (Figure 2.8) and the fifth most important key category '1 A 2 f i — Stationary combustion in manufacturing industries and construction: Other' (– 44.4 %).

Figure 2.8 shows the contribution to total EU-27 emissions made by the aggregated sector groups. The 'commercial, institutional and households' sector group is a very significant source of PM_{10}, as well as of $PM_{2.5}$, total PAHs, PCDD/Fs and PCBs.

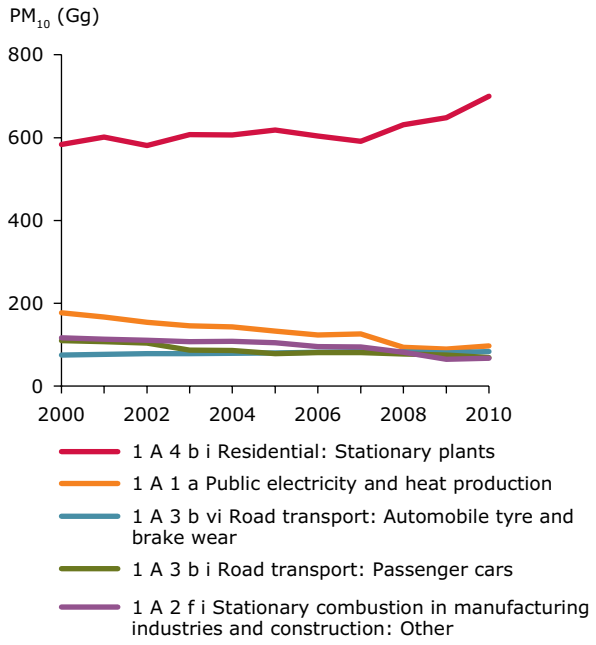
Table 2.8 Member State contributions to EU PM_{10} emissions (Gg)

Member State	PM_{10} (Gg)											Change		Share in EU-27	
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	1990–2010 (%)	2009–2010 (%)	1990 (%)	2010 (%)
Austria	39	39	38	38	38	38	37	36	37	35	35	– 9.1	1.1	1.7	1.8
Belgium	46	45	44	44	42	34	34	30	28	23	24	– 48	5.3	2.0	1.2
Bulgaria	35	33	36	42	42	45	47	47	46	39	41	16	4.5	1.5	2.1
Cyprus	5.9	5.5	5.4	5.4	4.9	4.4	4.3	4.4	4.3	3.6	3.4	– 41	– 5.5	0.3	0.2
Czech Republic	48	43	51	51	47	34	35	35	35	36	37	– 23	1.9	2.1	1.9
Denmark	29	29	28	30	30	32	33	36	34	31	32	11	0.9	1.2	1.6
Estonia	37	37	33	30	30	27	20	29	25	23	32	– 13	39.0	1.6	1.6
Finland	54	54	54	54	56	50	52	48	52	52	55	1.5	6.3	2.4	2.8
France	502	488	460	463	450	428	410	393	385	364	367	– 27	0.8	21.9	18.6
Germany	240	234	225	218	214	207	206	201	195	187	193	– 20	3.1	10.5	9.8
Greece															
Hungary	47	43	44	33	47	52	48	36	38	48	46	– 2.0	– 3.5	2.1	2.3
Ireland	17	18	17	16	16	17	16	16	15	13	13	– 28	– 2.6	0.8	0.6
Italy	209	211	206	204	212	197	197	207	204	198	202	– 3.3	2.3	9.1	10.3
Latvia	27	29	29	30	39	33	32	33	32	33	33	23	– 1.0	1.2	1.7
Lithuania	11	11	11	11	11	11	11	12	12	11	13	11	14.1	0.5	0.6
Luxembourg	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE				
Malta	1.4	2.0	1.9	2.0	2.0	2.1	2.1	2.2	2.2	2.2	1.3	– 8.8	– 40.9	0.1	0.1
Netherlands	39	37	37	35	34	33	33	32	32	30	29	– 25	– 2.1	1.7	1.5
Poland	282	300	303	296	280	289	285	269	247	249	279	– 0.9	12.4	12.3	14.2
Portugal	101	107	93	87	94	97	88	85	85	83	71	– 29	– 14.1	4.4	3.6
Romania	102	107	111	112	117	126	123	137	144	136	143	40	5.0	4.4	7.2
Slovakia	45	47	40	36	32	42	37	32	31	31	30	– 33	– 2.0	2.0	1.5
Slovenia	19	19	19	18	18	19	18	18	17	19	20	2.2	4.7	0.8	1.0
Spain	146	145	146	144	143	141	137	139	123	113	112	– 23	– 0.9	6.4	5.7
Sweden	40	40	40	41	41	41	41	41	40	39	44	10	11.6	1.7	2.2
United Kingdom	171	165	143	140	138	135	133	131	126	114	114	– 33	0.2	7.5	5.8
EU-27 (a)	**2 292**	**2 290**	**2 217**	**2 181**	**2 180**	**2 133**	**2 080**	**2 048**	**1 989**	**1 912**	**1 969**	**– 14**	**3.0**	**100**	**100**
EU-27 (b)	**2 292**	**2 296**	**2 205**	**2 196**	**2 181**	**2 133**	**2 080**	**2 048**	**1 989**	**1 912**	**1 969**				

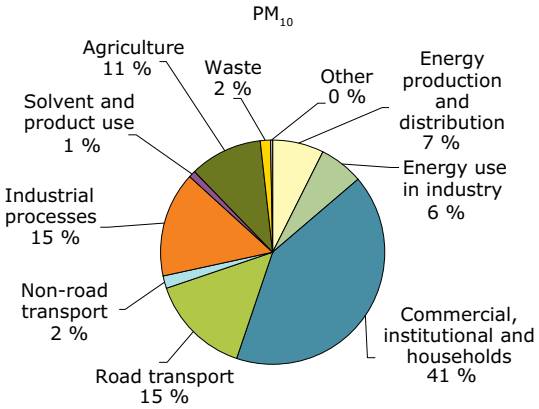
Notes: (a) Sum of national totals as reported by Member States.
(b) Sum of sectors: differences are due to reallocation of memo items in line with the new UNECE reporting guidelines (UNECE, 2009) for countries that reported emissions in older NFR formats, and to Member States only providing national total data.
Parties to the LRTAP Convention are formally requested to report emissions of PM only for the years 2000 and after.
Negative percentage values indicate that emissions have decreased.

Figure 2.8 **PM_{10} emissions in the EU-27: (a) trend in PM_{10} emissions from the five most important key categories, 1990–2010; (b) share of emissions by sector group, 2010; (c) gridded data reported by Member States, 2010**

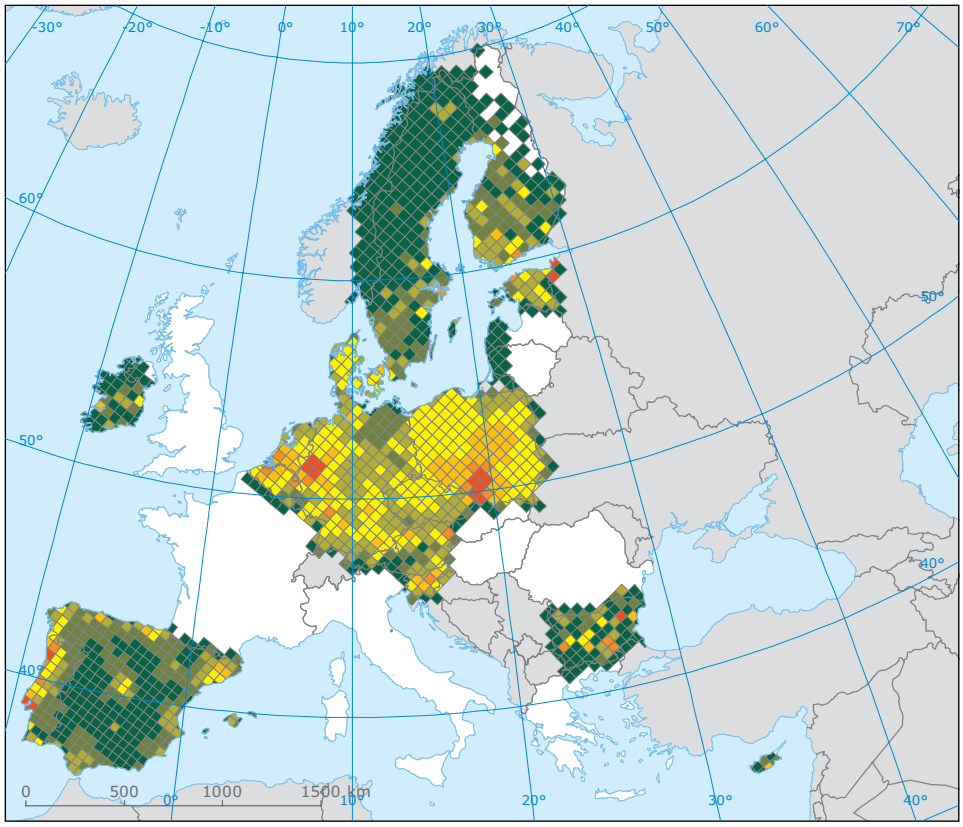
(a)



(b)



(c)



Emissions of coarse particulate matter (PM_{10}, particles measuring 10 µm or less), 2010

Gg

- <0.25
- 0.25–0.5
- 0.5–1.0
- 1.0–2.0
- 2.0–3.0
- 3.0–5.0
- >5.0
- Outside study area
- No data

Note: Parties to the LRTAP Convention are formally requested to report emissions of PM only for the year 2000 and onwards.

2.8 Total suspended particulate (TSP) emission trends

Between 1990 and 2010, TSP emissions in the EU-27 decreased by 48 %. Between 2009 and 2010, emissions increased by 4.1 %, mainly due to an increase of emissions in Hungary (+ 106.2 %, 85 Gg) and Poland (+ 10.3 %, 42 Gg). The main reduction was reported by Portugal (Table 2.9). The Member States that contributed most (more than 10 %) to the emissions of TSP in 2010 were France and Poland. Greece and Luxembourg did not report PM_{10} emissions for any year, and thus data for this country could not be gap-filled. The EU-27 total is therefore underestimated.

The decrease of TSP emissions from Estonia between 1995 and 2000 is due to enhanced efficiency of combustion devices and cleaning installations (especially in oil-shale power plants and cement factories), as well as decrease drop in electricity production. The significant growth of TSP emissions in 2010 compared to 2009 is the result of increasing electricity production at the same time (Appendix 7, Estonia's IIR).

The reason for the emission increase in Latvia for the years 2003 to 2004 is the same as for the increase of NMVOC emissions at the same time: Latvia entered the EU in May 2004, whereupon financial resources from EU projects became available for national infrastructure projects. Emissions occurred due to asphalt roofing and road paving as large amounts of bitumen mixtures were imported and used (Appendix 7, Latvia's IIR).

Table 2.9 Member State contributions to EU TSP emissions (Gg)

Member State	TSP (Gg)													Change		Share in EU-27	
	1990	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	1990–2010	2009–2010	1990	2010
														(%)	(%)	(%)	(%)
Austria	63	63	63	63	62	63	63	63	62	61	62	60	60	– 4.1	0.7	0.9	1.7
Belgium	88	81	80	100	99	99	97	66	65	61	58	46	48	– 46	3.6	1.3	1.3
Bulgaria	82	111	82	94	84	106	111	128	130	140	125	96	98	20	2.1	1.2	2.7
Cyprus	17	13	11	9.2	9.0	8.6	7.8	6.9	6.7	6.9	6.8	5.7	5.4	– 68	– 5.1	0.245	0.2
Czech Republic	640	202	57	71	76	77	75	64	68	67	64	62	61	– 90	– 1.9	9.3	1.7
Denmark	31	34	37	38	37	39	40	41	42	46	43	40	40	29	0.9	0.5	1.1
Estonia	277	134	75	73	53	49	46	37	28	36	32	28	38	– 86	34.4	4.0	1.1
Finland	29	27	72	78	79	80	79	75	81	73	78	76	80	179	5.4	0.4	2.2
France	1 338	1 251	1 200	1 183	1 149	1 174	1 162	1 108	1 084	1 050	1 046	1 018	1 020	– 24	0.1	19.4	28.4
Germany	1 852	373	336	327	315	305	300	289	288	281	274	260	266	– 86	2.2	26.9	7.4
Greece																	
Hungary	197	155	129	122	119	125	91	90	83	60	64	80	166	– 16	106.2	2.9	4.6
Ireland	34	31	29	30	28	27	27	28	26	26	25	22	21	– 38	– 2.5	0.5	0.6
Italy	291	292	254	257	252	251	260	244	243	257	253	244	250	– 14	2.4	4.2	7.0
Latvia	23	27	31	34	34	36	75	44	43	47	47	41	41	77	0.4	0.34	1.1
Lithuania	13	13	13	12	12	14	15	14	15	14	13	14	16	22	13.8	0.2	0.4
Luxembourg	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE				
Malta	2.8	3.8	4.6	5.5	5.3	5.7	5.7	6.0	6.0	6.2	5.9	5.9	1.4	– 48	– 75.7	0.04	0.04
Netherlands	90	68	46	50	49	45	45	40	39	40	38	35	35	– 61	– 0.7	1.3037	1.0
Poland	464	463	464	491	491	476	453	457	458	430	402	404	445	– 4.0	10.3	6.7	12.4
Portugal	134	191	229	268	227	197	229	251	212	200	203	203	166	24	– 18.6	1.9	4.6
Romania	238	236	245	247	250	249	253	257	233	275	269	233	251	5.6	7.7	3.5	7.0
Slovakia	290	106	57	57	49	44	45	53	46	40	37	36	36	– 88	– 1.7	4.2	1.0
Slovenia	31	28	25	25	25	24	24	25	24	24	22	24	25	– 19	4.0	0.4	0.7
Spain	205	207	209	208	211	207	206	201	195	199	178	166	165	– 20	– 0.3	3.0	4.6
Sweden	60	55	45	46	46	47	47	48	48	48	47	45	51	– 16	11.6	0.869	1.4
United Kingdom	407	330	281	275	242	241	240	234	232	228	220	201	204	– 50	1.7	5.9	5.7
EU-27 (a)	**6 896**	**4 494**	**4 072**	**4 165**	**4 003**	**3 987**	**3 997**	**3 870**	**3 759**	**3 714**	**3 612**	**3 445**	**3 588**	**– 48**	**4.1**	**100**	**100**
EU-27 (b)	**6 896**	**4 494**	**4 072**	**4 169**	**3 984**	**3 986**	**3 997**	**3 870**	**3 759**	**3 714**	**3 612**	**3 445**	**3 588**				

Notes: (a) Sum of national totals as reported by Member States.
(b) Sum of sectors: differences are due to reallocation of memo items in line with the new UNECE reporting guidelines (UNECE, 2009) for countries that reported emissions in older NFR formats, and to Member States only providing national total data.
Negative percentage values indicate that emissions have decreased.

2.9 Carbon monoxide (CO) emission trends and key categories

Between 1990 and 2010, CO emissions decreased in the EU-27 by 62 %. Between 2009 and 2010, the increase was 3.4 %, mainly due to an increase of emissions in Germany (+ 10.6 %, 321 Gg), France (+ 8.7 %, 319 Gg) and Poland (+ 10.7 %, 298 Gg). The main reductions were reported by the United Kingdom, Portugal, Greece and Hungary (Table 2.10). The Member States that contributed most (more than 10 %) to the emissions of CO in 2010 were France, Germany, Poland and Italy.

'1 A 4 b i — Residential: Stationary plants' and '1 A 3 b i — Road transport: Passenger cars' were the most important key categories for CO emissions, jointly accounting for 55 % of total CO emissions. Among the top five key categories, the highest relative reductions in emissions between 1990 and 2010 were achieved in the second most important key category, '1 A 3 b i — Road transport: Passenger cars' (– 80.7 %) (Figure 2.9).

Figure 2.9 shows the contribution to total EU-27 emissions made by the aggregated sector groups. For CO, common important emission sources are 'commercial, institutional and households' and road transport.

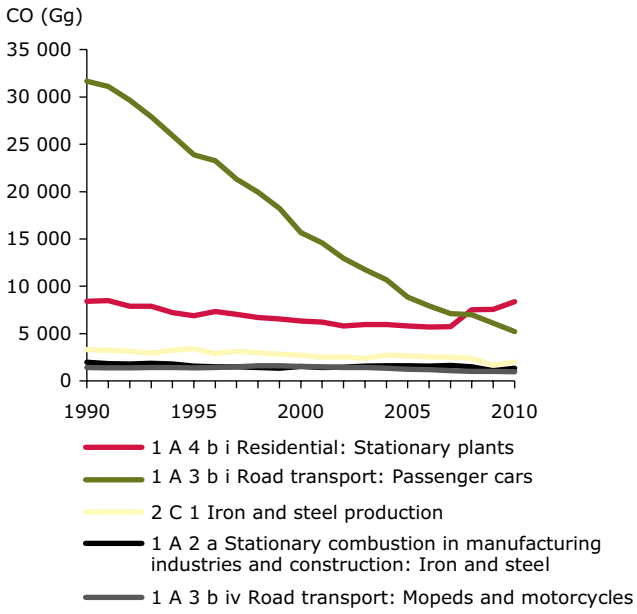
Table 2.10 Member State contributions to EU CO emissions (Gg)

Member State	CO (Gg)													Change		Share in EU-27	
	1990	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	1990–2010	2009–2010	1990	2010
														(%)	(%)	(%)	(%)
Austria	1 436	1 274	959	919	882	874	835	809	769	717	678	632	639	– 56	1.1	2.2	2.6
Belgium	1 356	1 055	1 028	1 011	981	949	896	717	704	618	614	381	461	– 66	21.1	2.1	1.9
Bulgaria	731	510	370	332	347	376	341	350	361	308	285	254	275	– 62	8.4	1.1	1.1
Cyprus	53	46	35	34	33	32	29	27	25	24	23	20	19	– 65	– 7.0	0.1	0.1
Czech Republic	1 030	897	643	649	546	579	575	511	484	509	439	403	402	– 61	– 0.27	1.6	1.6
Denmark	722	631	470	465	445	452	440	449	442	453	433	407	399	– 45	– 1.8	1.1	1.6
Estonia	227	197	183	188	182	174	171	158	144	163	167	168	177	– 22	4.9	0.3	0.7
Finland	721	623	610	603	598	577	565	530	507	501	486	465	485	– 33	4.2	1.1	1.9
France	10 920	9 289	6 567	6 165	5 958	5 688	5 812	5 311	4 786	4 520	4 355	3 666	3 985	– 64	8.7	16.6	16.0
Germany	12 372	6 561	4 810	4 604	4 314	4 117	3 879	3 659	3 579	3 482	3 396	3 011	3 332	– 73	10.6	18.8	13.4
Greece	1 133	954	923	913	856	812	808	721	737	682	622	591	527	– 54	– 10.9	1.7	2.1
Hungary	23	547	547	538	530	556	540	541	552	529	530	518	480	1967	– 7.4	0.0	1.9
Ireland	418	314	253	243	223	212	202	192	183	172	159	152	139	– 67	– 8.5	0.6	0.6
Italy	7 093	7 043	4 802	4 550	4 227	3 998	3 801	3 446	3 234	3 098	2 964	2 725	2 711	– 62	– 0.5	10.8	10.9
Latvia	455	347	288	298	284	288	283	282	277	265	249	267	258	– 43	– 3.4	0.7	1.0
Lithuania	521	289	211	221	220	224	186	194	204	202	177	169	211	– 60	24.6	0.8	0.8
Luxembourg	484	286	93.4	87.2	78.1	74.6	72.8	64.5	56.6	52.8	43.8	37.6	39.00	– 92	3.9	0.74	0.16
Malta	24	30	0.6	0.7	0.7	0.8	0.8	0.7	0.8	0.8	0.8	31	11	– 54	– 64.6	0.04	0.04
Netherlands	1 124	915	756	734	706	682	690	659	649	629	632	580	577	– 49	– 0.5	1.7	2.3
Poland	7 406	4 547	3 463	3 528	3 410	3 318	3 426	2 521	2 603	2 603	2 690	2 778	3 076	– 58	10.7	11.3	12.3
Portugal	832	830	722	662	643	618	602	569	542	520	521	486	387	– 53	– 20.5	1.3	1.6
Romania	1 710	909	1 523	1 436	1 166	1 304	1 519	1 257	1 220	1 459	1 409	1 349	1 402	– 18	3.9	2.6	5.6
Slovakia	515	423	300	305	290	292	292	272	273	249	245	208	221	– 57	6.5	0.8	0.9
Slovenia	319	296	199	192	180	174	159	152	139	137	136	151	161	– 50	6.6	0.5	0.6
Spain	3 680	3 185	2 697	2 626	2 394	2 452	2 308	2 123	2 099	2 081	1 951	1 710	1 771	– 52	3.5	5.6	7.1
Sweden	1 278	1 125	823	783	748	728	677	661	626	617	607	612	639	– 50	4.4	1.9	2.6
United Kingdom	9 087	7 554	5 653	5 303	4 677	4 194	3 901	3 510	3 280	2 982	2 818	2 317	2 125	– 77	– 8.3	13.8	8.5
EU-27 (a)	**65 670**	**50 677**	**38 928**	**37 388**	**34 918**	**33 742**	**33 012**	**29 683**	**28 478**	**27 576**	**26 631**	**24 091**	**24 908**	**– 62**	**3.4**	**100**	**100**
EU-27 (b)	**65 670**	**50 677**	**38 928**	**37 388**	**34 918**	**33 742**	**33 012**	**29 683**	**28 478**	**27 576**	**26 615**	**24 091**	**24 908**				

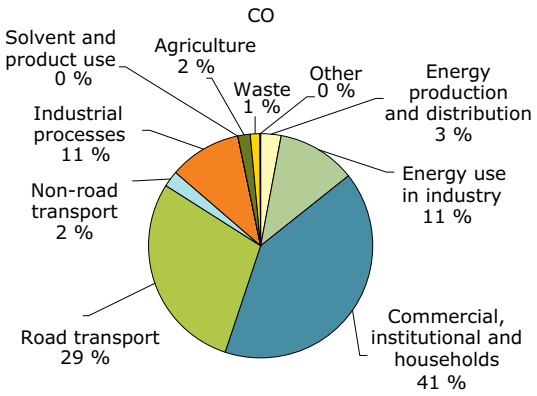
Notes: (a) Sum of national totals as reported by Member States.
(b) Sum of sectors: differences are due to reallocation of memo items in line with the new UNECE reporting guidelines (UNECE, 2009) for countries that reported emissions in older NFR formats, and to Member States only providing national total data.
Negative percentage values indicate that emissions have decreased.

Figure 2.9 **CO emissions in the EU-27: (a) trend in CO emissions from the five most important key categories, 1990–2010; (b) share of emissions by sector group, 2010; (c) gridded data reported by Member States, 2010**

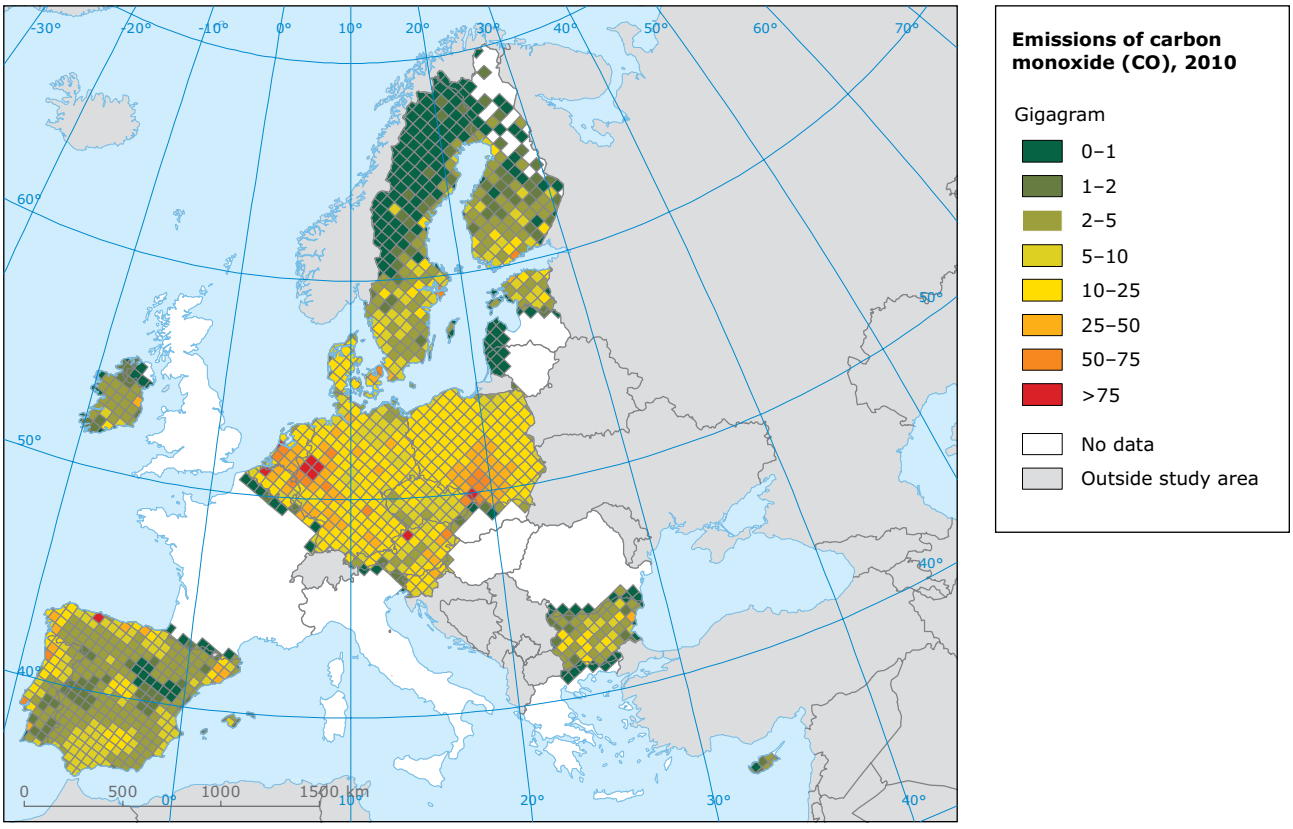
(a)



(b)



(c)



2.10 Lead (Pb) emission trends and key categories

Between 1990 and 2010, Pb emissions decreased in the EU-27 by 89 %. Between 2009 and 2010, emissions increased by 9.1 %, mainly due to an increase of emissions in Poland (+ 14.3 %, 65 Mg), Portugal (+ 35.4 %, 54 Mg) and Italy (+ 16.3 %, 38 Mg). The main reductions were reported by Hungary and the Czech Republic (Table 2.11). The Member States that contributed most (more than 10 %) to the emissions of Pb in 2009 were Poland, Greece and Italy. Luxembourg once reported a notation key 'NR' for Pb emissions, which was used for gap-filling all missing years. Therefore, the EU-27 total is underestimated.

The categories '2 C 1 — Iron and steel production', '1 A 2 b — Stationary Combustion in manufacturing industries and construction: Non-ferrous metals' and '1 A 2 f i — Stationary combustion in manufacturing industries and construction: Other' were the most important key categories for Pb emissions, together making up 47 % of total Pb emissions (Figure 2.10).

The largest relative reductions in emissions between 1990 and 2010 were from the third most important key category, '1 A 2 f i — Stationary combustion in manufacturing industries and construction: Other' (– 72.5 %), the fourth most important key category '1 A 4 b i — Residential: Stationary plants' (– 61.7 %), and the most important category '2 C 1 — Iron and steel production' (– 55.3 %).

Much progress has been made since the early 1990s in reducing certain point-source emissions of Pb (e.g. emissions from industrial facilities). This has been achieved through improvements in

Table 2.11 Member State contributions to EU Pb emissions (Mg)

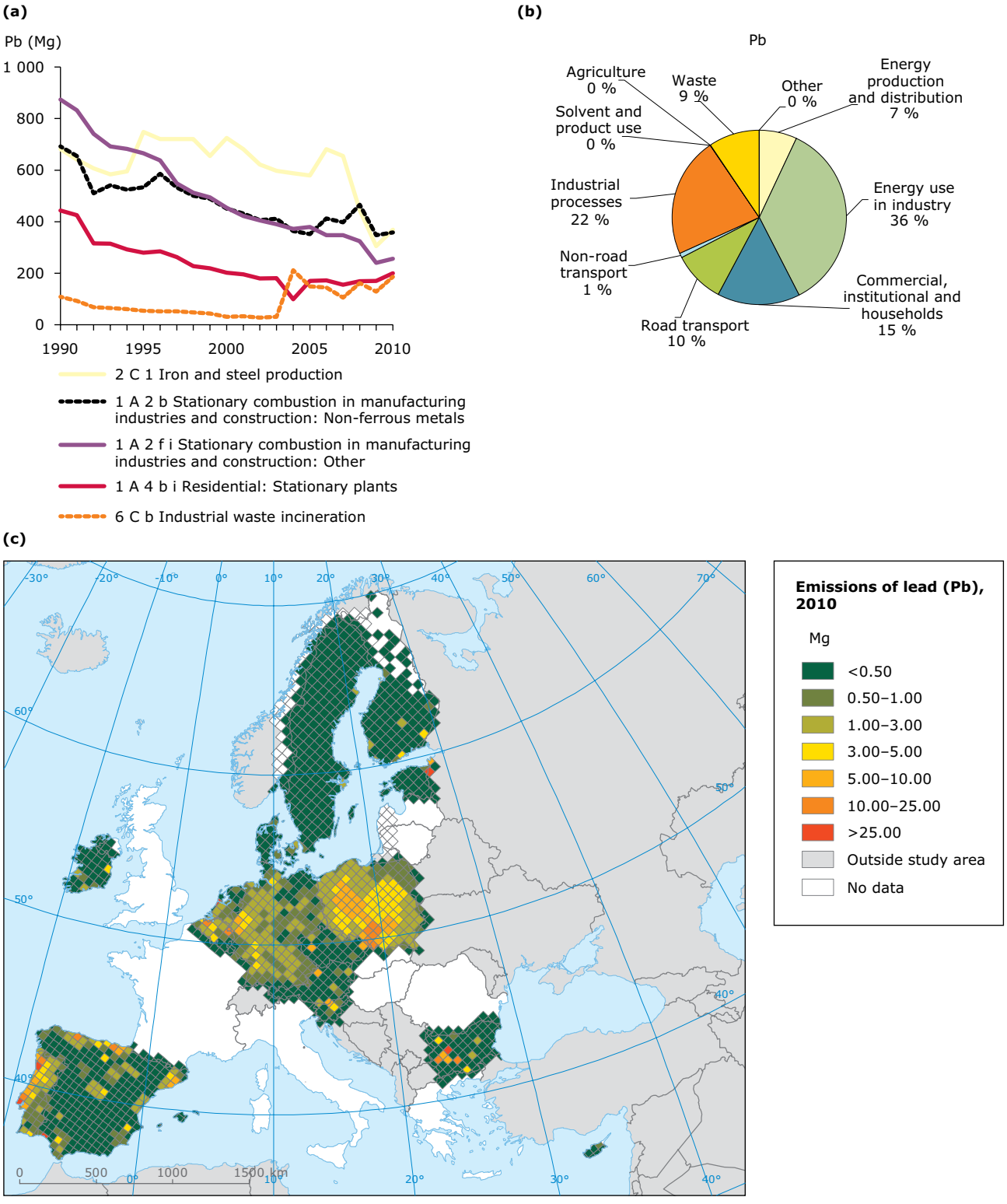
Member State	Pb (Mg)													Change		Share in EU-27	
	1990	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	1990–2010	2009–2010	1990	2010
														(%)	(%)	(%)	(%)
Austria	219	16	12	12	12	12	13	14	14	14	15	13	15	– 93	18.8	0.9	0.6
Belgium	491	259	106	87	81	77	86	78	73	64	73	34	43	– 91	27.0	2.1	1.7
Bulgaria	321	333	267	248	209	248	144	127	128	118	225	112	107	– 67	– 4.8	1.4	4.2
Cyprus	25	26	21	20	18	17	6.9	2.3	2.4	2.5	2.6	2.6	2.6	– 90	– 1.6	0.1	0.1
Czech Republic	269	180	108	47	47	39	37	47	43	44	39	40	26	– 90	– 34.6	1.2	1.0
Denmark	125	23	17	17	16	17	19	16	14	12	12	11	11	– 91	– 0.4	0.5	0.4
Estonia	205	85	36	36	36	38	36	35	31	40	35	28	39	– 81	37.2	0.9	1.5
Finland	338	67	45	45	46	38	28	22	25	22	20	18	23	– 93	29.3	1.5	0.9
France	4 258	1 434	239	205	197	144	128	125	116	112	99	74	83	– 98	12.2	18.4	3.2
Germany	2 075	693	433	418	397	382	373	352	348	339	199	174	191	– 91	9.9	9.0	7.5
Greece	470	470	470	470	470	470	470	470	470	470	470	470	470	0.0	0.0	2.0	18.4
Hungary	663	130	42	51	34	34	34	38	37	35	36	32	17	– 97	– 47.7	2.9	0.7
Ireland	125	80	18	17	16	19	19	20	19	19	19	15	14	– 89	– 7.8	0.5	0.5
Italy	4 414	2 028	944	711	251	256	271	280	288	312	301	232	270	– 94	16.3	19.1	10.6
Latvia	92	63	10	11	11	11	11	8.4	8.6	8.9	8.4	7.5	8.2	– 91	9.0	0.4	0.3
Lithuania	47	30	16	15	15	15	5.2	5.7	6.0	6.8	3.7	3.5	2.6	– 94	– 24.6	0.2	0.1
Luxembourg	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR				
Malta	0.4	0.5	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.7	0.7	3.4	849	362.9	0.002	0.1
Netherlands	336	159	33	37	41	38	39	35	36	41	36	37	44	– 87	16.6	1.5	1.7
Poland	1 372	937	648	610	588	596	544	536	589	553	510	459	524	– 62	14.3	5.9	20.6
Portugal	566	785	73	88	85	86	172	189	180	139	186	151	205	– 64	35.4	2.4	8.0
Romania	206	174	145	137	130	125	123	107	105	106	92	54	61	– 70	14.0	0.9	2.4
Slovakia	150	71	67	66	63	63	68	70	72	60	61	42	56	– 63	33.3	0.6	2.2
Slovenia	357	260	63	57	13	13	13	13	15	15	15	14	14	– 96	5.4	1.5	0.6
Spain	2 788	967	627	409	275	271	267	274	277	277	271	237	247	– 91	4.3	12.0	9.7
Sweden	355	37	26	23	20	19	18	14	14	14	9.3	13	13	– 96	4.0	1.5	0.5
United Kingdom	2 887	1 529	149	142	132	116	118	107	88	79	73	63	59	– 98	– 6.4	12.5	2.3
EU-27 (a)	**23 156**	**10 835**	**4 615**	**3 981**	**3 204**	**3 145**	**3 043**	**2 987**	**3 000**	**2 904**	**2 813**	**2 336**	**2 549**	**– 89**	**9.1**	**100**	**100**
EU-27 (b)	**22 686**	**10 365**	**4 145**	**3 513**	**2 734**	**2 675**	**2 574**	**2 517**	**2 530**	**2 434**	**2 343**	**1 866**	**2 079**				

Notes: (a) Sum of national totals as reported by Member States.
(b) Sum of sectors: differences are due to reallocation of memo items in line with the new UNECE reporting guidelines (UNECE, 2009) for countries that reported emissions in older NFR formats, and to Member States only providing national total data.
Negative percentage values indicate that emissions have decreased.
Empty rows indicate that the Member State has not reported any data.

abatement technologies for wastewater treatment and incinerators, for example, and in metal refining and smelting industries. Some countries have also closed older industrial facilities as a consequence of economic restructuring (EEA, 2011f).

Figure 2.10 shows the contribution to total EU-27 emissions made by the aggregated sector groups. For Pb, common important emission sources are the sectors 'energy use in industry', 'industrial processes' and 'commercial, institutional and households'.

Figure 2.10 Pb emissions in the EU-27: (a) trend in Pb emissions from the five most important key categories, 1990–2010; (b) share of emissions by sector group, 2010; (c) gridded data reported by Member States, 2010



2.11 Cadmium (Cd) emission trends and key categories

Between 1990 and 2010, Cd emissions decreased in the EU-27 by 60 %. Between 2008 and 2010, they increased by 7.5 % (Table 2.12), mainly due to an increase of emissions in Poland (+ 20.1 %, 7 Mg). The main reductions were reported by Hungary and the Czech Republic. The Member States that contributed most (more than 10 %) to the emissions of Cd in 2010 were Poland and Spain. Luxembourg only once reported a notation key 'NR' for Cd emissions, which was used for gap-filling all other years. The EU-27 total is therefore underestimated.

Categories '1 A 4 b i — Residential: Stationary plants' and '1 A 2 f i — Stationary combustion in manufacturing industries and construction: Other' were the most important key categories for Cd emissions, making up 40 % of total Cd emissions (Figure 2.11). Among the top five key categories, the highest relative reductions in emissions between 1990 and 2010 were achieved from the second most important key category '1 A 2 f i — Stationary combustion in manufacturing industries and construction: Other' (– 81.7 %), and the third most important key category '1 A 1 a —Public Electricity and Heat Production' (– 59.6 %) (Figure 2.11).

As was the case for Pb, since the early 1990s, industrial sources of Cd emissions have in general decreased, reflecting improved abatement technologies for combustion facilities and in the metal refining and smelting industries (EEA, 2011f).

Table 2.12 Member State contributions to EU Cd emissions (Mg)

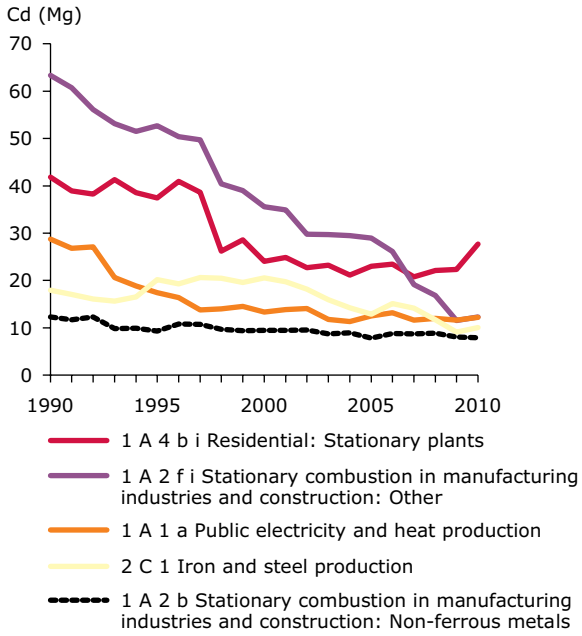
Member State	Cd (Mg)													Change		Share in EU-27	
	1990	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	1990–2010 (%)	2009–2010 (%)	1990 (%)	2010 (%)
Austria	1.6	1.0	0.9	0.9	0.9	1.0	1.0	1.1	1.1	1.1	1.1	1.0	1.1	– 28	10.0	0.6	1.1
Belgium	7.2	5.3	3.0	2.1	2.0	1.9	2.3	2.7	2.7	2.5	2.8	2.1	2.7	– 63	29.2	2.8	2.6
Bulgaria	5.2	3.6	3.5	3.4	3.1	3.4	3.4	2.9	2.8	2.5	3.2	2.2	1.9	– 64	– 13.0	2.0	1.8
Cyprus	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	45	– 15.2	0.02	0.1
Czech Republic	4.3	3.6	2.9	2.6	2.7	2.2	2.4	3.1	3.2	2.9	3.8	3.4	0.9	– 80	– 73.7	1.7	0.9
Denmark	1.0	0.5	0.4	0.4	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2	– 80	– 0.9	0.4	0.2
Estonia	4.4	2.0	0.6	0.5	0.6	0.6	0.6	0.6	0.5	0.7	0.6	0.5	0.7	– 85	39.5	1.7	0.6
Finland	6.3	1.7	1.3	1.7	1.3	1.2	1.5	1.3	1.3	1.0	1.2	1.3	1.4	– 78	9.5	2.5	1.4
France	21	18	14	13	12	9.1	6.5	6.2	4.6	4.3	4.2	2.9	2.9	– 86	– 0.7	8.0	2.8
Germany	17	11	10	9.7	9.1	8.7	8.0	7.3	6.9	6.4	5.5	4.7	5.3	– 69	12.4	6.7	5.2
Greece	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	0.0	0.0	1.2	2.9
Hungary	5.5	3.8	3.0	3.1	2.8	2.9	2.7	1.5	1.7	1.5	1.6	3.4	0.7	– 87	– 79.3	2.1	0.7
Ireland	0.8	0.9	1.1	0.9	0.7	0.7	0.7	0.7	0.6	0.6	0.6	0.4	0.4	– 50	– 1.5	0.3	0.4
Italy	10	9.3	8.8	8.6	7.0	7.2	7.8	8.1	8.3	8.9	8.7	7.1	8.2	– 19	14.8	3.9	7.9
Latvia	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	– 29	10.6	0.1	0.2
Lithuania	3.8	2.1	1.4	1.2	1.0	0.9	0.5	0.4	0.4	0.4	0.3	0.4	0.4	– 89	– 4.8	1.5	0.4
Luxembourg	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR				
Malta	0.2	0.4	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.04	– 83	– 92.6	0.1	0.04
Netherlands	2.1	1.1	0.9	1.6	2.2	2.3	1.7	1.7	1.9	1.7	1.9	1.8	2.5	20	40.8	0.8	2.4
Poland	92	83	50	53	49	48	46	46	43	40	40	37	44	– 52	20.1	35.6	42.9
Portugal	5.4	5.7	5.5	5.5	6.2	5.4	5.3	6.2	5.2	5.4	5.0	3.4	3.8	– 31	10.2	2.1	3.6
Romania	4.3	3.9	3.6	3.5	3.4	3.3	3.3	3.1	3.1	3.7	3.2	2.8	2.2	– 49	– 23.0	1.7	2.1
Slovakia	9.4	10	7.0	7.0	4.9	5.7	6.7	6.0	5.9	1.2	1.2	1.0	1.2	– 87	16.8	3.7	1.2
Slovenia	0.9	0.7	0.6	0.6	0.5	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.6	– 33	– 1.5	0.3	0.6
Spain	27	23	20	20	21	19	19	19	18	15	15	13	16	– 42	19.1	10.4	15.1
Sweden	2.3	0.7	0.5	0.6	0.5	0.5	0.5	0.5	0.5	0.6	0.5	0.5	0.6	– 74	8.7	0.9	0.6
United Kingdom	23	11	6.0	4.7	4.7	3.4	3.5	3.7	3.6	2.8	2.8	2.3	2.4	– 90	3.1	9.0	2.3
EU-27 (a)	**258**	**206**	**150**	**148**	**140**	**133**	**128**	**127**	**121**	**109**	**108**	**96**	**103**	**– 60**	**7.5**	**100**	**100**
EU-27 (b)	**255**	**203**	**147**	**145**	**137**	**130**	**125**	**124**	**118**	**106**	**105**	**93**	**100**				

Notes: (a) Sum of national totals as reported by Member States.
(b) Sum of sectors: differences are due to reallocation of memo items in line with the new UNECE reporting guidelines (UNECE, 2009) for countries that reported emissions in older NFR formats, and to Member States only providing national total data.
Negative percentage values indicate that emissions have decreased.

