EMEP/MSC-W Note 1/2003
Date: July 2003

METEOROLOGISK INSTITUTT
Norwegian Meteorological Institute

Technical Report

Review and Revision

Emission data reported to CLRTAP

MSC-W Status Report 2003

by

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ISSN 0804-2446

Preface & acknowledgements

This note was prepared to be presented to the Steering Body to the Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe (EMEP) at its twenty-seventh session in Geneva, 8-10 September 2003. It presents the status of UNECE (United Nations Economic Commission for Europe)/EMEP emission data stored and distributed by the Meteorological Synthesizing Centre-West (MSC-W) of EMEP.

Much work has been performed in order to develop the UNECE database to accommodates all types of data now requested by the new Guidelines for estimating and reporting emission data under the Convention on Long-Range Transboundary Air Pollution (CLRTAP). The main task has nevertheless been the development of a new system for creating improved emission input to model calculations (EMEP-MODINP).

The author would like to thank Heiko Klein, met.no/MSC-W, for continuous support, contributions and creativity in all tasks connected to the UNECE database systems.

Stephan Reis, IER Stuttart, on behalf of the GENEMIS project, kindly provided the GENEMIS LPS database for use within EMEP, and hence facilitated the development of EMEP-MODINP. Thanks to colleagues from CIAM/IIASA, Wolfgang Schoepp, for providing gridded population data, and Chris Heyes and Zbigniew Klimont, who provided emission data from the RAINS model. Thanks also to CONCAWE for their feedback on the old MSC-W gridded expert estimates.

As always, Leonor Tarrasón, met.no/MSC-W, has actively taken part in the discussions, and provided valuable feedback in particular to the development of the new procedure for creating emission input data to modelling activities.

The work of EMEP is carried out in collaboration with a broad network of scientists at national level that contribute with the systematic collection, analysis and reporting of emission inventories and measurements from the EMEP monitoring networks. The scientists within EMEP appreciate and acknowledge all the good work that national experts perform. Without them, this report would not have been possible.

Last but not least, the author would like to thank Brinda Wachs at the UNECE secretariat for the good co-operation during the last year, and Per Helmer Skaali met.no/MSC-W for his cheerful support with all the emission tables in this report.

CONTENTS

Introduction

More than fifty percent of the Parties to the Convention on Long-Range Transboundary Air Pollution (CLRTAP) have already implemented the new Guidelines for Estimating and Reporting Emission data (EB.AIR/GE.1/2002/7).

The timeliness, the amount of data, the completeness and the internal consistency of this year's submissions have increased compared to previous years.

We are grateful to the Parties for their enthusiastic efforts to contribute with emission data on a sufficiently disaggregated level, for input to different kinds of EMEP and other studies performed on European emission data.

The focus in this year's emission report from EMEP/MSC-W is on review and revision. Part I of the report concentrates on the officially reported data to the CLRTAP, while Part II concerns the MSC-W expert estimates.

The officially reported emissions data together with the expert estimates is available from WEBDAB: *http://webdab.emep.int/*. The officially reported emission data is further documented in the UNECE Note, Present State of Emission Data (EB.AIR/GE.1/2003/6), prepared by MSC-W in consultation with the UNECE secretariat. This report is therefore more focused on the revision of the expert estimates used within EMEP documented in Part II.

A transparent system for emission data checking, storing, distribution, production and quality assessment is now largely completed within EMEP. Figure 1 shows a simplified picture of this data handling and quality assessment/quality control (QA/QC) system.

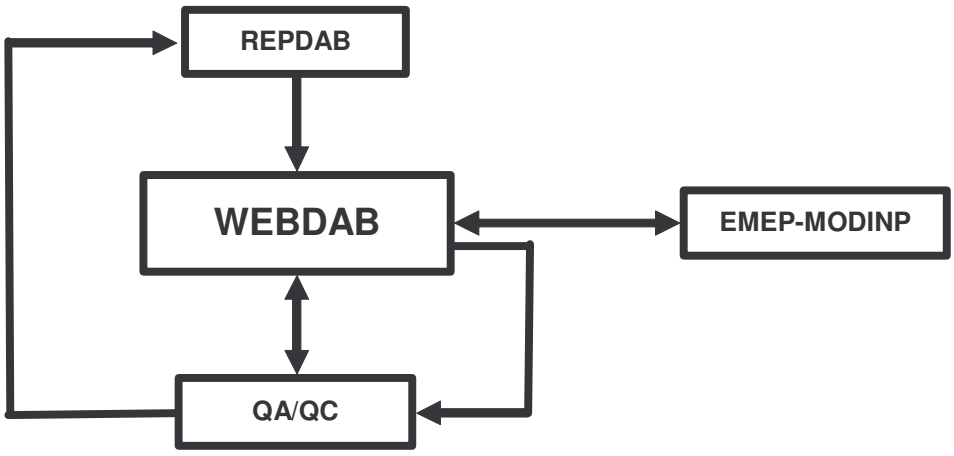

Figure 1 The EMEP emission data handling and QA/QC System

Last year MSC-W made available to Parties the REPDAB data checking system, in order to facilitate the checking of emission data by Parties upfront the official reporting to the CLRTAP and NEC (the National Emission Ceiling Directive).

The REPDAB checks:

- Format
- Completeness
- Consistency between sectors, aggregated sectors and national totals

of latest submissions in NFR format in accordance with the new Guidelines. REPDAB is available at: *http://webdab.emep.int/repdab.html*, and a short description are given in Appendix B in this report.

When the CLRTAP submissions have passed the REPDAB checks, data is submitted to the UNECE for registration of timeliness and completeness, and transferred to the MSC-W for initial loading to the WEBDAB.

WEBDAB was developed by MSC-W in 2001/2002, and is further developed this year, to accommodate the data reported in accordance with the new Guidelines. All checked officially reported data, together with expert estimates created and or used by MSC-W (see Part II) is made available to the Parties and to the public at: http: *//webdab.emep.int/*. WEBDAB is documented in EMEP/MSC-W Note 1/2002 (Vestreng and Klein, 2002).

When WEBDAB has been updated with the most recent submissions, MSC-W checks the consistency and completeness of the whole time series available in WEBDAB, and pose questions to Parties whenever the quality check highlight problems with the emission data. Parties are actively taking part in the QA/QC process by responding to the questions and comments from MSC-W. WEBDAB is again updated according to the responses from the Parties.

The arrow in Figure 1 from QA/QC to REPDAB, represents the situation where Parties chose to wait until the next reporting round before they correct or comment on their emission data.

The consistency and completeness of emission inventories have improved during the QA/QC phase, but still MSC-W has to complete and correct officially reported emission data (create MSC-W expert estimates) in order to prepare emission input to trend analysis and model calculations. These expert estimates are in turn loaded in WEBDAB.

This year, MSC-W has developed EMEP-MODINP. This system replaces the old routine for production and QC of expert gridded sector emissions. EMEP-MODINP is documented and evaluated in Part II, Chapter 2, of this report. The gridded MSC-W expert estimates created by EMEP-MODINP, is included in WEBDAB, and the WEBDAB is made available on the internet for Parties to review the MSC-W expert estimates.

The QA/QC with respect to timeliness, completeness and consistency of emission inventories is well taken care of by the QA/QC procedure outlined above. It is however felt that the methodologies used to assess the emission data should be documented and agreed in order to increase the transparency. Further, comparability between emission inventories and to some extent accuracy, should be included in the EMEP QA/QC procedure.

Motivated by the wish to further assist Parties in their work on enhancing the quality of their emission inventories and the need to harmonize the emission input to different assessments

performed on European emission data, MSC-W has collaborated with the ETC-ACC (European Topic Centre on Air and Climate Change) to prepare a proposal for emission data review of CLRTAP and NEC emission data. This proposal will be presented and discussed in the forthcoming joint TFEIP/EIONET meeting 22-24 September in Warsaw.

Part I: Data officially reported under the Convention on LRTAP

1. Overview of official submissions to the UNECE/EMEP

This was the first year of reporting according to the new Guidelines for Estimating and Reporting Emission data (EB.AIR/GE.1/2002/7). The deadline for submission of emission data to the UNECE was two weeks later than before, namely 15th February 2003 (1st March for gridded data). It is highly appreciated that more than fifty percent of the Parties reported at least some of their emission data according to the new Guidelines.

Results from the checks emission data at MSC-W showed that both the completeness and the consistency of reported data has increased. The initial checking of submissions at the UNECE secretariat with REPDAB, and the secretariats immediate response to Parties on their submissions has most likely contributed to the increases seen in completeness and consistency.

All Parties should aim at reporting all emission data according to the new Guidelines for the whole time series: 1980-2001 for SO_2, NO_x, NH_3, NMVOC and CO, 1990-2001 for Heavy metals and Persistent Organic Pollutants, 2000, 2001 for PMs and 1990, 1995 and 2000 for gridded sector and total emissions. In addition national total projections for 2010, 2015 and 2020, and projected activity data for 1990, 1995, 2000, 2010, 2015 and 2020 should be reported in accordance with the new Guidelines.

Problems and errors detected in the new Guidelines have been recorded at the UNECE Secretariat, and will be discussed in the TFEIP meeting in September. Two issues are worth mentioning here. Firstly, based on the experience form this year's reporting, the reporting template for LPS (Large Point Sources) should be revised, and a clearer definition of LPS included in the new Guidelines. Secondly, removing of the terms "National Protocol Total", "NFR11" and "National Overseas emissions" from the Guidelines and reporting templates has caused some problems in terms of consistency in the emission inventory for some Parties. These Parties have, for the part of their time series reported according to the new NFR source sectors, included emissions from the whole of their territory and emissions from "NFR11, Other sources and sinks" in the "National total", while national total emissions for years not recalculated, not include these emissions.

An overview of the most updated national total emissions of SO_2, NO_x, NH_3, NMVOC, CO, Particulate Matter (TSP, PM_{10}, $PM_{2.5}$), Heavy Metals (HMs) and Persistent Organic Pollutants (POPs), reported under the CLRTAP to the UNECE secretariat, and available in WEBDAB, can be found in Annex A, Tables 1-10. For the first time, Azerbaijan submitted emission data.

1.1 Timeliness and format of submissions

Figure 1.1 shows the timeliness of the 2003 data submissions to CLRTAP. Twenty-nine Parties (59% of the total number of Parties) reported emissions by the due date. As of June 1st 2003, the number of Parties for which assessments were available had increased to 36 (73% of the total number of Parties).

Last year only 33% of the submissions were on time, so there is a considerable improvement in timeliness this year. This is thought to be mainly an effect of the fact that the deadline is now two weeks later than last year, but the harmonization of the reporting format with the UNEFCC might also have contributed, as it facilitates the work of the Parties that provide data to both UNECE and UNFCCC.

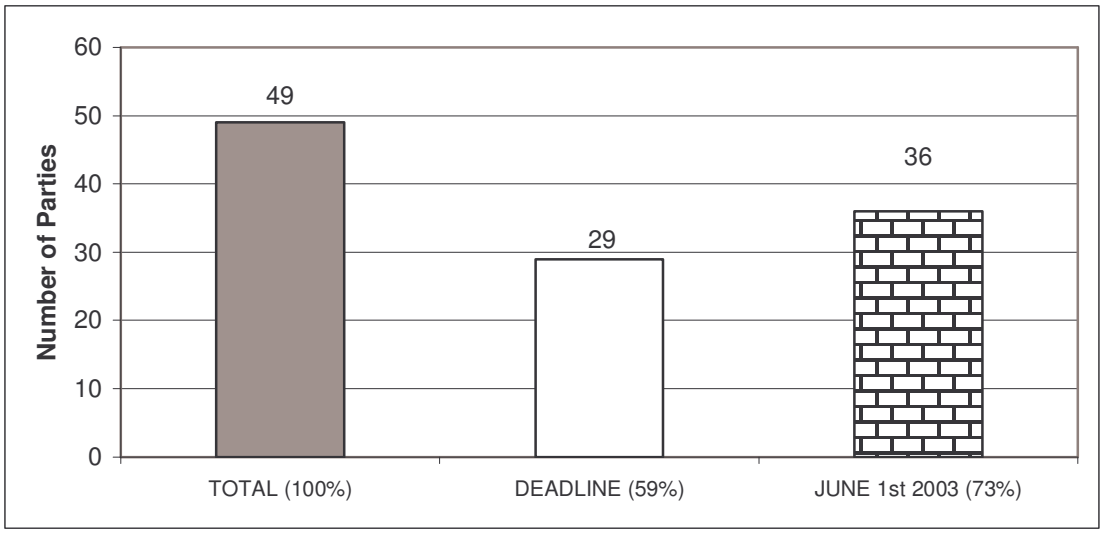

Figure 1.1 Timeliness of submissions

1.2 Reporting formats

A large number of Parties have already adopted the new Guidelines in their reporting. Twenty-seven Parties, 75% of the Parties submitting data this year, and 55% of the total number of Parties, reported at least some of their data in the new reporting format. Only nine Parties were reporting all their emission data in the old format (Figure 1.2).

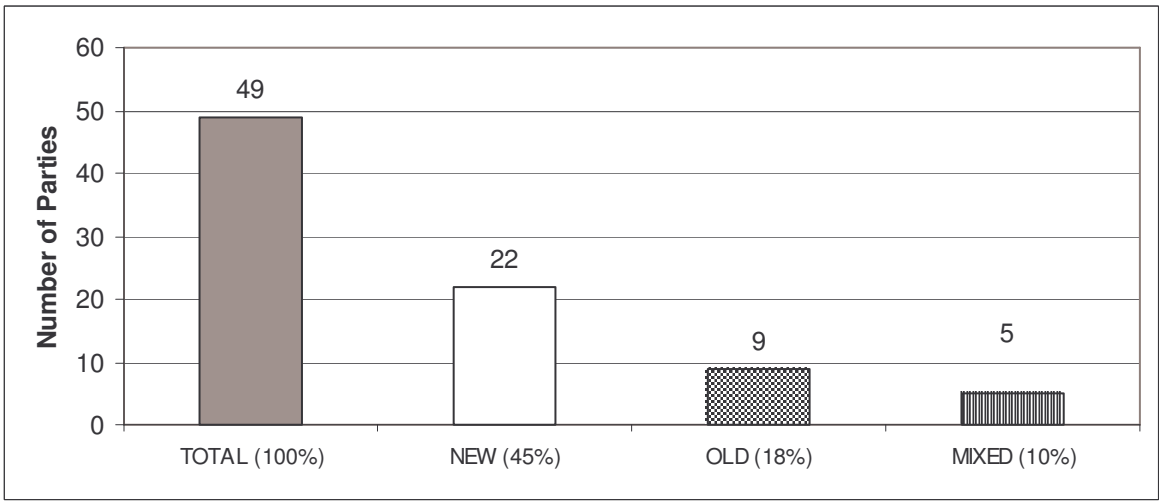

Figure 1.2 Reporting formats

1.3 National total emissions of SO_2, NO_x, NH_3, NMVOC and CO

Figure 1.3 shows the development in the amount of official submissions of national totals from the reporting years 1998 to 2003. In Figure 1.3 we see that the reporting of national totals for SO_2, NO_x, NH_3, NMVOC and CO has remained relatively constant the last three years. The reporting of NH_3 is already somewhat lower than for the other pollutants, and there is a tendency that the reporting of NH_3 decreases. The reporting of NMVOC increased slightly this year.