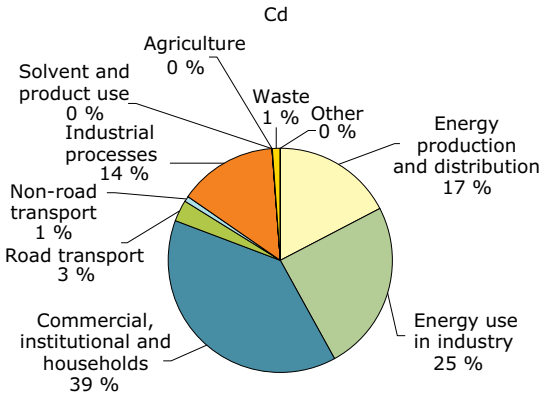
Figure 2.11 shows the contribution to total EU-27 emissions made by the aggregated sector groups. For Cd, common important emission sources are the energy sectors, and the 'commercial, institutional and households' energy use sector.

Figure 2.11 Cd emissions in the EU-27: (a) trend in Cd emissions from the five most important key categories, 1990–2010; (b) share of emissions by sector group, 2010; (c) gridded data reported by Member States, 2010

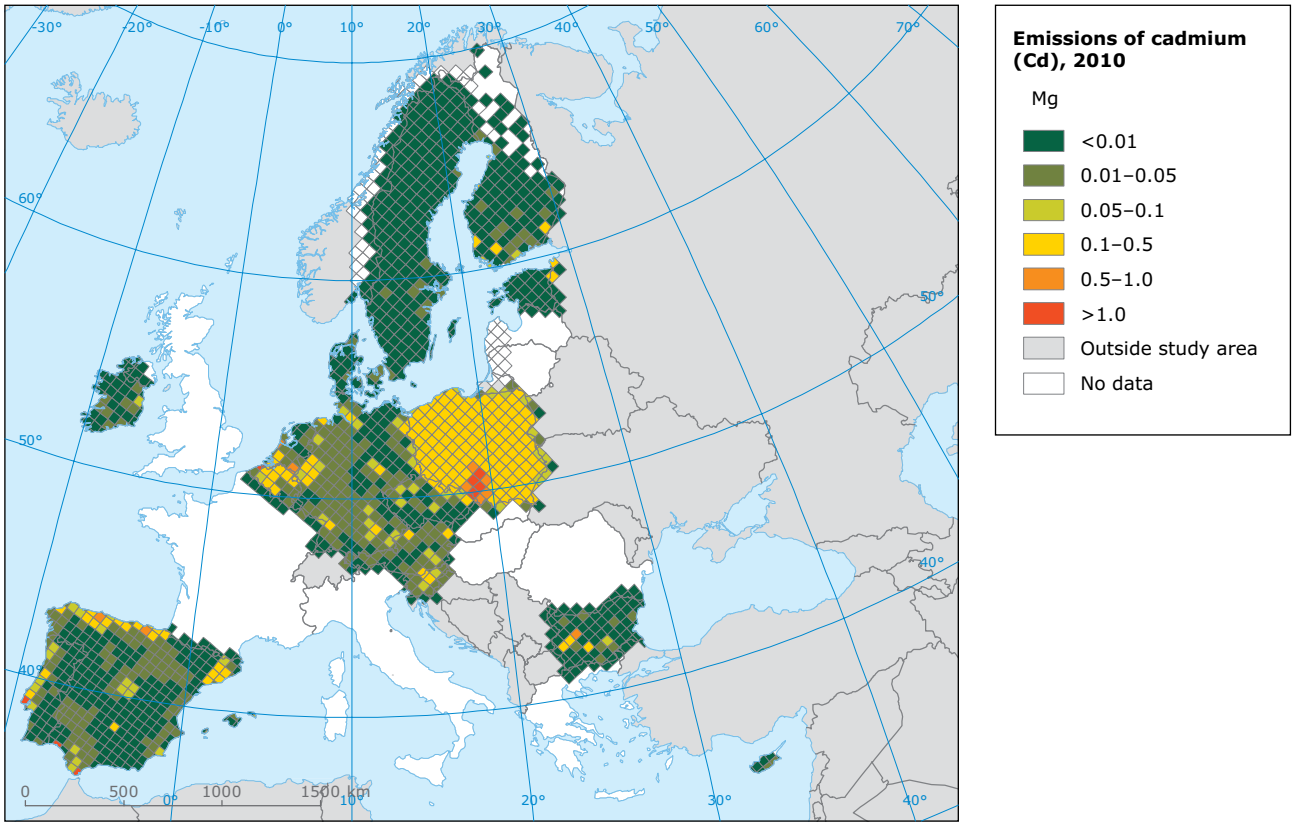
(a)



(b)



(c)



2.12 Mercury (Hg) emission trends and key categories

Between 1990 and 2010, Hg emissions decreased in the EU-27 by 62 %. Between 2009 and 2010, the decrease was 2.4 % (Table 2.13). The Member States that contributed most (more than 10 %) to the emissions of Hg in 2010 were Poland, Greece, Italy and Germany. Luxembourg only once reported the notation key 'NR' for Hg emissions, which was used for gap-filling all other years. The EU-27 total is therefore underestimated.

The categories '1 A 1 a — Public electricity and heat production' and '2 C 1 — Iron and steel production' were the most important key categories for Hg emissions, making up 49 % of total Hg emissions (Figure 2.12). Among the top five key categories, the highest relative reductions in emissions between 1990 and 2010 were achieved from the third most important key category, '1 A 2 f i — Stationary combustion in manufacturing industries and construction: Other' (– 76.4 %) and the most important key category '1 A 1 a — Public electricity and heat production' (– 58.7 %) (Figure 2.12).

Emissions from the categories '1 A 1 a — Public electricity and heat production' and '1 A 2 f i — Stationary combustion in manufacturing industries and construction: Other' have decreased significantly since 1990, partly reflecting a general decline of coal use across Europe as a result of fuel switching (Figure 2.12) (EEA, 2011f).

Figure 2.12 shows the contribution to total EU-27 emissions made by the aggregated sector groups. For Hg, common important emission sources are the energy sectors and the sector 'Industrial processes'.

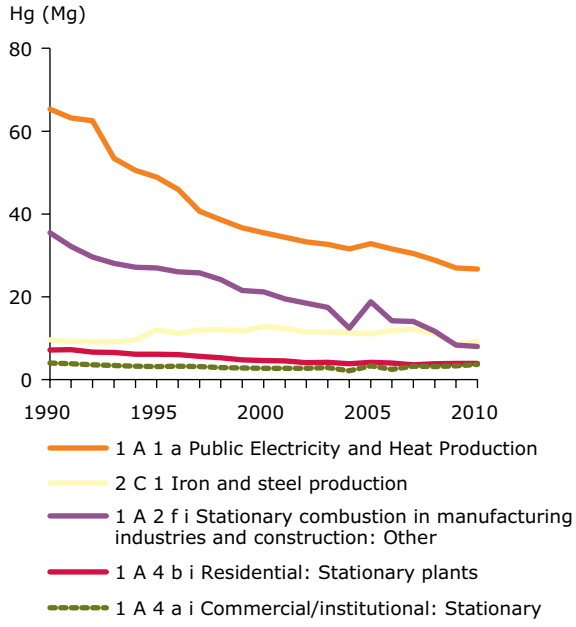
Table 2.13 Member State contributions to EU Hg emissions (Mg)

Member State	Hg (Mg)													Change		Share in EU-27	
	1990	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	1990–2010 (%)	2009–2010 (%)	1990 (%)	2010 (%)
Austria	2.1	1.2	0.9	1.0	0.9	1.0	0.9	1.0	1.0	1.0	1.0	0.9	1.0	– 54	10.5	0.9	1.1
Belgium	6.8	3.5	3.3	2.3	3.3	3.1	3.0	2.5	2.3	3.4	3.8	2.0	2.1	– 70	1.2	3.0	2.4
Bulgaria	2.4	1.9	1.5	1.4	1.3	2.2	2.1	1.6	1.7	1.5	1.4	1.0	0.9	– 64	– 11.7	1.1	1.0
Cyprus	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	– 15	– 17.6	0.1	0.1
Czech Republic	7.5	7.4	3.8	3.3	2.8	1.8	2.1	3.8	3.8	3.9	4.1	4.3	3.5	– 54	– 19.0	3.3	4.0
Denmark	3.1	2.3	1.1	1.1	0.9	0.9	0.8	0.8	0.7	0.7	0.7	0.5	0.4	– 86	– 15.8	1.3	0.5
Estonia	1.1	0.6	0.5	0.5	0.5	0.6	0.5	0.5	0.5	0.7	0.6	0.4	0.6	– 44	42.7	0.5	0.7
Finland	1.1	0.7	0.6	0.7	0.7	0.8	0.7	0.9	1.0	0.8	0.8	0.8	0.9	– 22	16.7	0.5	1.0
France	24	20	11	9.7	8.9	6.4	6.1	6.2	6.2	4.5	4.3	3.9	4.2	– 83	8.3	10.4	4.8
Germany	28	14	14	14	13	13	12	12	11	11	9.8	8.9	9.3	– 67	4.6	12.3	10.7
Greece	13	13	13	13	13	13	13	13	13	13	13	13	13	0.0	0.0	5.7	15.0
Hungary	6.3	4.9	4.4	4.4	4.0	4.0	3.8	4.1	3.2	2.8	3.0	2.8	0.8	– 88	– 72.3	2.7	0.9
Ireland	0.9	0.8	0.7	0.9	0.8	0.8	0.8	0.9	0.8	0.9	0.8	0.5	0.4	– 51	– 12.8	0.4	0.5
Italy	11	10	9.1	9.3	9.2	9.1	9.8	9.9	10	11	10	8.6	9.5	– 17	10.5	5.0	11.0
Latvia	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	– 69	12.2	0.1	0.1
Lithuania	3.48	1.6	0.7	0.4	0.3	0.4	0.4	0.4	0.4	0.4	0.3	0.6	0.4	– 89	– 37.9	1.52	0.4
Luxembourg	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR				
Malta	0.3	0.4	0.5	0.6	0.5	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.01	– 96	– 98.0	0.1	0.01
Netherlands	3.5	1.4	1.0	0.8	0.7	0.7	0.8	0.9	0.8	0.8	0.7	0.6	0.7	– 80	8.1	1.5	0.8
Poland	33	32	26	23	20	20	20	20	16	16	16	14	15	– 55	4.4	14.5	17.1
Portugal	3.8	4.0	3.7	3.5	3.8	3.1	3.1	3.3	2.9	2.7	2.6	2.5	2.1	– 46	– 16.6	1.7	2.4
Romania	9.4	8.8	8.2	8.0	7.9	7.8	7.7	7.4	7.6	10.6	8.3	4.5	5.3	– 43	18.3	4.1	6.2
Slovakia	12	3.9	5.2	3.6	3.0	2.7	3.0	2.8	3.3	2.4	2.7	1.0	1.2	– 91	13.8	5.4	1.4
Slovenia	1.2	0.9	0.9	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.9	0.8	0.7	– 44	– 20.2	0.5	0.8
Spain	15	15	13	13	13	12	12	12	11	10	9.5	8.0	7.8	– 46	– 2.2	6.3	9.0
Sweden	1.6	1.0	0.7	0.6	0.6	0.7	0.7	0.7	0.6	0.6	0.5	0.6	0.6	– 65	– 5.5	0.7	0.6
United Kingdom	38	20	8.1	7.9	7.0	7.5	6.5	7.2	7.3	6.8	6.5	7.4	6.3	– 83	– 15.1	16.4	7.3
EU-27 (a)	**230**	**169**	**131**	**124**	**117**	**113**	**112**	**113**	**108**	**108**	**102**	**89**	**87**	**– 62**	**– 2.4**	**100**	**100**
EU-27 (b)	**217**	**156**	**118**	**111**	**104**	**100**	**99**	**100**	**95**	**95**	**89**	**76**	**74**				

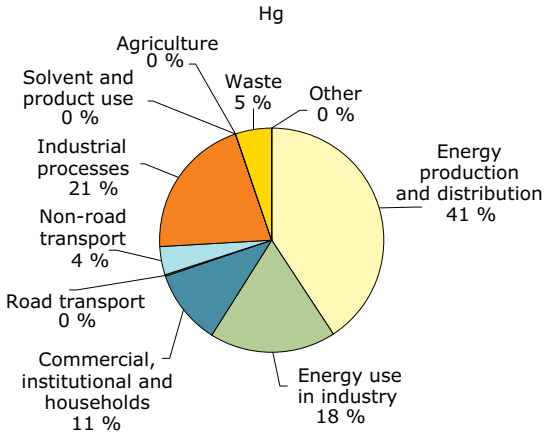
Notes: (a) Sum of national totals as reported by Member States.
(b) Sum of sectors: differences are due to reallocation of memo items in line with the new UNECE reporting guidelines (UNECE, 2009) for countries that reported emissions in older NFR formats, and to Member States only providing national total data.
Negative percentage values indicate that emissions have decreased.

Figure 2.12 **Hg emissions in the EU-27: (a) trend in Hg emissions from the five most important key categories, 1990–2010; (b) share of emissions by sector group, 2010; (c) gridded data reported by Member States, 2010**

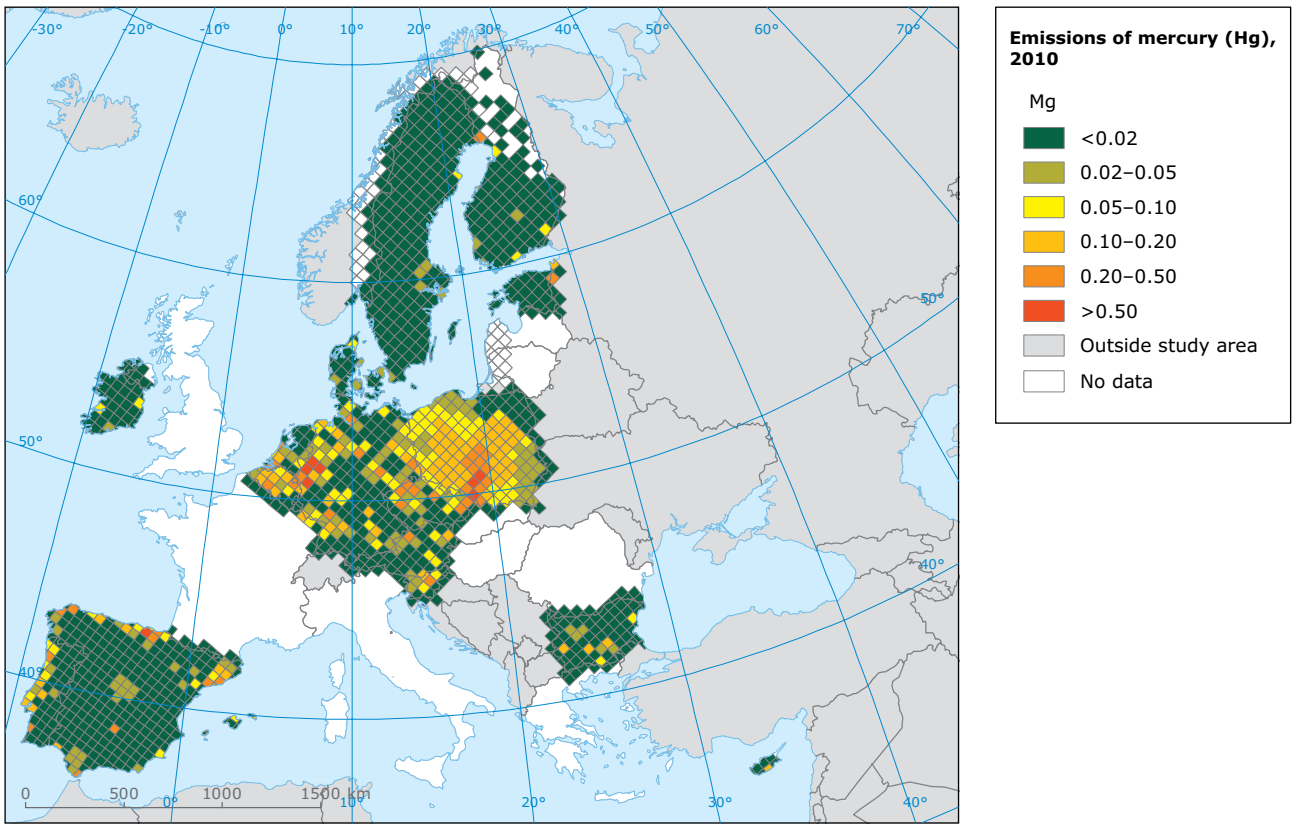
(a)



(b)



(c)



2.13 Arsenic (As) emission trends

Between 1990 and 2010, As emissions in the EU-27 decreased by 64 %. Between 2009 and 2010, emissions increased by 4.9 %, mainly due to increases of emissions in Slovakia (+ 26.6 %, 5 Mg) and Poland (+ 10.9 %, 4 Mg). The main reductions were reported by Hungary, Bulgaria and the Czech Republic (Table 2.14). The Member States that contributed most (more than 10 %) to the emissions of As in 2010 were Italy, Poland and Slovakia. Austria, Luxembourg and Slovenia report arsenic emissions as 'NR', and this notation key was used for gap-filling all other years. The EU-27 total is therefore underestimated.

Table 2.14 Member State contributions to EU As emissions (Mg)

Member State	As (Mg)													Change		Share in EU-27	
	1990	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	1990–2010	2009–2010	1990	2010
														(%)	(%)	(%)	(%)
Austria	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR				
Belgium	7.0	6.6	4.7	3.6	3.3	3.1	3.1	3.5	3.4	4.3	3.6	2.4	2.6	– 63	5.5	1.2	1.3
Bulgaria	19	15	7.3	6.4	12	14	15	15	16	14	14	13	12	– 38	– 12.6	3.4	5.7
Cyprus	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	9.0	– 29.8	0.02	0.1
Czech Republic	2.4	2.3	3.4	3.5	6.4	6.0	5.8	4.0	2.6	2.6	3.4	4.6	3.0	28	– 34.3	0.4	1.5
Denmark	1.3	0.8	0.8	0.7	0.7	0.7	0.6	0.5	0.4	0.5	0.4	0.3	0.3	– 77	– 4.7	0.2	0.1
Estonia	19	10	8.6	8.4	8.4	10	9.8	9.2	8.6	11	9.4	7.6	11	– 42	44.2	3.3	5.3
Finland	33	3.5	4.3	5.2	3.7	3.2	3.8	2.7	2.8	2.7	2.9	2.7	3.7	– 89	37.7	5.9	1.8
France	16	16	14	13	12	11	11	9.9	9.6	9.4	10.4	6.2	5.9	– 63	– 5.3	2.8	2.9
Germany	82	7.6	6.5	6.4	6.2	6.7	6.4	6.5	6.9	6.7	6.4	5.8	6.1	– 93	4.1	14.5	3.0
Greece	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	0.0	0.0	0.7	1.9
Hungary	16	9.0	6.3	6.1	5.9	6.4	6.2	6.4	4.6	4.1	4.5	4.3	2.4	– 85	– 44.2	2.8	1.2
Ireland	4.5	3.9	3.1	3.2	3.1	3.1	3.0	3.1	3.0	3.0	2.9	2.5	2.3	– 48	– 6.2	0.8	1.1
Italy	37	27	45	45	41	42	41	40	41	41	42	42	45	22	6.1	6.5	21.8
Latvia	0.4	0.2	0.1	0.2	0.2	0.2	0.2	0.1	0.2	0.2	0.1	0.2	0.2	– 60	5.2	0.07	0.1
Lithuania	3.4	1.7	0.8	0.8	0.8	0.9	0.2	0.2	0.3	0.2	0.1	0.2	0.3	– 92	17.1	0.6	0.1
Luxembourg	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR				
Malta	0.1	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.1	3.5	– 55.8	0.02	0.1
Netherlands	1.5	1.0	1.1	0.9	1.2	1.0	1.5	1.5	0.7	1.1	0.8	0.8	0.8	– 42	5.1	0.3	0.4
Poland	82	73	50	53	49	50	50	49	48	45	43	40	45	– 46	10.9	14.5	21.7
Portugal	3.0	3.2	3.1	3.1	3.4	2.7	2.7	3.1	2.6	2.4	2.2	2.1	1.7	– 44	– 18.9	0.5	0.8
Romania	20	18	15	14	14	13	13	12	13	14	13	8	9	– 56	5.5	3.5	4.3
Slovakia	147	39	9	13	10	11	17	23	27	24	23	17	22	– 85	26.6	25.9	10.6
Slovenia	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR				
Spain	17	17	21	20	22	20	18	20	19	18	17	16	15	– 10	– 5.8	3.0	7.4
Sweden	5.6	1.5	0.8	1.0	0.8	0.9	0.9	0.9	0.9	1.1	0.8	0.9	1.0	– 83	12.4	1.0	0.5
United Kingdom	46	32	20	17	15	15	14	14	14	14	14	13	13	– 71	– 1.3	8.1	6.4
EU-27 (a)	**566**	**292**	**230**	**230**	**225**	**226**	**227**	**231**	**227**	**223**	**218**	**196**	**205**	**– 64**	**4.9**	**100**	**100**
EU-27 (b)	**562**	**288**	**226**	**226**	**221**	**222**	**223**	**227**	**223**	**219**	**214**	**192**	**201**				

Notes: (a) Sum of national totals as reported by Member States.
(b) Sum of sectors: differences are due to reallocation of memo items in line with the new UNECE reporting guidelines (UNECE, 2009) for countries that reported emissions in older NFR formats, and to Member States only providing national total data.
Negative percentage values indicate that emissions have decreased.

2.14 Chromium (Cr) emission trends

Between 1990 and 2010, Cr emissions in the EU-27 decreased by 73 %. Between 2009 and 2010, emissions increased by 12.6 %, mainly due to increases of emissions in Finland (+ 69.9 %, 10 Mg), Poland (+ 16.8 %, 7 Mg) and Hungary (+ 81.1 %, 5 Mg) (Table 2.15). The Member States that contributed most (more than 10 %) to the emissions of Cr in 2010 were Italy, Germany and Poland. Austria, Luxembourg and Slovenia report chromium emissions as 'NR', and this notation key was used for gap-filling all other years. The EU-27 total is therefore underestimated.

Table 2.15 Member State contributions to EU Cr emissions (Mg)

Member State	Cr (Mg)													Change		Share in EU-27	
	1990	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	1990–2010 (%)	2009–2010 (%)	1990 (%)	2010 (%)
Austria	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR				
Belgium	33	27	18	19	18	19	19	17	18	19	18	9.1	13	– 61	40.9	2.4	3.4
Bulgaria	21	11	7.6	7.5	7.5	8.6	9.0	10	12	10	10	6.5	5.5	– 74	– 16.4	1.5	1.4
Cyprus	0.3	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	35	– 9.5	0.02	0.1
Czech Republic	29	21	12	12	14	14	16	14	13	12	12	15	19	– 35	26.1	2.1	4.9
Denmark	6.0	3.1	1.3	1.2	1.2	1.3	1.3	1.1	1.2	1.2	1.1	1.0	0.9	– 85	– 8.1	0.4	0.2
Estonia	18	10	8.1	8.0	8.1	10	9.1	8.8	8.2	10	9.0	7.2	10	– 44	42.2	1.3	2.7
Finland	29	22	28	26	38	27	24	18	23	27	20	15	25	– 13	69.9	2.1	6.7
France	390	187	101	73	47	39	40	41	41	31	31	24	25	– 94	1.6	28.1	6.5
Germany	188	124	128	125	125	125	127	123	129	132	57	50	55	– 71	9.3	13.6	14.4
Greece	10	10	10	10	10	10	10	10	10	10	10	10	10	0.0	0.0	0.7	2.6
Hungary	16	11	8.3	8.2	7.6	7.8	7.4	7.8	6.8	6.4	6.7	5.8	11	– 35	81.1	1.2	2.8
Ireland	8.8	8.1	6.8	5.9	5.2	4.9	4.7	5.0	4.8	4.7	4.6	4.2	4.0	– 55	– 4.8	0.6	1.0
Italy	93	75	52	53	53	56	58	60	61	63	61	50	55	– 41	8.9	6.7	14.4
Latvia	1.7	0.9	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.8	0.9	– 47	10.7	0.1	0.2
Lithuania	7.4	4.2	2.3	2.1	2.1	1.9	1.6	1.1	1.1	1.2	0.8	1.5	1.3	– 83	– 14.3	0.5	0.3
Luxembourg	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR				
Malta	0.6	0.9	1.2	1.3	1.3	1.4	1.4	1.5	1.5	1.5	1.4	1.4	1.3	116	– 7.1	0.04	0.3
Netherlands	10	6.6	3.1	2.8	3.2	2.9	3.1	2.3	2.2	2.3	2.1	1.5	1.6	– 84	7.2	0.7	0.4
Poland	155	118	84	64	56	55	55	54	47	49	49	41	48	– 69	16.8	11.1	12.7
Portugal	11	12	12	12	13	11	11	12	11	10	10	8.9	8.9	– 18	– 0.5	0.8	2.3
Romania	65	53	42	39	36	35	33	28	28	28	23	14	14	– 78	6.6	4.7	3.8
Slovakia	77	12	6.6	7.2	6.3	6.6	6.1	6.4	6.2	5.1	4.7	4.1	4.0	– 95	– 3.3	5.5	1.1
Slovenia	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR				
Spain	37	41	44	46	48	45	45	45	43	43	41	35	35	– 4	– 0.3	2.7	9.3
Sweden	23	12	6.8	7.4	9.0	7.4	8.3	10	11	13	10	3.4	5.1	– 78	51.8	1.7	1.3
United Kingdom	159	114	74	54	42	41	39	37	34	30	29	27	26	– 83	– 2.1	11.5	6.9
EU-27 (a)	**1 388**	**883**	**659**	**586**	**555**	**530**	**531**	**514**	**513**	**511**	**410**	**338**	**380**	**– 73**	**12.6**	**100**	**100**
EU-27 (b)	**1 378**	**873**	**649**	**576**	**544**	**520**	**521**	**505**	**503**	**501**	**400**	**328**	**370**				

Notes: (a) Sum of national totals as reported by Member States.
(b) Sum of sectors: differences are due to reallocation of memo items in line with the new UNECE reporting guidelines (UNECE, 2009) for countries that reported emissions in older NFR formats, and to Member States only providing national total data.
Negative percentage values indicate that emissions have decreased.

2.15 Copper (Cu) emission trends

Between 1990 and 2010, Cu emissions in the EU-27 decreased by 0.5 %. Between 2009 and 2010, emissions increased by 3.5 %, due mainly to increases in emissions from Germany (+ 1.9 %, 39 Mg), Poland (+ 10.3 %, 31 Mg) and Malta (+ 3 144.5 %, 26 Mg). The main reduction was reported by Bulgaria (Table 2.16). The Member State that contributed most (more than 10 %) to the emissions of Cu in 2010 was Germany. Austria, Luxembourg and Slovenia report Cu emissions as 'NR', and this notation key was used for gap-filling all other years. The EU-27 total is therefore underestimated.

Table 2.16 Member State contributions to EU Cu emissions (Mg)

Member State	Cu (Mg)													Change		Share in EU-27	
	1990	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	1990–2010	2009–2010	1990	2010
														(%)	(%)	(%)	(%)
Austria	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR				
Belgium	61	56	57	24	24	23	23	60	54	58	59	54	58	– 5	6.2	1.6	1.5
Bulgaria	103	74	56	51	72	83	91	98	102	79	89	93	83	– 19	– 11.0	2.7	2.2
Cyprus	1.9	2.5	3.2	3.1	3.2	3.4	3.4	3.5	3.5	3.7	3.8	3.6	3.6	89	– 0.6	0.1	0.1
Czech Republic	24	20	17	16	20	18	19	20	18	18	16	17	24	– 1	35.1	0.6	0.6
Denmark	37	42	45	44	45	47	50	48	50	52	52	50	50	36	– 0.7	1.0	1.3
Estonia	10	5.1	3.7	4.0	4.2	4.5	4.5	4.5	4.4	5.0	4.6	4.0	4.9	– 52	22.2	0.3	0.1
Finland	157	89	78	78	83	73	68	60	63	61	59	58	63	– 60	8.0	4.1	1.7
France	236	237	232	231	234	226	230	227	228	223	222	220	224	– 5	1.5	6.2	5.9
Germany	1 694	1 817	2 005	2 037	2 060	2 057	2 083	2 033	2 070	2 093	2 086	2 044	2 083	23	1.9	44.6	55.1
Greece	14	14	14	14	14	14	14	14	14	14	14	14	14	0.0	0.0	0.4	0.4
Hungary	31	19	19	17	18	20	20	22	21	21	22	21	28	– 9	34.3	0.8	0.7
Ireland	17	17	22	22	23	23	24	25	26	27	26	23	22	30	– 6.9	0.4	0.6
Italy	183	199	198	201	204	205	208	208	209	212	206	189	193	5.8	2.3	4.8	5.1
Latvia	5.7	3.8	3.9	4.6	4.7	4.9	5.1	5.3	5.8	6.5	6.1	5.4	5.8	1.2	6.8	0.2	0.2
Lithuania	12	6.8	6.4	4.7	3.1	3.1	3.1	11	12	10	6.1	5.5	5.7	– 52	3.6	0.3	0.1
Luxembourg	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR				
Malta	0.6	0.7	0.8	0.8	0.8	0.9	0.9	0.9	1.1	0.9	0.8	0.8	27	4 595	3 144.5	0.0	0.7
Netherlands	69	70	71	69	72	74	75	75	76	76	78	80	82	18	2.6	1.8	2.2
Poland	599	465	375	394	388	397	376	356	387	355	317	296	327	– 45	10.3	15.8	8.6
Portugal	22	28	37	38	39	37	38	38	37	36	36	35	34	55	– 2.1	0.6	0.9
Romania	22	20	18	18	18	18	18	17	18	19	18	14	14	– 36	3.3	0.6	0.4
Slovakia	97	44	20	27	24	25	32	38	45	44	44	34	47	– 52	38.3	2.6	1.2
Slovenia	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR				
Spain	164	190	274	279	290	298	279	303	305	312	300	288	284	73	– 1.3	4.3	7.5
Sweden	98	83	73	68	64	59	54	49	51	54	52	52	54	– 45	2.8	2.6	1.4
United Kingdom	142	108	81	70	64	67	65	61	60	59	59	50	51	– 64	1.9	3.7	1.3
EU-27 (a)	**3 798**	**3 610**	**3 709**	**3 716**	**3 773**	**3 781**	**3 783**	**3 777**	**3 859**	**3 841**	**3 777**	**3 652**	**3 779**	**– 0.5**	**3.5**	**100**	**100**
EU-27 (b)	**3 784**	**3 596**	**3 695**	**3 705**	**3 758**	**3 767**	**3 769**	**3 763**	**3 845**	**3 827**	**3 763**	**3 638**	**3 765**				

Notes: (a) Sum of national totals as reported by Member States.
(b) Sum of sectors: differences are due to reallocation of memo items in line with the new UNECE reporting guidelines (UNECE, 2009) for countries that reported emissions in older NFR formats, and to Member States only providing national total data.
Negative percentage values indicate that emissions have decreased.

2.16 Nickel (Ni) emission trends

Between 1990 and 2010, Ni emissions in the EU-27 decreased by 59 %. Between 2009 and 2010, emissions decreased by 4.2 %, mainly due to reductions reported in France, Malta and Hungary (Table 2.17). The Member States that contributed most (more than 10 %) to the emissions of Ni in 2010 were Spain, Poland and Italy. Austria, Luxembourg and Slovenia report Ni emissions as 'NR', and this notation key was used for gap-filling all other years. The EU-27 total is therefore underestimated.

In Bulgaria, the Ni emissions in 2000 and 2001 are much lower than in the years before and after due to decrease of Ni emissions from the primary copper production (source: comment received from Bulgaria).

Table 2.17 Member State contributions to EU Ni emissions (Mg)

Member State	Ni (Mg)													Change		Share in EU-27	
	1990	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	1990–2010 (%)	2009–2010 (%)	1990 (%)	2010 (%)
Austria	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR				
Belgium	90	78	36	94	84	88	82	28	29	25	20	11	14	– 85	20.6	3.4	1.3
Bulgaria	29	23	7.6	6.5	18	20	22	23	24	25	21	21	19	– 34	– 11.4	1.1	1.8
Cyprus	7.3	9.1	12	12	12	13	14	14	13	14	14	12	8.8	20	– 29.6	0.3	0.8
Czech Republic	27	19	16	15	17	16	17	17	18	19	11	24	13	– 50	– 44.3	1.0	1.3
Denmark	21	15	8.1	7.5	8.4	8.0	7.3	7.3	7.7	5.9	5.4	4.7	4.6	– 77	– 0.9	0.8	0.4
Estonia	27	11	6.6	6.5	6.3	6.8	6.7	6.5	5.8	6.8	6.0	4.9	6.7	– 76	35.5	1.0	0.6
Finland	63	34	34	32	36	34	45	27	25	22	21	18	22	– 65	20.0	2.4	2.1
France	293	235	193	183	149	139	140	140	126	99	91	80	64	– 78	– 20.1	11.2	6.0
Germany	269	157	114	112	107	127	119	130	142	130	120	107	105	– 61	– 2.2	10.3	9.8
Greece	101	101	101	101	101	101	101	101	101	101	101	101	101	0.0	0.0	3.9	9.5
Hungary	42	51	39	39	29	28	23	23	21	21	22	22	8.9	– 79	– 59.6	1.6	0.8
Ireland	41	51	67	73	63	63	61	63	57	62	54	33	29	– 29	– 11.5	1.6	2.8
Italy	123	114	105	110	113	113	112	111	109	106	103	104	111	– 9.5	7.1	4.7	10.5
Latvia	23	12	5.0	4.4	4.2	4.2	4.0	3.5	3.6	3.4	2.9	3.1	3.3	– 86	4.8	0.9	0.3
Lithuania	96	52	27	24	23	19	13	13	12	14	7.2	8.4	10	– 89	23.0	3.7	1.0
Luxembourg	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR				
Malta	8.3	13	17	19	18	20	20	21	21	21	20	20	6.1	– 27	– 68.7	0.3	0.6
Netherlands	75	87	19	24	12	13	14	11	10	9.2	9.0	3.0	1.8	– 98	– 39.5	2.9	0.2
Poland	370	312	251	287	258	261	249	237	180	187	149	145	164	– 56	13.3	14.1	15.4
Portugal	104	107	95	99	110	77	73	89	66	61	56	45	42	– 60	– 6.6	4.0	3.9
Romania	112	91	71	66	63	58	53	50	47	45	36	28	24	– 79	– 14.0	4.3	2.2
Slovakia	72	33	23	22	22	23	23	23	23	21	19	18	19	– 74	2.8	2.8	1.7
Slovenia	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR				
Spain	269	325	300	309	329	282	275	278	250	237	229	202	190	– 29	– 6.1	10.3	17.8
Sweden	32	33	20	21	22	24	21	19	19	15	14	15	20	– 39	34.3	1.2	1.9
United Kingdom	321	299	167	169	132	122	126	128	118	109	114	81	79	– 75	– 2.8	12.3	7.4
EU-27 (a)	**2617**	**2261**	**1733**	**1835**	**1738**	**1659**	**1622**	**1565**	**1428**	**1358**	**1246**	**1112**	**1066**	**– 59**	**– 4.2**	**100**	**100**
EU-27 (b)	**2 516**	**2 160**	**1 632**	**1 734**	**1 636**	**1 558**	**1 521**	**1 464**	**1 327**	**1 257**	**1 145**	**1 011**	**965**				

Notes: (a) Sum of national totals as reported by Member States.
(b) Sum of sectors: differences are due to reallocation of memo items in line with the new UNECE reporting guidelines (UNECE, 2009) for countries that reported emissions in older NFR formats, and to Member States only providing national total data.
Negative percentage values indicate that emissions have decreased.

2.17 Selenium (Se) emission trends

Between 1990 and 2010, Se emissions in the EU-27 decreased by 13 %. Between 2009 and 2010, emissions increased by 6.4 %, mainly due to increases of emissions in Spain (+ 5.2 %, 5 Mg), Belgium (+ 45.8 %, 4 Mg) and Slovakia (+ 43.8 %, 3 Mg). The increase in Belgium is mainly due to a particular company in the glass industry in Wallonia (source: comment received from Belgium). The main reduction was reported by the Czech Republic (Table 2.18). The Member States that contributed most (more than 10 %) to the emissions of Se in 2010 were Spain and the United Kingdom. Austria, Luxembourg and Slovenia report Se emissions as 'NR', and Poland as 'NE'. These notation keys were used for gap-filling all other years. The EU-27 total is therefore underestimated.

Table 2.18 Member State contributions to EU Se emissions (Mg)

Member State	Se (Mg)													Change		Share in EU-27	
	1990	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	1990–2010 (%)	2009–2010 (%)	1990 (%)	2010 (%)
Austria	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR				
Belgium	7.0	7.9	7.8	4.9	6.8	23	18	29	13	15	10	8.7	13	81	45.8	2.5	5.2
Bulgaria	41	12	5.2	5.0	8.5	8.1	12	13	16	16	20	17	17	– 58	0.3	14.7	7.1
Cyprus	0.09	0.10	0.13	0.12	0.13	0.13	0.14	0.14	0.14	0.14	0.15	0.13	0.09	10	– 26.6	0.03	0.04
Czech Republic	8.4	8.4	8.4	8.4	9.7	8.4	10	8.8	8.0	7.0	6.8	10	8.1	– 2.9	– 16.5	3.0	3.4
Denmark	4.9	4.5	2.9	2.5	2.6	3.0	2.5	2.0	2.0	2.1	1.9	1.4	1.6	– 68	11.1	1.8	0.6
Estonia	0.006	0.002	0.002	0.003	0.003	0.014	0.014	0.014	0.014	0.024	0.021	0.021	0.023	298	9.0	0.002	0.01
Finland	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.05	0.06	0.07	0.34	0.62	0.45	369	– 26.9	0.03	0.2
France	15	15	15	14	15	14	14	14	14	14	13	11	12	– 20	1.7	5.2	4.8
Germany	3.4	3.7	3.8	3.8	3.7	3.9	4.0	4.1	4.1	4.0	3.9	3.8	3.7	7.7	– 2.9	1.2	1.5
Greece	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.0	0.0	0.1	0.1
Hungary	3.3	2.5	1.7	1.7	1.4	1.4	1.3	1.2	1.0	1.0	1.0	1.0	4.1	22	322.6	1.2	1.7
Ireland	2.9	3.3	4.2	4.7	4.2	4.0	3.9	4.1	3.8	4.0	3.6	2.5	2.3	– 21	– 7.1	1.0	0.9
Italy	10	10	11	11	11	12	12	12	12	12	12	10	11	14	5.9	3.5	4.5
Latvia	0.35	0.17	0.08	0.10	0.09	0.08	0.09	0.08	0.07	0.09	0.09	0.09	0.09	– 75	– 1.4	0.1	0.04
Lithuania	1.61	0.35	0.08	0.07	0.06	0.06	0.05	0.04	0.04	0.03	0.03	0.04	0.03	– 98	– 24.8	0.6	0.01
Luxembourg	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR				
Malta	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.003	0.002	0.002	0.002	0.07	3601	3864.7	0.001	0.03
Netherlands	0.4	0.3	0.5	0.5	1.2	0.7	1.1	2.6	0.8	1.0	2.5	0.9	1.5	289	65.6	0.1	0.6
Poland	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE				
Portugal	12	15	20	21	21	21	20	19	18	20	20	18	18	51	– 1.7	4.2	7.3
Romania	16	16	16	16	16	16	16	16	18	18	18	15	15	– 10	– 2.1	5.8	6.0
Slovakia	8.7	9.0	6.7	7.5	7.2	6.9	7.8	8.5	10	9.4	10	8.0	11	31	43.8	3.1	4.7
Slovenia	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR				
Spain	62	73	93	100	105	104	103	104	102	101	98	87	91	48	5.2	22.1	37.7
Sweden	0.6	0.7	0.6	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	38	14.0	0.2	0.3
United Kingdom	82	54	38	38	33	34	40	41	38	35	36	31	32	– 61	1.8	29.4	13.1
EU-27 (a)	**279**	**236**	**235**	**240**	**246**	**262**	**266**	**281**	**263**	**262**	**259**	**228**	**243**	**– 13**	**6.4**	**100**	**100**
EU-27 (b)	**279**	**236**	**235**	**240**	**246**	**261**	**266**	**281**	**263**	**261**	**259**	**228**	**242**				

Notes: (a) Sum of national totals as reported by Member States.
(b) Sum of sectors: differences are due to reallocation of memo items in line with the new UNECE reporting guidelines (UNECE, 2009) for countries that reported emissions in older NFR formats, and to Member States only providing national total data.
Negative percentage values indicate that emissions have decreased.