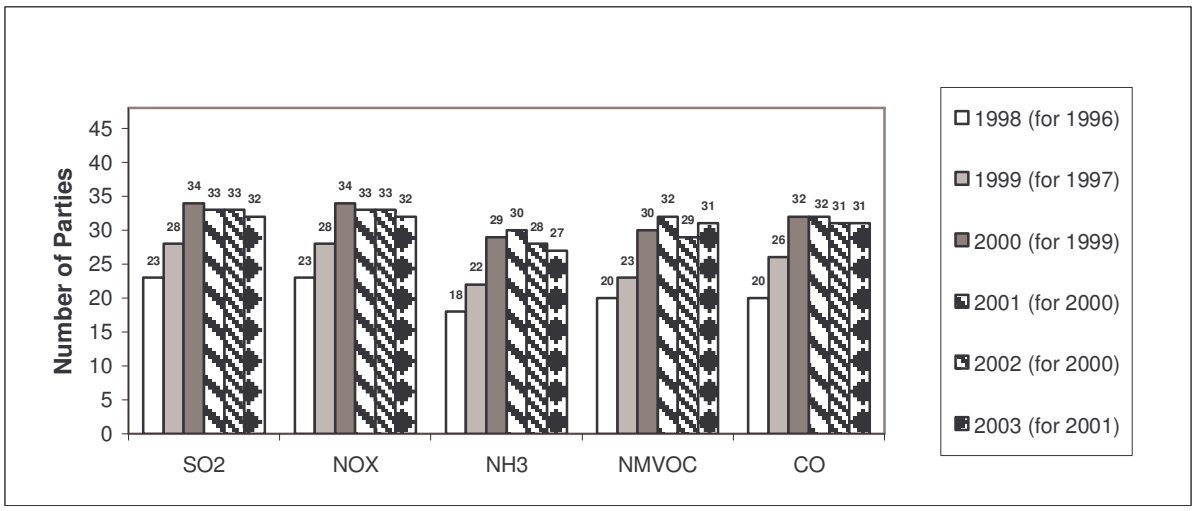

Figure 1.3 Official submissions of national emission totals

1.4 National total emissions of HMs and POPs

Figure 1.4 concerning the official submissions of HMs and POPs shows that despite efforts to highlight the importance of the reporting of these substances, the reporting of HM and POPs is still much lower than for the other pollutants. This year the reporting of HM went back somewhat, while the reporting of POPs increased a little compared to last year. Data on heavy metals and POPs are increasingly important for the preparations for the review of the Protocols on Heavy Metals and POPs, which must take place no later than one year after they enter into force. Parties are therefore kindly requested to improve the reporting of HMs and POPs.

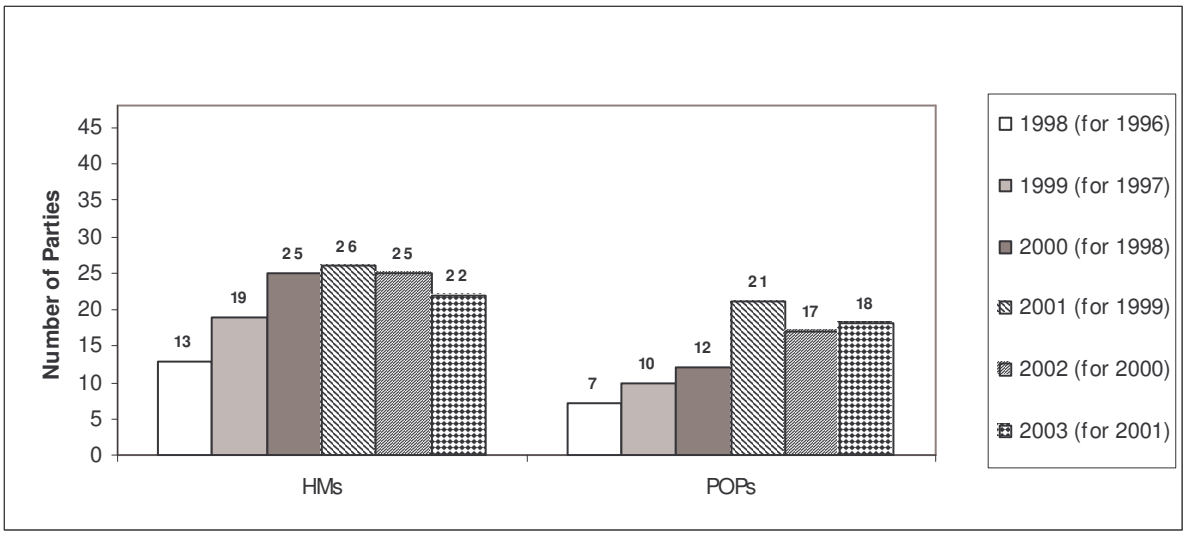

Figure 1.4 Official submissions of national HM and POP emission totals

1.5 National total emissions of Particulate Matter

The reporting of particulate matter has increased considerably for TSP, PM_{10} and $PM_{2.5}$ (Figure 1.5). The reporting has reached a level of reporting comparable to HMs and POPs. Still there is room for improvement, and the good development in PM reporting should continue next year.

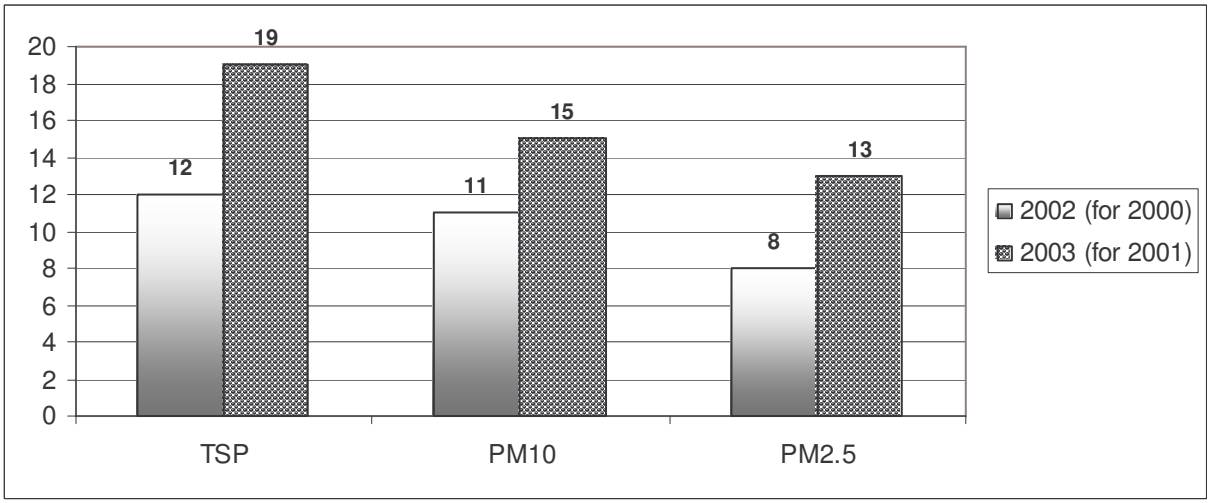

Figure 1.5 Official submissions of national total emissions of Particulate Matter

1.6 Inventory reports

Only three Parties submitted an informative inventory report as requested by the Guidelines. These reports should be submitted no later than three months after the due data of emission submission, and should contain:

1. A description of the specific methodologies and assumptions used in each sector, including a description of any national methodology used by the Party, as well as information on expected future improvements in methodologies.

2. References or sources of information related to methodologies, emission factors and activity data, as well as the rationale for their selection.
3. Information on any recalculations related to previously submitted inventory data
4. Information on notation keys (NA, NE, NO, IE, C)
5. Information on any quality assurance/quality control (QA/QC) procedures implemented
6. Information on uncertainties
7. A separate section clearly identifying major changes with respect to the previous years, including changes in methodologies, sources of information and assumptions
8. Information on the following general assumptions (key features of the projection used for the preparation of the reported projection data) should be provided: GDP (sectoral value added, if available) in constant prices for the year 1990, and population.

This information is in many cases crucial in order to correctly assess the officially reported emission data. In order to increase the transparency of the EMEP emission inventory in the future, Parties are kindly requested to improve their submission of inventory reports.

3. Detection of national emission reductions

Detection of emission reductions achieved by each Party is naturally a central issue in the work of the CLRTAP. Figures 3.1-3.4 present the percentage emission reduction between 1990 (the Gothenburg Protocol base year) and 2001 ($100^* (E_{1990} - E_{2001})/E_{2001}$). The calculated reductions tabulated in Appendix A, Table 11, are based on the most updated emissions **officially reported** by each Party. Non-Signatories to the Gothenburg Protocol (UNECE, 1999) are listed to the right in the figures. The Protocol had 31 Signatories as of 3 January 2003.