2.18 Zinc (Zn) emission trends

Between 1990 and 2010, Zn emissions in the EU-27 decreased by 43 %. Between 2009 and 2010, emissions increased by 8.1 %, mainly due to increases of emissions in Poland (+ 16.9 %, 196 Mg), Italy (+ 20.0 %, 146 Mg) and Germany (+ 2.2 %, 40 Mg). The main reductions were reported by the Czech Republic and Hungary (Table 2.19). The Member States that contributed most (more than 10 %) to the emissions of Zn in 2010 were Germany, Poland, Italy and Spain. Austria, Luxembourg and Slovenia report selenium emissions as 'NR', and this notation key was used for gap-filling all other years. The EU-27 total is therefore underestimated.

Table 2.19 Member State contributions to EU Zn emissions (Mg)

Member State	Zn (Mg)													Change		Share in EU-27	
	1990	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	1990–2010 (%)	2009–2010 (%)	1990 (%)	2010 (%)
Austria	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR				
Belgium	231	182	169	142	145	136	162	118	115	121	115	74	96	– 58	29.2	2.0	1.4
Bulgaria	219	151	287	274	138	155	180	174	193	164	185	158	151	– 31	– 4.5	1.9	2.3
Cyprus	3.4	4.1	5.4	5.2	5.4	5.7	6.0	6.2	6.0	6.2	6.4	5.7	4.5	33	– 22.1	0.03	0.1
Czech Republic	395	283	184	156	169	166	169	166	171	168	150	137	114	– 71	– 16.3	3.4	1.7
Denmark	52	50	38	39	37	38	39	39	39	40	39	37	38	– 28	1.1	0.5	0.6
Estonia	105	58	45	44	44	52	52	49	44	56	49	40	56	– 47	40.3	0.9	0.8
Finland	591	342	91	91	110	85	151	135	138	126	131	134	161	– 73	19.9	5.1	2.4
France	1 999	1 184	766	639	523	378	323	311	338	282	270	230	239	– 88	3.6	17.3	3.6
Germany	1 599	1 603	1 770	1 802	1 819	1 816	1 836	1 789	1 820	1 844	1 840	1 809	1 849	16	2.2	13.8	27.9
Greece	52	52	52	52	52	52	52	52	52	52	52	52	52	0.0	0.0	0.4	0.8
Hungary	97	70	79	82	83	83	83	79	86	88	91	63	42	– 56	– 33.2	0.8	0.6
Ireland	45	46	49	32	19	19	19	20	20	20	19	17	16	– 64	– 5.7	0.4	0.2
Italy	927	908	870	873	876	892	939	945	1 015	1 022	1 001	729	875	– 5.6	20.0	8.0	13.2
Latvia	21	13	13	15	14	15	16	16	16	16	15	15	16	– 23	8.3	0.2	0.2
Lithuania	9	9	4	4	4	4	4	4.4	4.7	4.3	3.2	3.2	3.1	– 67	– 1.2	0.1	0.05
Luxembourg	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR				
Malta	0.4	0.5	0.6	0.7	0.7	0.7	0.7	0.7	0.9	0.8	0.7	0.7	10	2 469	1 307.6	0.003	0.2
Netherlands	221	142	91	87	86	87	84	84	85	81	87	92	106	– 52	15.4	1.9	1.6
Poland	3 092	2 580	2 173	1 709	1 639	1 657	1 503	1 350	1 588	1 433	1 259	1 163	1 359	– 56	16.9	26.7	20.5
Portugal	40	45	53	54	55	53	53	54	52	53	52	51	47	18	– 7.2	0.3	0.7
Romania	128	115	103	101	98	96	95	91	90	92	82	56	63	– 51	11.4	1.1	0.9
Slovakia	101	64	55	57	63	57	61	63	69	63	62	47	55	– 46	17.6	0.9	0.8
Slovenia	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR				
Spain	455	484	678	695	708	716	725	740	768	823	808	714	739	62	3.4	3.9	11.1
Sweden	200	158	119	135	131	135	135	141	153	154	158	157	180	– 10	14.5	1.7	2.7
United Kingdom	982	943	620	582	535	459	465	418	388	396	368	342	355	– 64	4.0	8.5	5.4
EU-27 (a)	**11 563**	**9 489**	**8 316**	**7 673**	**7 355**	**7 158**	**7 152**	**6 844**	**7 252**	**7 108**	**6 846**	**6 127**	**6 626**	**– 43**	**8.1**	**100**	**100**
EU-27 (b)	**11 511**	**9 437**	**8 264**	**7 621**	**7 303**	**7 106**	**7 100**	**6 792**	**7 200**	**7 056**	**6 794**	**6 075**	**6 574**				

Notes: (a) Sum of national totals as reported by Member States.
(b) Sum of sectors: differences are due to reallocation of memo items in line with the new UNECE reporting guidelines (UNECE, 2009) for countries that reported emissions in older NFR formats, and to Member States only providing national total data.
Negative percentage values indicate that emissions have decreased.

2.19 Dioxin and furan (PCDD/F) emission trends and key categories

Between 1990 and 2010, PCDD/F emissions decreased in the EU-27 by 83 %. Between 2009 and 2010, the increase was 4.7 % (Table 2.20), and was mainly caused by emission increases in Poland (+ 7.1 %, 28 g International Toxic Equivalents (I-TEQ)), the United Kingdom (+ 14.1 %, 23 g I-TEQ) and Italy (+ 4.5 %, 11 g I-TEQ). The main reductions were reported by Hungary and the Czech Republic. The Member States that contributed most (more than 10 %) to the emissions of PCDD/Fs in 2010 were Poland and Italy. Greece did not report PCDD/F emissions for any year, and thus data were not gap-filled. The EU-27 total is therefore underestimated.

'1 A 4 b i — Residential: Stationary plants' and '2 C 1 — Iron and steel production' were the most important key categories for PCDD/F emissions, together making up 48 % of total PCDD/F emissions (Figure 2.13). Among the top five key categories, the highest relative reductions in emissions between 1990 and 2010 were achieved in the fourth most important key category, '1 A 2 f i — Stationary combustion in manufacturing industries and construction: Other (– 81.7 %), and the third most important key category, '1 A 2 a — Stationary combustion in manufacturing industries and construction: Iron and steel' (– 76.7 %) (Figure 2.13).

Figure 2.13 shows the contribution to total EU-27 emissions made by the aggregated sector groups. The 'commercial, institutional and households' sector group is a very significant source of PCDD/Fs, as well as of $PM_{2.5}$, PM_{10}, total PAHs, and PCBs.

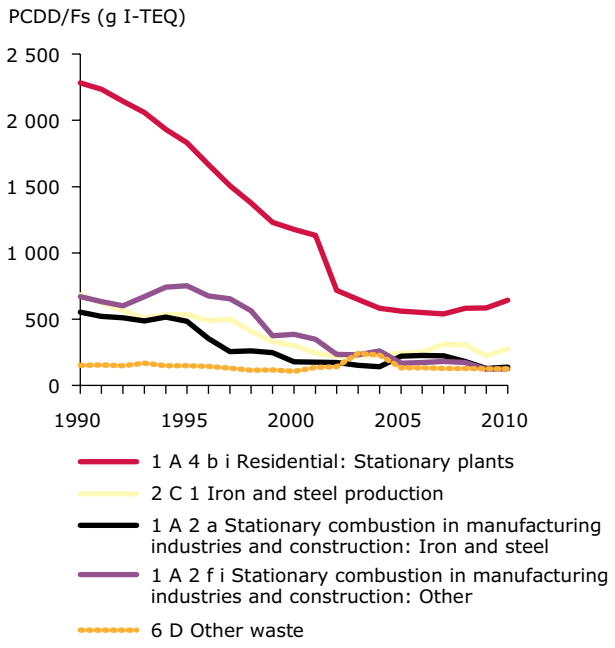
Table 2.20 Member State contributions to EU PCDD/F emissions (g I-TEQ)

Member State	PCDD/Fs (g I-TEQ)													Change		Share in EU-27	
	1990	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	1990–2010	2009–2010	1990	2010
														(%)	(%)	(%)	(%)
Austria	161	59	52	53	40	40	40	43	39	38	38	35	39	– 76	11.4	1.4	2.0
Belgium	619	481	115	80	58	60	62	61	58	60	72	55	59	– 91	6.9	5.5	3.1
Bulgaria	59	81	68	63	67	82	70	73	75	67	51	38	42	– 29	11.5	0.5	2.2
Cyprus	1.7	1.9	2.0	2.0	2.0	0.9	0.5	0.5	0.6	0.6	0.6	0.6	0.5	– 69	– 7.2	0.01	0.03
Czech Republic	1 252	1 135	744	620	177	114	187	179	175	169	150	141	129	– 90	– 8.1	11.1	6.8
Denmark	67	51	31	30	26	31	25	26	25	29	28	26	26	– 61	0.2	0.6	1.4
Estonia	5.7	4.5	3.4	3.5	3.8	4.1	3.8	3.4	2.8	4.9	5.2	4.9	5.6	– 1.0	15.2	0.1	0.3
Finland	37	43	30	28	30	30	29	10	11	11	14	10	15	– 60	45.0	0.3	0.8
France	1 745	1 684	514	382	354	233	313	192	119	116	102	89	98	– 94	11.0	15.5	5.2
Germany	747	229	152	131	110	92	69	69	70	71	71	61	68	– 91	10.3	6.6	3.6
Greece																	
Hungary	172	95	74	104	73	76	74	92	92	85	88	75	44	– 74	– 40.7	1.5	2.3
Ireland	26	25	23	24	30	35	27	23	23	16	16	16	16	– 41	– 1.3	0.2	0.8
Italy	466	455	374	300	296	296	304	307	316	332	323	251	262	– 44	4.5	4.1	13.8
Latvia	27	29	26	29	27	29	30	30	30	30	28	31	30	12	– 3.4	0.2	1.6
Lithuania	20	10	4.3	8.1	12	12	11	11	11	11	11	11	13	– 34	26.3	0.2	0.7
Luxembourg	46	31	5.7	4.4	3.1	1.8	1.7	1.6	1.5	1.4	1.3	1.2	1.1	– 98	– 8.9	0.4	0.1
Malta	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	0.0	0.0	0.1	0.5
Netherlands	743	69	30	31	29	28	28	31	27	28	28	29	30	– 96	4.2	6.6	1.6
Poland	529	515	333	447	433	482	483	416	449	396	400	393	421	– 21	7.1	4.7	22.1
Portugal	14	14	13	11	11	11	11	11	10	10	10	11	8.2	– 42	– 24.8	0.1	0.4
Romania	3 073	2 063	1 053	851	649	447	245	174	130	140	159	146	157	– 95	7.6	27.2	8.2
Slovakia	167	149	99	92	99	99	75	82	73	62	78	45	52	– 69	17.2	1.5	2.8
Slovenia	16	12	11	11	11	10	10	10	10	10	11	10	11	– 33	6.0	0.1	0.6
Spain	185	165	152	147	147	151	155	154	161	168	162	134	140	– 24	4.6	1.6	7.3
Sweden	60	40	33	34	34	34	37	39	38	36	38	37	43	– 29	15.4	0.5	2.3
United Kingdom	1037	670	238	231	215	217	237	207	190	169	172	163	186	– 82	14.1	9.2	9.8
EU-27 (a)	**11 286**	**8 119**	**4 190**	**3 725**	**2 949**	**2 625**	**2 536**	**2 254**	**2 149**	**2 070**	**2 067**	**1 820**	**1 905**	**– 83**	**4.7**	**100**	**100**
EU-27 (b)	**11 286**	**8 119**	**4 190**	**3 725**	**2 949**	**2 625**	**2 536**	**2 253**	**2 149**	**2 070**	**2 067**	**1 820**	**1 905**				

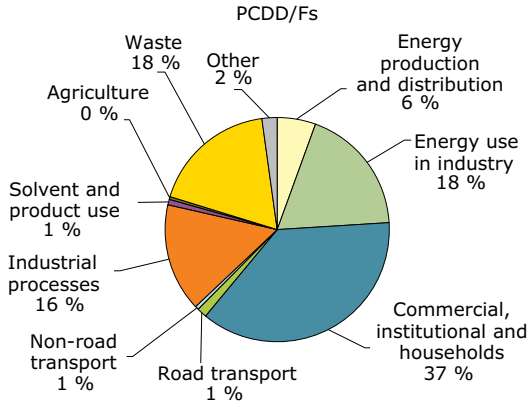
Notes: (a) Sum of national totals as reported by Member States.
(b) Sum of sectors: differences are due to reallocation of memo items in line with the new UNECE reporting guidelines (UNECE, 2009) for countries that reported emissions in older NFR formats, and to Member States only providing national total data.
Negative percentage values indicate that emissions have decreased.

Figure 2.13 **PCDD/F emissions in the EU-27: (a) trend in PCDD/F emissions from the five most important key categories, 1990–2010; (b) share of emissions by sector group, 2010; (c) gridded data reported by Member States, 2010**

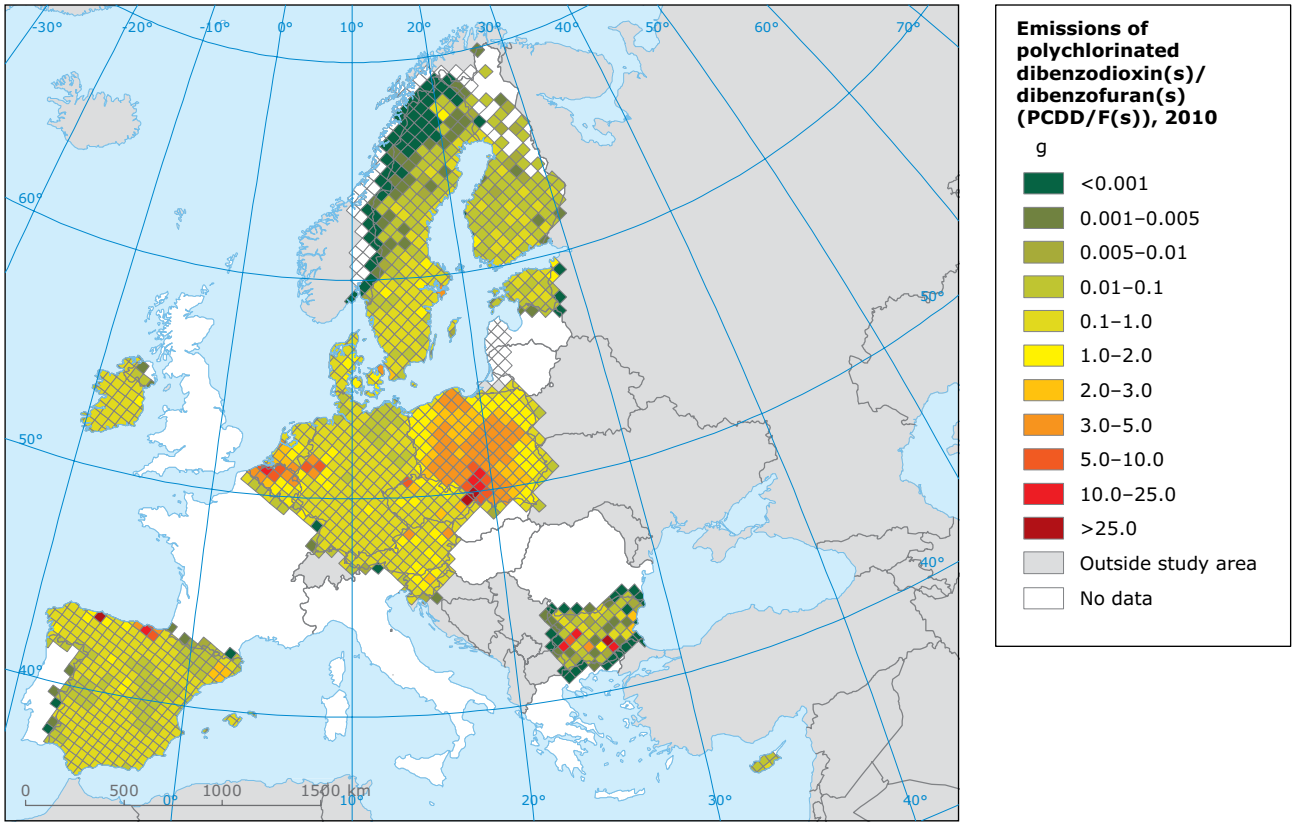
(a)



(b)



(c)



Note: Gridded data reported by Bulgaria was adjusted by a factor of 10^6 to correct an apparent error in units

2.20 Polycyclic aromatic hydrocarbon (total PAH) emission trends and key categories

Between 1990 and 2010, total PAH emissions decreased in the EU-27 by 52 %. Between 2009 and 2010, they increased by 10.8 %, mainly due to emission increases in Germany (+ 15.2 %, 25 Mg), Belgium (+ 15.8 %, 23 Mg) and Hungary (+ 97.1 %, 22 Mg) (Table 2.21). The increase is mainly due to the Flemish Region, due to increasing emission in residential heating (increasing use of wood in stoves and fire places), industry (revival after economical crisis), agriculture and horticulture (use of biomass in greenhouses) (source: comment received from Belgium). The Member States that contributed most (more than 10 %) to the emissions of total PAHs in 2009 were Spain, Germany, Belgium, Italy and Poland. Greece did not report PAH emissions for any year, and thus data were not gap-filled. The EU-27 total is therefore underestimated.

The increase in emissions reported by Romania after 2004, is due to a lack of activity data before that.. From 2005 until now these data are available (source: comment received from Romania).

'1 A 4 b i — Residential: Stationary plants' was the most important key category for total PAHs emissions, making up 55 % of total PAHs emissions (Figure 2.14). Among the top five key categories, the highest relative reductions in emissions between 1990 and 2009 were achieved in the fourth most important key category, '2 C 3 — Aluminium production' (– 71.5 %), and the third most important key category, '2 C 1 — Iron and steel production' (– 62.7 %) (Figure 2.14).

Table 2.21 Member State contributions to EU total PAHs emissions (Mg)

Member State	Total PAHs (Mg)													Change		Share in EU-27	
	1990	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	1990–2010	2009–2010	1990	2010
														(%)	(%)	(%)	(%)
Austria	17	10	8.2	8.6	8.2	8.3	8.3	8.8	7.9	7.7	7.7	7.2	8.0	– 54	10.2	0.6	0.6
Belgium	390	274	167	243	235	247	244	159	140	145	155	144	166	– 57	15.8	13.0	11.5
Bulgaria	27	21	22	19	26	29	27	26	27	25	27	25	28	1.3	12.6	0.9	1.9
Cyprus	4.6	4.0	2.8	2.8	2.7	2.5	2.7	2.2	2.0	1.7	1.3	1.4	1.1	– 77	– 23.5	0.2	0.1
Czech Republic	752	1357	488	460	24	21	24	24	17	16	19	15	17	– 98	12.1	25.0	1.2
Denmark	8	9	11	11	11	13	13	15	16	19	17	16	16	117	2.4	0.3	1.1
Estonia	12	14	13	13	13	13	14	13	12	13	14	15	17	38	11.9	0.4	1.2
Finland	17	19	14	16	17	17	17	13	13	13	15	16	18	5.3	13.1	0.6	1.2
France	39	38	28	27	24	25	24	22	20	19	19	19	21	– 47	7.4	1.3	1.4
Germany	374	163	156	166	156	155	147	144	150	145	158	166	191	– 49	15.2	12.4	13.2
Greece																	
Hungary	48	26	19	55	20	22	21	23	23	13	15	22	44	– 10	97.1	1.6	3.0
Ireland	6.4	4.1	3.0	2.8	2.8	2.7	2.6	2.7	2.7	2.6	2.8	2.8	2.7	– 57	– 2.7	0.2	0.2
Italy	99	113	115	119	117	121	139	136	140	152	153	139	153	54	10.1	3.3	10.5
Latvia	26	29	28	28	28	29	29	29	29	28	27	30	30	12	– 2.8	0.9	2.0
Lithuania	18	56	34	39	45	47	15	16	16	15	15	15	21	13	39.2	0.6	1.4
Luxembourg	1.3	0.9	0.9	0.9	0.8	0.7	0.8	0.9	0.9	1.0	1.1	0.9	0.8	– 33	– 4.3	0.0	0.1
Malta	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.002	0.004
Netherlands	20	10	3.8	3.7	3.5	3.4	5.2	3.8	3.7	4.3	4.5	4.1	3.7	– 81	– 8.3	0.7	0.3
Poland	159	237	167	164	160	157	158	165	162	154	139	133	149	– 6.2	12.7	5.3	10.3
Portugal	129	118	115	116	116	115	126	125	125	120	125	121	128	– 0.9	6.3	4.3	8.9
Romania	274	182	91	72	54	36	17	132	132	135	157	136	140	– 49	3.0	9.1	9.7
Slovakia	29	15	13	14	13	13	16	19	18	18	18	18	18	– 37	2.5	1.0	1.3
Slovenia	13	12	12	10	10	10	10	10	10	10	10	11	12	– 14	5.6	0.4	0.8
Spain	321	307	275	260	227	281	255	224	250	258	248	230	238	– 26	3.2	10.7	16.4
Sweden	17	16	14	15	14	16	16	18	19	18	19	14	16	– 2.3	18.1	0.6	1.1
United Kingdom	203	91	14	15	13	11	11	10	9.0	8.5	9.0	8.8	8.8	– 96	0.1	6.8	0.6
EU-27 (a)	**3 007**	**3 128**	**1 814**	**1 880**	**1 340**	**1 395**	**1 343**	**1 343**	**1 345**	**1 343**	**1 377**	**1 309**	**1 447**	**– 52**	**10.6**	**100**	**100**
EU-27 (b)	**3 007**	**3 128**	**1 814**	**1 880**	**1 340**	**1 406**	**1 343**	**1 343**	**1 345**	**1 343**	**1 377**	**1 309**	**1 447**				

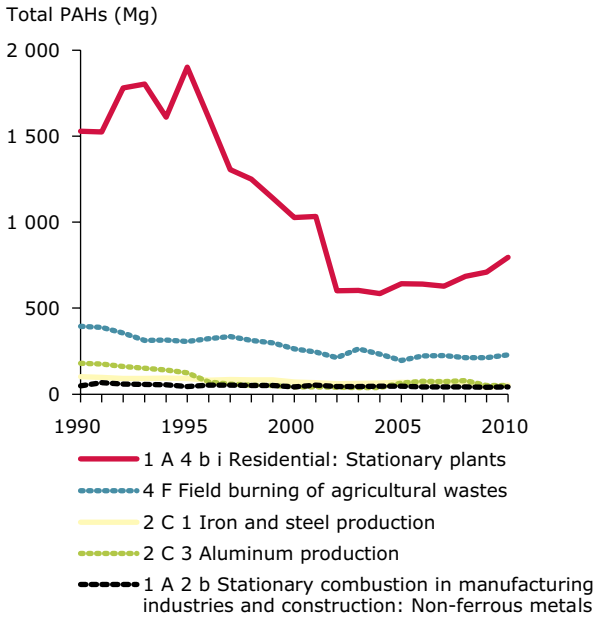
Notes: (a) Sum of national totals as reported by Member States.
(b) Sum of sectors: differences are due to reallocation of memo items in line with the new UNECE reporting guidelines (UNECE, 2009) for countries that reported emissions in older NFR formats, and to Member States only providing national total data.
Negative percentage values indicate that emissions have decreased.

Emissions from these sources have in general declined since 1990 as a result of decreased residential use of coal, improvements in abatement technologies for metal refining and smelting, and stricter regulations on emissions from the road transport sector (EEA, 2011g).

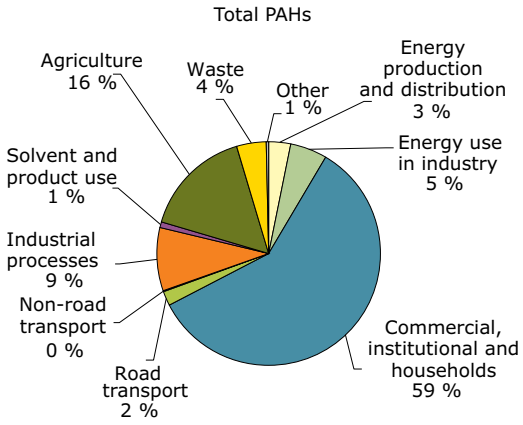
Figure 2.14 shows the contribution to total EU-27 emissions made by the aggregated sector groups. The 'commercial, institutional and households' sector group is a very significant source of total PAHs, as well as of $PM_{2.5}$, PM_{10}, PCDD/Fs, and PCBs.

Figure 2.14 Total PAHs emissions in the EU-27: (a) trend in total PAHs emissions from the five most important key categories, 1990–2010; (b) share of emissions by sector group, 2010; (c) gridded data reported by Member States, 2010

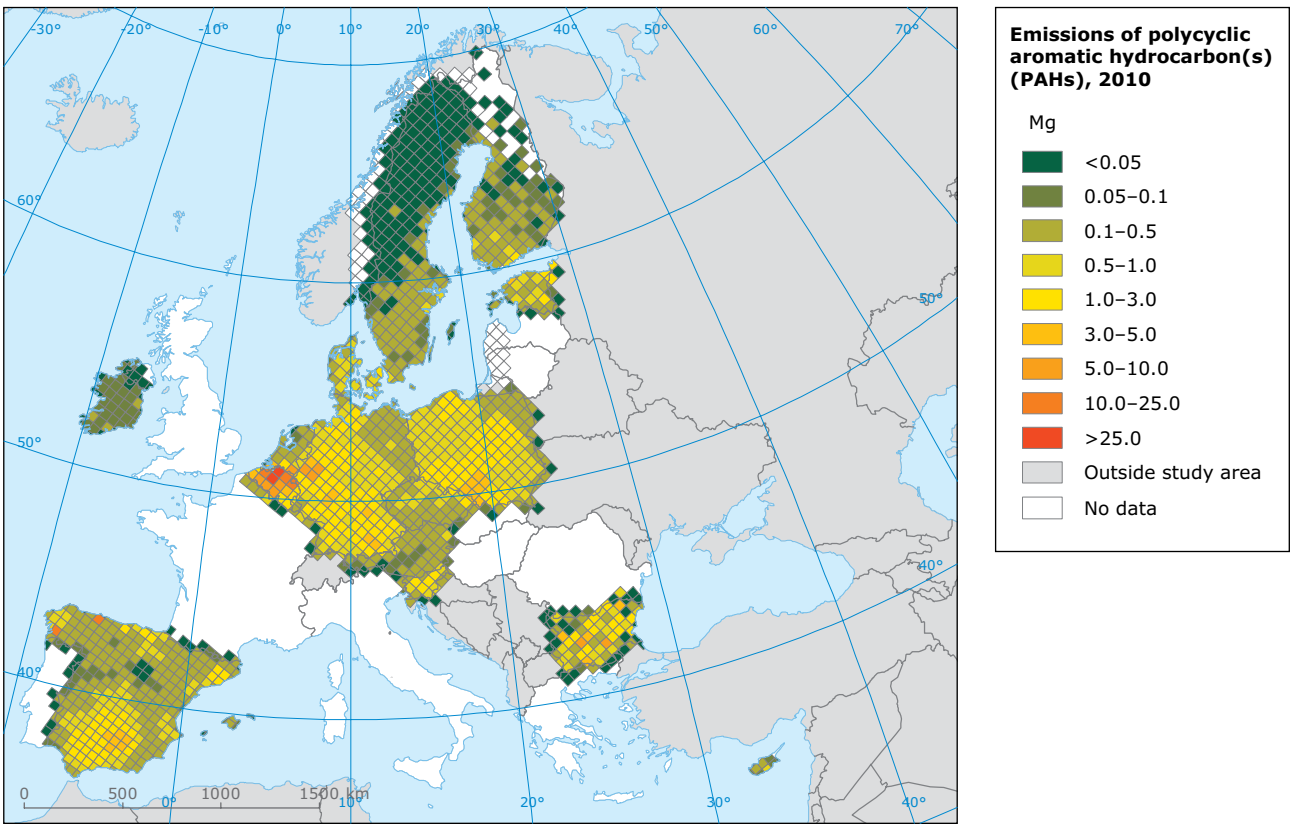
(a)



(b)



(c)



2.21 Benzo(a)pyrene (BaP) emission trends

Between 1990 and 2010, BaP emissions in the EU-27 decreased by 43 %. Between 2009 and 2010, emissions increased by 10.3 %, mainly due to increases of emissions in Poland (+ 13.8 %, 5 Mg) and Germany (+ 15.5 %, 4 Mg) (Table 2.22). The Member States that contributed most (more than 10 %) to the emissions of BaP in 2010 were Poland, Romania and Germany. Austria once reported BaP emissions as 'NR', Belgium and Portugal as not estimated ('NE'), and Spain, Finland and Italy as included elsewhere ('IE'). These notation keys were used to gap-fill all other years. Greece did not report any data or notation keys. The EU-27 total is therefore underestimated.

Table 2.22 Member State contributions to EU BaP emissions (Mg)

Member State	Benzo(a)pyrene (Mg)													Change		Share in EU-27	
	1990	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	1990–2010	2009–2010	1990	2010
														(%)	(%)	(%)	(%)
Austria	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR				
Belgium	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE				
Bulgaria	7.9	6.2	6.6	5.6	7.8	8.5	7.9	7.6	8.0	7.4	7.6	7.3	8.2	3.8	12.5	2.4	4.4
Cyprus	0.1	0.1	0.2	0.2	0.2	0.2	0.1	0.2	0.2	0.1	0.1	0.1	0.1	4.5	– 12.3	0.03	0.1
Czech Republic	11	10	8.6	8.5	7.7	6.4	8.1	8.3	5.9	5.7	7.9	4.7	5.1	– 54	6.6	3.3	2.7
Denmark	2.1	2.6	3.1	3.3	3.2	3.7	3.9	4.4	4.6	5.5	5.2	4.8	4.9	128	2.5	0.6	2.6
Estonia	3.6	4.4	3.8	3.7	3.8	4.0	4.1	3.8	3.8	3.9	4.2	4.5	5.1	39	11.9	1.1	2.7
Finland	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE				
France	11	11	7.9	7.5	6.7	6.9	6.6	6.1	5.4	5.0	5.2	5.2	5.6	– 50	8.1	3.3	3.0
Germany	138	48	30	31	28	26	23	23	24	23	25	27	31	– 78	15.5	41.7	16.5
Greece																	
Hungary	13.5	7.7	6.0	6.0	6.0	6.7	6.5	6.9	6.5	3.9	4.3	6.3	8.7	– 35	39.2	4.1	4.6
Ireland	3.4	2.1	1.5	1.4	1.4	1.3	1.3	1.4	1.3	1.3	1.4	1.4	1.4	– 59	– 3.8	1.0	0.7
Italy	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE				
Latvia	8.0	9.1	9.0	8.8	8.7	9.1	9.1	9.2	9.1	8.8	8.4	10	9.4	17	– 1.9	2.41	5.0
Lithuania	5.3	10	15	16	17	18	3.6	3.7	3.8	3.5	3.5	3.5	4.9	– 8.0	38.8	1.6	2.6
Luxembourg	0.4	0.3	0.3	0.3	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	– 31	– 4.3	0.1	0.1
Malta	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.0	0.0	0.01	0.01
Netherlands	5.2	2.9	1.3	1.3	1.2	1.2	1.5	1.4	1.2	1.3	1.4	1.3	1.2	– 76	– 2.8	1.6	0.7
Poland	46	46	47	47	46	46	46	48	47	45	41	39	45	– 3.1	13.8	13.9	23.7
Portugal	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE				
Romania	2.8	2.8	4.8	9.3	14	16	17	39	39	40	46	40	41	1357	2.8	0.8	21.8
Slovakia	3.0	3.3	3.7	3.9	3.6	3.9	4.7	5.3	4.9	5.0	5.1	5.1	5.0	68	– 1.5	0.9	2.7
Slovenia	3.8	3.5	3.4	3.0	3.0	2.9	3.0	3.0	3.0	3.0	3.0	3.2	3.3	– 12	5.6	1.1	1.8
Spain	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE				
Sweden	5.2	5.2	4.4	4.6	4.5	5.0	4.9	5.5	5.7	5.5	5.7	4.5	5.3	0.9	17.9	1.6	2.8
United Kingdom	61	21	4.9	5.0	4.2	3.5	3.4	3.2	3.0	3.0	3.3	3.2	3.2	– 95	1.7	18.4	1.7
EU-27 (a)	**332**	**196**	**161**	**166**	**166**	**169**	**155**	**180**	**177**	**171**	**179**	**171**	**189**	**– 43**	**10.3**	**100**	**100**
EU-27 (b)	**332**	**196**	**161**	**166**	**166**	**174**	**155**	**180**	**177**	**171**	**179**	**171**	**189**				

Notes: (a) Sum of national totals as reported by Member States.
(b) Sum of sectors: differences are due to reallocation of memo items in line with the new UNECE reporting guidelines (UNECE, 2009) for countries that reported emissions in older NFR formats, and to Member States only providing national total data.
Negative percentage values indicate that emissions have decreased.
See Appendix 1 for an explanation of the notation keys reported by Member States.

2.22 Benzo(b)fluoranthene emission trends

Between 1990 and 2010, benzo(b)fluoranthene emissions in the EU-27 decreased by 24 %. Between 2009 and 2010, emissions increased by 7.9 %, mainly due to an increase of emissions in Poland (+ 11.7 %, 5 Mg) (Table 2.23). The Member States that contributed most (more than 10 %) to the emissions of benzo(b)fluoranthene in 2010 were Romania and Poland. Austria reported benzo(b)fluoranthene emissions as 'NR', Belgium and Portugal as 'NE', and Spain, Finland and Italy as 'IE'. These notation keys were used to gap-fill all other years. Greece did not report any data or notation keys. The EU-27 total is therefore underestimated.

The increase in emissions reported by Romania after 2004, is due to a lack of activity data in the years prior to 2005 (source: comment received from Romania).

Table 2.23 Member State contributions to EU benzo(b)fluoranthene emissions (Mg)

Member State	Benzo(b)fluoranthene (Mg)													Change		Share in EU-27	
	1990	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	1990–2010	2009–2010	1990	2010
														(%)	(%)	(%)	(%)
Austria	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR				
Belgium	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE				
Bulgaria	11	8.3	7.8	6.5	9.2	10	9.3	8.8	9.4	8.6	8.7	8.3	9.4	– 13	13.5	5.0	5.8
Cyprus	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	7.6	– 11.7	0.06	0.1
Czech Republic	8.3	8.3	8.3	8.3	7.3	6.9	7.2	7.0	5.0	4.8	2.7	4.7	5.3	– 35	12.7	3.9	3.3
Denmark	2.3	2.8	3.4	3.6	3.5	3.9	4.1	4.6	4.9	5.8	5.4	5.0	5.1	117	1.9	1.1	3.1
Estonia	4.3	4.8	4.2	4.2	4.3	4.4	4.7	4.3	3.9	4.4	4.6	5.0	5.6	31	12.9	2.0	3.4
Finland	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE				
France	13	12	9.2	8.8	7.8	8.0	7.7	7.2	6.4	6.0	6.1	6.2	6.6	– 49	7.5	6.0	4.1
Germany	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	32	1.2	0.01	0.02
Greece																	
Hungary	15	8.6	6.2	6.3	6.5	7.4	7.1	8.2	8.1	4.6	5.1	7.9	9.3	– 39	18.4	7.1	5.7
Ireland	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	– 23	3.8	0.2	0.2
Italy	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE				
Latvia	9.0	9.3	8.6	8.9	8.7	9.1	9.2	9.4	9.2	8.9	8.6	10	9.5	5.4	– 2.6	4.18	5.8
Lithuania	4.4	6.7	9.1	10	10	11	4.1	4.1	4.2	3.9	3.8	3.9	5.4	24	39.2	2.0	3.3
Luxembourg	0.5	0.3	0.3	0.3	0.3	0.2	0.3	0.3	0.3	0.3	0.4	0.3	0.3	– 39	– 4.3	0.2	0.2
Malta	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.0	0.0	0.01	0.01
Netherlands	8.0	3.2	1.2	1.2	1.1	1.1	2.0	1.2	1.2	1.5	1.6	1.4	1.2	– 85	– 13.2	3.7	0.8
Poland	51	51	51	51	50	49	49	52	50	47	42	40	45	– 12	11.7	23.7	27.5
Portugal	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE				
Romania	0.1	0.1	0.1	0.1	0.1	0.1	0.1	44	44	45	52	44	46	30791	3.2	0.1	28.1
Slovakia	4.2	4.3	4.5	4.7	4.3	4.6	5.4	7.0	6.6	6.6	6.6	6.5	6.6	57	1.3	1.9	4.0
Slovenia	4.9	4.6	4.4	3.8	3.9	3.8	3.8	3.8	3.8	3.9	3.9	4.1	4.4	– 11	6.5	2.3	2.7
Spain	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE				
Sweden	2.7	2.5	2.3	2.8	2.6	2.8	3.0	3.8	4.8	3.9	3.9	0.3	0.4	– 86	12.4	1.3	0.2
United Kingdom	76	39	3.9	4.2	3.7	3.3	3.3	3.2	3.0	2.8	2.9	2.9	2.9	– 96	0.1	35.2	1.8
EU-27 (a)	**215**	**166**	**125**	**124**	**124**	**126**	**121**	**169**	**165**	**158**	**159**	**151**	**163**	**– 24**	**7.9**	**100**	**100**
EU-27 (b)	**215**	**166**	**125**	**124**	**124**	**127**	**121**	**169**	**165**	**158**	**159**	**151**	**163**				

Notes: (a) Sum of national totals as reported by Member States.
(b) Sum of sectors: differences are due to reallocation of memo items in line with the new UNECE reporting guidelines (UNECE, 2009) for countries that reported emissions in older NFR formats, and to Member States only providing national total data.
Negative percentage values indicate that emissions have decreased.
See Appendix 1 for an explanation of the notation keys reported by Member States.

2.23 Benzo(k)fluoranthene emission trends

Between 1990 and 2010, benzo(k)fluoranthene emissions in the EU-27 decreased by 18 %. Between 2009 and 2010, emissions increased by 9.2 %, mainly because of increases of emissions in Hungary (+ 67.0 %, 2 Mg) and Poland (+ 14.9 %, 1.7 Mg) (Table 2.24). The Member States that contributed most (more than 10 %) to the emissions of benzo(k) fluoranthene in 2010 were Romania and Poland.

Austria reported benzo(k)fluoranthene emissions as 'NR', Belgium and Portugal as 'NE', and Spain, Finland and Italy as 'IE'. These notation keys were used to gap-fill all other years. Greece and Germany did not report any data or notation keys. The EU-27 total is therefore underestimated.

The increase in emissions reported by Romania after 2004, is due to a lack of activity data in the years prior to 2005 (source: comment received from Romania).

Table 2.24 Member State contributions to EU benzo(k)fluoranthene emissions (Mg)

Member State	Benzo(k)fluoranthene (Mg)													Change		Share in EU-27	
	1990	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	1990–2010 (%)	2009–2010 (%)	1990 (%)	2010 (%)
Austria	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR				
Belgium	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE				
Bulgaria	4.6	3.6	4.0	3.4	4.7	5.1	4.8	4.6	4.9	4.5	4.6	4.5	5.0	10	12.2	4.7	6.2
Cyprus	0.07	0.08	0.09	0.10	0.10	0.09	0.09	0.1	0.1	0.09	0.09	0.08	0.07	6.6	– 11.2	0.1	0.1
Czech Republic	3.3	3.3	3.3	3.3	3.3	2.6	3.3	3.3	2.3	2.2	4.3	2.1	2.3	– 31	8.1	3.4	2.8
Denmark	1.3	1.6	1.9	2.0	2.0	2.2	2.3	2.6	2.7	3.3	3.1	2.8	2.9	129	1.6	1.3	3.6
Estonia	2.2	2.6	2.3	2.3	2.3	2.4	2.5	2.2	2.1	2.4	2.5	2.7	3.0	36	11.0	2.3	3.7
Finland	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE				
France	8.4	8.2	6.3	6.0	5.4	5.6	5.4	5.1	4.6	4.3	4.4	4.4	4.7	– 44	6.7	8.6	5.8
Germany																	
Greece																	
Hungary	8.5	4.3	3.3	3.4	3.5	3.8	3.7	3.9	3.1	1.9	2.1	3.1	5.1	– 40	67.0	8.7	6.3
Ireland	0.2	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	– 8.1	0.0	0.2	0.2
Italy	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE				
Latvia	4.6	5.1	4.8	4.9	4.9	5.1	5.1	5.2	5.1	5.0	4.8	5.4	5.2	13	– 3.8	4.67	6.4
Lithuania	3.5	5.1	6.6	6.9	7.3	7.6	2.4	2.4	2.5	2.4	2.3	2.3	3.2	– 9.4	38.0	3.6	3.9
Luxembourg	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.1	0.1	– 35	– 4.4	0.2	0.2
Malta	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.0	0.0	0.01	0.02
Netherlands	4.0	2.2	0.7	0.6	0.6	0.6	0.8	0.6	0.6	0.7	0.8	0.7	0.6	– 84	– 7.8	4.1	0.8
Poland	16	15	15	15	15	15	15	15	15	14	13	11	13	– 19	14.9	16.1	15.8
Portugal	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE				
Romania	0.1	0.1	0.1	0.1	0.1	0.1	0.1	28	29	29	35	29	30	31450	3.1	0.1	36.8
Slovakia	1.8	1.9	2.1	2.1	1.9	2.1	2.4	2.9	2.8	2.8	2.8	2.6	2.8	58	8.4	1.8	3.5
Slovenia	1.8	1.6	1.6	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.5	– 17	5.4	1.9	1.9
Spain	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE				
Sweden	0.21	0.2	0.2	0.2	0.18	0.18	0.2	0.2	0.2	0.2	0.2	0.17	0.19	– 12	12.2	0.2	0.2
United Kingdom	38	20	3.0	3.1	2.9	2.4	2.4	2.2	1.7	1.4	1.4	1.4	1.4	– 96	– 3.3	38.3	1.7
EU-27 (a)	**98**	**75**	**55**	**55**	**56**	**57**	**52**	**81**	**78**	**76**	**83**	**74**	**81**	**– 18**	**9.2**	**100**	**100**
EU-27 (b)	**98**	**75**	**55**	**55**	**56**	**59**	**52**	**81**	**78**	**76**	**83**	**74**	**81**				

Notes: (a) Sum of national totals as reported by Member States.
(b) Sum of sectors: differences are due to reallocation of memo items in line with the new UNECE reporting guidelines (UNECE, 2009) for countries that reported emissions in older NFR formats, and to Member States only providing national total data.
Negative percentage values indicate that emissions have decreased.
See Appendix 1 for an explanation of the notation keys reported by Member States.

2.24 Indeno(1,2,3-cd)pyrene emission trends

Between 1990 and 2010, indeno(1,2,3-cd)pyrene emissions in the EU-27 decreased by 17 %. Between 2009 and 2010, emissions increased by 9.4 %, mainly due to an increase of emissions in Poland (+ 11.9 %, 5 Mg) (Table 2.25). The Member States that contributed most (more than 10 %) to the emissions of indeno(1,2,3-cd)pyrene in 2010 were Poland and Romania. Austria reported indeno(1,2,3-cd)pyrene emissions as not relevant, Belgium and Portugal as not estimated, and Spain, Finland and Italy as included elsewhere. These notation keys were used to gap-fill all other years. Greece did not report any data or notation keys. The EU-27 total is therefore underestimated.

The increase in emissions reported by Romania after 2004, is due to a lack of activity data in the years prior to 2005 (source: comment received from Romania).

Table 2.25 Member State contributions to EU indeno(1,2,3-cd)pyrene emissions (Mg)

Member State	Indeno(1,2,3-cd)pyrene (Mg)													Change		Share in EU-27	
	1990	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	1990–2010	2009–2010	1990	2010
														(%)	(%)	(%)	(%)
Austria	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR				
Belgium	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE				
Bulgaria	4.1	3.3	4.0	3.5	4.7	5.1	4.8	4.6	4.9	4.6	4.7	4.6	5.1	25	11.6	2.9	4.3
Cyprus	0.07	0.09	0.1	0.1	0.1	0.1	0.09	0.10	0.1	0.09	0.09	0.08	0.07	5.9	– 12.1	0.05	0.1
Czech Republic	10	8.7	7.1	7.0	6.2	5.4	5.8	5.6	3.9	3.8	4.4	3.6	4.4	– 57	22.2	7.1	3.7
Denmark	1.8	2.0	2.3	2.4	2.4	2.7	2.8	3.2	3.4	4.0	3.7	3.3	3.4	94	3.6	1.2	2.9
Estonia	2.1	2.7	2.4	2.3	2.4	2.5	2.6	2.3	2.0	2.5	2.7	2.9	3.2	55	11.0	1.4	2.6
Finland	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE				
France	6.7	6.5	5.0	4.8	4.3	4.4	4.2	4.0	3.6	3.4	3.5	3.5	3.7	– 45	7.2	4.7	3.1
Germany	5.3	3.3	2.8	2.2	2.2	2.4	2.6	2.5	2.5	2.5	2.5	2.0	2.5	– 53	20.5	3.7	2.1
Greece																	
Hungary	11	5.7	3.5	3.7	3.8	4.3	4.0	4.5	5.1	3.1	3.4	5.1	5.2	– 54	3.8	7.8	4.4
Ireland	2.5	1.5	1.0	1.0	1.0	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	– 64	– 3.8	1.7	0.7
Italy	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE				
Latvia	4.8	5.6	5.3	5.4	5.3	5.6	5.6	5.6	5.5	5.3	5.2	5.8	5.6	16	– 3.8	3.3	4.7
Lithuania	5.0	7.3	10	10	11	10	5.3	5.3	5.4	5.0	5.0	5.1	7.1	42	40.2	3.5	5.9
Luxembourg	0.2	0.2	0.2	0.2	0.2	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	– 25	– 4.3	0.1	0.1
Malta	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.0	0.0	0.01	0.01
Netherlands	2.8	1.4	0.6	0.6	0.5	0.5	0.9	0.6	0.6	0.7	0.8	0.7	0.6	– 77	– 9.0	2.0	0.5
Poland	52	51	51	51	49	47	48	51	50	48	43	42	47	– 8.6	11.9	35.7	39.1
Portugal	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE				
Romania	0.1	0.1	0.1	0.1	0.1	0.1	0.1	21	20	21	25	23	23	41034	3.0	0.04	19.5
Slovakia	2.9	3.0	3.1	3.1	2.7	2.9	3.2	4.1	3.9	3.8	3.8	3.6	3.8	33	5.8	2.0	3.2
Slovenia	2.9	2.5	2.4	2.1	2.1	2.1	2.0	2.1	2.1	2.1	2.1	2.2	2.3	– 19	4.7	2.0	2.0
Spain	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE				
Sweden	0.7	0.6	0.6	0.7	0.6	0.7	0.7	0.9	1.1	0.9	0.9	0.1	0.1	– 81	10.2	0.5	0.1
United Kingdom	29	12	2.5	2.3	1.8	1.7	1.5	1.4	1.3	1.3	1.4	1.3	1.3	– 96	– 0.2	20.2	1.1
EU-27 (a)	**144**	**118**	**104**	**103**	**100**	**99**	**95**	**119**	**117**	**113**	**113**	**110**	**120**	**– 17**	**9.4**	**100**	**100**
EU-27 (b)	**144**	**118**	**104**	**103**	**100**	**102**	**95**	**119**	**117**	**113**	**113**	**110**	**120**				

Notes: (a) Sum of national totals as reported by Member States.
(b) Sum of sectors: differences are due to reallocation of memo items in line with the new UNECE reporting guidelines (UNECE, 2009) for countries that reported emissions in older NFR formats, and to Member States only providing national total data.
Negative percentage values indicate that emissions have decreased.
See Appendix 1 for an explanation of the notation keys reported by Member States.

2.25 Hexachlorobenzene (HCB) emission trends and key categories

Between 1990 and 2010, HCB emissions decreased in the EU-27 by 91 %. Between 2009 and 2010, the increase was 0.7 %, mainly due to emission increases in Spain (+ 6.8 %, 20 kg) and Austria (+ 13.4 %, 5 kg). The main reductions were reported by Finland and Hungary (Table 2.26). The Member State that contributed most (more than 10 %) to the emissions of HCB in 2010 was Spain.. Greece and Lithuania did not report HCB emissions for any year, and thus data were not gap-filled. The EU-27 total is therefore underestimated.

The strong emission decrease in France between 1990 and 1995 is mainly due to the cessation of the aluminium industry in 1994 (Appendix 7, France's IIR).

'2 C 1 — Iron and steel production' was the most important key category for HCB emissions, accounting for 67 % of total HCB emissions (Figure 2.15). Among the top five key categories, the highest relative reductions in emissions between 1990 and 2010 were achieved in the third most important key category, '4 G — Agriculture other' (– 84.6 %). In contrast, emissions from the most important key category, '2 C 1 — Iron and steel production', exhibit a pronounced increase (+ 38.4 %) since 1990 (Figure 2.15).

Figure 2.15 shows the contribution to total EU-27 emissions made by the aggregated sector groups. For HCB, the most important emission source is the 'industrial processes' sector group.

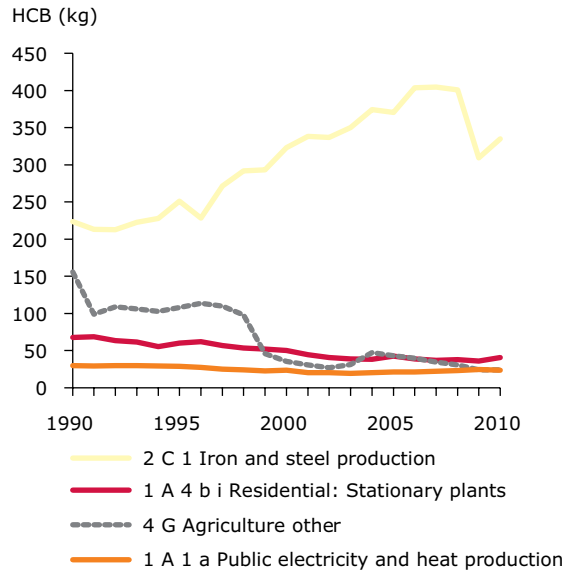
Table 2.26 Member State contributions to EU HCB emissions (kg)

Member State	HCB (kg)													Change		Share in EU-27	
	1990	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	1990–2010	2009–2010	1990	2010
														(%)	(%)	(%)	(%)
Austria	92	53	44	46	42	41	40	45	41	40	40	36	41	– 55	13.4	1.7	8.3
Belgium	19	7.7	18	8.7	10	10	8.6	16	16	16	16	10	11	– 40	16.8	0.3	2.2
Bulgaria	23	25	20	19	16	21	21	21	25	23	26	23	19	– 16	– 15.4	0.4	3.8
Cyprus	0.06	0.06	0.07	0.07	0.07	0.03	0.02	0.02	0.02	0.02	0.02	0.01	0.01	– 79	– 17.0	0.001	0.002
Czech Republic	4.1	4.1	4.1	4.1	4.1	0.1	4.3	4.7	3.7	3.9	3.7	2.7	2.7	– 34	0.8	0.1	0.5
Denmark	3.2	1.9	0.7	0.6	0.6	0.6	0.5	0.5	0.5	0.5	0.6	0.6	0.6	– 81	11.0	0.1	0.1
Estonia	0.06	0.12	0.13	0.14	0.13	0.15	0.18	0.15	0.12	0.13	0.15	0.17	0.22	259	24.6	0.001	0.04
Finland	41	40	43	24	17	15	31	37	43	44	26	34	16	– 61	– 52.1	0.8	3.2
France	1200	76	51	42	34	29	24	20	14	15	15	16	16	– 99	2.7	22.4	3.2
Germany	5.3	4.5	4.4	4.2	3.8	3.4	3.0	3.0	3.1	3.1	3.2	3.2	3.5	– 35	7.8	0.1	0.7
Greece																	
Hungary	6.9	3.7	4.4	0.7	4.6	4.5	4.4	6.1	7.1	6.7	8.6	6.3	1.2	– 82	– 80.7	0.1	0.2
Ireland	40	40	0.5	0.1	0.2	1.3	1.7	1.3	1.2	1.2	1.2	1.2	1.2	– 97	– 0.2	0.7	0.2
Italy	43	38	24	34	31	32	24	21	27	26	26	23	23	– 46	0.9	0.8	4.6
Latvia	0.18	0.26	0.25	0.29	0.27	0.29	0.31	0.31	0.33	0.33	0.28	0.32	0.31	74	– 2.1	0.003	0.1
Lithuania																	
Luxembourg	0.2	1.1	2.1	1.9	1.7	1.5	1.3	1.2	1.0	0.8	0.7	0.6	0.5	165	– 11.3	0.0	0.1
Malta	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0	0.0	0.00001	0.0001
Netherlands	0.6	0.6	1.0	1.0	1.0	1.0	1.1	1.0	1.1	1.0	1.1	1.4	1.4	146	– 1.8	0.0	0.3
Poland	62	51	46	8.4	8.5	7.0	8.1	9.0	8.6	10	10	10	11	– 82	19.2	1.2	2.3
Portugal	1.2	1.2	0.7	0.3	0.3	0.2	0.2	0.1	0.1	0.3	0.2	0.6	0.2	– 83	– 65.9	0.02	0.04
Romania	99	64	29	22	15	8.4	1.4	2.5	1.2	1.5	1.8	1.6	1.8	– 98	7.0	1.8	0.4
Slovakia	2.7	2.5	1.9	1.7	2.1	2.4	1.9	2.3	1.3	1.4	1.4	1.0	1.0	– 64	– 3.8	0.05	0.2
Slovenia	47	37	38	38	0.3	0.3	0.3	0.3	0.3	0.4	0.3	0.5	0.5	– 99	5.3	0.9	0.1
Spain	510	366	472	470	478	517	464	474	389	402	393	294	314	– 38	6.8	9.5	62.8
Sweden	0.02	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	45	47.0	0.0004	0.01
United Kingdom	3170	4128	80	70	66	64	75	71	66	62	58	32	32	– 99	2.9	59.0	6.5
EU-27 (a)	**5 370**	**4 945**	**885**	**797**	**737**	**758**	**716**	**736**	**652**	**660**	**634**	**496**	**500**	**– 91**	**0.7**	**100**	**100**
EU-27 (b)	**5 370**	**4 945**	**885**	**797**	**737**	**758**	**716**	**736**	**652**	**660**	**634**	**496**	**499**				

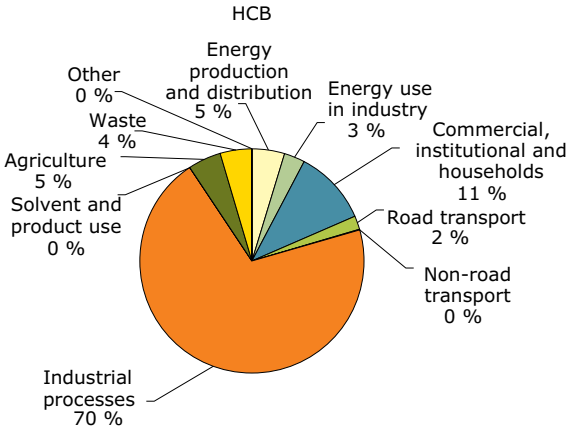
Notes: (a) Sum of national totals as reported by Member States.
(b) Sum of sectors: differences are due to reallocation of memo items in line with the new UNECE reporting guidelines (UNECE, 2009) for countries that reported emissions in older NFR formats, and to Member States only providing national total data.
Negative percentage values indicate that emissions have decreased.

Figure 2.15 **HCB emissions in the EU-27: (a) trend in HCB emissions from the five most important key categories, 1990–2010; (b) share of emissions by sector group, 2010; (c) gridded data reported by Member States, 2010**

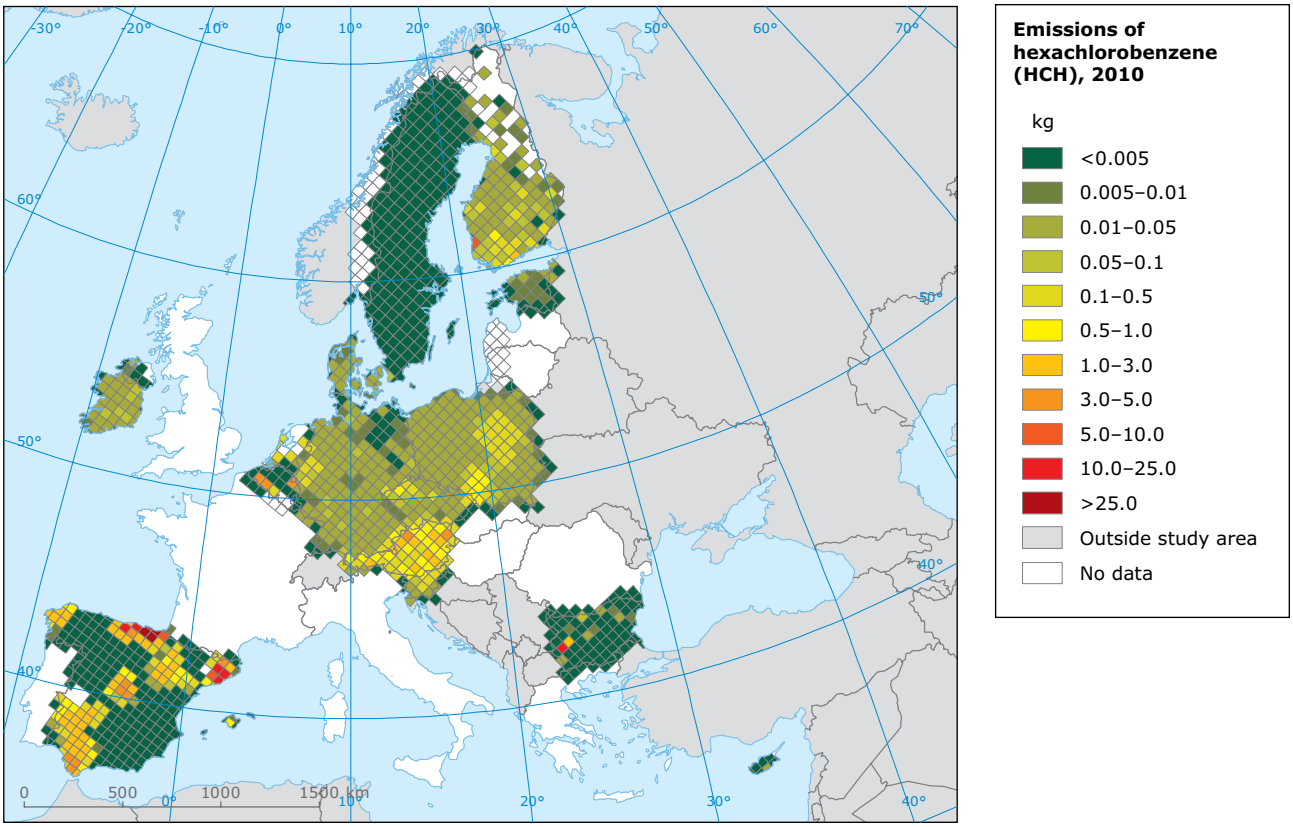
(a)



(b)



(c)



2.26 Hexachlorocyclohexane (HCH) emission trends and key categories

Several Member States did not report HCH emissions or a notation key for any years, and the data thus could not be gap-filled. The EU-27 total is therefore far from complete. The available data are presented in Table 2.27.

There were only two key categories for HCH emissions, 2 F — Consumption of POPs and heavy metals (e.g. electrical and scientific equipment)' and '4 G — Agriculture other', which jointly contributed 99 % to total HCH emissions. High relative reductions in emissions between 1990 and 2010 were achieved in both key categories '4 G — Agriculture other' (– 94.8 %) and '2 F — Consumption of POPs and heavy metals (e.g. electrical and scientific equipment)' (– 85.3 %) (Figure 2.16). The data for category '2 F — Consumption of POPs and heavy metals (e.g. electrical and scientific equipment)' were only based on data reported by a single Member State (the United Kingdom). The reliability of the EU-27 total is therefore not considered to be high.

Figure 2.16 shows the contribution to total EU-27 emissions made by the aggregated sector groups. For HCH, just two sector groups — industrial processes and agriculture — contribute the majority of emissions.

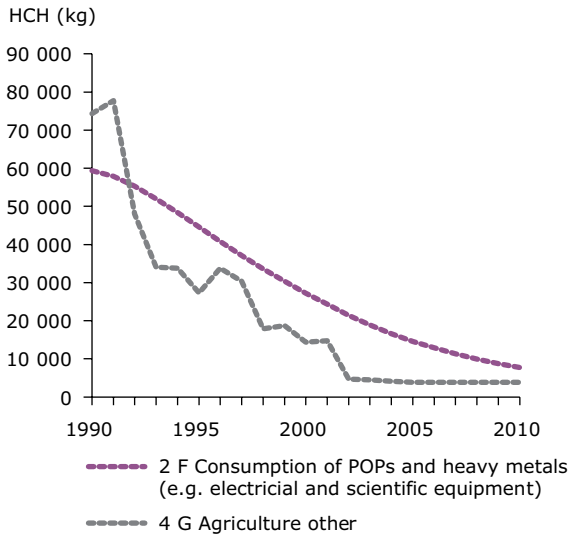
Table 2.27 Member State contributions to EU HCH (kg)

Member State	HCH (kg)													Change		Share in EU-27	
	1990	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	1990–2010 (%)	2009–2010 (%)	1990 (%)	2010 (%)
Austria	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR				
Belgium	162	165	167	167	168	168	169	170	171	172	173	174	175	8	0.7	0.1	1.5
Bulgaria	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA				
Cyprus	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE				
Czech Republic	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE				
Denmark	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE				
Estonia																	
Finland	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA				
France	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA				
Germany	60 200	13 100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			33.6	
Greece																	
Hungary	9 281	1 650	18	17	15	13	11	9.2	7.3	5.5	3.7	1.8	0.0	– 100	– 100.0	5.2	0.0
Ireland	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA				
Italy	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA				
Latvia	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA				
Lithuania	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE				
Luxembourg																	
Malta																	
Netherlands	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO				
Poland	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE				
Portugal																	
Romania	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA				
Slovakia	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE				
Slovenia	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR				
Spain	9 194	9 538	11 250	11 631	3 877	3 877	3 877	3 877	3 877	3 877	3 877	3 877	3 877	– 58	0.0	5.1	33.0
Sweden	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO				
United Kingdom	100 368	59 386	33 229	29 282	22 265	19 451	16 861	14 619	12 854	11 312	9 954	8 760	7 709	– 92	– 12.0	56.0	65.5
EU-27 (a)	**179 205**	**83 838**	**44 664**	**41 097**	**26 325**	**23 509**	**20 918**	**18 674**	**16 909**	**15 366**	**14 008**	**12 812**	**11 760**	**– 93**	**– 8.2**	**100**	**100**
EU-27 (b)	**169 924**	**82 188**	**44 646**	**41 080**	**26 310**	**23 496**	**20 907**	**18 665**	**16 902**	**15 360**	**14 004**	**12 810**	**11 760**				

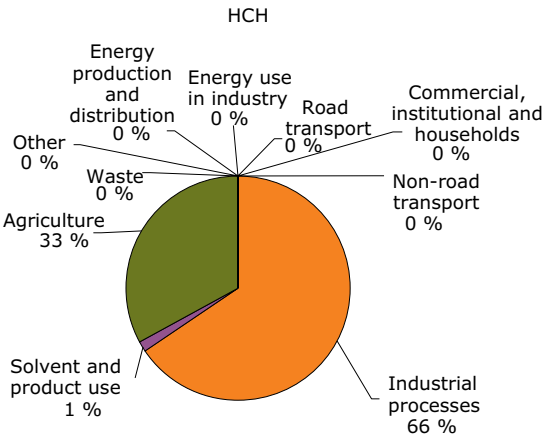
Notes: (a) Sum of national totals as reported by Member States.
(b) Sum of sectors: differences are due to reallocation of memo items in line with the new UNECE reporting guidelines (UNECE, 2009) for countries that reported emissions in older NFR formats, and to Member States only providing national total data.
Negative percentage values indicate that emissions have decreased.
See Appendix 1 for an explanation of the notation keys reported by Member States.

Figure 2.16 **HCH emissions in the EU-27: (a) trend in HCH emissions from the five most important key categories, 1990–2010; (b) share of emissions by sector group, 2010; (c) gridded data reported by Member States, 2010**

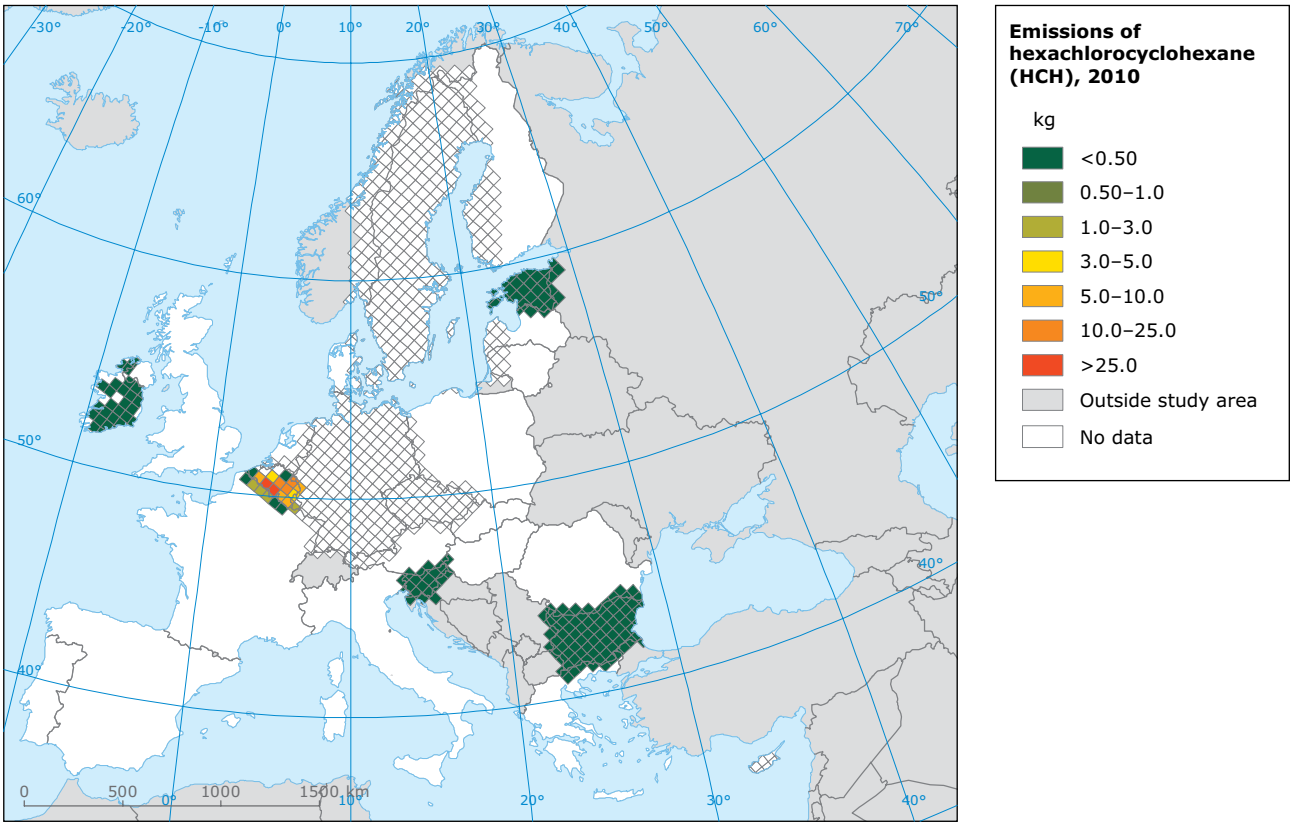
(a)



(b)



(c)



2.27 Polychlorinated biphenyl (PCB) emission trends and key categories

Based on the limited data available, it is estimated that between 1990 and 2010, PCB emissions decreased in the EU-27 by 74 %. Between 2009 and 2010, the increase was 13.2 %, mainly due to emission increases in Portugal (+ 45.0 %, 312 kg), Poland (+ 12.9 %, 85 kg) and Germany (+ 10.8 %, 22 kg). The main reductions were reported by Hungary and the United Kingdom (Table 2.28). The Member States that contributed most (more than 10 %) to the emissions of PCB in 2010 were Portugal, the United Kingdom and Poland. Several Member States did not report any PCB emissions, and thus data could not be gap-filled. The EU-27 total is therefore underestimated.

The increase of PCB emissions in Portugal is due to an increase in waste incineration (Appendix 7, Portugal's IIR).

The increase in emissions reported by Romania after 2004, is due to a lack of activity data in the years prior to 2005 (source: comment received from Romania).

The categories '6 C b — Industrial waste incineration' and '1 A 4 b i — Residential: Stationary plants' were the most important key categories for PCB emissions, together making up 47 % of total PCB emissions (Figure 2.17). Among the top five key categories, the highest relative reductions in emissions between 1990 and 2010 were achieved in the third most important key category,

Table 2.28 Member State contributions to EU PCB emissions (kg)

Member State	PCB (kg)													Change		Share in EU-27	
	1990	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	1990–2010 (%)	2009–2010 (%)	1990 (%)	2010 (%)
Austria	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR				
Belgium	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE				
Bulgaria	6.2	5.2	3.8	3.1	4.2	4.9	4.2	4.0	4.2	4.5	4.3	3.5	4.2	– 32	21.2	0.05	0.1
Cyprus	0.015	0.014	0.013	0.014	0.013	0.005	0.002	0.005	0.007	0.009	0.005	0.006	0.005	– 65	– 5.5	0.0001	0.0002
Czech Republic	773	623	474	407	82	3.2	88	82	89	48	43	33	24	– 97	– 27.8	5.8	0.7
Denmark	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE				
Estonia	10	9.2	7.1	10	9.4	10	9.2	8.9	8.1	8.0	9.1	10	11	8.9	14.4	0.1	0.3
Finland	314	284	221	209	192	192	180	174	177	164	156	148	156	– 50	5.5	2.4	4.5
France	179	158	106	97	75	74	77	76	72	67	66	58	59	– 67	2.5	1.3	1.7
Germany	1 672	1 536	1 071	884	712	544	204	206	216	221	225	206	229	– 86	10.8	12.5	6.6
Greece																	
Hungary	151	113	102	101	99	103	93	84	75	66	57	48	19	– 88	– 61.0	1.1	0.5
Ireland	68	63	58	52	66	79	55	43	42	20	20	18	17	– 75	– 2.6	0.5	0.5
Italy	278	289	253	258	262	265	270	267	275	275	269	197	219	– 21	11.1	2.1	6.3
Latvia	4.2	1.1	0.7	0.8	0.8	0.8	0.8	0.8	0.9	1.0	1.0	0.8	1.0	– 76	23.1	0.03	0.03
Lithuania	43	21	11	14	13	13	24	25	26	29	28	8.9	2.8	– 93	– 68.8	0.3	0.1
Luxembourg	73	73	47	34	21	8.2	7.2	6.2	5.2	4.1	3.1	1.8	1.6	– 98	– 13.4	0.5	0.0
Malta	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.0	0.0	0.0002	0.001
Netherlands	0.02	0.02	0.04	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	– 100	0.0	0.0001	0.0
Poland	2 425	2 323	2 265	2 327	2 282	2 281	2 256	2 281	2 292	641	663	663	749	– 69	12.9	18.2	21.6
Portugal	59	66	37	67	93	117	609	767	768	561	881	694	1 007	1593	45.0	0.4	29.0
Romania	135	87	39	30	20	11	1.4	224	202	224	205	63	79	– 41	26.3	1.0	2.3
Slovakia	67	40	33	32	31	33	31	36	35	35	37	30	33	– 50	9.0	0.5	1.0
Slovenia	448	321	231	213	184	170	150	124	107	107	73	65	59	– 87	– 10.0	3.4	1.7
Spain	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE				
Sweden	0.09	0.06	0.09	0.09	0.09	0.11	0.10	0.09	0.09	0.08	0.07	0.09	0.13	40	44.7	0.001	0.004
United Kingdom	6 626	4 936	1 334	1 269	1 182	1 149	1 119	1 058	1 003	962	913	817	800	– 88	– 2.1	49.7	23.1
EU-27 (a)	**13 333**	**10 948**	**6 294**	**6 006**	**5 329**	**5 060**	**5 179**	**5 467**	**5 398**	**3 438**	**3 654**	**3 067**	**3 471**	**– 74**	**13.2**	**100**	**100**
EU-27 (b)	**13 333**	**10 948**	**6 294**	**6 006**	**5 329**	**5 059**	**5 179**	**5 467**	**5 398**	**3 438**	**3 654**	**3 067**	**3 471**				

Notes: (a) Sum of national totals as reported by Member States.
(b) Sum of sectors: differences are due to reallocation of memo items in line with the new UNECE reporting guidelines (UNECE, 2009) for countries that reported emissions in older NFR formats, and to Member States only providing national total data.
Negative percentage values indicate that emissions have decreased.

'2 F — Consumption of POPs and heavy metals (e.g. electrical and scientific equipment)' (– 91.2 %) (Figure 2.17).

The large decrease in emissions from '2 F — Consumption of POPs and heavy metals (e.g. electrical and scientific equipment)' between 1999 and 2000 is due to reductions reported by the United Kingdom. The EU introduced controls on disposal of PCBs through Directive 76/403/EEC (EC, 1976). The EU later banned the use of PCBs in new facilities in 1985, restricting the marketing and use of certain dangerous substances and preparations under Directive 85/467/EEC (EC, 1985). Then in 1996, the EU required Member States to develop plans for existing electrical equipment above a specified size to be removed to a hazardous waste facility, under Directive 96/59/EC (EC, 1996a). This was implemented in the United Kingdom as the Waste Management (Hazardous Waste) Regulations 1998 (SI No 163/1998). Any equipment identified as containing more than 5 litres of PCB fluids was to be removed from service and disposed of accordingly. This resulted in a significant drop in emissions from the beginning of 2000, assuming the emissions to air from leaks of dielectric equipment still in use dropped due to a smaller stock remaining.

Figure 2.17 shows the contribution to total EU-27 emissions made by the aggregated sector groups. For PCBs, common important emission sources are waste and industrial processes, and the 'commercial, institutional and households' sector group — as with $PM_{2.5}$, PM_{10}, total PAHs, and PCDD/Fs.

Figure 2.17 PCB emissions from key categories in the EU-27: (a) trend in PCB emissions from the five most important key categories, 1990–2010; (b) share of emissions by sector group, 2010; (c) gridded data reported by Member States, 2010

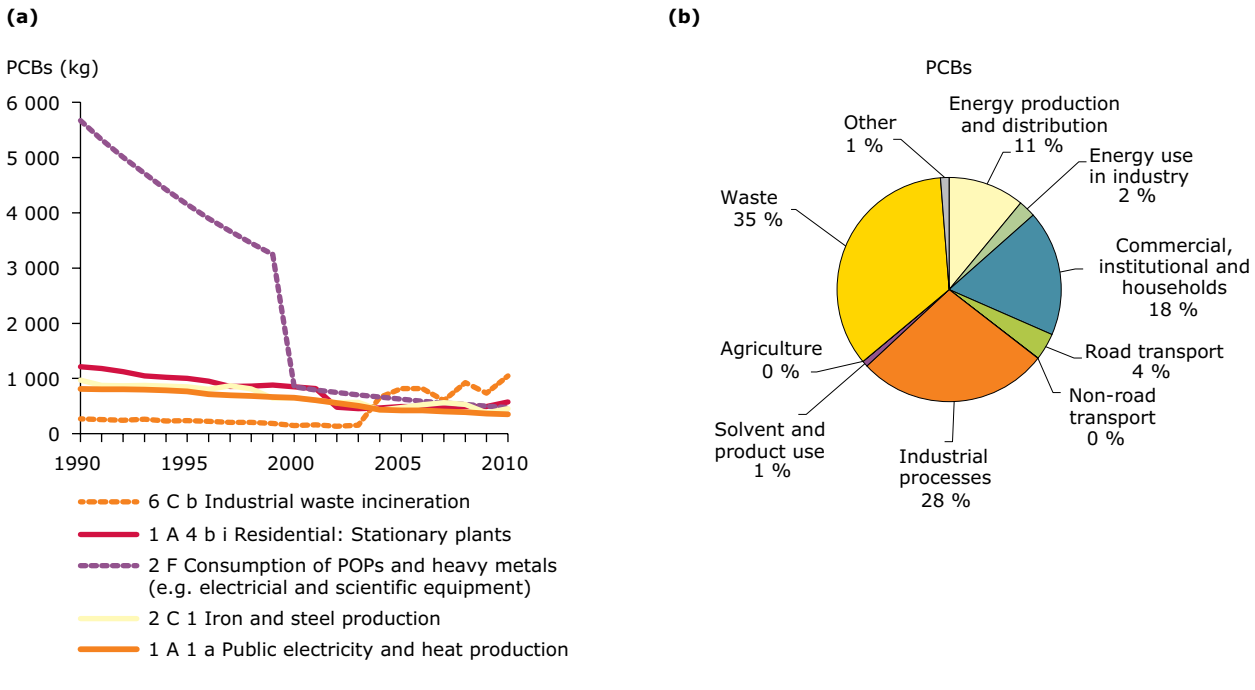
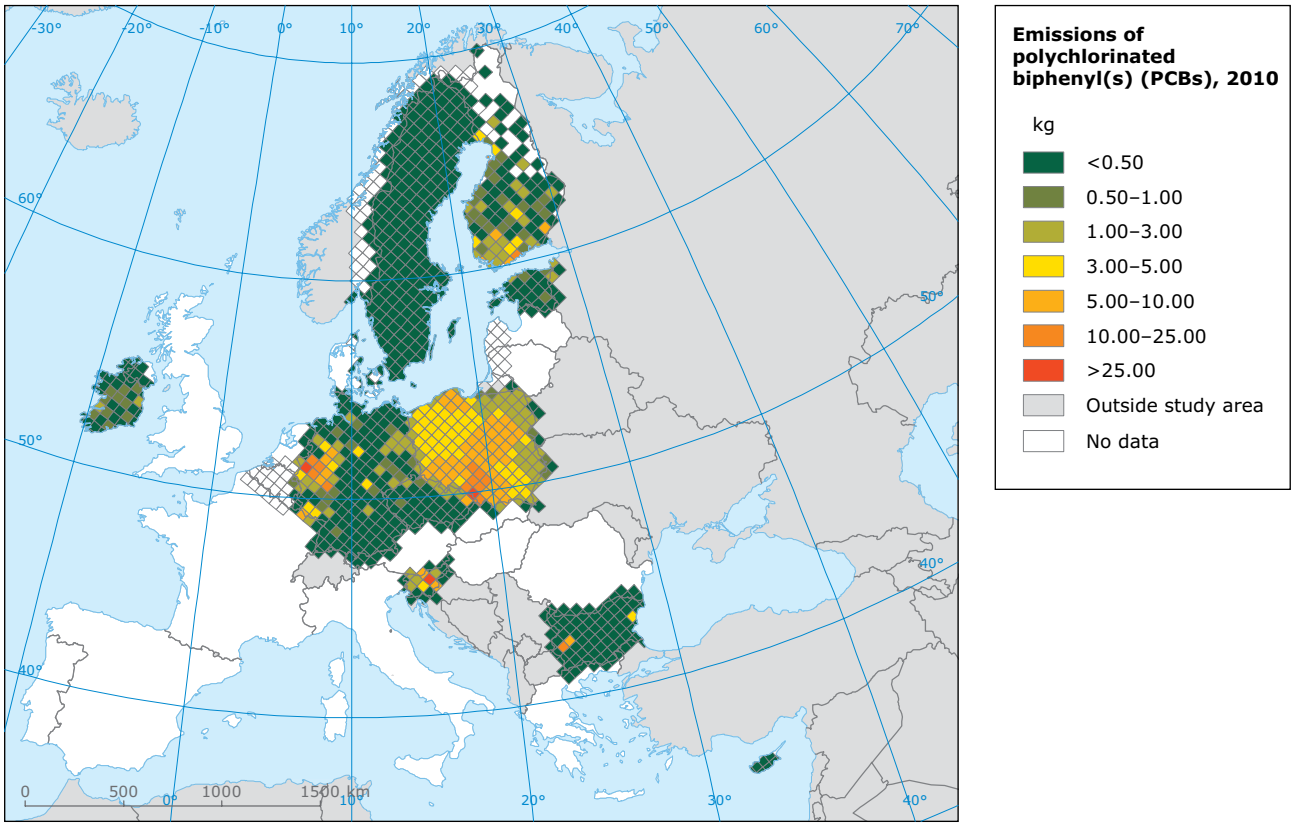


Figure 2.17 **PCB emissions from key categories in the EU-27: (a) trend in PCB emissions from the five most important key categories, 1990–2010; (b) share of emissions by sector group, 2010; (c) gridded data reported by Member States, 2010 (cont.)**

(c)



3 Sectoral analysis and emission trends for key pollutants

Chapter 3 sets out emission trends and detailed methodologies of the key pollutants aggregated into the following main sector groups:

- energy production and distribution
- energy use in industry
- industrial processes
- solvent and product use
- commercial, institutional and households (energy use)
- road transport
- non-road transport
- agriculture
- waste.

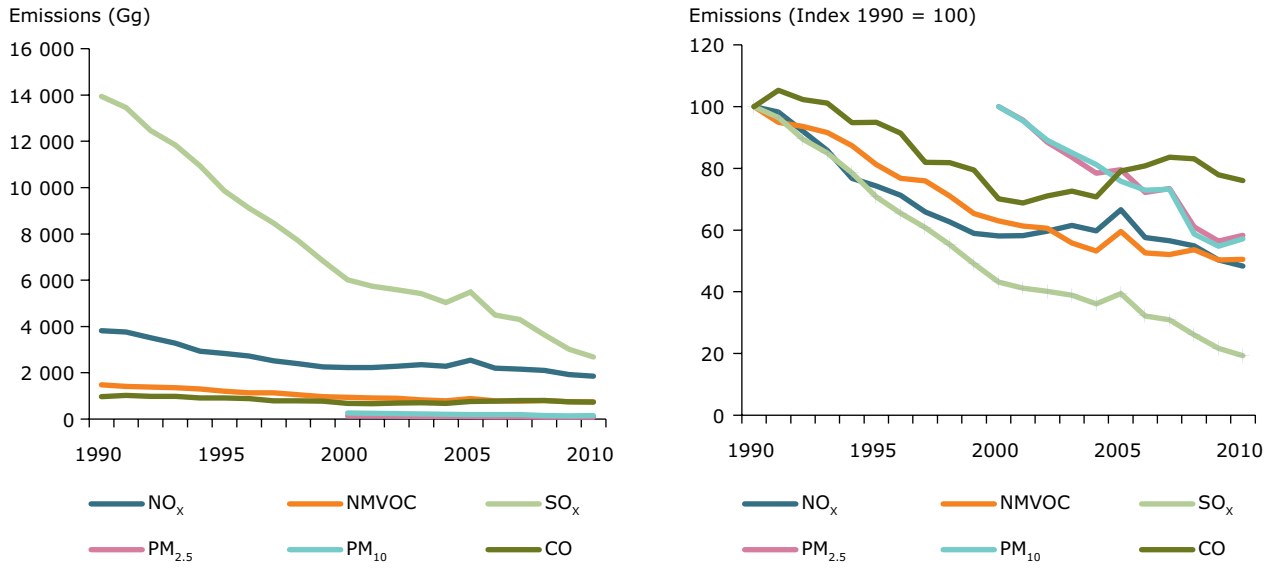
A conversion chart showing how each of the individual NFR source categories was included in each of the aggregated sector groups is provided in Appendix 5 of this report (Table A5.1).