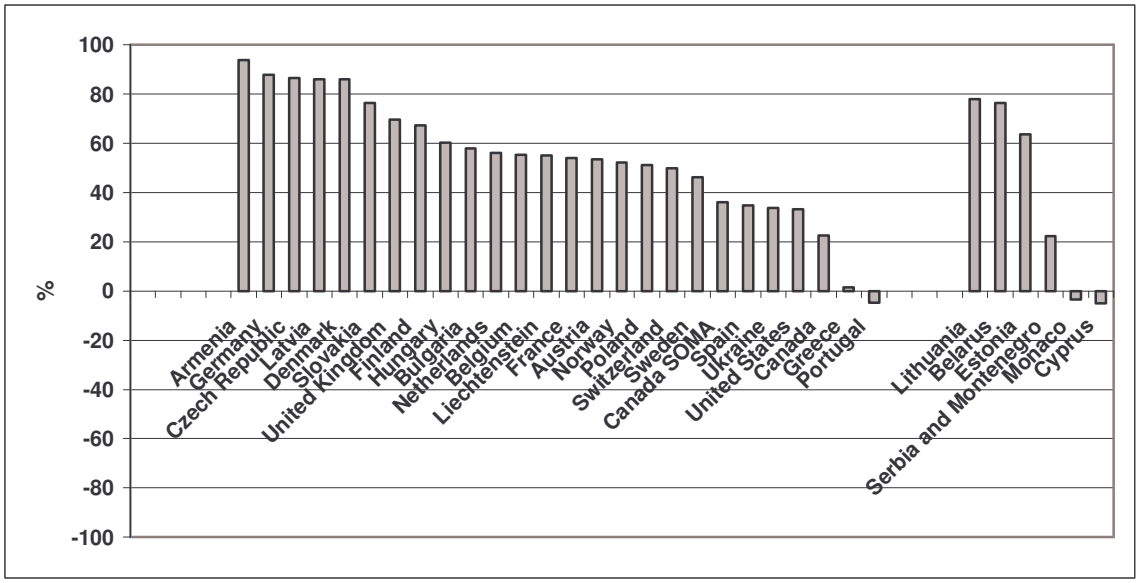

Figure 3.1 Emissions reductions of sulphur in the ECE region 1990-2001 (based on the latest data available, see Appendix A, Table 11). Signatories to the 1999 Gothenburg Protocol are on the left. Only countries that have reported national total emission data including main sources for both 1990 and 2001 are listed here.

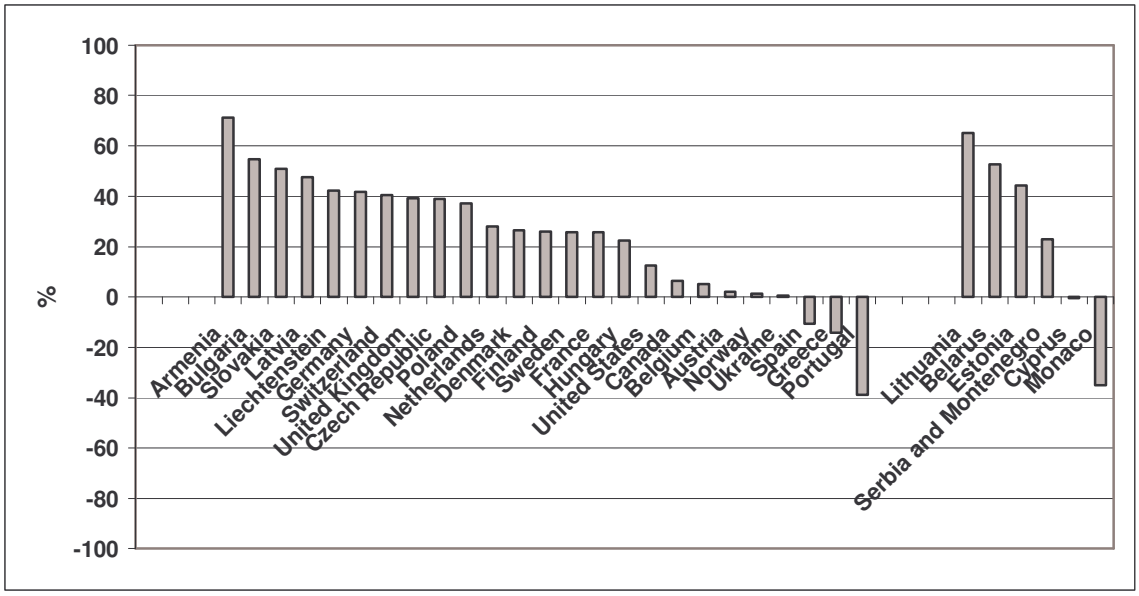

Figure 3.2 Emission reductions of nitrogen oxides in the ECE region 1990-2001 (based on the latest data available, see Appendix A, Table 11). Signatories to the 1999 Gothenburg Protocol are on the left. Only countries that have reported national total emission data including main sources for both 1990 and 2001 are listed here

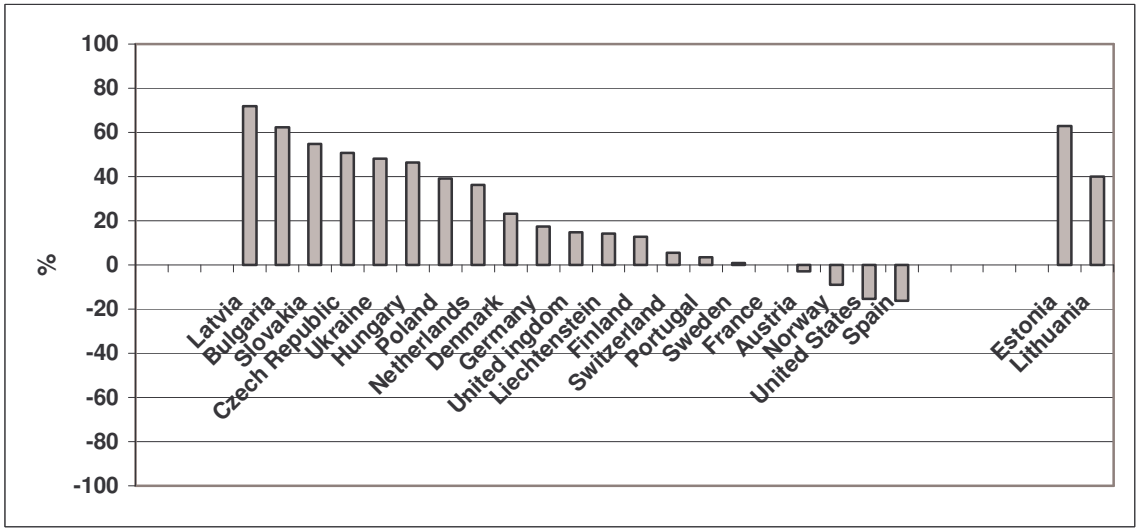

Figure 3.3 Emission reduction of ammonia in the ECE region 1990-2001 (based on the latest data available, see Appendix A, Table 11). Signatories to the 1999 Gothenburg Protocol are on the left. Only countries that have reported national total emission data including main sources for both 1990 and 2001 are listed here.