A table with information on detailed methodologies and on the tier method used by the Member States is given in Appendix 6 (Table A6.1).

3.1 Sectoral analysis and emission trends for 'energy production and distribution'

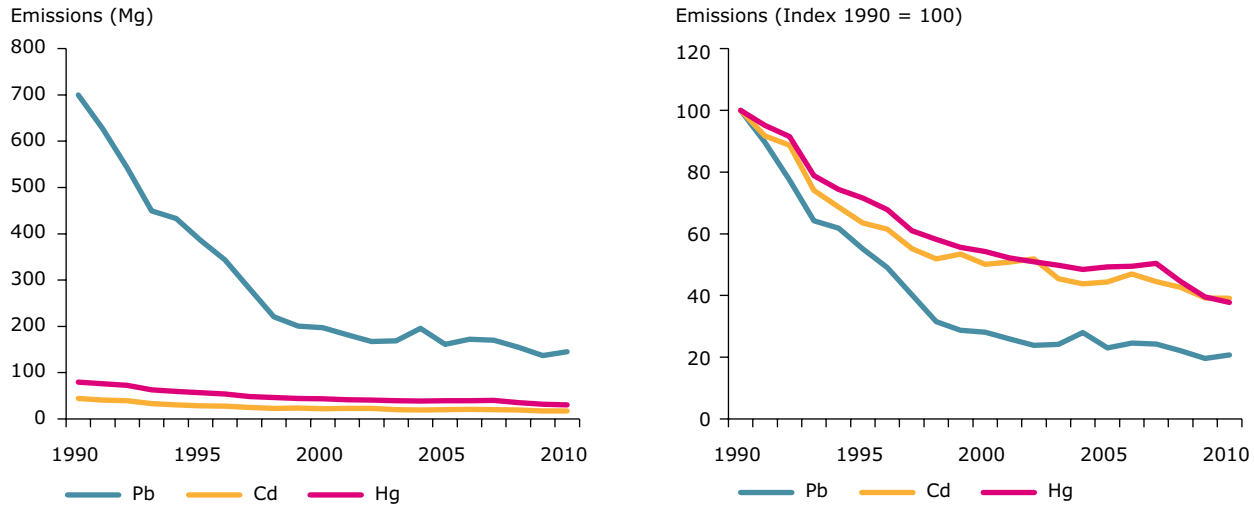
The 'energy production and distribution' sector grouping comprises emissions from a number of activities involving fuel combustion in order, for example, to produce energy products and electricity. It is an important source of many pollutants,

Figure 3.1 **EU-27 emission trends in the sector 'energy production and distribution' for NO_x, NMVOC, SO_x and CO in Gg between 1990 and 2010 (index year 1990 = 100), and for PM_{10} and $PM_{2.5}$ between 2000 and 2010 (index year 2000 = 100)**



Notes: For PM, data from some Member States could not be gap-filled as values were not reported for any years. To enable presentation of provisional emission trends, in these instances emissions have been aggregated without including data for all the EU-27 Member States.
Parties to the LRTAP Convention are formally requested to report emissions of PM only for the year 2000 and after.

Figure 3.2 **EU-27 emission trends in the sector group 'energy production and distribution' for the HMs Pb, Cd, Hg between 1990 and 2010 (index year 1990 = 100)**



Note: For the HMs, data for one or more Member States could not be gap-filled as values were not reported for any years. To enable presentation of provisional emission trends, in these instances emissions have been aggregated without including data for all the EU-27 Member States.

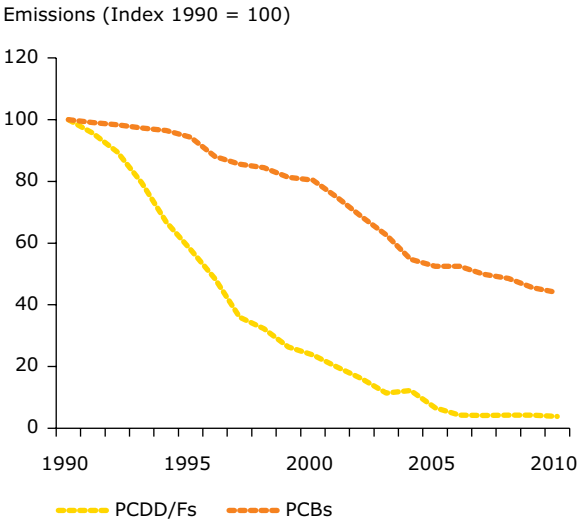
especially SO_X. Despite significant past reductions, this sector group still contributes 58 % of the total EU-27 emissions of this pollutant.

The sector is an important source for SO_X, Hg and NO_X. Poland, Bulgaria and Romania contributed most (in absolute terms) to the emissions of SO_X in this sector in the year 2010 (Appendix 4). For Hg, Poland and Germany reported the highest emissions. The United Kingdom, Germany and Poland contributed most to the emissions of NO_X.

For emissions of the main pollutants (Figure 3.1), the highest absolute and relative reduction (– 81 %) was for SO_X between 1990 and 2010. For PM_{10}, a notable relative reduction of more than 43 % has occurred within this sector group since 2000.

Of the three main HMs, lead shows the highest emission reduction in absolute and relative terms (– 79 %) (Figure 3.2). For emissions of POPs, the highest relative reduction occurred for PCDD/Fs (– 96 %) (Figure 3.3).

Figure 3.3 **EU-27 emission trends in the sector group 'energy production and distribution' for POPs (PCDD/Fs and PCBs) between 1990 and 2010 (index year 1990 = 100)**



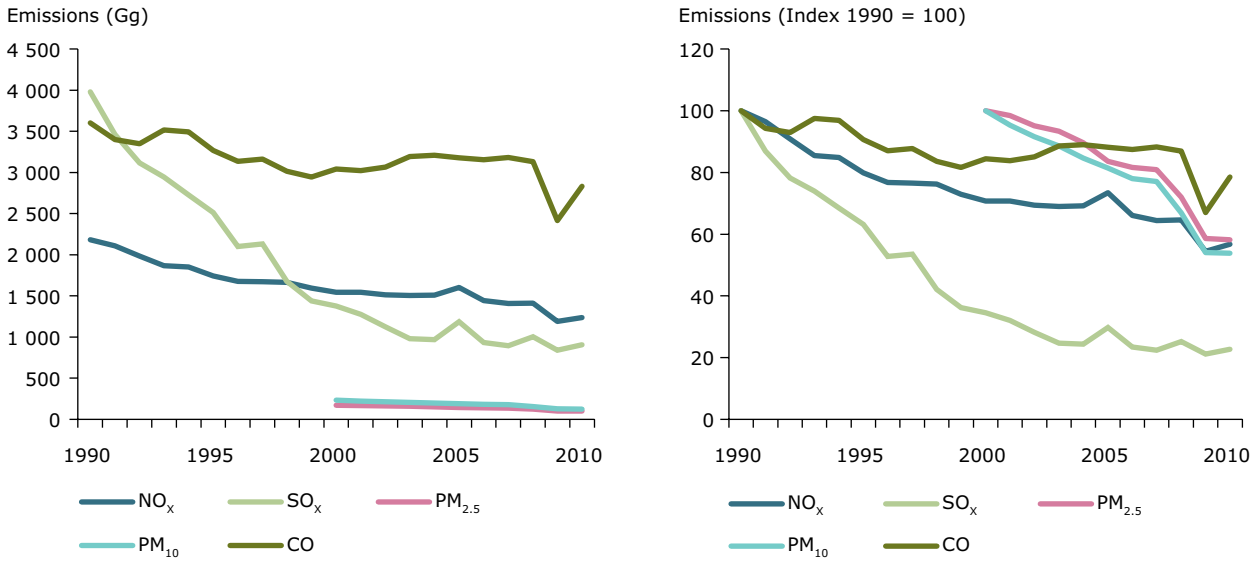
Note: For POPs, data from some Member States could not be gap-filled as values were not reported for any years. To enable presentation of provisional emission trends, in these instances emissions have been aggregated without including data for all the EU-27 Member States.

Table 3.1 Overview of methods and data used by Member States to calculate emissions from energy production and distribution

Member State	AD	EF	M
Austria	Energy balance, ETS data, Steam boiler data base, national studies, plant data	PS/CS	T2/T3
Belgium	Regional energy balances, annual industrial reports.	CS/D	T2
Bulgaria	National Statistic, Eurostat Energy Balance	D/CS	T1/T2
Cyprus	Plant data	D	T2
Denmark	Danish energy statistics	CS/PS	T2, T3
Estonia	Plant data, energy balance	D	T1, T3
Finland	National energy statistics	CS/PS	T2, T3
France	Plant data	CS, PS	T3
Germany	National energy statistics	CS	T2
Greece	Energy Balance, ETS data, public power corporation	PS	T2,T3
Ireland	Energy balance	D,PS	T2,T3
Italy	Energy Balance, national electricity producers, European Emissions Trading Scheme	D,CS	T2
Latvia	National energy statistics	D	T1
Lithuania	National energy statistics	D/CS	T1
Malta	Plant data, energy statistics	D	T1, T3
Netherlands	Plant data	PS	T3
Poland	Energy statistics, plant data	D/PS	T1, T3
Portugal	LPS survey, LCP survey, national report, national statistcs	D/CS	T2
Romania	Data from LCP Directive (Directive 2001/80/EC)	D	T1
Slovakia	Energy statistics, database	PS, D	T1, T3
Slovenia	Annual energy statistics	CS	T2
Spain	No information available		
Sweden	Quaterly fuel statistics	CS	T2, T3
United Kingdom	Plant data, energy statistics	CS	T3, T2

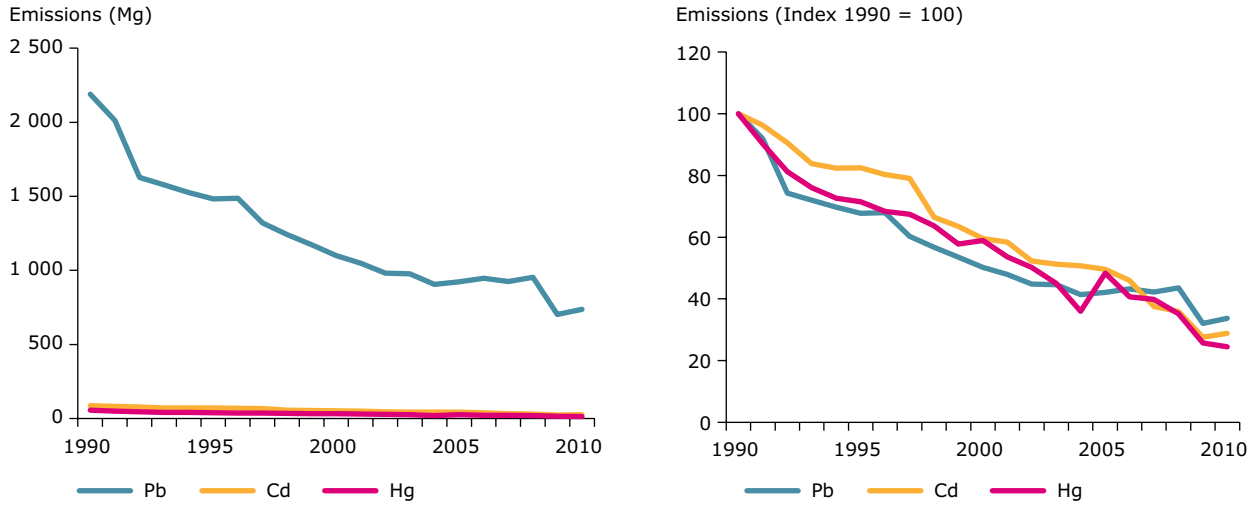
Notes: AD: activity data; EF: emission factor; M: method; CS: country specific; D: default value; PS: plant specific; T: tier method. Table 3.1 only provides an indication of the methods used on the aggregated sector level; for details, the respective IIR should be consulted. The level of detail concerning information on methods used varies widely across Member States. Member States that did not provide an IIR (Czech Republic, Hungary and Luxembourg) are not included in Table 3.1.

Figure 3.4 EU-27 emission trends in the sector group 'energy use in industry' for NO_x, SO_x and CO in Gg between 1990 and 2010 (index year 1990 = 100), and for PM_{10} and $PM_{2.5}$ between 2000 and 2010 (index year 2000 = 100)



Notes: For PM, data from some Member States could not be gap-filled as values were not reported for any years. To enable presentation of provisional emission trends, in these instances emissions have been aggregated without including data for all the EU-27 Member States.
Parties to the LRTAP Convention are formally requested to report emissions of PM only for the year 2000 and after.

Figure 3.5 **EU-27 emission trends in the sector group 'energy use in industry' for the HMs Pb, Cd, Hg between 1990 and 2010 (index year 1990 = 100)**



Note: For the HMs, data for one or more Member States could not be gap-filled as values were not reported for any years. To enable presentation of provisional emission trends, in these instances emissions have been aggregated without including data for all the EU-27 Member States.

3.2 Sectoral analysis and emission trends for 'energy use in industry'

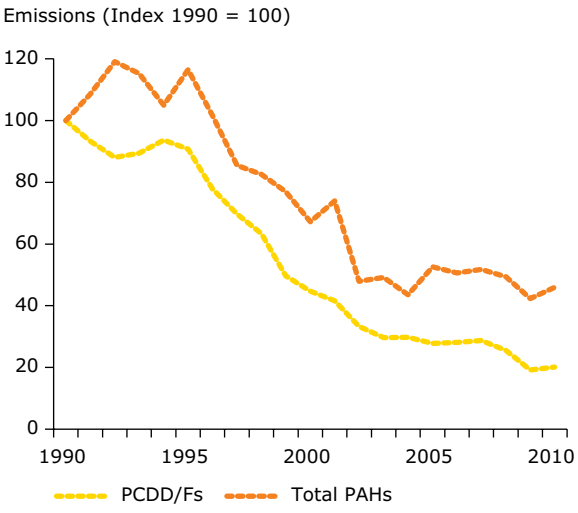
The 'energy use in industry' sector is an important source for lead and cadmium. Poland, Spain and Italy contributed most (in absolute terms) to the emissions of lead in this sector in the year 2010 (Appendix 4). Poland and Spain reported the highest emissions for cadmium.

Energy use (fuel combustion) in industry is an important source of many pollutants. For the main pollutants, the highest absolute and relative reduction (– 77 %) between 1990 and 2009 occurred for SO_X (Figure 3.4).

For the three HMs, lead shows the highest emission reduction in absolute terms (– 1 452 Mg, – 66 %) (Figure 3.5). Cadmium and mercury had similar reductions to lead in relative terms (– 71 % and – 76 %, respectively).

For POPs, only PCDD/Fs and total PAHs are important pollutants in the sector group 'energy use in industry'. Trends of these pollutants are given in Figure 3.6.

Figure 3.6 **EU-27 emission trends in the sector group 'energy use in industry' for the POPs (PCDD/Fs and total PAHs) between 1990 and 2009 (index year 1990 = 100)**



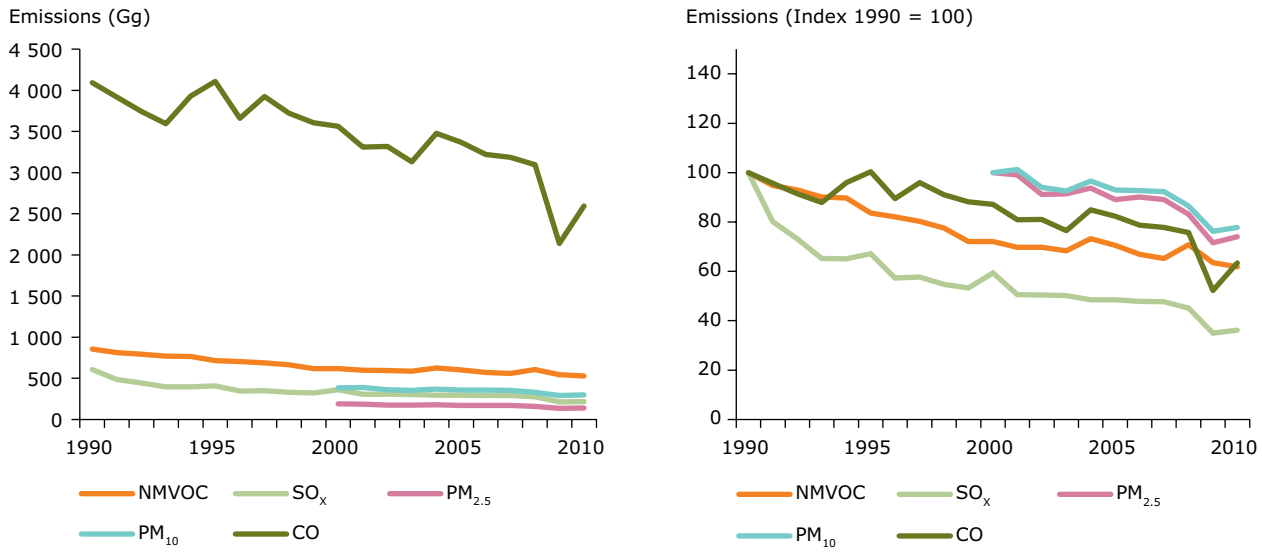
Notes: For POPs, data from some Member States could not be gap-filled as values were not reported for any years. To enable presentation of provisional emission trends, in these instances emissions have been aggregated without including data for all the EU-27 Member States

Table 3.2 Overview of methods and data used by Member States to calculate emissions from energy use in industry

Member State	AD	EF	M
Austria	Energy balance, ETS data, steam boiler data base, national studies, plant data	PS/CS	T2, T3
Belgium	Regional energy balances, plant data	CS/D	T1, T2
Bulgaria	National Statistic, Eurostat Energy Balance	D	T2
Cyprus	National statistics (questionnaires)	D	T1, T2
Denmark	Danish energy statistics	CS/PS	T2, T3
Estonia	Plant data, energy balance	D	T1
Finland	National energy statistics	CS/PS	T2, T3
France	Energy balance, survey, plant data	CS	T2, T3
Germany	National statistics (energy balance)	CS	T2
Greece	Energy balance	D	T1
Ireland	Energy balance	CS	T2
Italy	Energy balance	D/CS	T2
Latvia	National energy statistics	D	T1
Lithuania	National energy statistics	D/CS	T1
Malta	Energy statistics	D	T1
Netherlands	Plant data, energy statistics	CS/PS	T3
Poland	energy statistics	D/PS	T1, T3
Portugal	LPS, LCP, EPER/PCIP, energy balances	D/CS	T2, T3
Romania	Energy statistics, database	PS, D	T1, T3
Slovakia	Energy statistics, database	PS	T1, T3
Slovenia	National energy statistics	D	T1
Spain	No information provided		
Sweden	Plant data, national statistics	CS	T1, T2
United Kingdom	Plant data, energy statistics	CS	T1, T3

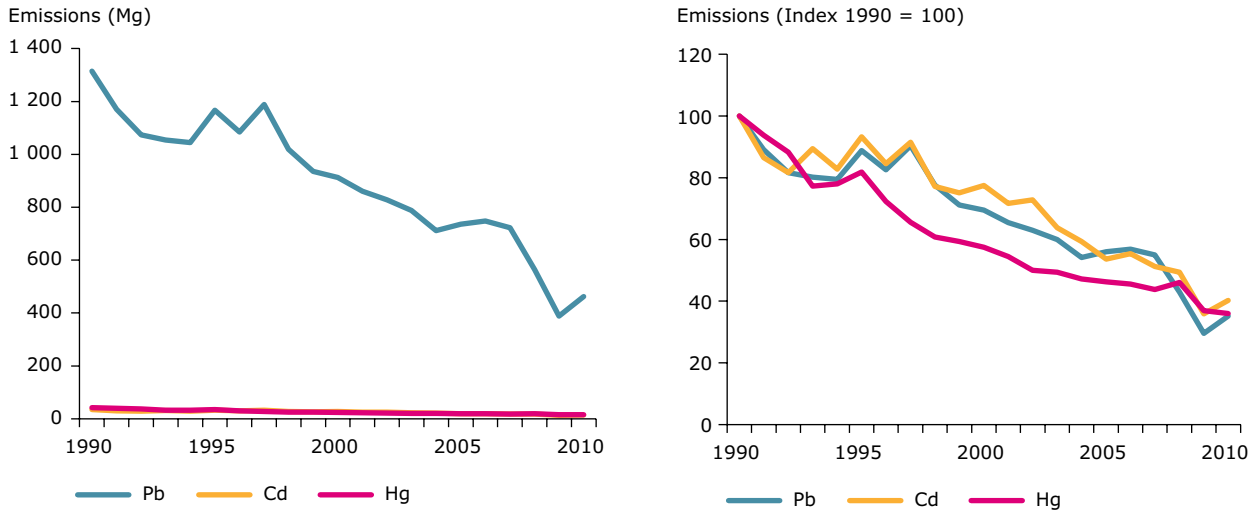
Notes: AD: activity data; EF: emission factor; M: method; CS: country specific; D: default value; PS: plant specific; T: tier method.
Table 3.2 only provides an indication of the methods used on the aggregated sector level; for details, the respective IIR should be consulted. The level of detail concerning information on methods used varies widely across Member States.
Member States that did not provide an IIR (Czech Republic, Hungary and Luxembourg) are not included in Table 3.2.

Figure 3.7 EU-27 emission trends in the sector group 'industrial processes' for NMVOC, SO_x and CO in Gg between 1990 and 2010 (index year 1990 = 100), for PM_{10} and $PM_{2.5}$ between 2000 and 2010 (index year 2000 = 100)



Notes: For PM, data from some Member States could not be gap-filled as values were not reported for any years. To enable presentation of provisional emission trends, in these instances emissions have been aggregated without including data for all the EU-27 Member States.
Parties to the LRTAP Convention are formally requested to report emissions of PM only for the year 2000 and after.

Figure 3.8 **EU-27 emission trends in the sector group 'industrial processes' for the HMs Pb, Cd, Hg between 1990 and 2010 (index year 1990 = 100)**



Note: For the HMs, data for one or more Member States could not be gap-filled as values were not reported for any years. To enable presentation of provisional emission trends, in these instances emissions have been aggregated without including data for all the EU-27 Member States.

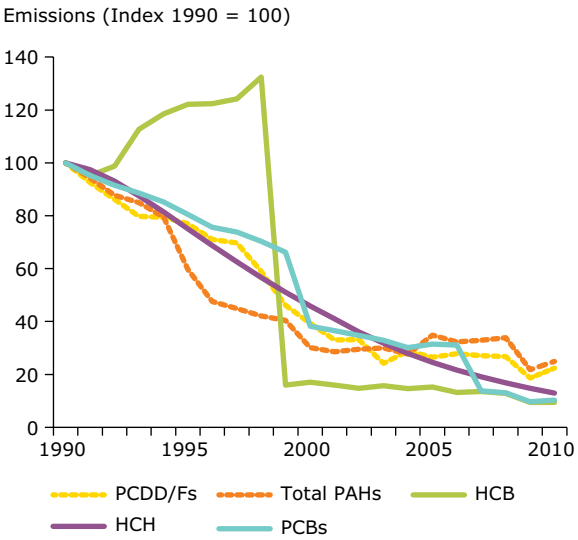
3.3 Sectoral analysis and emission trends for 'industrial processes'

The 'industrial processes' sector grouping refers to emissions from industrial sources other than those arising from fuel combustion within the industrial sector. This sector group is the most important sector for HCB and HCH emissions and makes important contributions to emissions of CO, PM, HMs and POPs. From all countries which reported data, Spain contributed most (in absolute terms) to the emissions of HCB in the 'industrial processes' sector in the year 2010 (Appendix 4). Past emission trends of the relevant main pollutants are shown in Figure 3.7.

Industrial processes make a significant contribution to the total EU-27 emissions of HMs, despite significant reductions since 1990. Past emission trends for these pollutants are shown in Figure 3.8. Lead shows the highest absolute and relative emission reduction between 1990 and 2010 (– 65 %).

For POPs, the highest relative reduction between 1990 and 2010 occurred for HCB (– 91 %), although the emission trend was far from consistent, increasing until 1998, then falling abruptly in 1999 and remaining fairly constant since (Figure 3.9). This significant change is mainly caused by a reported increase in HCB emissions from '2 C 3 — Aluminium production' in the United Kingdom until 1998. Subsequently, the country reported 'not applicable' for this category. Historically within the

Figure 3.9 **EU-27 emission trends in the sector group 'industrial processes' for the POPs (PCDD/Fs, total PAHs, HCB, HCH and PCBs) between 1990 and 2010 (index year 1990 = 100)**



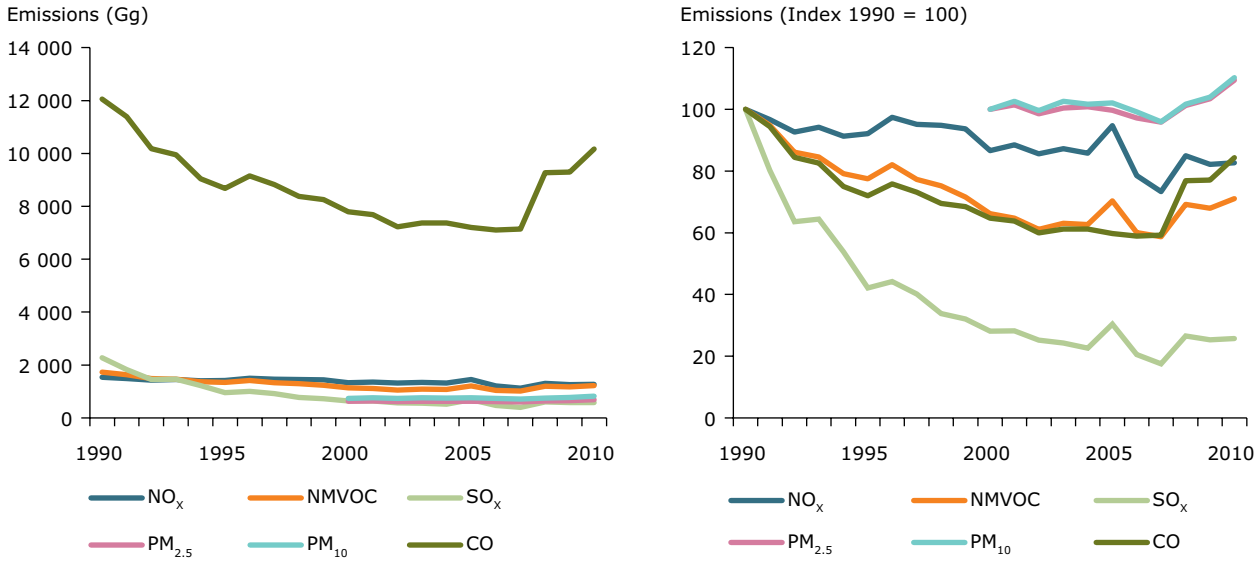
Notes: For POPs, data from some Member States could not be gap-filled as values were not reported for any years. To enable presentation of provisional emission trends, in these instances emissions have been aggregated without including data for all the EU-27 Member States.

Table 3.3 Overview of methods and data used by Member States to calculate emissions from industrial processes

Member State	AD	EF	M
Austria	National production statistics, Austrian foreign trade statistics, ETS, direct information from industry and associations	CS/PS	T2, T3
Belgium	Production figures, mainly directly originating from the industrial plant	PS/CS/D	T2, T3
Bulgaria	National production statistics, National registers (EPRTR and ET National studies),	D/CS	T2
Cyprus	National statistics, plant data	D	T1, T2
Denmark	Environmental Reports from plants, Statistics Denmark	PS/D	T1,T3
Estonia	Plant data, national statistics	D	T3, T2, T1
Finland	National and plant specific data	CS/PS	T2, T3
France	National production data, plant data	CS	T2, T3
Germany	National statistics	CS	T1, T2
Greece	Industrial production data	D	T1
Ireland	Industrial production data	PS/CS/D	T2,T3
Italy	National statistics and industrial associations, plant data	D/CS	T2
Latvia	National statistics, plant data	D	T1, T2
Lithuania	National production data, plant data	D	T1
Malta	Trade data, production data	D	T1
Netherlands	National statistics, environmental Reports from plants	PS/CS	T2
Poland	Official production statistics	D/PS	T1, T3
Portugal	Production data, plant data, energy balance		T1,T3
Romania	Production data	D/CS	T1, T2
Slovakia	Production data	D/CS	T1
Slovenia	National statistics, plant data	CS/PS	T2
Spain	No information provided		
Sweden	Production data	PS/CS/D	T2
United Kingdom	National statistics, production data	D/CS	T2

Notes: AD: activity data; EF: emission factor; M: method; CS: country specific; D: default value; PS: plant specific; T: tier method.
Table 3.3 only provides an indication of the methods used on the aggregated sector level; for details, the respective IIR should be consulted. The level of detail concerning information on methods used varies widely across Member States.
Member States that did not provide an IIR are not included (Czech Republic, Hungary and Luxembourg) in Table 3.3.

Figure 3.10 EU-27 emission trends in the sector group 'commercial, institutional and households' for NO_x, NMVOC, SO_x, and CO, in Gg between 1990 and 2010 (index year 1990 = 100), for PM_{10} and $PM_{2.5}$ between 2000 and 2010 (index year 2000 = 100)



Notes: For PM, data from some Member States could not be gap-filled as values were not reported for any years. To enable presentation of provisional emission trends, in these instances emissions have been aggregated without including data for all the EU-27 Member States.
Parties to the LRTAP Convention are formally requested to report emissions of PM only for the year 2000 and after.
The increase of CO in the years from 2008 to 2010 occured in consequence of the gap filling procedure.

United Kingdom, hexachloroethane (HCE) has been used as a cover gas within the secondary aluminium industry. The nature of how HCE is manufactured meant that it was contaminated with HCB and pentachlorobenzene. Van der Most (1992) quotes the emission factor for HCB within HCE as 5 g/t of HCE used. In 1999, the use of HCE for this application was banned within the United Kingdom, causing the resulting emissions to cease.

A similar high reduction was observed for PCB emissions (– 90 %).

3.4 Sectoral analysis and emission trends for 'commercial, institutional and households'

As indicated earlier in Chapter 2, emissions arising from fuel combustion by commercial and institutional facilities and households make a significant contribution to total emissions of many pollutants.

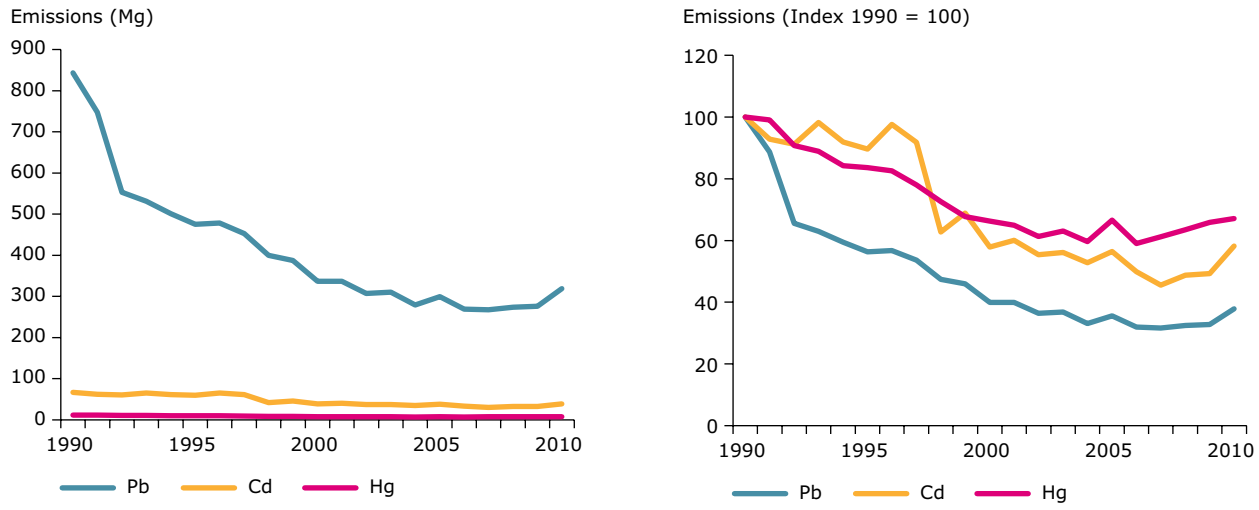
The 'commercial, institutional and households' sector is an important source for PAHs, $PM_{2.5}$, PM_{10} and CO. Germany and Poland contributed most (in absolute terms) to the emissions of total PAHs in this sector in the year 2010 (Appendix 4,). For $PM_{2.5}$, France and Romania, and for PM_{10}, Poland, France and Romania, reported the highest emissions. Poland, France and Germany contributed most to the emissions of CO.

For the main pollutants, the highest relative reduction between 1990 and 2010 for the sector grouping again occurred for SO_X (– 74 %). In contrast, PM emissions have changed little since 2000 (Figure 3.10). The increase of CO in the years from 2008 to 2010 is due to the agreed gap filling procedures, where the sectoral data submitted by Poland in earlier years are not taken into account as national totals for CO were submitted in 2012 via CRF reporting. Therefore, the increase seen for CO does not correspond to a real emission increase. In order to avoid this inconsistency in the future, a review of current gapfilling procedures is added to the improvement plan (see Section 4.2.1).

Of the three HMs in the sector 'commercial, institutional and households', Pb shows the highest emission reduction in absolute and relative terms (– 62 %) (Figure 3.11).

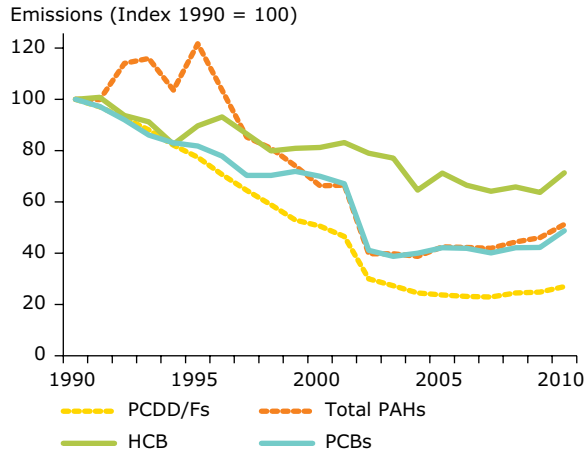
For POPs relevant to the 'commercial, institutional and households' sector, the highest relative reduction occurred for PCDD/Fs (– 73 %) (Figure 3.12).

Figure 3.11 EU-27 emission trends in the sector group 'commercial, institutional and households' for the HMs Pb, Cd, Hg between 1990 and 2010 (index year 1990 = 100)



Note: For the HMs, data for one or more Member States could not be gap-filled as values were not reported for any years. To enable presentation of provisional emission trends, in these instances emissions have been aggregated without including data for all the EU-27 Member States.

Figure 3.12 **EU-27 emission trends in the sector group 'commercial, institutional and households' for POPs (PCDD/Fs, total PAHs, HCB and PCBs) between 1990 and 2010 (index year 1990 = 100)**



Notes: For POPs, data from some Member States could not be gap-filled as values were not reported for any years. To enable presentation of provisional emission trends, in these instances emissions have been aggregated without including data for all the EU-27 Member States.

3.5 Sectoral analysis and emission trends for 'road transport'

As noted earlier, together, the individual NFR sources that make up the 'road transport' sector group contribute significantly to emissions of a number of pollutants, including NO_X, NMVOC, CO, $PM_{2.5}$, PM_{10} and certain POPs. Figure 3.13 shows the past emission trends for these pollutants in this sector.

France, Germany and Italy contributed most (in absolute terms) to the emissions of NO_X in the road transport sector in the year 2010 (Appendix 4). For CO, Italy, Germany and the United Kingdom reported the highest emissions.

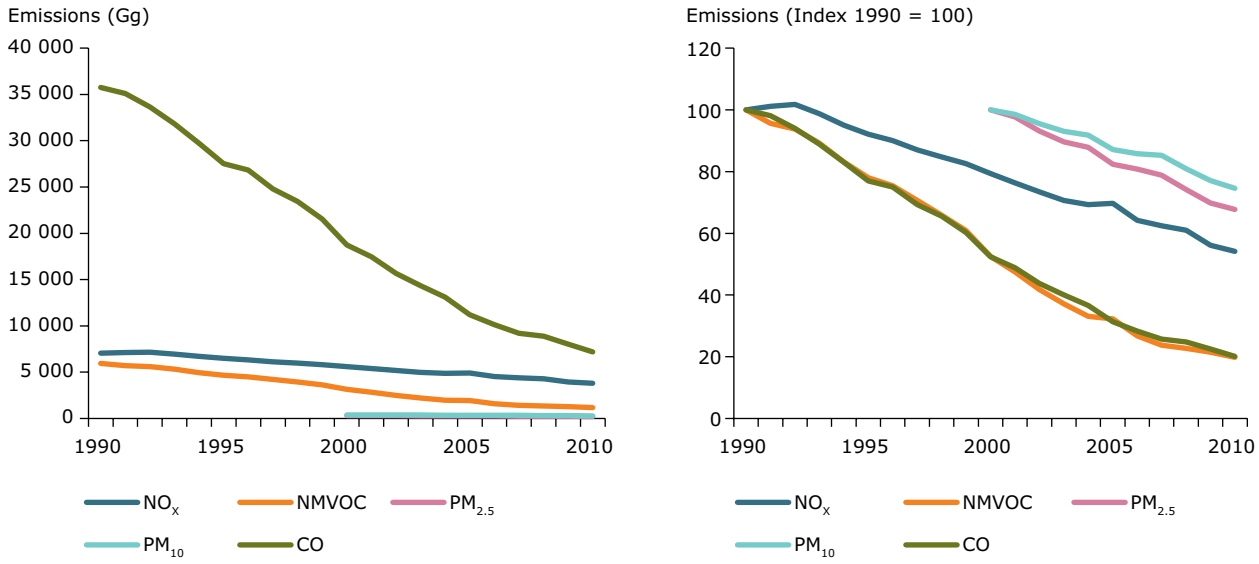
For the 'road transport' sector, the main HM is Pb, showing a high relative emission reduction (– 99 %) between 1990 and 2010 (Figure 3.14). However, over the past years, little progress has been made in reducing emissions further; total emissions of Pb have remained largely constant. The promotion of unleaded petrol within the EU and in other EEA member countries through a combination of fiscal and regulatory measures has been a particular

Table 3.4 **Overview of methods and data used by Member States to calculate emissions from commercial, institutional and household combustion**

Member State	AD	EF	M
Austria	Energy balance, ETS data, Steam boiler data base, national studies, plant data	CS	T2
Belgium	Regional energy balances	D/CS	T2
Bulgaria	National Statistic	D	T1
Cyprus	Energy balance	D	T1
Denmark	Danish energy statistics	CS/D	T2
Estonia	Energy Balance	D	T1
Finland	National energy statistics	CS	T2
France	National statistics	D/CS	T2
Germany	National statistics	CS	T1, T2, T3
Greece	Energy balance	D	T1
Ireland	Energy balance	CS	T2
Italy	Energy balance	D	T1,T2
Latvia	National energy statistics	D	T1
Lithuania	National energy statistics	D/CS	T1
Malta	Energy statistics	D	T1
Netherlands	Energy statistics	CS	T2, T3
Poland	Energy statistics,emission data from plants	D/CS	T1, T3
Portugal	Energy balances	D/CS	T2
Romania	National statistics	D	T1
Slovakia	Energy statistics, database	PS	T1, T3
Slovenia	Statistical Yearbook of Electricity Generating Industries	D	T1
Spain	No information provided		
Sweden	National statistics	CS	T1, T2
United Kingdom	Fuel consumption statistics	D/CS	T2

Notes: AD: activity data; EF: emission factor; M: method; CS: country specific; D: default value; PS: plant specific; T: tier method. Table 3.4 only provides an indication of the methods used on the aggregated sector level; for details, the respective IIR should be consulted. The level of detail concerning information on methods used varies widely across Member States. Member States that did not provide an IIR (Czech Republic, Hungary and Luxembourg) are not included in Table 3.4.

Figure 3.13 **EU-27 emission trends in the sector group 'road transport' for NO_x, NMVOC and CO in Gg between 1990 and 2010 (index year 1990 = 100), for PM_{10} and $PM_{2.5}$ between 2000 and 2010 (index year 2000 = 100)**

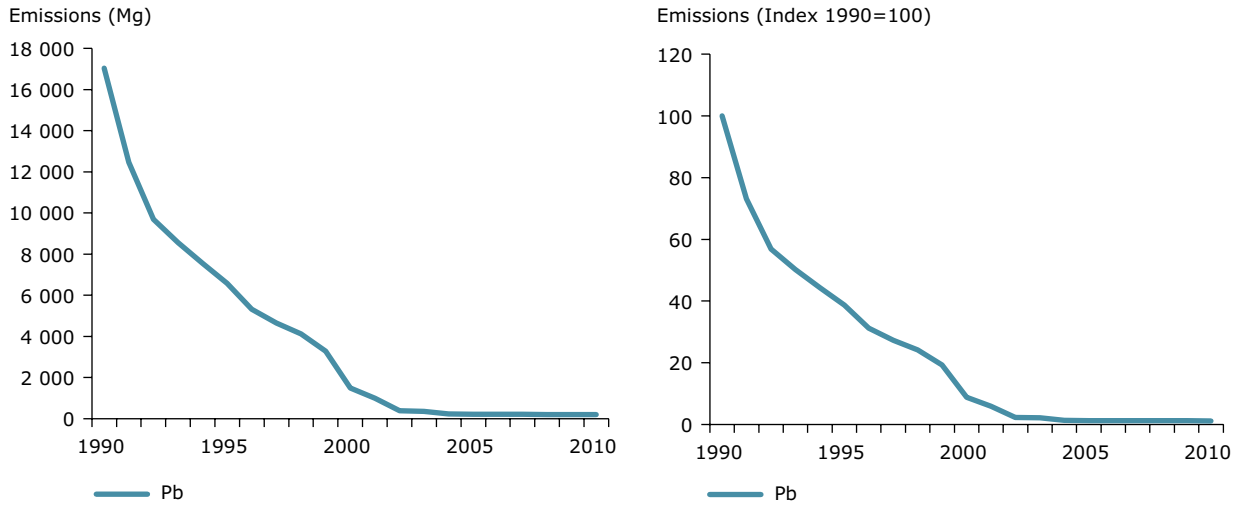


Notes: For PM, data from some Member States could not be gap-filled, as values were not reported for any years. To enable presentation of provisional emission trends, in these instances emissions have been aggregated without including data for all the EU-27 Member States.
Parties to the LRTAP Convention are formally requested to report emissions of PM only for the year 2000 and after.

success story. EU Member States have, for example, completely phased out the use of leaded petrol, a goal that was regulated by Directive 98/70/EC (EC, 1998). Nevertheless, the road transport sector remains an important source of Pb, contributing around 10 % of total Pb emissions in the EU-27.

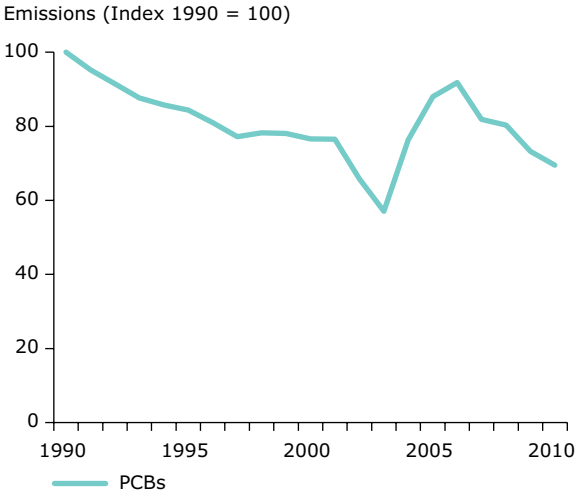
Of the POPs, PCBs are the most important in the 'road transport' sector group. Trends of past emissions for these pollutants are shown in Figure 3.15. Only a few countries (Czech Republic, Hungary, Finland, Lithuania, Poland and Slovakia) report PCB emission values. The emission decrease in the years 2001 to 2003 is due to a reported decrease by several Member States (Czech Republic, Lithuania, Poland and Slovakia). Subsequent emission increases are reported mainly by Lithuania, Czech Republic and Slovakia.

Figure 3.14 **EU-27 emission trends in the sector group 'road transport' for the priority HM Pb between 1990 and 2010 (index year 1990 = 100)**



Note: For lead, data for one or more Member States could not be gap-filled as values were not reported for any years. To enable presentation of provisional emission trends, in these instances emissions have been aggregated without including data for all the EU-27 Member States.

Figure 3.15 **EU-27 emission trends in the sector group 'road transport' for PCBs between 1990 and 2010 (index year 1990 = 100)**



Note: For POPs, data from some Member States could not be gap-filled as values were not reported for any years. To enable presentation of provisional emission trends, in these instances emissions have been aggregated without including data for all the EU-27 Member States.

Table 3.5 Overview of methods and data used by Member States to calculate emissions from road transport

Member State	AD	M
Austria	Energy balance	ARTEMIS, v2.1
Belgium	Regional energy balances	COPERT 4 (tier 3 methodology)
Bulgaria	Energy balance, Statistics vehicle fleet	COPERT 4
Cyprus	National statistics	COPERT 4 (tier 3 methodology)
Denmark	Transport and Statistics Denmark	COPERT 4 (tier 3 methodology)
Estonia	Estonian Road Administration, Statistics Estonia	COPERT 4 (tier 3 methodology)
Finland	National statistics	LIISA (sub-model of LIPASTO)
France	National statistics	COPERT 4 (tier 3 methodology)
Germany	National statistics	TREMOD, v5.03
Greece	Number and type of vehicles, fuel consumption	COPERT 4
Ireland	Energy balance	COPERT 4
Italy	Energy balance	COPERT 4
Latvia	National statistics	COPERT 4
Lithuania	National statistics	COPERT 4
Malta	National statistics	Customised model (basic tier 3 methodology)
Netherlands	National statistics	VERSIT+
Poland	Motor Transport Institute with estimations based on energy statistics	Country specific model
Portugal	Energy balances, road statistics	COPERT 4
Romania	Car registry, fuel statistics	COPERT 3
Slovakia	Fuel consumption statistics	COPERT 4
Slovenia	National statistics	COPERT 4
Spain	No information provided	
Sweden	National statistics	HBEFA 3.1 (tier 2), tier 1 for SO_X
United Kingdom	National statistics	COPERT 4

Notes: AD: activity data; M: method;
Table 3.5 only provides an indication of the methods used on the aggregated sector level; for details, the respective IIR should be consulted. The level of detail concerning information on methods used varies widely across Member States.
Member States that did not provide an IIR are not included (Czech Republic, Hungary and Luxembourg) in Table 3.5.

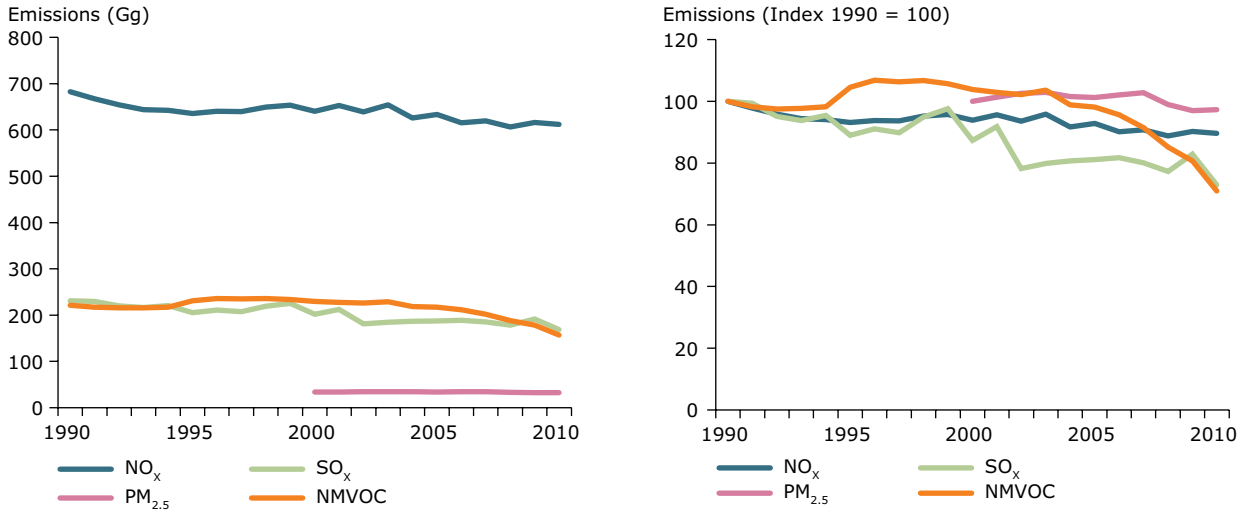
3.6 Sectoral analysis and emission trends for 'non-road transport'

NO_X is an important pollutant in the 'non-road transport' sector group. Spain and Italy contributed most (in absolute terms) to the emissions of NO_X in the year 2010 (Appendix 4).

Little progress has been made since 1990 in reducing emissions from NO_X (Figure 3.16). For the main pollutants, the highest relative reduction between 1990 and 2010 occurred for NMVOC (– 29 %).

The 'non-road transport' sector group does not contribute a great deal to emissions of HMs and POPs. Trends of pollutants from these two groups of substances are therefore not shown.

Figure 3.16 **EU-27 emission trends in the sector group 'non-road transport' for NO_x, NMVOC and SO_x in Gg between 1990 and 2010 (index year 1990 = 100), for $PM_{2.5}$ between 2000 and 2010 (index year 2000 = 100)**



Notes: For PM, data from some Member States could not be gap-filled as values were not reported for any years. To enable presentation of provisional emission trends, in these instances emissions have been aggregated without including data for all the EU-27 Member States.
Parties to the LRTAP Convention are formally requested to report emissions of PM only for the year 2000 and after.

Table 3.6 **Overview of methods and data used by Member States to calculate emissions from non-road transport**

Member State	AD	EF	M
Austria	Energy balance	CS	T2, T3
Belgium	Regional energy balances, airport data	D/CS	T2
Bulgaria	Eurostat energy, balance	CS/D	T1
Cyprus	National statistics	D	T2
Denmark	Danish Civil Aviation Agency, ferry data, energy statistics from DEA	D/CS	T1, T2
Estonia	Aviation fuel sale statistics, energy statistics	D	T1, T2
Finland	National statistics	CS	T3
France	French Civil Aviation Authority	D/CS	T3
Germany	National statistics	D/CS	T1, T2, T3
Greece	Civil Aviation Organization	D	IPCC Tier 2a
Ireland	Irish Aviation Authority, fuel consumption data	D	T3a
Italy	Italian Civil Aviation Authority, energy balance	Not specified	Not specified
Latvia	National statistics	D	T1, T2
Lithuania	National statistics	D/CS	T1
Malta	Aviation statistics	D	T1
Netherlands	National statistics	CS	T2 (railways), T3 (aviation, navigation)
Poland	Eurostat database, Energy statistics, Statistical Yearbook	CS (IST survey)	T2
Portugal	Energy balances, road statistics	Not specified	T1, T2b, T3
Romania	National statistics	D	T1
Slovakia	Not explained		
Slovenia	Energy statistics	D	T1
Spain	No information provided		
Sweden	National statistics	D/CS	T1, T2, T2a
United Kingdom	Transport statistics	CS	T3

Notes: AD: activity data; EF: emission factor; M: method; CS: country specific; D: default value; T: tier method.
Table 3.6 only provides an indication of the methods used on the aggregated sector level; for details, the respective IIR should be consulted. The level of detail concerning information on methods used varies widely across Member States.
Member States that did not provide an IIR are not included (Czech Republic, Hungary and Luxembourg) in Table 3.6.

3.7 Sectoral analysis and emission trends for 'solvent and product use'

The only significant emissions from this sector group are NMVOC. Germany, Spain and Italy contributed most (in absolute terms) to the emissions of NMVOC in the year 2010 (Appendix 4,).

Between 1990 and 2009, NMVOC emissions decreased by – 37 % in the EU-27 (Figure 3.17).

Figure 3.17 EU-27 emission trends in the sector group 'solvent and product use' NMVOC in Gg between 1990 and 2010 (index year 1990 = 100)

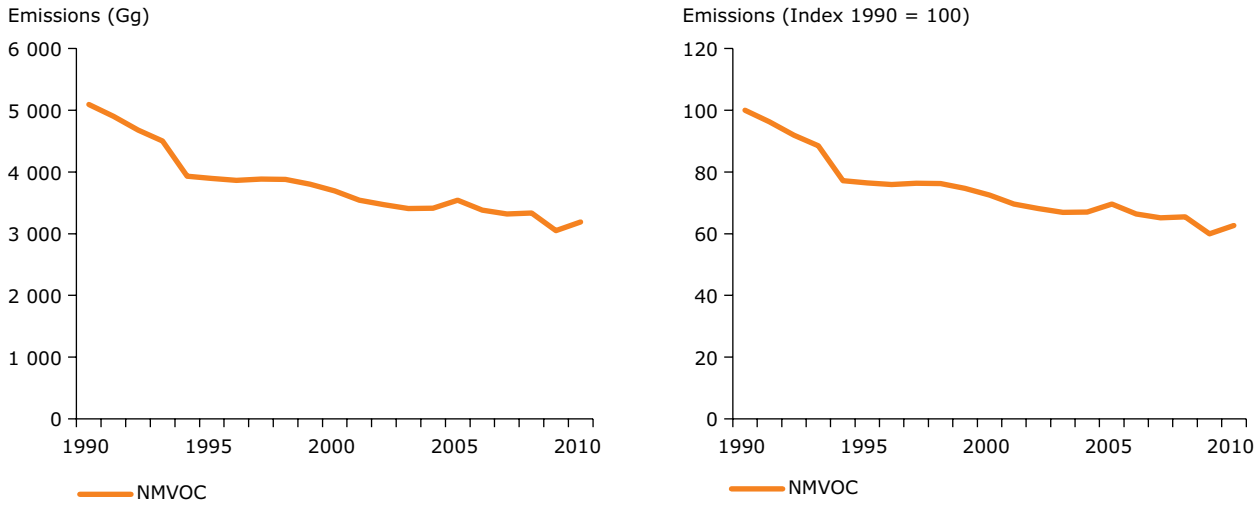
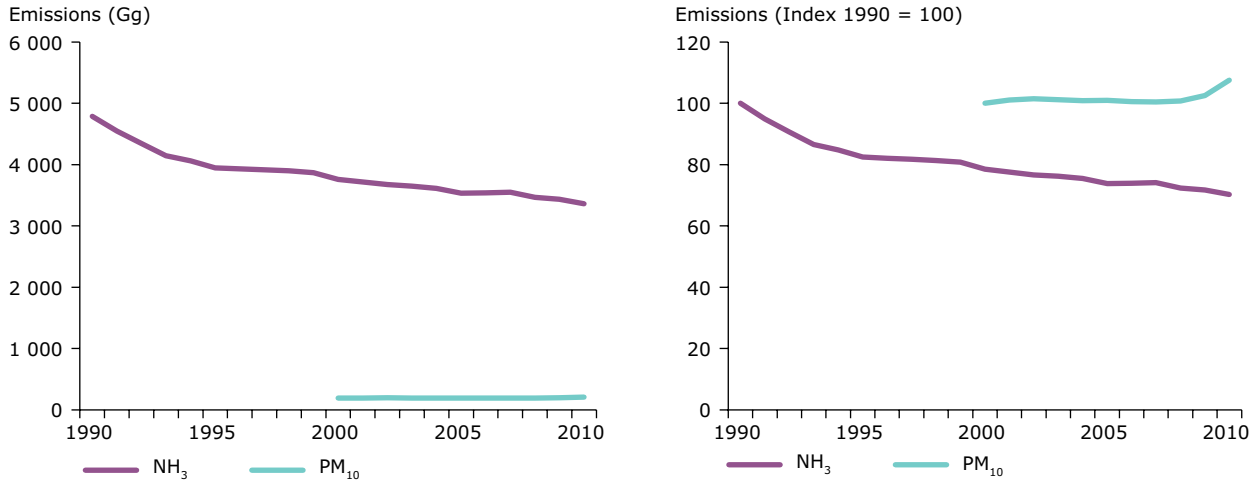


Table 3.7 Overview of methods and data used by Member States to calculate emissions from solvents

Member State	AD	EF	M
Austria	Statistics for trade & services, foreign trade statistics, Structural business statistics, surveys	CS	T2
Belgium	National studies	CS	T3
Bulgaria	National production statistics National VOC register	D	T1
Cyprus	National statistics	D	T2
Denmark	Nordic SPIN (Substances in Preparations in Nordic Countries) database	CS	T2
Estonia	Web-based air emissions data system for point sources (OSIS), Statistics Estonia	D	T1
Finland	Plant data, sales data	PS, CS	T1,T2
France	Plant data	D/CS	T1,T2
Germany	Foreign trade statistics, industry statistics	CS	T2
Greece	National statistics	D	T1
Ireland	Sales statistics, national statistics	D, PS	T1,T3
Italy	Industry data, international statistics	D, CS	T1
Latvia	National statistics, expert judgement	D	T1 (1990–2001), T2 (2002–2010)
Lithuania	National statistics	D	T1
Malta	Trade data	D	T1
Netherlands	National paint sales statistics, paint imports	CS	T2
Poland	Official production statistics	D/CS	
Portugal	Production data, industrial survey	D	T1
Romania	Statistics	D	T1, T2
Slovakia	Production and trade data	CS (literature)	T1
Slovenia	National statistics	D	T1
Spain	No information provided		
Sweden	National statistics	CS	T2
United Kingdom	Solvent consumption data	CS	T2

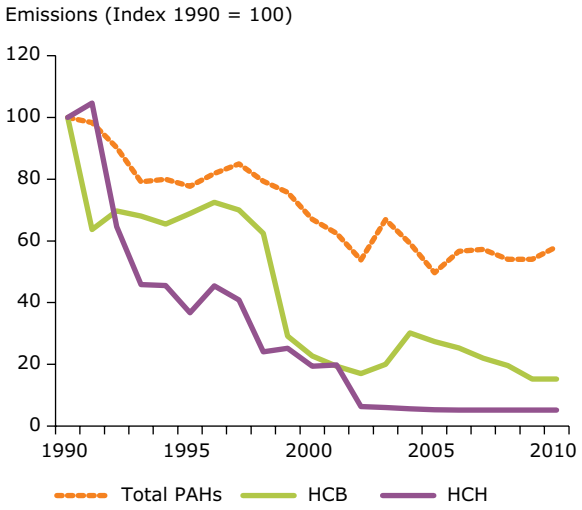
Notes: AD: activity data; EF: emission factor; M: method; CS: country specific; D: default value; PS: plant specific; T: tier method. Table 3.7 only provides an indication of the methods used on the aggregated sector level; for details, the respective IIR should be consulted. The level of detail concerning information on methods used varies widely across Member States. Member States that did not provide an IIR are not included (Czech Republic, Hungary and Luxembourg) in Table 3.7.

Figure 3.18 **EU-27 emission trends in the sector group 'agriculture' for NH_3 in Gg between 1990 and 2010 (index year 1990 = 100), for PM_{10} between 2000 and 2010 (index year 2000 = 100)**



Notes: For PM, data from some Member States could not be gap-filled as values were not reported for any years. To enable presentation of provisional emission trends, in these instances emissions have been aggregated without including data for all the EU-27 Member States.
Parties to the LRTAP Convention are formally requested to report emissions of PM only for the year 2000 and after.

Figure 3.19 **EU-27 emission trends in the sector group 'agriculture' for POPs (total PAHs, HCB and HCH) between 1990 and 2010 (index year 1990 = 100)**



Note: For POPs, data from some Member States could not be gap-filled as values were not reported for any years. To enable presentation of provisional emission trends, in these instances emissions have been aggregated without including data for all the EU-27 Member States.

3.8 Sectoral analysis and emission trends for 'agriculture'

As noted earlier, the agriculture sector group is particularly important in terms of its being responsible for the vast majority of NH_3 emissions in the EU-27. France and Germany contributed most (in absolute terms) to the emissions of NH_3 in the year 2010 (Appendix 4).

Agricultural emissions of NH_3 have decreased by – 30 % since 1990 (Figure 3.18). The sector also contributes around 11 % of PM_{10} emissions. Emissions of PM_{10} increased between 2000 and 2010 by 8 %.

The 'agriculture' sector group does not contribute significantly to emissions of HMs.

For the POPs, this sector contributes significantly to emissions of HCH, PAHs and HCB. Trends of past emissions for these pollutants are shown in Figure 3.19.

Table 3.8 Overview of methods and data used by Member States to calculate emissions from agriculture

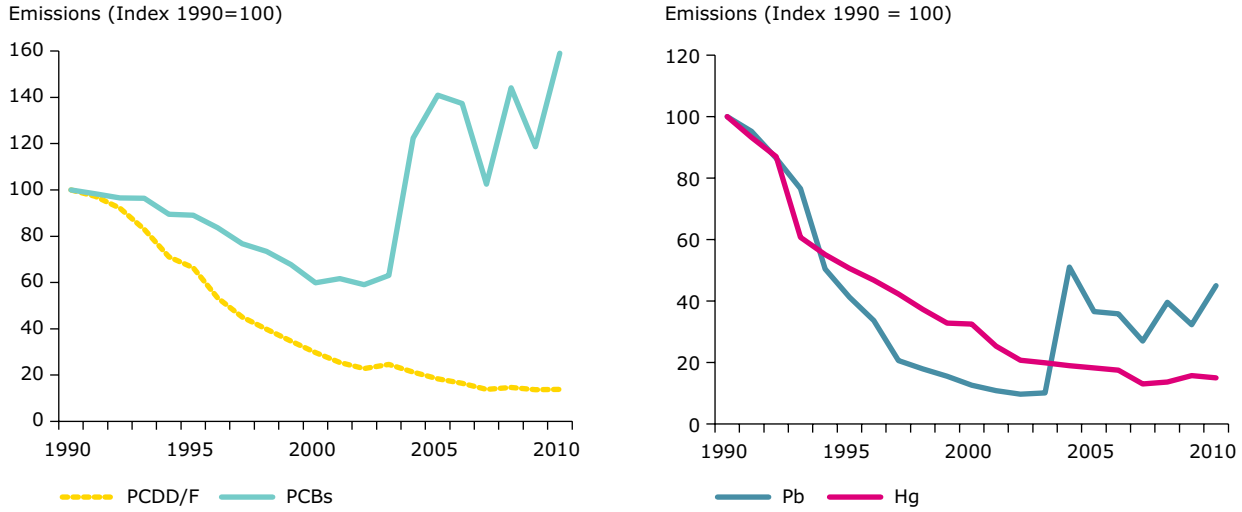
Member State	AD	EF	M
Austria	National agricultural statistics, national report, national studies, direct information from agricultural association	CS/D	T1
Belgium	National Institute of Statistics (survey of farms)	CS	T2, T3
Bulgaria	National agriculture statistics	D	
Cyprus	National statistics	D	T1
Denmark	Statistics Denmark	CS	T2
Estonia	National statistics	D	T1
Finland	National statistics	CS	T3
France	Agricultural statistics	CS	T2
Germany	National and regional statistics	D/CS	T1, T2, T3
Greece	National statistics, fertiliser production data	D	T1
Ireland	National studies, national statistics	D, CS	T2 (NH_3), T1 (NMVOC)
Italy	National statistics	D	T1 (4B), T1/2 (4D)
Latvia	National statistics	D/CS	T2
Lithuania	National statistics	D	T1
Malta	National statistics, trade statistics	D	T1, T2 (for 4D)
Netherlands	National statistics	D/CS	T2, T3
Poland	Statistical yearbooks	D/PS	T1
Portugal	Agricultural statistics, production statistics	D/CS	T1, T2
Romania	Agricultural statistics	D	T1
Slovakia	National statistics, census, national report	D	T1
Slovenia	National statistics	D/CS	T2 (4B), T1 (4D)
Spain	No information provided		
Sweden	National statistics, field investigation	D/CS	T2
United Kingdom	Census statistics, literature	CS	T2, T3 (model)

Notes: AD: activity data; EF: emission factor; M: method; CS: country specific; D: default value; PS: plant specific; T: tier method. Table 3.8 only provides an indication of the methods used on the aggregated sector level; for details, the respective IIR should be consulted. The level of detail concerning information on methods used varies widely across Member States. Member States that did not provide an IIR are not included (Czech Republic, Hungary and Luxembourg) in Table 3.8.

3.9 Sectoral analysis and emission trends for 'waste'

The 'waste' sector group is an important source of certain pollutants, including PCBs, PCDD/Fs, Pb and Hg. Figure 3.20 shows the past emission trends for PCBs and dioxin. The trend of PCB emissions is dominated by emissions reported by Portugal, the interannual variations follow the quantities of combusted industrial waste in Portugal.

Figure 3.20 EU-27 emission trends in the sector group 'waste' for POPs (PCDD/F and PCBs) and the HMs Pb and Hg between 1990 and 2010 (index year 1990 = 100)



Notes: The Pb, Hg and POPs data from some Member States could not be gap-filled as values were not reported for any years. To enable presentation of provisional emission trends, in these instances emissions have been aggregated without including data for all the EU-27 Member States.
The interannual variation is mainly of PCBs due to emission data reported by Portugal.

Table 3.9 Overview of methods and data used by Member States to calculate emissions from waste

Member State	AD	EF	M
Austria	National reports, national Database on landfill	CS	T2
Belgium	Plant data, national statistics	CS	T2
Bulgaria	National statistics, National studies	D	T1
Cyprus	National statistics	D	T1, T2
Denmark	National statistics	D	T1
Estonia	Statistics Estonia, Estonian Rescue Service and waste management system	D	T1
Finland	National statistics	CS	T2 (IPCC)
France	National waste statistics	D/CS	T1, T2
Germany	National statistics	D/CS	T1
Greece	National statistics	D	T1
Ireland	National waste reports, plant data	CS, D	T2
Italy	National waste cadastre	D	T2 (IPCC)
Latvia	National statistics	D/CS	T2
Lithuania	Not estimated		
Malta	Plant data		T3
Netherlands	National statistics	CS	T2
Poland	National statistics, domestic case study, branch information	D/CS	T1
Portugal	Waste statistics	D	T2
Romania	National waste database	D	T1, T2
Slovakia	National waste database	D/CS	T1
Slovenia	National statistics	D	T2 (IPCC)
Spain	No information provided		
Sweden	National statistics	D/CS	T1, T2
United Kingdom	Plant data, literature	CS, PS	T1, T3

Notes: AD: activity data; EF: emission factor; M: method; CS: country specific; D: default value; PS: plant specific; T: tier method. Table 3.9 only provides an indication of the methods used on the aggregated sector level; for details, the respective IIR should be consulted. The level of detail concerning information on methods used varies widely across Member States. Member States that did not provide an IIR are not included (Czech Republic, Hungary and Luxembourg) in Table 3.9.

4 Recalculations and planned improvements

4.1 Recalculations

Recalculations are changes made to past emission estimates (for one or more years) in order to eliminate errors or to incorporate additional factors or data. The EMEP/EEA guidebook (EMEP/EEA, 2009) stipulates that from a country perspective, it is considered good practice to change or refine data and/or methods when:

- available data have changed;
- the previously used method is not consistent with good practice for a certain category;
- an emissions source category has become a key category;
- the previously used method is inadequate to reflect mitigation activities in a transparent manner;
- the capacity (resources) for inventory preparation has increased;
- new inventory methods become available;
- the correction of errors is necessary.

It is important and necessary to identify inventory recalculations and to understand their origin in order to evaluate officially reported emissions data properly. The reason for Member States reporting different numbers in one year compared to an earlier year is often not documented.

Table 4.1 show a comparison of EU-27 total emissions submitted in 2011 and 2012. It should be noted that for some Member States, the recalculations might reflect changes in compilation methods (gap-filling) rather than 'true' recalculations performed by the countries themselves.

The high recalculations for HCH are due to new information available from Germany, which states that after 1998 no Lindane was used anymore.

So, emissions are not applicable and shall not be gap-filled as done in the last year report.

The major recalculations undertaken by Bulgaria are the result of a project to improve the 2012 submission under UNECE/CLRTAP and to reduce the differences with the UNFCCC report. The emissions from the transportsector and sub-sector 1A4b i 'Residential: Stationary plants' are recalculated for the entire time-series (1990–2009), based on activity data provided by Eurostat Energy Balance (Bulgaria's IIR, p. 32).

France's major CO recalculations in the industrial processes sector are attributable to updates of the energy balance and certain emission factors (France's IIR).

Recalculations were undertaken in Germany for the following reasons: 'revision of activity data — especially NFR 1.A due to revised National energy balance 2009, 1.A.3.b (mileage); 1.A.3.e (switch to ETS data), revision of entire model — for example: 1.A.3.b-d, NFR 4; newly available EF — for example: several HMs in 1.A.1, 1.A.3.d ii; revision of emission factors — for example: 1.A.2.f ii and 1.A.3.d ii (EF from TREMOD); reallocation of activity data and emissions — for example: from 1.A.2.f i to 1.A.2.a; revision of emission factors in 1.A.3.d i and 1.A.4.c iii (EF(HM) from 2009 EMEP EEA GB); deletion of NMVOC emissions from NFR 4' (Germany's IIR, Section 11.1).

Greece made recalculations of the whole time-series (1987–2009) of the road transport sector with more accurate and up-to-date input data and with equal methodological approach (COPERT IV version 7.1) (Greece's IIR, p. 8).

For Lithuania, a 'New COPERT 8.1 version for road transport emissions was applied, activity data have been corrected, and the sulphur/lead content in fuels was estimated.. This resulted in the recalculation of emissions from 1990–2010' (Lithuania's IIR, p. 17).

Romania notes the following concerning its recalculations: 'Notable differences from the last

Table 4.1 Comparison of data submitted for 2010 and 2011 by the Member States (relative data, EU-27 national total)

Pollutant	Unit	1990	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
NO_X	Gg	2 %	1 %	0 %	0 %	0 %	0 %	0 %	0 %	– 1 %	– 1 %	– 1 %	– 1 %
NMVOCs	Gg	– 2 %	– 3 %	– 3 %	– 3 %	– 6 %	– 7 %	– 7 %	– 4 %	– 5 %	– 10 %	– 5 %	– 5 %
SO_X	Gg	– 2 %	0 %	– 1 %	– 3 %	– 3 %	– 3 %	– 4 %	– 1 %	– 3 %	– 5 %	– 10 %	– 3 %
NH_3	Gg	– 2 %	– 3 %	– 4 %	– 3 %	– 3 %	– 2 %	– 3 %	– 4 %	– 3 %	– 2 %	– 3 %	– 3 %
CO	Gg	3 %	0 %	– 3 %	0 %	– 1 %	0 %	– 1 %	– 1 %	– 1 %	0 %	– 1 %	0 %
Pb	Mg	0 %	3 %	10 %	12 %	17 %	18 %	18 %	19 %	20 %	13 %	16 %	14 %
Cd	Mg	– 18 %	– 13 %	– 12 %	– 10 %	– 12 %	– 12 %	– 10 %	– 9 %	– 7 %	3 %	2 %	2 %
Hg	Mg	3 %	6 %	8 %	8 %	8 %	8 %	9 %	9 %	18 %	18 %	18 %	21 %
PCDD/Fs	g I-Teq	– 4 %	– 5 %	– 4 %	– 4 %	– 6 %	– 7 %	– 6 %	– 11 %	– 13 %	– 2 %	0 %	– 8 %
Total PAHs	Mg	– 19 %	– 12 %	– 12 %	– 4 %	– 7 %	– 7 %			– 5 %	– 7 %	– 6 %	– 10 %
HCB	kg	– 8 %	– 1 %	– 1 %	– 2 %	– 3 %	– 3 %	0 %	2 %	1 %	1 %	1 %	0 %
HCH	kg	0 %	– 1 %	– 26 %	– 27 %	– 37 %	– 40 %	– 42 %	– 45 %	– 47 %	– 49 %	– 51 %	– 53 %
PCBs	kg	– 2 %	– 4 %	– 4 %	– 4 %	– 6 %	– 6 %	0 %	4 %	1 %	– 11 %	– 11 %	– 9 %
$PM_{2.5}$	Gg			– 3 %	– 3 %	– 2 %	– 2 %	– 2 %	– 2 %	– 1 %	– 1 %	– 1 %	0 %
PM_{10}	Gg			– 1 %	0 %	3 %	0 %	1 %	0 %	0 %	– 3 %	– 4 %	– 3 %

Note: Data cannot be shown for total PAHs (2004–05) as last year these data were not used due to inconsistencies in the original data reported by a Member State.

Table 4.2 Overview of Member State recalculations contributing most to EU recalculations

Pollutant	Countries contributing most to recalculations at EU level
NO_X	BG, DE, LU, PT: 1990–2009 GB: 1990–1995, 2008, 2009LT, RO, FR, SE: 1990
NMVOC	BG; 1990, 2009 DE: 1990–2009 PL: 2002–2003, 2008 RO: 1995–2007 GB: 1990
SO_X	RO: 1990–2007 BG: 1990–2009 PL: 2005 ES: 2000–2009
NH_3	FR: 1990–2009 PL: 2005 BG: 2000
CO	BG: 2002–2009 FI: 1990–1995 FR: 2000–2009 DE: 1990, 2008 GR: 1990–2004 HU: 1990 LT: 2000 LU: 1990–1995 RO: 1990–2001 SE: 1990–2003
Pb	GR, BG: 1990–2009 RO: 1990–2005 PT: 2004, 2005

Pollutant	Countries contributing most to recalculations at EU level
Cd	BG: 1990, 2003, 2004 RO: 1990–2002
Hg	GR: 1990–2009 BG: 1990
PCDD/Fs	BG: 1990–2006, 2009 RO: 2005–2006 GB: 1990–2009
Total PAHs	BE: 1990, 2000, 2005–2009 BG: 1990–2006, 2009 Ro: 2005, 2006
HCB	BG: 1990–2003 IT: 1990–1995
HCH	RO: 1990–2008 DE: 2000–2009
PCBs	BG. EE: 1990–2009 HU: 2007–2009 LU: 1990–2001 PT: 2004–2009RO: 2005–2006 GB: 1990–2009
$PM_{2.5}$	FR: 2000–2009 IT: 2004–2009 PT: 2000–2009 RO: 2000–2003
PM_{10}	CZ: 2002 FR: 2000–2009 RO: 2000–2006

Note: As, Cr, Cu, Ni, Se, Zn, benzo(b)fluoranthene, benzo(a)pyrene, benzo(k)fluoranthene, indeno(1,2,3-cd)pyrene and TSP are not included, as this year is the first time that these pollutants are included in this EU inventory, and therefore no recalculations occur.

submissions (2005–2010 reporting years) are due to including 2 new activities, 1 B 2 c — 'Venting and flaring' and 2 A 6 — 'Road paving with asphalt', as well as updated activity data for NFR 6 A — 'Solid waste disposal on land'. Also, data from the Energy Balances from the National Institute of Statistics were updated, resulting in different production data for the industry sector' (Romania's IIR, p. 3). HCH was recalculated because Romania reported data in 2011, but did not do so again in 2012.

The United Kingdom provides detailed information on recalculations undertaken since their last CLRTAP submission. For PCBs, 'a number of assumptions have been reviewed in the waste burning mastersheet for all inventory years in the 2010 Inventory. These changes are based on expert judgement, made in relation to a national survey of waste burning habits' (the United Kingdom's IIR, p. 9). Recalculations for road transport are explained as follows: 'Road Transport improvements in the 2010 Inventory led to an increase in emissions. New NO_X emission factors were implemented for all vehicles (except motorcycles) and the emissions degradation methodology for LDVs [light-duty vehicles], based on COPERT 4 (version 8.1). New data suggests that the vehicle fleet on roads are generally newer than what we previously assumed' (the United Kingdom's IIR, p. 8).

Under the revised reporting guidelines (UNECE, 2009), all countries should submit explanatory IIRs which should include details of recalculations made. References to the IIRs of the Member States are listed in Appendix 7. Some Member States do provide very detailed explanations and justifications for their recalculations of parts or the whole time-series (e.g. methodological improvements, revisions of emission factors, reallocations, revisions of activity data, and corrections of errors). But other Member States do not provide information on the rationale behind recalculations, despite having submitted IIRs.

A summary of the individual recalculations reported by Member States is made available in the annual joint EMEP/EEA inventory review report. This report is made available through the CEIP website in July of each year (EMEP CEIP, 2012d).

4.1.1 Emission changes of Member States due to review improvements

The EMEP CEIP has also been assigned the task of reviewing the submitted emissions, to assist the parties in improving the quality of national inventories. These yearly reviews shall help Member States to prepare and improve their inventories. Member States compile their individual emission estimates and submit their inventories together with their IIR.

The stage 1 review — an automated test — is carried out every year to assess timeliness, completeness and format. The stage 2 review assesses recalculations, KCA, inventory comparison, trends and time series. Stage 3 is an in-depth review carried out by experts nominated by the parties. Each year, a review of 10 parties' inventories is foreseen.

In 2010, the following EU Member States were reviewed: Austria, Cyprus, Germany, Italy, Netherlands, Romania, Slovakia, and the United Kingdom, as well as the Russian Federation and Switzerland. It is not possible to find out whether emissions changed, or in what way, as a result of recommendations made by the review team. Some Member States refer explicitly to the reviews undertaken in their IIRs.

The IIRs of three countries (Bulgaria, Cyprus and Finland) contained specific information regarding changes in their inventory due to review improvements ([13]).

4.2 Planned improvements

The EEA-ETC/ACM has noted that the main future challenge for EU Member States continues to be that of improving the quality of data submissions, particularly in order to obtain more complete and timely UNECE LRTAP Convention emission inventories. Improvements cannot be implemented at EU level alone; the development and prioritisation of reliable and timely inventory reporting systems in the Member States themselves is also needed.

Improvements to the quality of Member States' inventories are facilitated through the joint

([13]) Bulgaria states: 'The conclusions and recommendations of Expert Review Team (ERT) set out in the report of the individual review of the 2010 annual submission of Bulgaria (FCCC/ARR/2010/BGR) indicate that all activities for improvements of institutional, legal and procedural arrangements within the BGNIS as well as for improvement of quality of GHGs inventory are adequately planned and implemented by the Bulgarian Government' (IIR of Bulgaria, p. 4).
Cyprus states: 'In the 2010 reporting round, and in response to the review of the 2008 submission to the LRTAP Convention, Cyprus made several improvements to the National Emission Inventory and to the Informative Inventory Report' (IIR of Cyprus, p. 79).
Finland provides a table containing the responses to review requests in its IIR (p. 337 ff.).

EMEP/EEA annual review of inventory data. The review of data reported under the LRTAP Convention is performed jointly with the review of data reported by Member States under the NEC Directive (Directive 2001/81/EC). Since 2009, a centralised stage 3 review process has been in place that aims to review inventories from 10 countries annually. The reviews are performed by two teams of emission experts. Member States are encouraged to nominate reviewers for the EMEP roster of emission review experts; details on the nomination process are available on the CEIP website.

4.2.1 Improvements at EU level

The following series of bullet points highlights planned and implemented improvements in the EU LRTAP Convention inventory compilation and reporting process.

Planned improvements

- Further progress concerning completeness of reporting: Despite clear progress having been made in recent years in terms of the completeness of reporting, a complete set of emission inventory data for the air pollutants is still not available for all Member States, as was noted earlier in this report. Further, for certain pollutants (including PM, HMs and POPs), data could not be fully gap-filled as emission values for some Member States were not reported in any years.

- Updating of emission data by Member States, also for past years: A further issue identified by the ETC/ACM concerns the use of data submitted several years ago in the gap-filling procedure. In a number of cases, because countries have not since resubmitted corrected or updated data sets, inconsistencies are unavoidably introduced into the EU-27 inventory. The quality of the EU's inventory would thus be enhanced if the consistency and completeness of Member States' submissions improves, particularly for the reporting of 1990-to-2001 data and POPs data in general. Such improvements would facilitate reliable trend analysis and inform policy.

- Review the current gapfilling procedures to ensure that gap-filling procedures use the best approach reflecting real emissions: The improved inventory gap-filling procedure performed in 2011 and continued in 2012 has helped ensure a more complete EU emission inventory, but still can be improved.

- It is intended to reduce the need for gapfilling, this can be achieved if Member States report complete time series to the extent possible, also if the data have been already provided in earlier submission under LRTAP. As the current gapfilling procedures take first submission received in the actual reporting years under various reporting mechanisms, and secondly older LRTAP submissions.

- More explanatory information on trends and recalculations could be provided if such information is present in the IIRs received.

- Based on Member State information, develop an uncertainty and sensitivity analysis of the EU's LRTAP Convention emission inventory. This could be used in the future to identify specific sources within the inventories of Member States that would benefit from further improvements, for example, scientific research to improve the robustness of emission factors. However, this type of analysis also requires Member States to report sufficient information to underpin the analysis, something not yet applicable.

- Further research on outliers in Member State's emission data, in order to ensure true emissions are reflected: A comparison of Member States' shares in the EU-27 total reveals significantly high shares in some instances, e.g. for cadmium in Poland (43.0 %), copper in Germany (55.1 %), PCB in the United Kingdom (23.1 %) and Portugal (29.0 %), lead in Poland (20.6 %), HCB in Spain (62.8 %), and PM_{10}, $PM_{2.5}$ and TSP in France (18.6 %, 19.1 % and 28.4 %, respectively). Future investigation could determine whether these high shares reflect true emissions, or whether they are attributable to incomplete reporting (or underestimates) of other Member States.

- This year for the first time, information on sectoral methods used by Member States is given. This information needs to be reviewed and further elaborated. Support from Member States on this issue is appreciated.

- Provide more information on the improvements undertaken at Member State level, specifically to see if recommendations for improvements from reviews are implemented.

Improvements undertaken in 2012

- Adaption of the report to the recommended structure for IIRs (performed in 2011 and 2012), as far as is feasible.

- Inclusion of all pollutants (also of the ones which are additionally reported (performed in 2012)).
- Further elaboration of trend explanations.
- New chapter on data sources (Section 1.4.1).
- Overview of general methods used by the individual Member States (Section 1.4.3).
- New chapter on data completeness (Section 1.8).
- Tables on Member States' sectoral emissions for 2010 (Appendix 4).