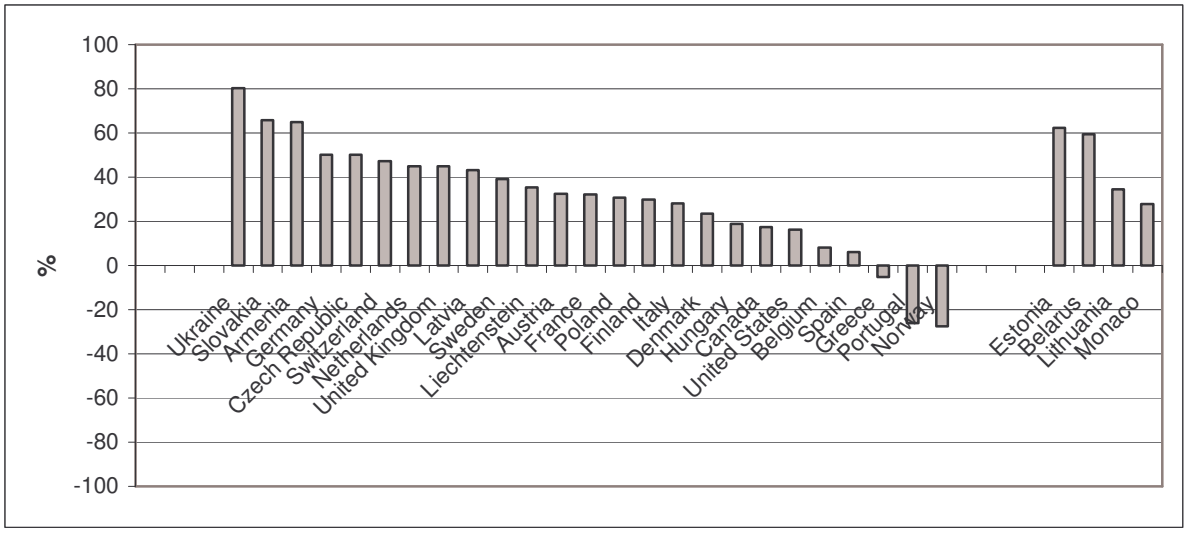

Figure 3.4 Emission reductions of non-methane volatile organic compounds in the ECE region 1990-2001 (based on the latest data available, see Appendix A, Table 11). Signatories to the 1999 Gothenburg Protocol are on the left. Only countries that have reported national total emission data including main sources for both 1990 and 2001 are listed here.

The largest reductions are detected in sulphur emissions (Figurer 3.1). Large decreases are reported both for Signatories and non-Signatories to the Gothenburg Protocol. For Canada, the reductions in the Sulphur Management Area (SOMA) has been reported and included in Figure 3.1 this year. Portugal is the only Signatory to the Protocol reporting increased sulphur emissions. The non-Signatories, Monaco and Cyprus also report increases. The largest increases are reported for nitrogen oxides (Figure 3.2). Signatories reporting increasing nitrogen oxides emissions are Portugal, Greece and Spain. Non-Signatories, Monaco and Cyprus also report increases. Increased emissions of ammonia (Figure 3.3) have been reported by Spain, United States, Norway and Austria. Increases of non-methane volatile organic compounds (Figure 3.4) have been reported by Norway, Portugal and Greece.

Part II: MSC-W Expert estimates

1. Review and revision of trends in national totals

At this stage, we still have to rely upon the national totals to decide the emission level of all types of expert estimates created by MSC-W, as much of the sector data is incomplete, leading to inconsistencies between the sector data and the national data. Hence, the work of scrutinizing and completing/correcting the national totals is important. Below follows a documentation of the result of this year's work with review and revision of the national totals for use in trend analysis.

1. 1 National total emissions used in model calculations

Tables 1.1-1.6 show the national total emission trends per country and for the whole of the EMEP area. The trends are based on data officially reported to the CLRTAP (displayed with no background colour), but as indicated by grey shading, modifications of reported data and filling of gaps, have been performed for a number of countries, years and pollutants. The most prominent changes this year has been:

- Inclusion of emission data reported from Azerbaijan for the first time, and subsequently reduction of the "Remaining Asian areas" where Azerbaijan was previously included.
- Emission data reported by Kazakhstan has been included for the first time. Based on a split of the area within and outside the EMEP domain, 25% of the reported emissions were included.
- The NH_3 emissions from Ukraine have changed because Ukraine for the first time reported ammonia emissions.
- Cyprus for the first time reported NMVOC emissions
- For the first time Portugal informed that the Azores and Madeira Islands, were included in their emission data, hence, based on population data, the Portuguese emission were reduced by 5% for all pollutants and the whole time series 1980-2001.
- Spain has also reported non-gridded emission data including areas outside the EMEP domain (Canary Islands, Ceuta and Melilla), and between 1990 and 2001 the sum of the gridded data has been used to create a consistent time series.
- The Russian Federation emissions for NO_x and NMVOC for the time period 1980-1987, have been modified to include also emissions from mobile sources.
- Emissions of NO_x between 1980 and 1984 reported from Moldova did not include mobile sources and the data have been completed by adding emissions from mobile sources reported in 1990.
- The emission data from Serbia and Montenegro only includes stationary sources, and emission data provided from the Centre for Integrated Assessment Modelling (CIAM)/IIASA, has been used to replace the reported NO_x emissions. In general, modelled emission data provided from CIAM has been more extensively used to fill gaps this year than in previous years.
- The NH_3 emissions from Lithuania doubled from 2000 to 2001 due to inclusion of emissions from nitrogen fertilisers for the first time in 2001. Other years in the time series were accordingly updated by MSC-W.

- Projections for 2010 constitutes this year mainly Current Legislation Projections (CLE) provided from CIAM (CIAM, 2003). Only where no data was provided from CIAM, reported projections or latest year available emission data was used.

1.2 National total emission tables for trend analysis

Tables 1.1-1.5 display the national totals (1980-2001, 2010) to be used in the model calculations this year. Emission figures in cells with grey background are expert estimates of different kinds. Emission figures in bold indicate that the figure has been changed from last years report. The reason for the changes is recalculations provided by the Parties to the CLRTAP and improvements of the expert estimates. Parties' comments/explanations to emission figures can be found in the footnotes to Tables 1-10 in Appendix A. deviations of ± 1% between the figures listed in Tables 1.1 -1.6 and the emission input to model calculations might occur (see Part II, Chapters 2.3 and 2.4).

Table 1.6 concerning PM_{10} and $PM_{2.5}$ only contains emission for 2000, 2001, and 2010.
Officially reported emissions are displayed with no shading. Expert estimates from IIASA are displayed in bold in grey shaded cells. Expert estimates from TNO (EMEP, 2002) are displayed in grey shaded cells.

Tables displaying trends in the EMEP area exclude emissions from Canada, United States, and Kyrgyzstan, as they are outside the EMEP area. Emissions from the European Community, Liechtenstein and Monaco are also excluded as they are not included in the model calculations. By contrast, emissions from Albania (non-Party to the Convention) along with several Asiatic and North African regions are included in these tables as they are confined to the EMEP area.

1.2.1 Recalculations and documentation of and expert estimates for SO_2, Table 1.1[1]

Recalculations are reported from: Austria (1980-2000), France (1980-2000), Greece (1990-2000) Latvia (1990-2000), Spain (1980-2000) and Sweden (1990-2000). For Austria and Latvia the recalculations exceeds ±10%. Latvian recalculations reach 26% in 1992.

Expert estimates from IIASA have been included for 1990, 1995 and 2000 for Albania, Bosnia and Herzegovina and The FYR of Macedonia.

Other emission figures displayed with grey background are either interpolated, or the latest reported value has been continued backwards or forwards.

1.2.2 Recalculations and documentation of and expert estimates for NO_2, Table 1.2[1]

Recalculations are reported from: Austria (1980-2000), Czech Republic (1990-2000), Denmark (1985-2000), Germany (1987-2000), Greece (1990-2000), Latvia (1990-2000) and

[1] Reference is also made to the overview given at the beginning of this chapter

Norway (1980-2000). Recalculations exceed ± 10% for the Czech Republic and Latvia (up to 25-30%).

Expert estimates from IIASA have been included for 1990, 1995 and 2000 for Albania, Bosnia and Herzegovina Serbia and Montenegro and The FYR of Macedonia.

Other emission figures displayed with grey background are either interpolated, or the latest reported value has been continued backwards or forwards.

1.2.3 Recalculations and documentation of and expert estimates for NH_3, Table 1.3[1]

Recalculations are reported from: Austria (1980-2000), France (1980-2000), and Sweden (1980-2000).

Expert estimates from IIASA have been included for 1990, 1995 and 2000 for Albania, Bosnia and Herzegovina and Serbia and Montenegro (only 1990 and 1995)

Other emission figures displayed with grey background are either interpolated, or the latest reported value has been continued backwards or forwards.

1.2.4 Recalculations and documentation of and expert estimates for NMVOC, Table 1.4[1]

Recalculations are reported from: Austria (1980-2000), Belgium (1990, -10%), Denmark (1985-2000), France (1988-2000), Greece (1990-2000), Italy (1990-2000), Latvia (1990-2000), Spain (1980-2000), Sweden (1988-2000) and United Kingdom (1980-2000).