Further, additional method-specific information was included:

- overview of methods used to calculate emissions from road transport (Table 1.6, Section 1.4.2);
- effect of gap-filling on EU emission data (Table 1.8, Section 1.4.4);
- information on uncertainty evaluation at Member State level (Table 1.12, Section 1.7);
- overview of methods and data used by Member States to calculate emissions from the individual sectors (Chapter 3);
- details on methodology used (tier method) (Appendix 6).

Improvements undertaken in 2012, regarding the improvement plan in last year's report

- Timely submission: This year, only five Member States did not report on time, compared with six countries in 2011.
- Completeness: Last year, Luxembourg and Malta did not submit any data. This year, all countries submitted emission data, although Greece and Luxembourg did so only for the main pollutants.
- Gap-filling procedures have not changed in 2012.
- High emission shares have not been further investigated, although explanations for signfiicant trends were provided where possible.
- Format of reporting: The updated reporting guidelines (UNECE, 2009) request that all Parties to the LRTAP Convention report emissions using the new NFR09 reporting format for their 2009 submissions. Of the 27 Member States that submitted inventories in 2012, all EU Member States except Italy used the new template. In 2011, only 22 EU Member States had used the right template.

4.2.2 Improvements at Member State level

Improvements at Member State level also automatically improve the EU inventory. For this reason, it is a point of interest to know which countries are planning improvements. A systematic overview is difficult, as the information provided differs widely across Member States.

Table 4.3 Overview of improvements planned at Member State level

Member State	Improvements planned
Austria	Required methodological changes and planned improvements are described in the corresponding sector analysis chapters (Austria's IIR, p. 37).
Belgium	The emission inventory of POPs will be optimised by VITOunder the authority of the Flemish Environment Agency (VMM). The results are expected in November 2012 (IIR, p. 54). Improvement of emission estimates for the 3D3 source category is planned (Belgium's IIR, p. 44).
Bulgaria	As noted earlier, the Bulgarian National Inventory System (BGNIS) plans that the same team dealing with the greenhouse gas inventory be responsible for preparation of UNECE/CLRTAP inventory. Thus any differences with the UNFCCC report will be eliminated. Planned improvements: Application of higher tier method for estimation of emissions; incorporation of ETS and E-PRTR databases into emission inventory in NFR sector 1 Energy and NFR sector 2 Industrial processes; incorporation of data, provided by branch business associations; allocation of fuel consumption between navigation and marine bunkers for the complete time-series; revision of activity data in NFR sector 4 (Agriculture) in accordance with agrostatistic data of the Ministry of Agriculture and Food (Bulgaria's IIR, p. 65).
Cyprus	The following improvement is planned: estimation of emissions of cement plants using tier 2 methodology (Cyprus' IIR, p. 79).
Czech Republic	No IIR available.

Table 4.3 Overview of improvements planned at Member State level (cont.)

Member State	Improvements planned
Denmark	The inventories are still being improved through work to increase the number of LPSs, e.g. power plants, included in the databases as individual point sources. Such an inclusion makes it possible to use plant-specific data for emissions available, e.g. in annual environmental reports from the plants in question (IIR, p. 316). Improvements and additions are continuously being implemented due to the comprehensiveness and complexity of the use and application of solvents in industries and households (IIR, p. 319). Sector-specific planned improvements are described in the relevant sectoral chapters (Denmark's IIR, p. 316).
Estonia	Source-specific planned improvements are listed in Estonia's IIR.
Finland	Sector specific improvements and needs are set out in Table 14.3 of the Finnish IIR.
France	Various studies have already been carried and or planned for this issue: keep researching in order to have more precise emission data especially for key sources; look after the quantification of uncertainty; reduce the sources not taken into account or not treated sufficiently; It is foreseen to improve the estimate of residential heating, which influences NO_X emissions. Enforce all actions towards a better quality assurance and quality control, which includes adaption of tools and procedures, communication with experts from different fields, the keeping of the certified quality ISO9001, etc. (France's IIR, p. 89).
Germany	Improvements listed for individual source categories: updating the database for emission factors of large combustion plants (LCPs) (NFR 1.A); inclusion of particle exhaust emissions from gasoline-driven road vehicles (especially 1 A 3 b); revision of emission estimates for solid fuels in railways (1 A 3 c), particle emissions from coal production (NFR 1 B 1 a), particle emissions from flaring in oil production plants and refineries (NFR 1 B 2 a), VOC emissions from lignite production (NFR 1 B 1 a), VOCs from cleaning of tank cars (NFR 1 B 2); revision of mineral fertilizer production (NFR 2 B 5 Other); relevance of NMVOC (NH_3) from 6.B wastewater (latrines).
Greece	The main implemented/adopted measures for the improvement of the conventional power generation system are: The gradual decommissioning of old inefficient and more pollutant thermal power units. The commissioning of new Carbon Capture Ready power units that follows BAT and the new IED. The increase of NG share in electricity production. The interconnection of certain islands with the mainland grid. Use of natural gas in Crete island for electricity production. (Greece's IIR, p. 27).
Hungary	No IIR available.
Ireland	Energy sector: by updating emission factors using the information in the latest version of the Inventory Guidebook and by accounting more completely for technological improvements over time. Industry, solvents and waste sector: continue the practice of outsourcing contracts on a periodic basis to re-examine and extend the inventory time series. General: review emission estimates in light of any new information that may become available for future submissions.
Italy	For the energy and industrial processes sectors, a major progress will regard the harmonisation of information collected in the framework of different obligations, Large Combustion Plant, E-PRTR and Emissions Trading, thus highlighting the main discrepancies in data and detecting potential errors. For the agriculture and waste sectors, improvements will be related to the availability of new information on emission factors, activity data as well as parameters necessary to carry out the estimates; specifically, a study on the best available technologies used in agriculture practices and availability of information on waste composition and other parameters following the entering into force of the European landfill directive. A general revision will concern PAH, dioxin and heavy metals estimates in order to improve the accuracy and reduce the uncertainty (Italian's IIR, p. 128).
Latvia	Planned improvements are listed in the IIR (p. 106) and concern mainly activity data for Energy, Solvent use and Industry; for agriculture, research for animal waste management systems is foreseen.
Lithuania	No information on planned improvements.
Luxembourg	No IIR available.
Malta	Future improvements will look into the possibility of updating the time series with respect to HM emissions (Malta's IIR, p. 19).
Netherlands	For the coming submission the following improvements are envisaged. Transport: new average annual mileages are being derived for motorcycles by Statistics Netherlands, using odometer readings from the national car passport corporation (NAP) register. A survey will be held among motorcycle owners next year to complement NAP data. The Netherlands Organisation for Applied Scientific Research (TNO) is preparing a study on the average load factors for heavy-duty trucks. Industrial Processes: in coming submissions, incomplete TSP and Cd time-series will be repaired (the Netherlands' IIR, p. 80).
Poland	The planned improvement programme is focused on the following tasks: further recalculations of emissions resulting from corrections of activity data (energy statistics, production statistics) for all sectors; further recalculations of emissions resulting from methodology changes (updating of emission factors and including additional emission sources); further methodology development by applying higher tier of estimation methodology, especially for key categories (Poland's IIR, p. 5).
Portugal	Considering the limitations in the time trend in load and the share of each treatment system concerning industrial wastewater handling, efforts will continue in order to improve knowledge of the situation of industrial wastewater. Emission factors for burning of industrial waste shall be revised in the near future to better reflect the conditions and technologies used by industrial units where incineration occurs (Portugal's IIR, pp 8–22).
Romania	Main priorities for the next submission include the implementation of a QA/QC system, adding new sources to the estimates, and improvement of existing ones (Romania's IIR, p. 3).

Table 4.3 Overview of improvements planned at Member State level (cont.)

Member State	Improvements planned
Slovakia	No information on planned improvements.
Slovenia	Public Power, Industrial Combustion (1A1a–1A2fi): plans to recalculate of D/F emissions as soon as better emission factors will be available. Residential: Stationary plants (1A4bi): plans to recalculate emissions of D/F, PAHs, NO_x, NMVOC and PM from biomas burning as soon as better emission factors will be available (new installations). Road transport (1A3bi–1A3bvii): The latest version of COPERT 4 methodology (for the time being: version 9.0) is planned to be used for emission calculation in next submission (Solvenia's IIR, p. 156).
Spain	No information on planned improvements.
Sweden	No major improvements are planned for the next submission (IIR, p. 134). All relevant data are kept under constant review. For future submissions, a number of actions are planned in order to improve the quality of the inventory for the energy sector, where appropriate (p. 66).
United Kingdom	A number of improvements to the inventory are planned, although it is anticipated that not all improvements will be incorporated into the next version of the inventory. The relevant sources are for 1 A 1 a, 1 A 1 c and 2 C 1 (the United Kingdom's IIR, p. 193).

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Appendix 1 Notation keys

Where methodological or data gaps in inventories exist, information on these gaps should be presented in a transparent manner. Parties should clearly indicate the sources not considered in their inventories albeit included in the *EMEP/EEA air pollutant emission inventory guidebook —2009* (EMEP/EEA, 2009), and explain the reason for the exclusion. Similarly, each party should indicate if part of its territory has been excluded, and explain the reason for this. In addition, each party should use the notations presented below to fill the blanks in all the tables of the NFR inventory. This approach facilitates assessment of the completeness of emission data reports. The notations are as follows ([14]):

NO 'Not occurring' is used where an emissions source or process does not exist within a country.

NE 'Not estimated' is used where emissions occur, but have not been estimated or reported. Where 'NE' is used in an inventory, the party should indicate why emissions could not be estimated.

NA 'Not applicable' is used where a source exists, but relevant emissions are considered never to occur.

IE 'Included elsewhere' is used for emissions that are estimated and included in the inventory, but not presented separately for the respective source. Where 'IE' is used, the party should indicate where in the inventory the emissions from the displaced source category have been included, and should give the reasons for deviating from the expected category.

C 'Confidential' is used for emissions that are aggregated and included elsewhere in the inventory, because reporting at a disaggregated level could lead to the disclosure of confidential information. Where 'C' is used in an inventory, reference should be made to the protocol provision that authorises such practice.

NR 'Not relevant'. According to Article III, paragraph 9 in the emission reporting guidelines, emission inventory reporting should cover all years from 1980 onwards if data are available. However, 'NR' (not relevant) is introduced to ease the reporting where emissions are not strictly required by the different protocols, e.g. for some parties, this includes emissions of NMVOCs prior to 1988.

If a party estimates emissions from country-specific sources, it should explicitly describe which source categories these are, as well as which methodologies, emission factors and activity data have been used for their estimation.

([14]) Further explanation and guidance concerning the use of these notation codes may be found in the EMEP emission reporting guidelines (UNECE, 2009).

Appendix 2 LRTAP Convention emission reporting programme for 2012

Emission data should be submitted to the EMEP CEIP by 15 February 2012. The deadline for gridded and LPS data is 1 March 2012. IIRs should reach the centre no later than 15 March 2012. Table A2.1 below summarises information contained in the revised emission reporting guidelines (UNECE, 2009).

Table A2.1 Summary of the information requested in the EMEP emission reporting guidelines

Description of contents	Components	Reporting years [a]
Yearly: minimum (and **additional**)		
A. National totals		
1. Main pollutants	NO_x, NMVOCs, SO_x, NH_3, CO	1980–2010
2. Particulate matter	$PM_{2.5}$, PM_{10}, TSP	2000–2010
3. Heavy metals	Pb, Cd, Hg (As, Cr, Cu, Ni, Se, Zn)	1990–2010
4. POPs	[b]	1990–2010
B. Sector emissions		
1. Main pollutants	NO_x, NMVOCs, SO_x, NH_3, CO	1980–2010
2. Particulate matter	$PM_{2.5}$, PM_{10}, TSP	2000–2010
3. Heavy metals	Pb, Cd, Hg (As, Cr, Cu, Ni, Se, Zn)	1990–2010
4. POPs	[b]	1990–2010
C. Activity data	Liquid fuels, solid fuels, gaseous fuels, biomass, other fuels, other activity	1990–2010
5-yearly: minimum reporting		
D. Gridded data in the EMEP 50 x 50 km² grid (GNFR aggregated sectors)	Main pollutants, PM, Pb, Cd, Hg, PAHs, HCH, HCB, PCBs, PCDD/Fs	1990, 1995, 2000, 2005 and 2010 (PM for 2000, 2005 and 2010)
E. Emissions from large point sources	Main pollutants, PM, HMs, PCDD/Fs, PAHs, HCB, HCH, PCBs	1990, 1995, 2000, 2005 and 2010 (PM for 2000, 2005 and 2010)
F. Projected emissions and activity data		
1. National projections with measures	See Annex IV — Table 2B-WM in the emission reporting guidelines	2015,2020, 2030 and 2050
2. National projections with additional measures	See Annex IV — Table 2B-WAM in the emission reporting guidelines	2015,2020, 2030 and 2050
3. National projected activity data with measures	See Annex IV — Table 2B-WM in the emission reporting guidelines	2015,2020, 2030 and 2050
4. National projected activity data with additional measures	See Annex IV — Table 2B-WAM in the emission reporting guidelines	2015,2020, 2030 and 2050
5-yearly: additional reporting for review and assessment purposes		
VOC speciation/height distribution/temporal distribution		Parties are encouraged to review the information used for modelling at http://www.ceip.at/webdab-emission-database/emissions-as-used-in-emep-models/ (accessed 24 May 2012.
Land-use data/mercury breakdown		
Percentage of toxic congeners of PCDD/F emissions		
Pre-1990 emissions of PAHs, HCB, PCDD/Fs and PCBs		
Information on natural emissions		

Notes: [a] As a minimum, data for the base year of the relevant protocol and from the year of entry into force of that protocol and up to the latest year (current year – 2) should be reported.
[b] Polychlorinated dibenzodioxin/polychlorinated dibenzofuran (PCDD/Fs), polycyclic aromatic hydrocarbons (PAHs), hexachlorobenzene (HCB), hexachlorocyclohexane (HCH), polychlorinated biphenyls (PCBs). See revised emission reporting guidelines (EMEP CEIP, 2012b).

Reporting format

Each party should use the reporting format set out in Annex IV of the reporting guidelines (UNECE, 2009) for its annual submissions. The information should be formally submitted to the CEIP, with notification to the UNECE secretariat, preferably in electronic form. The reporting format, including the NFR, is a standardised format for reporting estimates of emissions — i.e. the NFR format — including activity data, projected activity data, projected emissions and other relevant information. The reporting format aims to facilitate electronic submissions to simplify the processing of emissions information and the preparation of useful technical analysis and synthesis documentation. The reporting format covers:

- national annual emissions and national annual sector emissions using NFR09 (Annex IV, Table 1);
- total and aggregated sector emissions for reporting emissions of NO_X, NMVOCs, sulphur, NH_3, PM, CO, lead, cadmium, mercury, PCDD/F, PAHs, HCB, HCH and PCBs, for the EMEP grid squares of 50 km × 50 km and emissions from LPSs (Annex IV, Tables IV 3A gridded and IV 3B LPS);
- for the years 2015, 2020, 2030 and 2050, projected activity data and projected national total emissions of sulphur (S), NO_X, NH_3 and NMVOC to be reported for the source categories listed in Annex IV (2A-WM, 2BWM, 2A-WaM, 2BWaM).

Appendix 3 Status of reporting

Table A3.1 Date on which the EEA received inventory submissions, years covered and information provided by Member States, as of 11 May 2012

Annual reporting							Minimum 5-year reporting		
Member State	**Submission date [a)]**	**Date of resub-mission and/or additional information**	**NFR template**	**Other format**	**IIR 2010**	**Activity data [b)]**	**Projections**	**Gridded data**	**LPS emissions**
Austria	15.02.2012		2009-1		15.03.2012	1980—2010	2010, 2015, 2020, 2030	1990, 1995, 2000, 2005, 2010	1990, 1995, 2000, 2005, 2010
Belgium	15.02.2012	01.03.2012	2009-1		15.03.2012	1990, 2000, 2005—2010	2015, 2020	2010	2010
Bulgaria	15.02.2012	01.03.2012	2009-1		15.03.2012	1990—2010	np	2010	2010
Cyprus	13.02.2012		2009-1		12.03.2012	1990—2010	2010, 2015, 2020	1990, 1995, 2000, 2005, 2010	1990, 1995, 2000, 2005, 2010
Czech Republic	23.03.2012	23.04.2012	2009-1			2010	2010, 2015, 2020, 2030, 2050	2010	2010
Denmark	14.02.2012	29.02.2012	2009-1		15.03.2012	1980—2010	2010, 2015, 2020, 2030	2005, 2010	2005, 2010
Estonia	15.02.2012	01.03.2012, 15.03.2012, 20.03.2012	2009-1		15.03.2012	1990—2010	2010, 2015	1990, 1995, 2000, 2005, 2010	2010
Finland	11.02.2012	01.03.2012, 30.03.2012	2009-1		15.03.2012, 30.03.2012	2008—2010	2020, 2030, 2050	2010	2010
France	15.02.2012		2009-1		16.03.2012	1980—2010	2010, 2015, 2020	np	np
Germany	13.02.2012	27.02.2012	2009-1		15.12.2011	1990—2010	2010, 2015, 2020	1990, 1995, 2000, 2005, 2010	np
Greece	07.03.2012	19.03.2012	2009-1		02.04.2012	np	2020	2010	np
Hungary	22.02.2012		2009-1			2010	np	np	np
Ireland	14.02.2012	16.03.2012	2009-1		04.05.2012	1990—2010	np	1990, 1995, 2000, 2005, 2010	1990, 1995, 2000, 2005, 2010
Italy	05.03.2012	03.05.2012	2008-1		03.05.2012	1980—2010	np	np	np
Latvia	15.02.2012	01.03.2012	2009-1		15.03.2011	1990—2010	np	np	2010
Lithuania	13.02.2012	08.03.2012	2009-1		08.03.2012	2008—2010	2015, 2020	2010	2010
Luxembourg	16.02.2012	30.03.2012	2009-1			1990—2010	np	np	np
Malta	14.02.2012		2009-1		20.03.2012	2000—2010	np	np	np
Netherlands	15.02.2012	01.03.2012	2009-1		15.03.2011	1990—2010	2010, 2015, 2020, 2030	1990, 1995, 2000, 2005, 2010	1990, 1995, 2000, 2005, 2010
Poland	15.02.2012	05.03.2012, 06.03.2012	2009-1		15.02.2012, 05.03.2012	2009, 2010	2010	2010	2010
Portugal	15.02.2012	15.03.2012, 13.04.2012	2009-1		15.03.2012	1990—2010	np	2010	2010
Romania	15.02.2012	21.02.2012, 15.03.2012	2009-1		15.03.2012	2005—2010	2010, 2015, 2020	np	np
Slovakia	13.02.2012	24.02.2012	2009-1	Nat. tot. (1990—1999)	13.02.2012	2000—2010	2010, 2015, 2020, 2030, 2050	2000, 2005, 2010	2010

Table A3.1 Date on which the EEA received inventory submissions, years covered and information provided by Member States, as of 11 May 2012 (cont.)

Annual reporting							Minimum 5-year reporting		
Member State	**Submission date [a)]**	**Date of resub-mission and/or additional information**	**NFR template**	**Other format**	**IIR 2010**	**Activity data [b)]**	**Projections**	**Gridded data**	**LPS emissions**
Slovenia	15.02.2012	09.03.2012	2009-1			1990—2010	2010, 2015, 2020, 2030	2000, 2005, 2010	2000, 2005, 2010
Spain	15.02.2012		2009-1	Level 1 (1980—1989)	13.01.2012	1990—2010	2015, 2020	1990—2010	1990—2010
Sweden	22.12.2011	27.02.2012	2009-1		22.12.2011	1990—2010	np	2010	np
United Kingdom	15.02.2012	29.02.2012, 06.03.2012	2009-1		14.03.2012	1990—2010	2010, 2015, 2020	2005, 2009	2005, 2009

Note: ([a]) Refers to the first submission of inventory data to the CDR; submission of other data is possible at later dates.
([b]) Activity data reported in 2011.
The Czech Republic submitted its IIR only to the CEIP and did not post a copy on the CDR.
'IIR' denotes 'informative inventory report'; 'np' denotes 'not provided'.

Table A3.2 Overview of air pollutants and years reported by Member States in their LRTAP Convention Submissions of 2012 (as of 11 May 2012)

Member State	SO_x, NO_x, CO, NH_3, NMVOCs	Cd, Hg, Pb	Additional HMs	$PM_{2.5}$, PM_{10}	TSP	POPs
Austria	1980—2010	1985—2010	np	1990—2010	1990—2010	1985—2010
Belgium	1990, 2000, 2005—2010	1990, 2000, 2005—2010	1990, 2000, 2005—2010	2000, 2005—2010	2000, 2005—2010	1990, 2000, 2005—2010
Bulgaria	1990—2010	1990—2010	1990—2010	1990—2010	1990—2010	1990—2010
Cyprus	1990—2010	1990—2010	1990—2010	2000—2010	2000—2010	1990—2010
Czech Republic	2010	2010	2010	2010	2010	2010
Denmark	1980—2010	1990—2010	1990—2010	2000—2010	2000—2010	1990—2010
Estonia	1990—2010	1990—2010	1990—2010	2000—2010	1990—2010	1990—2010
Finland	1980—2010	1990—2010	1990—2010	1990—2010	1990—2010	1990—2010
France	1980—2010	1990—2010	1990—2010	1990—2010	1990—2010	1990—2010
Germany	1990—2010	1990—2010	1990—2010	1995—2010	1990—2010	1990—2010
Greece	1990—2010	np	np	np	np	np
Hungary	2010	2010	2010	2010	2010	2010
Ireland	1987, 1990—2010	1990—2010	1990—2010	1990—2010	1990—2010	1990—2010
Italy	1980—2010	1990—2010	1990—2010	1990—2010	1990—2010	1990—2010
Latvia	1990—2010	1990—2010	1990—2010	2000—2010	2000—2010	1990—2010
Lithuania	2008—2010	2008—2010	2008—2010	2008—2010	2008—2010	2008—2010
Luxembourg	1990—2010	np	np	np	np	1990, 1993, 1998, 2003, 2008—2010
Malta	2000—2010	2000—2010	2000—2010	2000—2010	2000—2010	2010
Netherlands	1990—2010	1990—2010	1990—2010	1990—2010	1990—2010	1990—2010
Poland	2005, 2009, 2010	2009, 2010	2009, 2010	2005, 2009, 2010	2009, 2010	2009, 2010
Portugal	1990—2010	1990—2010	1990—2010	1990—2010	1990—2010	1990—2010
Romania	2005—2010	2005—2010	2005—2010	2005—2010	2005—2010	2005—2010
Slovakia	2000—2010	2000—2010	2000—2010	2000—2010	2000—2010	2000—2010
Slovenia	1980—2010	1990—2010	np	2000—2010	2000—2010	1990—2010
Spain	1990—2010	1990—2010	1990—2010	2000—2010	2000—2010	1990—2010
Sweden	1990—2010	1990—2010	1990—2010	1990—2010	1990—2010	1990—2010
United Kingdom	1980—2010	1980—2010	1980—2010	1980—2010	1980—2010	1990—2010

Notes: 'TSP' denotes 'total suspended particulates'. Reporting of TSP is not required if a Member State reports PM emissions.
'HMs' denotes 'heavy metals'. Reporting of additional HMs is not mandatory.

Appendix 4 Member States' shares in sectoral emissions in 2010

Table A4.1 Member State sectoral emissions in the 'energy production and distribution' sector in 2010

Energy production and distribution		NO_x	NMVOC	SO_x	NH_3	$PM_{2.5}$	PM_{10}	TSP	CO	Pb	Cd	Hg	As	Cr	Cu	Ni	Se	Zn	PCDD/F	Total PAH	Benzo (a) pyrene	Benzo(b) fluoranthene	Benzo(k) fluoranthene	Indeno (1,2,3-cd) pyrene	HCB	HCH	PCB
		Gg	Gg	Gg	Gg	Gg	Gg	Gg	Gg	Mg	Mg	Mg	Mg	Mg	Mg	Mg	Mg	Mg	g	Mg	Mg	Mg	Mg	Mg	kg	kg	kg
	Austria	15	3	3	< 1	1	2	2	5	2	< 1	< 1							1	< 1					< 1		
	Belgium	20	11	16	< 1	< 1	1	2	9	2	< 1	< 1	< 1	< 1	1	2	< 1	3	6	9							
	Bulgaria	49	6	347		< 1	7	21	1	2	< 1	< 1	2	< 1	3	2	< 1	3	2	< 1	< 1	< 1	< 1	< 1			< 1
	Cyprus	6	1	20		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	7	< 1	2	< 1			< 1	< 1	< 1			
	Czech Republic	85	7	108	< 1	2	3	4	11	4	< 1	2	2	8	3	10	7	21	6	2	< 1	< 1	< 1	< 1	2		< 1
	Denmark	27	12	5	< 1	< 1	< 1	2	12	< 1	< 1	< 1	< 1	< 1	< 1	< 1	1	3	1	< 1	< 1	< 1	< 1	< 1	< 1		
	Estonia	15	5	78	< 1	7	14	16	27	36	< 1	< 1	11	10	2	6	< 1	50	3	3	< 1	1	< 1	< 1	< 1		3
	Finland	46	10	38	< 1	5	9	14	15	7	< 1	< 1	2	7	10	7	< 1	49	4	2				< 1	3		16
	France	89	39	132	< 1	4	7	9	56	4	< 1	< 1	1	3	2	44	< 1	15	3	< 1	< 1	< 1	< 1	< 1	3		13
	Germany	310	96	252	2	10	12	14	169	26	3	7	5	8	16	89	1	13	5	2	< 1				2		98
	Greece	120	36	209					44																		
	Hungary	23	6	12	< 1	< 1	1	2	16	3	< 1	< 1	2	1	1	2	4	11	2	1	< 1	< 1	< 1	< 1			5
	Ireland	12	6	10		1	4	8	6	< 1	< 1	< 1	< 1	< 1	< 1	1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1			2
	Italy	73	74	107	< 1	4	4	6	33	4	< 1	< 1	4	19	5	13	3	6	8	6					< 1		62
	Latvia	3	< 1	< 1		< 1	< 1	< 1	3	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	2	< 1	< 1	< 1	< 1	< 1	< 1	< 1		< 1
	Lithuania	13	11	20		2	2	4	5	< 1	< 1	< 1	< 1	< 1	< 1	9	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1			< 1
	Luxembourg	2	19	< 1					< 1																		
	Malta	5	< 1	8		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	5	< 1	2		< 1				< 1			
	Netherlands	36	17	20	< 1	< 1	< 1	1	11	< 1	< 1	< 1	< 1	< 1	< 1	< 1	1	11	1	< 1	< 1	< 1	< 1	< 1	1		< 1
	Poland	287	81	510		17	44	75	61	28	4	9	6	7	21	45		100	14	16	7	3	3	3	< 1		120
	Portugal	21	19	31	< 1	2	2	2	6	3	< 1	< 1	< 1	< 1	1	15	< 1	4	2	< 1							< 1
	Romania	60	57	301	< 1	3	6	22	34	5	< 1	< 1	4	3	< 1	5	14	4	3	< 1	< 1			< 1			< 1
	Slovakia	14	10	43	< 1	< 1	1	2	19	2	< 1	< 1	< 1	< 1	< 1	< 1	< 1	3	8	2	< 1	< 1	< 1	< 1	< 1		< 1
	Slovenia	11	3	6	< 1	< 1	< 1	< 1	2	< 1	< 1	< 1							< 1	< 1	< 1	< 1	< 1	< 1	< 1		18
	Spain	143	43	145	< 1	5	8	12	26	5	6	4	3	8	5	102	3	35	2	1					4		
	Sweden	20	18	11	< 1	5	6	7	46	3	< 1	< 1	< 1	< 1	2	6	< 1	67	24	2	< 1	< 1	< 1	< 1			
	United Kingdom	339	156	250	< 1	6	10	11	115	7	< 1	2	< 1	4	3	10	8	11	8	< 1	< 1	< 1	< 1	< 1	9		41
	EU-27	1 845	748	2 684	6	79	146	237	733	145	17	30	44	83	79	383	45	412	106	46	11	5	4	7	23	0	382

Note: Empty cells indicate that no value is given (e.g. notation keys).

Table A4.2 Member State sectoral emissions in the 'energy use in industry' sector in 2010

Energy use in industry		NO_x	NMVOC	SO_x	NH_3	$PM_{2.5}$	PM_{10}	TSP	CO	Pb	Cd	Hg	As	Cr	Cu	Ni	Se	Zn	PCDD/F	Total PAH	Benzo (a) pyrene	Benzo(b) fluoranthene	Benzo(k) fluoranthene	Indeno (1,2,3-cd) pyrene	HCB	HCH	PCB
		Gg	Gg	Gg	Gg	Gg	Gg	Gg	Gg	Mg	Mg	Mg	Mg	Mg	Mg	Mg	Mg	Mg	g	Mg	Mg	Mg	Mg	Mg	kg	kg	kg
	Austria	32	2	11	< 1	3	3	5	138	4	< 1	< 1							6	< 1					2		
	Belgium	33	3	19	< 1	2	2	4	185	3	< 1	< 1	< 1		1	6	8	11	< 1	2	< 1	< 1	< 1	< 1			
	Bulgaria	6	< 1	8		< 1	< 1	5	2	91	1	< 1	9	4	71	16	17	97	5	< 1	< 1	< 1	< 1	< 1	< 1		< 1
	Cyprus	2	< 1	1	< 1	< 1	< 1	< 1	2	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1		< 1
	Czech Republic	32	2	27	< 1	1	2	3	117	16	< 1	< 1	< 1	7	8	2	< 1	27	65	< 1	< 1	< 1	< 1	< 1	< 1		3
	Denmark	14	1	3	< 1	< 1	< 1	< 1	10	< 1	< 1	< 1	< 1	< 1	< 1	2	< 1	1	< 1	< 1	< 1	< 1	< 1	< 1	< 1		
	Estonia	3	< 1	4	< 1	2	3	3	7	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	1	< 1	< 1	< 1	< 1	< 1	< 1	< 1		< 1
	Finland	39	2	19	< 1	2	4	6	48	8	< 1	< 1	< 1	5	3	6		17	2	< 1				< 1	< 1		< 1
	France	143	12	77	< 1	14	17	22	604	47	2	1	3	9	10	13	10	59	31	< 1	< 1	< 1	< 1	< 1	< 1		9
	Germany	103	9	44	1	5	5	6	208	< 1	< 1	< 1	< 1	< 1	< 1	4	< 1	< 1	1	< 1	< 1				< 1		17
	Greece	19	4	12					11																		
	Hungary	10	2	4					25	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	2	1	< 1				< 1			
	Ireland	9	< 1	6		2	3	3	13	< 1	< 1	< 1	< 1	< 1	< 1	22	< 1	2	2	< 1	< 1	< 1	< 1	< 1			1
	Italy	131	10	47	1	13	14	19	248	104	2	2	40	13	20	10	6	162	62	2					3		16
	Latvia	3	2	< 1		2	2	2	20	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	2	4	2	< 1	< 1	< 1	< 1	< 1		< 1
	Lithuania	5	3	6	< 1	1	2	3	6	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1			2
	Luxembourg	7	2	1	< 1				7										< 1	< 1	< 1	< 1	< 1	< 1			< 1
	Malta	< 1	< 1	< 1		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1		< 1	< 1		< 1		< 1	< 1			
	Netherlands	41	8	11	< 1	< 1	< 1	< 1	129	3	1	< 1	< 1	< 1	1	< 1	< 1	10	6	< 1	< 1	< 1	< 1	< 1			
	Poland	104	9	188		8	14	23	216	224	6	2	19	6	182	19		398	37	1	< 1		< 1	< 1	8		13
	Portugal	40	11	25	< 1	9	10	22	28	16	3	< 1	< 1	7	4	22	17	25	2	4							
	Romania	33	8	62		9	9	10	88	15	< 1	1	< 1	2	2	11	< 1	17	16	11	3	4	2	1	< 1		11
	Slovakia	19	< 1	22	< 1	1	2	4	110	41	< 1	< 1	21	2	38	10	11	28	19	< 1	< 1	< 1	< 1	< 1	< 1		3
	Slovenia	4	1	2	< 1	1	1	1	9	< 1	< 1	< 1							< 1	< 1	< 1	< 1	< 1	< 1	< 1		2
	Spain	203	17	226	< 1	12	16	24	225	147	6	1	11	16	73	58	87	328	60	51							
	Sweden	25	3	5	< 1	3	3	3	33	2	< 1	< 1	< 1	< 1	< 1	7	< 1	34	9	< 1	< 1						
	United Kingdom	178	23	71	< 1	8	11	12	342	13	< 1	< 1	1	2	4	19	1	147	23	< 1	< 1	< 1	< 1	< 1	< 1		4
	EU-27	1 238	137	905	6	99	125	181	2 830	737	25	13	109	75	421	230	161	1 369	352	77	5	7	3	2	15	0	85

Note: Empty cells indicate that no value is given (e.g. notation keys).

Table A4.3 Member State sectoral emissions in the 'industrial processes' sector in 2010

Indistrial processes		NO_X	NMVOC	SO_X	NH_3	$PM_{2.5}$	PM_{10}	TSP	CO	Pb	Cd	Hg	As	Cr	Cu	Ni	Se	Zn	PCDD/F	Total PAH	Benzo (a) pyrene	Benzo(b) fluoranthene	Benzo(k) fluoranthene	Indeno (1,2,3-cd) pyrene	HCB	HCH	PCB
		Gg	Gg	Gg	Gg	Gg	Gg	Gg	Gg	Mg	Mg	Mg	Mg	Mg	Mg	Mg	Mg	Mg	g	Mg	Mg	Mg	Mg	Mg	kg	kg	kg
Austria		1	5	1	< 1	1	8	15	24	7	< 1	< 1							3	< 1					4		
Belgium		18	21	13	1	3	5	10	74	30	1	1	1	8	3	3	2	54	9	21					9		
Bulgaria		21	4	23	3	1	8	46	30	11	< 1	< 1	< 1	< 1	< 1	< 1		38	4						19		
Cyprus			< 1			1	2	3	< 1																		
Czech Republic		3	3	1	< 1	1	3	5	16	4	< 1	< 1	< 1	3	2	< 1	< 1	56	40	< 1	< 1						15
Denmark		< 1	5	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	1	< 1	< 1	< 1	< 1	< 1	< 1	< 1		
Estonia		< 1	< 1	< 1	< 1	< 1	< 1	1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1		< 1									
Finland		< 1	8	2	< 1	2	4	7	4	4	< 1	< 1	< 1	11	2	4	< 1	21	5	< 1					7		23
France		6	47	9	3	60	100	278	796	6	< 1	< 1	< 1	4	1	1	< 1	38	4	< 1	< 1	< 1	< 1	< 1			21
Germany		89	34	85	11	15	52	110	809	64	1	2		19	< 1	6		6	29	9	< 1				< 1		79
Greece		< 1	32	4					20																		
Hungary		2	10	< 1	< 1	< 1	4	8	< 1	8	< 1	< 1	< 1	8	< 1	< 1	< 1	7	14						< 1		10
Ireland						< 1	< 1	< 1		< 1	< 1		< 1	< 1		< 1		< 1	2	< 1	< 1		< 1				
Italy		6	44	21	< 1	6	15	20	115	69	1	3	< 1	9	6	4	< 1	583	76	33					93		
Latvia		3	16	< 1		1	4	13	< 1	4	< 1	< 1	< 1	< 1	< 1	< 1	< 1	5									
Lithuania		2	10	2	< 1			< 1	2																		
Luxembourg			< 1																< 1	< 1	< 1	< 1	< 1	< 1	< 1		< 1
Malta			< 1									< 1															
Netherlands		< 1	21	< 1	1	4	9	12	3	32	< 1	< 1	< 1	1	17	1	< 1	41	2	< 1	< 1	< 1	< 1	< 1			
Poland		7	43	4	< 1	5	9	14	29	77	3	2	1	10	17	8		157	14	2	< 1	< 1	< 1	< 1	< 1		29
Portugal		5	33	5	1	16	33	120	41																		
Romania		7	16	3	< 1	2	11	91	38	28	< 1	< 1	< 1	9	< 1	2	< 1	15	8	24	6	8	8	1	< 1		59
Slovakia		< 1	1	< 1	< 1	< 1	< 1	< 1	< 1	2	< 1	< 1	< 1	< 1	3	8	< 1	15	7	1	< 1	< 1	< 1	< 1	< 1		2
Slovenia		< 1	1	< 1	< 1	< 1	< 1	< 1	3	11	< 1	< 1							3	< 1	< 1	< 1	< 1	< 1	< 1		5
Spain		8	55	11	13	4	7	8	363	72	4	2	< 1	2	5	3	< 1	276	25	41					310		
Sweden		14	14	12	2	6	8	9	23	3	< 1	< 1	< 1	4	1	1		21	4	< 1							
United Kingdom		7	103	20	4	8	16	27	202	31	< 1	2	< 1	9	9	5	16	101	48	< 1	< 1	< 1	< 1	< 1		7709	618
EU-27		201	529	219	45	140	298	802	2 593	462	14	15	7	98	67	48	20	1 435	297	132	7	10	10	1	350	7 709	957

Note: Empty cells indicate that no value is given (e.g. notation keys).

Table A4.4 Member State sectoral emissions in the 'commercial, institutional and households' sector in 2010

Commercial, institutional and households		NO_x	NMVOC	SO_x	NH_3	$PM_{2.5}$	PM_{10}	TSP	CO	Pb	Cd	Hg	As	Cr	Cu	Ni	Se	Zn	PCDD/F	Total PAH	Benzo (a) pyrene	Benzo(b) fluoranthene	Benzo(k) fluoranthene	Indeno (1,2,3-cd) pyrene	HCB	HCH	PCB
		Gg	Gg	Gg	Gg	Gg	Gg	Gg	Gg	Mg	Mg	Mg	Mg	Mg	Mg	Mg	Mg	Mg	g	Mg	Mg	Mg	Mg	Mg	kg	kg	kg
	Austria	23	34	3	< 1	8	9	10	302	2	< 1	< 1							26	6					35		
	Belgium	30	14	18	< 1	4	5	6	131	3	< 1	< 1	< 1	< 1	< 1	< 1	< 1	6	19	113							
	Bulgaria	4	32	9	< 1	24	24	26	197	2	< 1	< 1	< 1	< 1	< 1	< 1	< 1	6	28	28	8	9	5	5	< 1		3
	Cyprus	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1		< 1
	Czech Republic	48	22	34	< 1	9	16	19	113	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	4	18	15	4	5	2	4	< 1		5
	Denmark	19	24	3	< 1	20	20	21	257	2	< 1	< 1	< 1	< 1	< 1	< 1	< 1	5	18	15	5	5	3	3	< 1		
	Estonia	5	19	< 1	< 1	14	14	16	120	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	3	2	13	4	4	2	3	< 1		7
	Finland	23	47	7	< 1	23	25	29	212	4	< 1	< 1	< 1	3	4	4		48	1	15					4		7
	France	202	220	34		111	121	143	1613	15	< 1	< 1	2	8	5	5	1	47	16	15	4	5	3	2	2		14
	Germany	139	68	67	3	40	42	43	1143	11	< 1	< 1	< 1	3	2	< 1		61	28	178	31				1		34
	Greece	30	10	5					95																		
	Hungary	19	31	15	< 1	23	23	24	192	3	< 1	< 1	< 1	< 1	< 1	5	< 1	9	27	26	8	9	5	5	< 1		3
	Ireland	14	5	10	< 1	2	3	6	41	3	< 1	< 1	1	2	3	6	< 1	5	4	2	1	1	< 1	< 1			4
	Italy	143	184	11	< 1	96	97	113	850	77	4	3	< 1	7	9	75	< 1	48	73	79					8		46
	Latvia	5	31	1	< 1	23	23	24	200	2	< 1	< 1	< 1	< 1	< 1	2	< 1	5	24	24	7	8	4	5	< 1		< 1
	Lithuania	5	16	10	< 1	6	7	8	145	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	13	20	5	5	3	7			< 1
	Luxembourg	2		< 1	< 1				2										< 1	< 1	< 1	< 1	< 1	< 1	< 1		< 1
	Malta	< 1	< 1	< 1		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1		< 1	< 1	< 1	< 1	< 1	< 1	< 1			
	Netherlands	51	18	< 1	< 1	2	2	4	131	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	6	3	1	< 1	< 1	< 1			
	Poland	179	153	269	< 1	76	166	214	2044	176	31	2	19	23	102	87		704	224	129	34	41	9	44	2		476
	Portugal	24	14	3	< 1	13	14	14	154	1	< 1	< 1	< 1	< 1	< 1	3	< 1	5	3	< 1							
	Romania	28	140	6	< 1	103	103	108	792	6	< 1	< 1	< 1	< 1	1	5	< 1	21	104	105	31	33	19	21	< 1		9
	Slovakia	9	11	4	< 1	23	25	27	37	1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	3	3	15	4	6	2	3	< 1		9
	Slovenia	6	13	< 1	< 1	14	14	15	107	< 1	< 1	< 1				1	< 1		7	11	3	4	1	2	< 1		5
	Spain	119	47	22	< 1	26	28	30	529	1	< 1	< 1	< 1	< 1	5	1	< 1	3	32	20							
	Sweden	19	31	1	< 1	9	10	10	303	1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	28	5	14	4						
	United Kingdom	125	39	49	2	17	27	34	457	6	< 1	< 1	< 1	< 1	2	38	2	6	23	6	2	2	< 1	< 1			6
	EU-27	1 270	1 224	584	8	686	816	945	10 168	319	39	8	27	52	140	237	6	1 019	705	852	158	137	60	106	54	0	629

Note: Empty cells indicate that no value is given (e.g. notation keys).

Table A4.5 Member State sectoral emissions in the 'road transport' sector in 2010

Road transport		NO_X	NMVOC	SO_X	NH_3	$PM_{2.5}$	PM_{10}	TSP	CO	Pb	Cd	Hg	As	Cr	Cu	Ni	Se	Zn	PCDD/F	Total PAH	Benzo (a) pyrene	Benzo(b) fluoranthene	Benzo(k) fluoranthene	Indeno (1,2,3-cd) pyrene	HCB	HCH	PCB
		Gg	Gg	Gg	Gg	Gg	Gg	Gg	Gg	Mg	Mg	Mg	Mg	Mg	Mg	Mg	Mg	Mg	g	Mg	Mg	Mg	Mg	Mg	kg	kg	kg
Austria		109	12	< 1	1	4	6	13	156	< 1	< 1	< 1							1	2					< 1		
Belgium		107	9	< 1	1	5	6	18	56	5	< 1			< 1	45	< 1	< 1	21	< 1	< 1				< 1			
Bulgaria		28	5	< 1	< 1	1	2	< 1	42	< 1	< 1			< 1	7	< 1	< 1	5	< 1	< 1	< 1	< 1	< 1	< 1			
Cyprus		8	2	< 1	< 1	< 1	< 1	< 1	14	2	< 1			< 1	3	< 1	< 1	2	< 1	< 1	< 1	< 1	< 1	< 1			
Czech Republic		67	34	< 1	2	5	7	26	144	< 1	< 1			< 1	9	< 1	< 1	5	< 1	< 1	< 1	< 1	< 1	< 1			
Denmark		44	13	< 1	1	2	3	4	106	6	< 1	< 1	< 1	< 1	47	< 1	< 1	27	< 1	< 1	< 1	< 1	< 1	< 1			
Estonia		10	3	< 1	< 1	< 1	< 1	< 1	22	< 1	< 1			< 1	2	< 1	< 1	2	< 1	< 1	< 1	< 1	< 1	< 1			
Finland		43	22	< 1	3	7	11	18	177	< 1	< 1	< 1	< 1	< 1	44	< 1		23	3	1					< 1		19
France		594	111	< 1	7	49	64	89	697	2	< 1			< 1	150	< 1		77	2	5	1	2	1	1	9		
Germany		538	123	< 1	15	23	32	44	977	84	< 1	< 1	< 1	24	2063	4	2	1768	2	2	< 1	< 1		< 1			
Greece		104	46	< 1	2				318																		
Hungary		89	29	< 1	1	5	7	7	236	2	< 1			1	25	< 1	< 1	12	< 1	< 1	< 1	< 1	< 1	< 1			
Ireland		36	9	< 1	2	2	3	3	76	9	< 1			< 1	18	< 1	< 1	8	< 1	< 1	< 1	< 1	< 1	< 1			
Italy		491	274	< 1	9	30	34	43	1032	12	< 1			6	152	3	< 1	74	7	3							
Latvia		16	3	< 1	< 1	1	1	< 1	17	2	< 1			< 1	5	< 1	< 1	2	< 1	< 1	< 1	< 1	< 1	< 1			
Lithuania		29	8	< 1	< 1	1	1	1	51	2	< 1			< 1	5	< 1	< 1	2	< 1	< 1	< 1	< 1	< 1	< 1			
Luxembourg		34		< 1	< 1				28										< 1	< 1	< 1	< 1	< 1	< 1	< 1		< 1
Malta		2	< 1	< 1	< 1	< 1	< 1	< 1	10	3	< 1		< 1	1	27	< 1	< 1	8		< 1	< 1	< 1	< 1	< 1			
Netherlands		106	29	< 1	2	5	7	7	292	6	< 1		< 1	< 1	56	< 1	< 1	38	< 1	< 1	< 1	< 1	< 1	< 1			
Poland		273	160	1	< 1	22	25	80	688	17	< 1			2	4	7			< 1	3	3	< 1		< 1	< 1		100
Portugal		79	21	< 1	1	4	5		118	7	< 1			1	28	< 1	< 1	13	< 1								
Romania		133	106	< 1	2		7		448	7	< 1			< 1	7	< 1	< 1	4	< 1	< 1	< 1	< 1	< 1	< 1			
Slovakia		41	7	< 1	< 1	2	2	3	53	2	< 1			< 1	4	< 1	< 1	2	< 1	< 1	< 1	< 1	< 1	< 1	< 1		15
Slovenia		23	5	< 1	< 1	1	2	2	38	3	< 1								< 1	< 1	< 1	< 1	< 1	< 1	< 1		
Spain		370	47	< 1	4	19	24	30	276	21	< 1			8	195	2	< 1	94	4	11							
Sweden		67	35	< 1	3	7	11	19	208	4	< 1			< 1	49	< 1		30	< 1	< 1	< 1	< 1	< 1	< 1			
United Kingdom		371	70	< 1	10	18	25	32	909	2	< 1	< 1	< 1	< 1	24	2	5	88	2	< 1	< 1	< 1	< 1	< 1			
EU-27		3 812	1 182	7	71	216	287	443	7 192	200	3	0	1	49	2 967	22	8	2 304	27	30	5	3	2	2	10	0	135

Note: Empty cells indicate that no value is given (e.g. notation keys).

Table A4.6 Member State sectoral emissions in the 'non-road transport' sector in 2010

Non-road transport		NO_x	NMVOC	SO_x	NH_3	$PM_{2.5}$	PM_{10}	TSP	CO	Pb	Cd	Hg	As	Cr	Cu	Ni	Se	Zn	PCDD/F	Total PAH	Benzo (a) pyrene	Benzo(b) fluoranthene	Benzo(k) fluoranthene	Indeno (1,2,3-cd) pyrene	HCB	HCH	PCB
		Gg	Gg	Gg	Gg	Gg	Gg	Gg	Gg	Mg	Mg	Mg	Mg	Mg	Mg	Mg	Mg	Mg	g	Mg	Mg	Mg	Mg	Mg	kg	kg	kg
	Austria	3	1	< 1	< 1	< 1	< 1	2	8	< 1	< 1	< 1							< 1	< 1					< 1		
	Belgium	12	< 1	2	< 1	< 1	< 1	2	5	< 1	< 1	< 1	< 1	< 1	3	< 1	< 1	< 1	< 1	< 1							
	Bulgaria	2	< 1	< 1	< 1	< 1	< 1	< 1	< 1		< 1			< 1	< 1	< 1	< 1	< 1		< 1							
	Cyprus	< 1	< 1	< 1		< 1	< 1	< 1	1																		
	Czech Republic	4	< 1	< 1	< 1	< 1	< 1	< 1	2	< 1	< 1			< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1			
	Denmark	24	2	2	< 1	< 1	< 1	< 1	9	< 1	< 1	< 1	< 1	< 1	< 1	2	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1		
	Estonia	3	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1		< 1
	Finland	15	6	1	< 1	< 1	< 1	< 1	28	< 1																	< 1
	France	43	45	7		4	6	8	180	6	< 1	< 1	< 1	< 1	54	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1			< 1
	Germany	40	4	1	< 1	< 1	< 1	< 1	27	5	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	1	< 1					< 1			< 1
	Greece	47	2	34					9																			
	Hungary	7	< 1	< 1	< 1	< 1	< 1	< 1	2	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1			
	Ireland	4	< 1	< 1		< 1	< 1	< 1	2	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1								
	Italy	105	62	22	< 1	8	8	8	162	1	< 1		< 1	< 1	< 1	5	< 1	< 1		< 1								
	Latvia	3	< 1	< 1	< 1	< 1	< 1	< 1	1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1			< 1
	Lithuania	3	< 1	< 1	< 1	< 1	< 1	< 1	1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1				
	Luxembourg	< 1	< 1	< 1	< 1				< 1																			
	Malta	< 1	< 1	< 1		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1						< 1			< 1
	Netherlands	35	2	< 1	< 1	1	1	1	10	3	< 1		< 1	< 1	7	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1				
	Poland	14	3	< 1	< 1	1	1	1	9		< 1				< 1	< 1			< 1	< 1	< 1	< 1	< 1	< 1				
	Portugal	13	< 1	2	< 1	1	1	1	5	< 1	< 1	< 1	< 1	< 1	< 1	1	< 1	< 1		< 1								
	Romania	12	< 1	< 1	< 1	< 1	< 1	< 1	2	< 1	< 1	3	3	< 1	3	< 1	< 1	< 1		< 1	< 1	< 1	< 1	< 1	< 1			
	Slovakia	5	< 1	< 1	< 1	< 1	< 1	< 1	2		< 1			< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1			
	Slovenia	< 1	< 1	< 1		< 1	< 1	< 1	1	< 1	< 1								< 1	< 1	< 1	< 1	< 1	< 1				
	Spain	111	5	75	< 1	9	9	9	9	< 1	< 1	< 1	< 1	< 1	2	24	< 1	2	6	< 1					< 1			
	Sweden	16	7	4	< 1	< 1	< 1	< 1	26	< 1	< 1	< 1	< 1	< 1	< 1	5	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1			< 1
	United Kingdom	85	12	14		2	3	3	74	< 1	< 1	< 1	< 1	< 1	< 1	4	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1			
	EU-27	612	157	168	0	33	36	41	577	18	1	3	4	1	72	43	1	6	10	2	0	0	0	0	0	0	0	2

Note: Empty cells indicate that no value is given (e.g. notation keys).

Table A4.7 Member State sectoral emissions in the 'solvent and product use' sector in 2010

Solvent and product use		NO_X	NMVOC	SO_X	NH_3	$PM_{2.5}$	PM_{10}	TSP	CO	Pb	Cd	Hg	As	Cr	Cu	Ni	Se	Zn	PCDD/F	Total PAH	Benzo (a) pyrene	Benzo(b) fluoranthene	Benzo(k) fluoranthene	Indeno (1,2,3-cd) pyrene	HCB	HCH	PCB
		Gg	Gg	Gg	Gg	Gg	Gg	Gg	Gg	Mg	Mg	Mg	Mg	Mg	Mg	Mg	Mg	Mg	g	Mg	Mg	Mg	Mg	Mg	kg	kg	kg
Austria			74			< 1	< 1	< 1		< 1	< 1																
Belgium			45																	12						175	
Bulgaria			10																								
Cyprus			5																								
Czech Republic			83																								
Denmark		< 1	27	< 1	< 1	< 1	< 1	< 1	2	< 1	< 1	< 1	< 1	< 1	2	< 1	< 1	2	< 1	< 1	< 1	< 1	< 1	< 1			
Estonia		< 1	6	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1			< 1	< 1	< 1	< 1	< 1	< 1				
Finland		< 1	21	< 1	< 1	< 1	< 1	< 1	< 1	< 1		< 1	< 1		< 1				< 1	< 1							
France		< 1	362			1	3	4	< 1	< 1	< 1	< 1	< 1	< 1	< 1				< 1	< 1	< 1	< 1	< 1	< 1			
Germany			720		2	10	10	10	< 1	< 1										< 1	< 1	< 1	< 1	< 1			
Greece			54																								
Hungary		< 1	25			< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1					< 1							
Ireland			23																								
Italy			408			< 1	< 1	< 1											< 1	< 1							
Latvia			13																								
Lithuania			21																								
Luxembourg			4																								
Malta			2																								
Netherlands			54		1	< 1	1	1											15	< 1	< 1		< 1	< 1			
Poland			210		< 1																< 1	< 1	< 1	< 1			
Portugal			62			< 1	< 1	< 1																			
Romania			50					20			< 1		< 1	< 1		< 1	< 1										
Slovakia			32																								
Slovenia			12					< 1												< 1	< 1	< 1	< 1	< 1			30
Spain			431																	< 1							
Sweden			87			< 1	< 1	< 1		< 1	< 1	< 1	< 1	< 1	< 1				< 1	< 1	< 1	< 1	< 1	< 1			
United Kingdom			351		1	1	4	5												< 1	< 1	< 1	< 1	< 1	< 1		
EU-27		0	3 190	0	4	15	20	41	2	0	0	0	0	0	2	0	0	2	15	12	0	0	0	0	0	175	30

Note: Empty cells indicate that no value is given (e.g. notation keys).

Table A4.8 Member State sectoral emissions in the 'agriculture' sector in 2010

Agriculture		NO_x	NMVOC	SO_x	NH_3	$PM_{2.5}$	PM_{10}	TSP	CO	Pb	Cd	Hg	As	Cr	Cu	Ni	Se	Zn	PCDD/F	Total PAH	Benzo (a) pyrene	Benzo(b) fluoranthene	Benzo(k) fluoranthene	Indeno (1,2,3-cd) pyrene	HCB	HCH	PCB
		Gg	Gg	Gg	Gg	Gg	Gg	Gg	Gg	Mg	Mg	Mg	Mg	Mg	Mg	Mg	Mg	Mg	g	Mg	Mg	Mg	Mg	Mg	kg	kg	kg
Austria		6	2	< 1	58	1	5	12	< 1	< 1	< 1	< 1							< 1	< 1					< 1		
Belgium					64	< 1	3	7																			
Bulgaria		4	33		36				2																		
Cyprus		< 1	2	< 1	5	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1		< 1	< 1	< 1	< 1	< 1							
Czech Republic					66	< 1	6	3																			
Denmark		< 1	2	< 1	72	1	6	12	2	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1			
Estonia		1	4		10	< 1	< 1	< 1																			
Finland		< 1			34	< 1	1	4																	< 1		
France		< 1	3	< 1	628	8	47	464	27																		
Germany		104			513	6	39	39										5									
Greece		1			62				30																		
Hungary		12	< 1	< 1	64	2	11	124	9	< 1	< 1	< 1	< 1	< 1		< 1	< 1		< 1	16							
Ireland			< 1		105	< 1	< 1	< 1																	1		
Italy		< 1	1		358	6	18	27	12																		
Latvia		< 1	< 1		16	< 1	2	1	< 1										< 1	< 1	< 1	< 1	< 1	< 1			
Lithuania					30																						
Luxembourg		< 1	< 1		4																						
Malta					1	< 1	< 1	< 1																			
Netherlands		7	< 1		107	< 1	6	6										5									
Poland			< 1		266	< 1	10	22											< 1								
Portugal		2	3		43	3	3	3	19	< 1	< 1	< 1	< 1	< 1		< 1	< 1	< 1	< 1	99							
Romania		< 1	65		143	1	6																				
Slovakia			< 1		24																						
Slovenia					17	< 1	3	6																			
Spain		21	48	4	343	4	21	52	340										7	113					3877		
Sweden					44	< 1	4																				
United Kingdom					253	2	13	73																	23		
EU-27		160	165	4	3 364	39	206	855	443	1	0	0	0	0	0	0	0	5	8	229	0	0	0	0	24	3 877	0

Note: Empty cells indicate that no value is given (e.g. notation keys).

Table A4.9 Member State sectoral emissions in the 'waste' sector in 2010

Waste		NO_X	NMVOC	SO_X	NH_3	$PM_{2.5}$	PM_{10}	TSP	CO	Pb	Cd	Hg	As	Cr	Cu	Ni	Se	Zn	PCDD/F	Total PAH	Benzo (a) pyrene	Benzo(b) fluoranthene	Benzo(k) fluoranthene	Indeno (1,2,3-cd) pyrene	HCB	HCH	PCB
		Gg	Gg	Gg	Gg	Gg	Gg	Gg	Gg	Mg	Mg	Mg	Mg	Mg	Mg	Mg	Mg	Mg	g	Mg	Mg	Mg	Mg	Mg	kg	kg	kg
Austria		< 1	< 1	< 1	1	< 1	< 1	< 1	5	< 1	< 1	< 1							< 1	< 1					< 1		
Belgium		< 1	< 1	< 1	2	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	23	7					2		
Bulgaria		< 1	1	< 1	10	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1		3	4	< 1					< 1		< 1
Cyprus			< 1		< 1	< 1	< 1	< 1											< 1	< 1							
Czech Republic		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1		2	< 1	< 1	< 1	< 1	< 1	< 1	< 1		< 1
Denmark		< 1	< 1	< 1	< 1	< 1	< 1	< 1	1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	6	< 1	< 1	< 1	< 1	< 1	< 1		
Estonia		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1		< 1	< 1	< 1	< 1	< 1				< 1								
Finland		< 1	< 1	< 1		< 1	< 1	< 1	< 1	< 1		< 1	< 1	< 1	< 1	< 1		2	< 1	< 1		< 1	< 1	< 1	< 1		< 1
France		3	14	< 1	6	3	3	3	14	3	< 1	< 1	< 1	< 1	< 1	< 1	< 1	2	41	< 1	< 1	< 1	< 1	< 1	2		1
Germany		< 1	< 1	< 1		< 1	< 1	< 1		< 1	< 1	< 1							< 1		< 1						
Greece																											
Hungary		< 1	2	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1		2	< 1	< 1	< 1	< 1	< 1	< 1	< 1		< 1
Ireland		< 1	< 1	< 1		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1		< 1	7	< 1	< 1	< 1	< 1	< 1	< 1		8
Italy		14	22	< 1	9	10	12	13	260	4	< 1	< 1	< 1	< 1	< 1	< 1	< 1	2	35	30					11		2
Latvia		< 1	< 1	< 1	1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1		< 1	< 1	< 1	< 1				< 1		< 1
Lithuania																											
Luxembourg																			< 1	< 1	< 1	< 1	< 1	< 1	< 1		< 1
Malta		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1		< 1	8	< 1							
Netherlands		< 1	< 1	< 1	< 1	< 1	< 1	< 1				< 1							< 1								
Poland		2	2	< 1	3	5	8	13	28	1	< 1	< 1	< 1	< 1	< 1	< 1		< 1	130						< 1		11
Portugal		1	10	< 1	2	< 1	3	3	16	178	< 1	< 1	< 1	< 1	< 1	< 1			< 1	23					< 1		1 007
Romania		< 1	2	< 1	16	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1		< 1	25						< 1		< 1
Slovakia			< 1							8	< 1	< 1	< 1	< 1	1	< 1	< 1	3	15						< 1		3
Slovenia		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1							< 1	< 1		< 1	< 1		< 1		< 1
Spain		< 1	2	< 1	11	< 1	< 1	< 1	2	1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	1	6	< 1		< 1			< 1		
Sweden		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1			< 1	< 1	< 1	< 1	< 1	< 1			
United Kingdom		1	34	< 1	12	2	2	3	14	< 1	< 1	2	9	9	5	< 1		2	41	< 1	< 1	< 1	< 1	< 1	< 1		86
EU-27		25	93	3	75	21	29	36	340	197	1	4	10	11	9	1	0	21	344	62	0	0	0	0	23	0	1 208

Note: Empty cells indicate that no value is given (e.g. notation keys).

Appendix 5 Schema for mapping EMEP NFR09 sectors

To enable the presentation of sectoral emission trends (Chapter 3), individual NFR source categories for the EU-27 inventory were aggregated into the following main sector groups:

- energy production and distribution
- energy use in industry
- industrial processes
- solvent and product use
- commercial, institutional and households (energy use)
- road transport
- non-road transport
- agriculture
- waste.

A conversion chart showing which of the individual NFR source categories was included in each of the aggregated sector groups is provided in Table A5.1.

Table A5.1 Schema for mapping EMEP NFR09 sectors

NFR code	Full name	EEA aggregated sector name
1 A 1 a	1 A 1 a Public electricity and heat production	Energy production and distribution
1 A 1 b	1 A 1 b Petroleum refining	Energy production and distribution
1 A 1 c	1 A 1 c Manufacture of solid fuels and other energy industries	Energy production and distribution
1 A 2 a	1 A 2 a Stationary combustion in manufacturing industries and construction: Iron and steel	Energy use in industry
1 A 2 b	1 A 2 b Stationary combustion in manufacturing industries and construction: Non-ferrous metals	Energy use in industry
1 A 2 c	1 A 2 c Stationary combustion in manufacturing industries and construction: Chemicals	Energy use in industry
1 A 2 d	1 A 2 d Stationary combustion in manufacturing industries and construction: Pulp, paper and print	Energy use in industry
1 A 2 e	1 A 2 e Stationary combustion in manufacturing industries and construction: Food processing, beverages and tobacco	Energy use in industry
1 A 2 f i	1 A 2 f i Stationary combustion in manufacturing industries and construction: Other (Please specify in your IIR)	Energy use in industry
1 A 2 f ii	1 A 2 f ii Mobile Combustion in manufacturing industries and construction: (Please specify in your IIR)	Energy use in industry
1 A 3 a ii (i)	1 A 3 a ii (i) Civil aviation (Domestic, LTO)	Non-road transport
1 A 3 a i (i)	1 A 3 a i (i) International aviation (LTO)	Non-road transport
1 A 3 b i	1 A 3 b i Road transport: Passenger cars	Road transport
1 A 3 b ii	1 A 3 b ii Road transport: Light duty vehicles	Road transport
1 A 3 b iii	1 A 3 b iii Road transport: Heavy-duty vehicles	Road transport
1 A 3 b iv	1 A 3 b iv Road transport: Mopeds and motorcycles	Road transport
1 A 3 b v	1 A 3 b v Road transport: Gasoline evaporation	Road transport
1 A 3 b vi	1 A 3 b vi Road transport: Automobile tyre and brake wear	Road transport
1 A 3 b vii	1 A 3 b vii Road transport: Automobile road abrasion	Road transport
1 A 3 c	1 A 3 c Railways	Non-road transport

Table A5.1 Schema for mapping EMEP NFR09 sectors (cont.)

NFR code	Full name	EEA aggregated sector name
1 A 3 d i (ii)	1 A 3 d i (ii) International inland waterways	Non-road transport
1 A 3 d ii	1 A 3 d ii National navigation (Shipping)	Non-road transport
1 A 3 e	1 A 3 e Pipeline compressors	Energy production and distribution
1 A 4 a i	1 A 4 a i Commercial/institutional: Stationary	Commercial, institutional and households
1 A 4 a ii	1 A 4 a ii Commercial/institutional: Mobile	Commercial, institutional and households
1 A 4 b i	1 A 4 b i Residential: Stationary plants	Commercial, institutional and households
1 A 4 b ii	1 A 4 b ii Residential: Household and gardening (mobile)	Commercial, institutional and households
1 A 4 c i	1 A 4 c i Agriculture/forestry/fishing: Stationary	Commercial, institutional and households
1 A 4 c ii	1 A 4 c ii Agriculture/forestry/fishing: Off-road vehicles and other machinery	Commercial, institutional and households
1 A 4 c iii	1 A 4 c iii Agriculture/forestry/fishing: National fishing	Non-road transport
1 A 5 a	1 A 5 a Other stationary (including military)	Commercial, institutional and households
1 A 5 b	1 A 5 b Other, Mobile (including military, land-based and recreational boats)	Commercial, institutional and households
1 B 1 a	1 B 1 a Fugitive emission from solid fuels: Coal mining and handling	Energy production and distribution
1 B 1 b	1 B 1 b Fugitive emission from solid fuels: Solid fuel transformation	Energy production and distribution
1 B 1 c	1 B 1 c Other fugitive emissions from solid fuels	Energy production and distribution
1 B 2 a i	1 B 2 a i Exploration, production, transport	Energy production and distribution
1 B 2 a iv	1 B 2 a iv Refining/storage	Energy production and distribution
1 B 2 a v	1 B 2 a v Distribution of oil products	Energy production and distribution
1 B 2 b	1 B 2 b Natural gas	Energy production and distribution
1 B 2 c	1 B 2 c Venting and flaring	Energy production and distribution
1 B 3	1 B 3 Other fugitive emissions from geothermal energy production, peat and other energy extraction not included in 1 B 2	Energy production and distribution
2 A 1	2 A 1 Cement production	Industrial processes
2 A 2	2 A 2 Lime production	Industrial processes
2 A 3	2 A 3 Limestone and dolomite use	Industrial processes
2 A 4	2 A 4 Soda ash production and use	Industrial processes
2 A 5	2 A 5 Asphalt roofing	Industrial processes
2 A 6	2 A 6 Road paving with asphalt	Industrial processes
2 A 7 a	2 A 7 a Quarrying and mining of minerals other than coal	Industrial processes
2 A 7 b	2 A 7 b Construction and demolition	Industrial processes
2 A 7 c	2A 7 c Storage, handling and transport of mineral products	Industrial processes
2 A 7 d	2 A 7 d Other mineral products (Please specify the sources included/excluded in the notes column to the right)	Industrial processes
2 B 1	2 B 1 Ammonia production	Industrial processes
2 B 2	2 B 2 Nitric acid production	Industrial processes
2 B 3	2 B 3 Adipic acid production	Industrial processes
2 B 4	2 B 4 Carbide production	Industrial processes
2 B 5 a	2 B 5 a Other chemical industry (Please specify the sources included/excluded in the notes column to the right)	Industrial processes
2 B 5 b	2 B 5 b Storage, handling and transport of chemical products (Please specify the sources included/excluded in the notes column to the right)	Industrial processes
2 C 1	2 C 1 Iron and steel production	Industrial processes
2 C 2	2 C 2 Ferroalloys production	Industrial processes
2 C 3	2 C 3 Aluminium production	Industrial processes
2 C 5 a	2 C 5 a Copper production	Industrial processes
2 C 5 b	2 C 5 b Lead production	Industrial processes
2 C 5 c	2 C 5 c Nickel production	Industrial processes

Table A5.1 Schema for mapping EMEP NFR09 sectors (cont.)

NFR code	Full name	EEA aggregated sector name
2 C 5 d	2 C 5 d Zinc production	Industrial processes
2 C 5 e	2 C 5 e Other metal production (Please specify the sources included/excluded in the notes column to the right)	Industrial processes
2 C 5 f	2 C 5 f Storage, handling and transport of metal products (Please specify the sources included/excluded in the notes column to the right)	Industrial processes
2 D 1	2 D 1 Pulp and paper	Industrial processes
2 D 2	2 D 2 Food and drink	Industrial processes
2 D 3	2 D 3 Wood processing	Industrial processes
2 E	2 E Production of POPs	Industrial processes
2 F	2 F Consumption of POPs and heavy metals (e.g. electrical and scientific equipment)	Industrial processes
2 G	2 G Other production, consumption, storage, transportation or handling of bulk products (Please specify the sources included/excluded in the notes column to the right)	Industrial processes
3 A 1	3 A 1 Decorative coating application	Solvent and product use
3 A 2	3 A 2 Industrial coating application	Solvent and product use
3 A 3	3 A 3 Other coating application (Please specify the sources included/excluded in the notes column to the right)	Solvent and product use
3 B 1	3 B 1 Degreasing	Solvent and product use
3 B 2	3 B 2 Dry cleaning	Solvent and product use
3 C	3 C Chemical products	Solvent and product use
3 D 1	3 D 1 Printing	Solvent and product use
3 D 2	3 D 2 Domestic solvent use including fungicides	Solvent and product use
3 D 3	3 D 3 Other product use	Solvent and product use
4 B 1 a	4 B 1 a Cattle dairy	Agriculture
4 B 1 b	4 B 1 b Cattle non-dairy	Agriculture
4 B 2	4 B 2 Buffalo	Agriculture
4 B 3	4 B 3 Sheep	Agriculture
4 B 4	4 B 4 Goats	Agriculture
4 B 6	4 B 6 Horses	Agriculture
4 B 7	4 B 7 Mules and asses	Agriculture
4 B 8	4 B 8 Swine	Agriculture
4 B 9 a	4 B 9 a Laying hens	Agriculture
4 B 9 b	4 B 9 b Broilers	Agriculture
4 B 9 c	4 B 9 c Turkeys	Agriculture
4 B 9 d	4 B 9 d Other poultry	Agriculture
4 B 13	4 B 13 Other	Agriculture
4 D 1 a	4 D 1 a Synthetic N-fertilisers	Agriculture
4 D 2 a	4 D 2 a Farm-level agricultural operations including storage, handling and transport of agricultural products	Agriculture
4 D 2 b	4 D 2 b Off-farm storage, handling and transport of bulk agricultural products	Agriculture
4 D 2 c	4 D 2 c N-excretion on pasture range and paddock unspecified (Please specify the sources included/excluded in the notes column to the right)	Agriculture
4 F	4 F Field burning of agricultural wastes	Agriculture
4 G	4 G Agriculture other (c)	Agriculture
6 A	6 A Solid waste disposal on land	Waste
6 B	6 B Wastewater handling	Waste
6 C a	6 C a Clinical waste incineration (d)	Waste
6 C b	6 C b Industrial waste incineration (d)	Waste

Table A5.1 Schema for mapping EMEP NFR09 sectors (cont.)

NFR code	Full name	EEA aggregated sector name
6 C c	6 C c Municipal waste incineration (d)	Waste
6 C d	6 C d Cremation	Waste
6 C e	6 C e Small scale waste burning	Waste
6 D	6 D Other waste (e)	Waste
7 A	7 A Other (included in national total for entire territory)	Other

Note: LTO: Landing/take off.

Appendix 6 Details on methodology used (tier method)

Table A6.1 Overview of methodology used per source category

Explanation of detailed methology (T1 = Tier 1, T2 = Tier 2 etc.)																									
	AT	BE	BG	CY	CZ	DK	EE	FI	FR	DE	GR	HU	IE	IT	LV	LT	LU	MT	NL	PL	PT	RO	SK	SI	ES	SE	GB
1 A 1 a										T2									T3			T1				T2, T3	
1 A 1 b										T2									T3		T2	T1				T2	
1 A 1 c										T2									T3			T1				T2	
1 A 2 a										T2									T3		T2	T1				T2	
1 A 2 b																			T3		T2	T2				T2	
1 A 2 c																			T3		T2					T2	
1 A 2 d																			T3		T2					T2	
1 A 2 e																			T3		T2					T2	
1 A 2 f i				T2						T2									T3		T2	T1, T2				T1, T2	
1 A 2 f ii							T1			T1									T3		T2					T1, T2	
1 A 3 a ii (i)	T3			T2			T2											T1	T3		T3, T2, T1					T2	
1 A 3 a i (i)	T3			T2			T2											T1	T3		T3, T2, T1						
1 A 3 b i				T3			T2	T3		T3; T1 (a)						T3		T3	T3							T2	
1 A 3 b ii							T2	T3		T3						T3		T3	T3							T2	
1 A 3 b iii							T2	T3		T3; T2 (b)						T3		T3	T3							T2	
1 A 3 b iv							T2	T3								T3		T3	T3							T2	
1 A 3 b v							T2			T1						T3		T3	T3							T2	
1 A 3 b vi							T2			T3						T3		T3	T3								
1 A 3 b vii							T2			T3						T3		T3	T3								
1 A 3 c							T1												T2			T1				T1	
1 A 3 d i (ii)																			T3		T2, T3						
1 A 3 d ii							T1												T3		T2, T3	T1				T1	
1 A 3 e																											
1 A 4 a i				IE						T2, T3									T2		T2	T1				T1	
1 A 4 a ii				IE			T1			NE									T3		T2					T1	
1 A 4 b i				T1						T2, T3									T2			T1				T2	
1 A 4 b ii				IE			T1			T1									T3							T2	
1 A 4 c i				T1						T2, T3									T2			T1				T1	
1 A 4 c ii				T1			T1			T1									T3			T1					

Table A6.1 Overview of methodology used per source category (cont.)

Explanation of detailed methology (T1 = Tier 1, T2 = Tier 2 etc.)																										
	AT	BE	BG	CY	CZ	DK	EE	FI	FR	DE	GR	HU	IE	IT	LV	LT	LU	MT	NL	PL	PT	RO	SK	SI	ES	SE	GB
1A 4 c iii							T1			T1									T3			T1					
1 A 5 a										T2, T3									T2								
1 A 5 b										T1									T3							T1	
1 B 1 a										NE												T1					
1 B 1 b										T1, T2												T1					
1 B 1 c										NA																T2	
1 B 2 a i				NO						T1, T2									T3			T1				T2	
1 B 2 a iv				T1						T1, T2									T2			T1				T2	
1 B 2 a v				T2			T2			T1, T2												T1				T2	
1 B 2 b	T3			NO			T1			T1, T2, T3									T3			T2					
1 B 2 c				T1						T1, T2																	
1 B 3										NA																	
2 A 1				T2			T3			T1												T1					
2 A 2				T1			T3			T1												T1					
2 A 3							T3																				
2 A 4																						T1					
2 A 5				T1																		T1					
2 A 6				T2			T1								T1												
2 A 7 a				T1																							
2 A 7 b				T1			T1																				
2 A 7 c				T2																		T1					
2 A 7 d										T1, T2					T1												
2 B 1							T3															T1					
2 B 2																						T1					
2 B 3																											
2 B 4																											
2 B 5 a							T3															T1, T2					
2 B 5 b							T3																				
2 C 1				NO			T3								T1							T2					
2 C 2				NO																		T1					
2 C 3				NO			T3															T2					
2 C 5 a				NO			T3															T1					
2 C 5 b				NO			T3															T1					
2 C 5 c				NO																							
2 C 5 d				NO			T3															T1					
2 C 5 e				NO			T3																				
2 C 5 f				NO																							
2 D 1							T3								T1							T1					
2 D 2				T2			T3															T2					
2 D 3							T3															T1					
2 E																											
2 F																											

Table A6.1 Overview of methodology used per source category (cont.)

Explanation of detailed methology (T1 = Tier 1, T2 = Tier 2 etc.)																										
	AT	BE	BG	CY	CZ	DK	EE	FI	FR	DE	GR	HU	IE	IT	LV	LT	LU	MT	NL	PL	PT	RO	SK	SI	ES	SE	GB
2 G										T1												T2					
3 A 1			T1	T2			T1			T2												T2					
3 A 2			T1	T2			T1			T2											T1	T2					
3 A 3			T1	T2			T1			T2																	
3 B 1			T1							T2												T1					
3 B 2			T1							T2																	
3 C			T1	NE						T2											T2	T2					
3 D 1				T1			T1			T2												T1					
3 D 2				T1			T1			T2												T1					
3 D 3										T2												T2					
4 B 1 a	T1			T1			T1			T3, T2, T1												T1					
4 B 1 b	T1			T1			T1			T3, T2, T1												T1					
4 B 2	T1			T1																		T1					
4 B 3	T1			T1						T2, T1												T1					
4 B 4	T1			T1						T2, T1												T1					
4 B 6	T1			T1						T2, T1												T1					
4 B 7	T1			T1						T2, T1																	
4 B 8	T1			T1						T3, T2, T1												T1					
4 B 9 a	T1			T1						T2, T1												T1					
4 B 9 b	T1			T1						T2, T1												T1					
4 B 9 c	T1			T1						T2, T1																	
4 B 9 d	T1			T1						T2, T1																	
4 B 13	T1			T1																							
4 D 1 a				T1						T1, T2								T2									
4 D 2 a										T3, T2, T1																T2	
4 D 2 b																											
4 D 2 c										T1, T3																	
4 F				T1																							
4 G																											
6 A				T1						NA																	
6 B				T1			T1			NA												T1, T2					
6 C a										NO												T1					
6 C b										NO												T1					
6 C c										NO																	
6 C d				T2						NO											T1						
6 C e				T1						NO												T1					

Table A6.1 Overview of methodology used per source category (cont.)

Explanation of detailed methology (T1 = Tier 1, T2 = Tier 2 etc.)																										
	AT	BE	BG	CY	CZ	DK	EE	FI	FR	DE	GR	HU	IE	IT	LV	LT	LU	MT	NL	PL	PT	RO	SK	SI	ES	SE	GB
6 D							T2			NA												T2					
7 A				T2																							
1 A 3 a ii (ii)																											
1 A 3 a i (ii)																											
1 A 3 d i (i)							T1																				
1 A 3																											
7 B																											
11A																											
11 B																											
11 C																											

Notes: (a) for natural gas;
(b) for petroleum.
T1 = tier 1, T2 = tier 2, T3 = tier 3.
Shaded rows indicate that the Member State has not submitted an IIR.
Improvement plans include filling empty cells for the next submission in 2013.
For an explanation of the notation keys, see Appendix 1.

Appendix 7 Reference to Member State IIRs

Table A7.1 List of submitted IIRs including source and date of submission

Country code	Title of Informative Inventory Report	Source	Date of submission
AT	AUSTRIA'S INFORMATIVE INVENTORY REPORT (IIR) 2012	http://cdr.eionet.europa.eu/at/un/CLRTAP_AT/envt2haba	15.3.2012
BE	Informative Inventory Report about Belgium's annual submission of air emission data	http://cdr.eionet.europa.eu/be/un/UNECE_CLRTAP_BE/envt2izjw/IIR_15032012_BE.pdf	15.3.2012
BG	Bulgarian Informative Inventory Report	http://cdr.eionet.europa.eu/bg/un/copy_of_UNECE_CLRTAP_BG/envt2hupg	15.3.2012
CY	Cyprus Informative Inventory Report 2010	http://cdr.eionet.europa.eu/cy/un/UNECE_CLRTAP_CY/envt120sa	12.3.2012
CZ	No IIR available		
DK	Annual Danish Informative Inventory Report to UNECE	http://cdr.eionet.europa.eu/dk/Air_Emission_Inventories/Submission_EMEP_UNECE/envt2clnw/Danish_Informative_Inventory_Report_2012.pdf	15.3.2012
EE	ESTONIAN INFORMATIVE INVENTORY REPORT 1990–2010	http://cdr.eionet.europa.eu/ee/un/UNECE_CLRTAP_EE/envt2h7oq/Estonian_IIR_2012.pdf	15.3.2012
FI	AIR POLLUTANT EMISSIONS IN FINLAND 1980–2010 INFORMATIVE INVENTORY REPORT	http://cdr.eionet.europa.eu/fi/un/UNECE_CLRTAP_FI/envt3v8lg/FI_IIR2012_2010emissions_300312_REVISED.docx/manage_document	30.3.2012
FR	INVENTAIRE DES EMISSIONS DE POLLUANTS ATMOSPHERIQUES EN FRANCE	http://cdr.eionet.europa.eu/fr/eu/colqhxdtq/envt2l5pa/UNECE_france_mars2012.pdf	16.3.2012
DE	German Informative Inventory Report (IIR)	http://cdr.eionet.europa.eu/de/eu/nec/envtuyxka/iir	15.3.2012
GR	INFORMATIVE INVENTORY REPORT 2012 GREECE	http://cdr.eionet.europa.eu/gr/un/colpovzow/envt3lkwq	2.4.2012
HU	No IIR available		
IE	IRELAND INFORMATIVE INVENTORY REPORT 2012	http://cdr.eionet.europa.eu/ie/un/coltzqmeg/envt6p3sq/Ireland_IIR_2012_FINAL.pdf/manage_document	4.5.2012
IT	Italian Emission Inventory 1990–2010 — Informative Inventory Report 2012	http://nfp-it.eionet.europa.eu:8980/Public/irc/circa-it/reportnet/library?l=/ae1sclrtapsandsnecsdata/ae-1_clrtap_2012&vm=detailed&sb=Title	3.5.2012
LV	LATVIA'S INFORMATIVE INVENTORY REPORT 1990–2010	http://cdr.eionet.europa.eu/lv/un/copy_of_colqhgwdg/coltzpjaa/envt2gxyw/LV_IIR_15032012.pdf	15.3.2012
LT	LITHUANIAN'S INFORMATIVE INVENTORY REPORT 2010	http://cdr.eionet.europa.eu/lt/un/UNECE_CLRTAP_LT/envt1h95a/IIR2010.pdf	9.3.2012
LU	No IIR available		
MT	Informative Inventory Report for Malta	http://cdr.eionet.europa.eu/mt/un/UNECE_CLRTAP_MT/envt2nnra/Malta_Information_Inventory_Report.pdf/manage_document	20.3.2012
NL	Emissions of transboundary air pollutants in the Netherlands 1990–2010 Informative Inventory Report 2012	http://cdr.eionet.europa.eu/nl/eu/colqt3lza/envt2iqhw/NL_IIR_2012.pdf	15.3.2012
PL	Poland's Informative Inventory Report 2012	http://cdr.eionet.europa.eu/pl/un/EMEP%20emissions%20data/envt1sbgq/IIR__Poland_2010_k.doc	5.3.2012
PT	Portuguese Informative Inventory Report 1990–2010	http://cdr.eionet.europa.eu/pt/un/UNECE_CLRTAP_PT/envt2ixuq/IIR_20120315_v20120315.pdf	15.3.2012
RO	Romania's Informative Inventory Report 2012	http://cdr.eionet.europa.eu/ro/un/UNECE_CLRTAP_RO/envt2h4_g/RO_IIR_2012_v1.doc	15.3.2012
SK	SLOVAK REPUBLIC INFORMATIVE INVENTORY REPORT 2012	http://cdr.eionet.europa.eu/sk/eu/nec/envtv2dpg/SVK_IIR_NEC_2011.pdf	30.12.2011

Table A7.1 List of submitted IIRs including source and date of submission (cont.)

SI	Informative Inventory Report 2012 for Slovenia	http://cdr.eionet.europa.eu/si/un/UNECE_CLRTAP_SI/colt7ea_g/envt7eb9g	14.5.2012
ES	INVENTARIO DE EMISIONES A LA ATMÓSFERA DE ESPAÑA	http://cdr.eionet.europa.eu/es/eu/nec/envtxayoa/Espana_Presentacion_Serie_1990-2010_Directiva_Techos__Diciembre_2011_.pdf	13.1.2012
SE	Informative Inventory Report 2012 Sweden	http://cdr.eionet.europa.eu/se/eu/colp93lqa/envtvl11q/IIR_submission_2012_Report_SE.pdf	22.12.2011
GB	UK Informative Inventory Report (1980–2010)	http://cdr.eionet.europa.eu/gb/un/cols3f2jg/envt2cb9g/UK_IIR_2012_final.pdf	14.3.2012

European Environment Agency

European Union emission inventory report 1990–2010 under the UNECE Convention on Long-range Transboundary Air Pollution (LRTAP)

2012 — 143 pp. — 21 x 29.7 cm

ISBN 978-92-9213-321-4
ISSN 1725-2237
doi:10.2800/5219

TH-AK-12-008-EN-N
doi:10.2800/5219

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ISBN 978-92-9213-321-4

Publications Office

European Environment Agency