Greece, Italy, Latvia and Sweden reduced NMVOC emission by up to 20-35%. For the other Parties, the changed were in the range of - 5%.

Expert estimates from IIASA have been included for 1990, 1995 and 2000 for Albania, Bosnia and Herzegovina and Serbia and Montenegro.

Other emission figures displayed with grey background are either interpolated, or the latest reported value has been continued backwards or forwards.

1.2.5 Recalculations and documentation of and expert estimates for CO, Table 1.5[1]

Recalculations are reported from: Austria (1980-2000), Belgium (1990, 17%), Czech republic (1990-2000), Denmark (1985-2000), France (1980-2000), Greece (1990-2000), Latvia (1990-2000), Norway (1980-2000), Spain (1980-2000), Sweden (1980-2000) and United Kingdom (1980-2000).

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[1] Reference is also made to the overview given at the beginning of this chapter

Czech Republic and Latvia are the only Parties with substantial differences (10-30%) from last year.

For Albania, Bosnia and Herzegovina, Cyprus and Serbia and Montenegro have the assumption that the CO equals 3.5 times the Kn_{ox} emissions has been used. This assumption is based on an average for all the latest reported data available.

Other emission figures displayed with grey background are either interpolated, or the latest reported value has been continued backwards or forwards.

1.2.6 Documentation of expert estimates for PM_{10} and $PM_{2.5}$Table 1.6

All data displayed in bold with grey background is expert estimates from IIASA. Other data displayed with grey background is expert estimates from TNO. Data displayed without grey shading is reported. ENTEC (ENTEC, 2000) data is used for PM_{10} in the Black Sea.

1.2.7 Documentation of expert estimates for "Other areas"

Total releases of SO_2, Kn_{ox}, NMVOC and CO from ship traffic in the Atlantic Ocean, the North Sea, the Baltic Sea, the Black Sea and the Mediterranean are used as estimated by Lloyd's Register of Shipping. These emissions refer to 1990 and are disaggregated at 50x50 km^2 spatial distribution. For PM_{10}, the emissions from shipping for year 2000 from ENTEC are included. The ENTEC emissions estimates for shipping are kindly facilitated to EMEP from the European Commission, DG Environment.

With regard to natural emissions, major contributions are volcanic releases of SO_2 reported by Italy for the period 1980-2000, and estimates of gridded biogenic emissions of sulphur (DMS) over the sea estimated by Tarrasón et al. (1995). These are listed separately in tables 1.1-1.6. Reported natural emissions other than volcanic sulphur are not included in these tables.

For "Remaining Asian Areas" (Syria, Lebanon, Israel, and parts of Uzbekistan, Turkmenistan, Iran, Iraq, Jordan) and "North Africa" SO_2 and NO_x emission totals are derived from the 1985 GEIA (Global Emission Inventory Activity) emission inventories (Benkovitz et al., 1996). For NH_3 totals are drawn from the 1990 global emission inventories developed at the National Institute of Public Health and the Environment (RIVM), the Netherlands. NMVOC and CO emissions for these regions have been deduced from those of NO_x using the assumption that NMVOC=NO_x and that CO=3.5*NO_x. SO_2 and NO_x data for Turkey, several Asiatic Areas and North Africa are drawn from the 1985 GEIA inventories, while in the case of NH_3 the comprehensive RIVM global inventory (Bouwman et al, 1997) is used for all these regions and Cyprus.

Table 1.1: National total emission trends
Emissions of sulphur (1980-1990) used for modelling at the MSC-W (Gg of SO_2 per year)[a]

Area/Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Albania	72	72	72	72	72	72	72	72	72	72	72
Armenia	141	111	101	110	97	100	111	111	104	63	72
Austria	**344**	**304**	**289**	**217**	**201**	**183**	**163**	**141**	**105**	**94**	**79**
Azerbajian	**15**	**15**	**15**	**15**	**15**	**15**	**15**	**15**	**15**	**15**	**15**
Belarus	740	730	710	710	690	690	690	761	720	668	637
Belgium	828	712	694	560	500	400	377	367	354	325	**362**
Bosnia and Herzegovina	482	482	482	482	482	482	482	482	482	482	482
Bulgaria	2050	2103	2156	2209	2261	2314	2367	2420	2228	2180	2008
Croatia	150	153	156	159	162	165	168	171	174	177	180
Cyprus	28	28	33	30	33	35	38	39	42	42	46
Czech Republic	2257	2341	2387	2338	2305	2277	2177	2164	2066	1998	1881
Denmark	452	370	379	323	305	339	288	255	250	197	180
Estonia	287	280	274	267	261	254	256	255	254	254	252
Finland	584	534	484	372	368	382	331	328	302	244	260
France	3261	2564	**2458**	**2024**	**1806**	**1508**	**1378**	**1361**	**1256**	**1419**	**1323**
Georgia	230	242	250	267	267	273	255	258	255	249	248
Germany	7514	7441	7440	7346	7633	7732	7641	7397	6487	6165	5322
Greece	400	420	440	460	480	500	**499**	**497**	**496**	494	**493**
Hungary	1633	1580	1545	1480	1440	1404	1362	1285	1218	1102	1010
Iceland	18	18	18	18	19	18	18	16	18	17	24
Ireland	222	192	158	142	142	140	162	174	152	162	186
Italy	3757	3330	2850	2463	2114	1901	1929	2029	1963	1854	1651
Kazakhstan	**289**	**289**	**289**	**289**	**289**	**289**	**289**	**289**	**289**	**289**	**289**
Latvia	**95**	**95**	**95**	**95**	**95**	**95**	**95**	**95**	**95**	**95**	**95**
Lithuania	311	312	304	310	303	304	316	316	300	298	222
Luxembourg	24	21	17	14	15	16	16	16	15	15	15
Netherlands	490	464	404	323	299	258	264	263	250	204	202
Norway	**136**	128	111	104	96	98	91	**72**	68	58	**52**
Poland	4100	4140	4180	4220	4260	4300	4200	4200	4180	3910	3210
Portugal	**253**	**265**	**278**	**291**	**239**	**188**	**222**	**207**	**194**	**247**	**273**
Republic of Moldova	308	305	287	284	270	282	297	317	273	238	265
Romania	1055	1095	1104	1229	1223	1255	1293	1305	1469	1517	1311
Russian Federation	7323	7110	7252	7095	6663	6350	5880	5806	5333	4875	4671
Serbia and Montenegro	406	408	409	440	456	478	470	484	502	506	508
Slovakia	780	747	713	680	646	613	604	614	589	573	542
Slovenia	234	254	256	274	250	241	247	222	210	211	196
Spain	**2913**	**2848**	**2811**	**2828**	**2583**	**2448**	**2323**	**2193**	**1845**	**2178**	**2102**
Sweden	491	431	371	305	296	266	272	228	224	160	**106**
Switzerland	116	108	100	92	84	76	68	62	56	49	42
TFYR of Macedonia	**107**	**107**	**107**	**107**	**107**	**107**	**107**	**107**	**107**	**107**	**107**
Turkey	1030	1043	1062	1125	1186	1345	1500	1432	1269	1566	1590
Ukraine	3849	3492	3427	3498	3470	3463	3393	3264	3211	3073	**2783**
United Kingdom	4854	4399	4187	3847	3698	3717	3877	3873	3810	3696	3719
North Africa	413	413	413	413	413	413	413	413	413	413	413
Remaining Asian areas [b]	**854**	**854**	**854**	**854**	**854**	**854**	**854**	**854**	**854**	**854**	**854**
Baltic Sea	228	228	228	228	228	228	228	228	228	228	228
Black Sea	57	57	57	57	57	57	57	57	57	57	57
Mediterranean Sea	1189	1189	1189	1189	1189	1189	1189	1189	1189	1189	1189
North Sea	454	454	454	454	454	454	454	454	454	454	454
Remaining N-E Atlantic Ocean	901	901	901	901	901	901	901	901	901	901	901
Natural marine emissions	743	743	743	743	743	743	743	743	743	743	743
Volcanic emissions [c]	2144	2144	2144	2144	2144	2144	2144	2181	2114	2493	2607
Total	**61611**	**59065**	**58137**	**56496**	**55164**	**54357**	**53587**	**52984**	**50254**	**49470**	**46529**
% change from 2002	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**-2**

[a] All emission figures are for the part of countries within the EMEP domain of calculation. Emission figures displayed without shading are officially reported to the CLRTAP. Emissions figures in grey shaded cells are expert estimates (see text). Emission figures in bold have changed from last year's emission report.
[b] "Remaining Asian areas" refers to Syria, Lebanon, Israel and parts of Uzbekistan, Turkmenistan, Iran, Iraq and Jordan.
[c] Natural emissions reported by Italy.

Table 1.1: Cont: National total emission trends
Emissions of sulphur (1991-2001, 2010) used for modelling at the MSC-W (Gg of SO_2 per year)

Area/Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2010[d]
Albania	**68**	**64**	**59**	**55**	**51**	**52**	**54**	**55**	**57**	**58**	**58**	55
Armenia	60	44	6	4	3	2	0.4	3	1	8	**4**	**4**
Austria	**72**	**59**	**58**	**52**	**52**	**51**	**46**	**43**	**39**	**38**	**37**	39
Azerbajian	**15**	**15**	**15**	**15**	**15**	**15**	**15**	**15**	**15**	**15**	**15**	49
Belarus	652	458	382	324	275	246	209	190	164	143	**151**	480
Belgium	330	315	294	252	**257**	240	219	212	181	**165**	**162**	106
Bosnia and Herzegovina	**457**	**433**	**408**	**383**	**359**	**371**	**383**	**395**	**407**	**419**	**419**	415
Bulgaria	1665	1115	1426	1480	1476	1420	1365	1251	943	982	**846**	**846**
Croatia	108	107	114	89	70	66	80	90	91	**58**	**58**	70
Cyprus	33	39	43	42	41	45	47	49	50	50	**48**	39
Czech Republic	1780	1543	1424	1275	1089	944	**697**	**438**	268	264	**251**	283
Denmark	239	186	152	156	148	179	109	**74**	**54**	**28**	**25**	**55**
Estonia	246	187	154	149	119	125	119	110	103	95	**92**	**175**
Finland	194	141	123	114	96	105	99	90	87	74	**85**	**116**
France	**1440**	1276	1110	1056	993	968	**820**	**846**	**723**	**654**	**610**	**400**
Georgia	194	135	71	47	20	30	33	20	9	9	**9**	9
Germany	3995	3307	2945	2472	**1939**	**1340**	**1039**	**835**	**738**	**638**	**650**	550
Greece	**532**	**546**	**545**	**517**	**541**	**525**	**521**	**528**	**540**	**483**	**485**	546
Hungary	913	827	757	741	705	673	659	592	590	486	**400**	**546**
Iceland	23	24	25	24	24	24	25	27	27	27	**27**	29
Ireland	180	172	161	175	161	147	166	176	157	131	**131**	42
Italy	1539	1394	1333	1271	1322	1250	1075	1039	923	**758**	**758**	500
Kazakhstan	**324**	**324**	**321**	**273**	**271**	**201**	**234**	**240**	**220**	**237**	**237**	**237**
Latvia	**71**	**59**	**58**	**71**	**55**	**51**	**39**	**36**	**29**	**17**	**13**	**104**
Lithuania	234	139	125	117	94	93	77	94	70	43	**49**	**107**
Luxembourg	15	15	15	13	9	8	6	4	4	3	**3**	4
Netherlands	173	172	164	146	141	135	118	108	103	92	**89**	**50**
Norway	44	36	35	**34**	**33**	33	30	30	29	**27**	**25**	22
Poland	2995	2820	2725	2605	2376	2368	2181	1897	1719	1511	**1564**	1397
Portugal	**269**	**326**	**292**	**265**	**302**	**248**	**252**	**284**	**300**	**274**	**286**	**170**
Republic of Moldova	260	168	156	109	64	67	36	32	12	12	**12**	**117**
Romania	1041	951	928	912	912	912	912	912	912	912	**912**	**594**
Russian Federation	4603	4033	3637	3131	2969	2774	2524	2275	2062	1997	**1997**	**2343**
Serbia and Montenegro	446	396	401	424	462	434	522	521	355	387	**394**	269
Slovakia	445	380	325	238	239	227	202	179	171	**124**	**129**	110
Slovenia	180	186	183	177	125	112	118	123	104	96	**96**	27
Spain	**2094**	**2070**	**1944**	**1894**	**1753**	**1539**	1715	**1581**	**1585**	**1484**	**1394**	774
Sweden	**99**	**88**	**78**	**80**	**73**	**97**	**70**	**67**	**54**	**57**	**57**	**67**
Switzerland	41	38	34	31	**34**	30	26	28	26	19	**21**	**26**
TFYR of Macedonia	105	105	105	105	105	105	105	105	105	105	**137**	81
Turkey	1666	1647	1593	1817	1772	1929	1990	2118	2104	2112	**2112**	1821
Ukraine	2538	2376	2194	1715	1639	1293	1132	1028	1029	**1029**	**1029**	**1476**
United Kingdom	3535	3461	3115	2675	2365	2029	1670	**1608**	**1229**	**1188**	**1125**	**625**
North Africa	413	413	413	413	413	413	413	413	413	413	**413**	413
Remaining Asian areas	**854**	**854**	**854**	**854**	**854**	**854**	**854**	**854**	**854**	**854**	**854**	**805**
Baltic Sea	228	228	228	228	228	228	228	228	228	228	**228**	228
Black Sea	57	57	57	57	57	57	57	57	57	57	**57**	57
Mediterranean Sea	1189	1189	1189	1189	1189	1189	1189	1189	1189	1189	**1189**	1189
North Sea	454	454	454	454	454	454	454	454	454	454	**454**	454
Remaining N-E Atlantic Ocean	901	901	901	901	901	901	901	901	901	901	**901**	901
Natural marine emissions	743	743	743	743	743	743	743	743	743	743	**743**	743
Volcanic emissions	1645	2235	2027	1918	2000	2000	2000	2000	2000	2000	**2000**	2000
Total	**42396**	**39250**	**36899**	**34282**	**32387**	**30343**	**28578**	**27188**	**25225**	**24146**	**23841**	**22304**
% change from 2002	**0**	**0**	**0**	**0**	**-1**	**-1**	**-1**	**-1**	**-1**	**-2**		**-2**

[d] Grey shaded cells contain emission projections expert estimates provided by IIASA (Current Legislation Projections)

Table 1.2: National total emission trends
Emissions of nitrogen oxides (1980-1990) used for modelling at the MSC-W (Gg of NO_2 per year)[a]

Area/Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Albania	24	24	24	24	24	24	24	24	24	24	24
Armenia	15	15	17	17	16	45	53	52	56	51	46
Austria	**243**	**228**	**224**	**227**	**227**	**232**	**225**	**223**	**217**	**213**	**204**
Azerbaijan	**43**	**43**	**43**	**43**	**43**	**43**	**43**	**43**	**43**	**43**	**43**
Belarus	234	235	235	237	240	**238**	358	263	262	263	285
Belgium	442	419	395	372	348	325	317	338	345	357	**334**
Bosnia and Herzegovina	**79**	**79**	**79**	**79**	**79**	**79**	**79**	**79**	**79**	**79**	**79**
Bulgaria	416	416	416	416	416	416	416	416	415	411	361
Croatia	60	63	66	68	71	74	77	79	82	85	88
Cyprus	13	13	14	14	14	14	15	16	17	17	18
Czech Republic	937	819	818	830	844	831	826	816	858	920	**544**
Denmark	273	243	264	257	**276**	295	316	307	**298**	**280**	277
Estonia	70	70	70	70	70	70	70	70	70	69	68
Finland	295	276	271	261	257	275	277	288	293	301	300
France	**2023**	**1926**	1894	1873	1870	**1846**	**1806**	**1837**	1841	**1901**	1897
Georgia	121	126	130	138	137	140	134	134	135	131	130
Germany	3334	3259	3219	3258	3305	3276	3286	**3350**	**3230**	**3011**	**2728**
Greece	306	306	306	306	306	306	**296**	**285**	304	**297**	**290**
Hungary	273	270	268	266	264	263	264	265	258	247	238
Iceland	21	21	21	22	22	21	22	24	25	25	26
Ireland	73	86	86	85	84	91	100	115	122	127	118
Italy	1638	1604	1605	1583	1596	1614	1690	1811	1854	1917	1938
Kazakhstan	**89**	**89**	**89**	**89**	**89**	**89**	**89**	**89**	**89**	**89**	**89**
Latvia	**80**	**80**	**80**	**80**	**80**	**80**	**80**	**80**	**80**	**80**	**80**
Lithuania	152	154	156	158	162	166	169	171	172	173	158
Luxembourg	23	22	22	21	21	21	20	20	21	22	23
Netherlands	583	575	562	555	573	589	587	599	602	584	**570**
Norway	191	178	182	187	201	213	228	**230**	224	**225**	**224**
Poland	1229	1283	1337	1392	1446	1500	1510	1530	1550	1480	1280
Portugal	**158**	**166**	**174**	**182**	**137**	**91**	**105**	**110**	**116**	**194**	**272**
Republic of Moldova	**115**	**114**	**107**	**99**	**101**	**123**	**129**	**128**	**131**	**127**	100
Romania	523	528	516	542	546	542	559	580	590	579	546
Russian Federation	**3634**	**3815**	**3902**	**3876**	**3779**	**3803**	**3771**	3411	3287	3335	3600
Serbia and Montenegro	**192**	**195**	**195**	**198**	**203**	**203**	**203**	**205**	**208**	**207**	**211**
Slovakia	197	197	197	197	197	197	197	197	212	227	215
Slovenia	51	52	52	51	52	53	58	57	59	58	63
Spain	**1068**	**982**	**972**	**994**	**1007**	**979**	**1001**	**1059**	**1092**	**1185**	**1207**
Sweden	404	417	412	401	411	426	432	437	432	418	**334**
Switzerland	170	172	174	175	177	179	176	174	172	169	154
TFYR of Macedonia	**39**	**39**	**39**	**39**	**39**	**39**	**39**	**39**	**39**	**39**	**39**
Turkey	364	377	408	433	459	483	528	570	571	609	644
Ukraine	1145	1145	1153	1153	1102	1059	1112	1094	1090	1065	1097
United Kingdom	2581	2497	2488	2498	2458	2537	2620	2731	2786	2787	2759
North Africa	96	96	96	96	96	96	96	96	96	96	96
Remaining Asian areas [b]	**169**	**169**	**169**	**169**	**169**	**169**	**169**	**169**	**169**	**169**	**169**
Baltic Sea	352	352	352	352	352	352	352	352	352	352	352
Black Sea	86	86	86	86	86	86	86	86	86	86	86
Mediterranean Sea	1639	1639	1639	1639	1639	1639	1639	1639	1639	1639	1639
North Sea	648	648	648	648	648	648	648	648	648	648	648
Remaining N-E Atlantic Ocean	1266	1266	1266	1266	1266	1266	1266	1266	1266	1266	1266
Natural marine emissions	0	0	0	0	0	0	0	0	0	0	0
Volcanic emissions [3]	0	0	0	0	0	0	0	0	0	0	0
Total	**28177**	**27875**	**27938**	**28020**	**28005**	**28145**	**28563**	**28600**	**28605**	**28677**	**27955**
% change from 2002	**8**	**8**	**8**	**8**	**8**	**8**	**8**	**1**	**1**	**0**	**-1**

[a] All emission figures are for the part of countries within the EMEP domain of calculation. Emission figures displayed without shading are officially reported to the CLRTAP. Emissions figures in grey shaded cells are expert estimates (see text). Emission figures in bold have changed from last year's emission report.
[b] "Remaining Asian areas" refers to Syria, Lebanon, Israel and parts of Uzbekistan, Turkmenistan, Iran, Iraq and Jordan.
[3] Natural emissions reported by Italy.

Table 1.2: Cont.: National total emission trends
Emissions of nitrogen oxides (1991-2001, 2010) used for modelling at the MSC-W (Gg of NO_2 per year)

Area/Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2010[4]
Albania	24	24	24	24	24	25	26	27	28	29	29	36
Armenia	40	22	12	12	15	11	15	11	11	10	13	13
Austria	209	200	197	191	188	207	195	203	193	196	199	103
Azerbaijan	43	43	43	43	43	43	43	43	43	43	43	90
Belarus	281	224	207	203	188	173	189	164	142	135	135	255
Belgium	326	334	330	333	359	315	306	312	289	329	317	181
Bosnia and Herzegovina	74	69	64	59	54	54	54	55	55	55	55	60
Bulgaria	256	230	242	230	266	259	225	223	202	185	164	266
Croatia	65	56	59	66	66	69	73	76	77	77	77	87
Cyprus	16	19	20	20	19	21	21	22	22	23	18	23
Czech Republic	521	496	454	375	368	366	349	321	313	321	332	286
Denmark	325	280	281	287	269	312	271	243	228	209	204	127
Estonia	63	39	38	41	42	44	45	46	40	41	38	73
Finland	290	284	282	282	258	268	260	252	247	236	222	153
France	1964	1920	1796	1747	1709	1678	1611	1592	1517	1441	1411	858
Georgia	113	48	33	21	27	50	55	42	30	30	30	30
Germany	2514	2323	2207	2055	1984	1897	1784	1675	1619	1584	1592	1081
Greece	298	297	292	299	296	306	310	334	326	321	331	334
Hungary	203	183	184	187	190	196	200	203	201	185	185	198
Iceland	27	28	29	29	28	30	29	28	28	28	28	30
Ireland	120	130	119	115	115	120	119	122	119	125	125	65
Italy	1984	2010	1990	1789	1768	1744	1662	1594	1485	1372	1372	1000
Kazakhstan	100	94	93	74	71	63	53	57	51	50	50	50
Latvia	63	51	51	46	47	43	42	40	38	35	42	84
Lithuania	166	98	78	77	65	65	57	60	54	48	55	110
Luxembourg	24	24	25	23	21	22	18	17	16	17	17	10
Netherlands	568	556	535	510	486	501	453	428	429	413	410	266
Norway	213	212	222	219	221	230	233	235	238	224	221	156
Poland	1205	1130	1120	1105	1120	1154	1114	991	951	838	805	879
Portugal	287	308	303	307	319	315	321	344	365	385	377	255
Republic of Moldova	97	67	53	46	38	38	37	22	17	17	17	66
Romania	464	357	318	319	319	319	319	319	319	319	319	437
Russian Federation	3435	3123	3054	2667	2570	2467	2379	2488	2494	2357	2357	2653
Serbia and Montenegro	200	189	177	166	155	155	156	156	157	158	158	152
Slovakia	194	181	174	165	174	132	125	130	118	106	106	130
Slovenia	58	58	63	66	67	70	71	64	58	58	58	45
Spain	1248	1278	1251	1258	1270	1231	1277	1273	1314	1335	1303	847
Sweden	334	319	307	320	296	295	280	267	259	252	248	148
Switzerland	146	138	129	124	120	113	107	104	99	96	92	79
TFYR of Macedonia	37	36	34	32	30	30	30	30	30	30	32	29
Turkey	649	667	748	731	800	873	879	863	952	951	951	951
Ukraine	989	830	700	568	531	467	455	558	543	561	561	1222
United Kingdom	2633	2553	2367	2301	2174	2164	2012	1918	1810	1737	1680	1181
North Africa	96	96	96	96	96	96	96	96	96	96	96	96
Remaining Asian areas	169	169	169	169	169	169	169	169	169	169	169	79
Baltic Sea	352	352	352	352	352	352	352	352	352	352	352	352
Black Sea	86	86	86	86	86	86	86	86	86	86	86	86
Mediterranean Sea	1639	1639	1639	1639	1639	1639	1639	1639	1639	1639	1639	1639
North Sea	648	648	648	648	648	648	648	648	648	648	648	648
Remaining N-E Atlantic Ocean	1266	1266	1266	1266	1266	1266	1266	1266	1266	1266	1266	1266
Natural marine emissions	0	0	0	0	0	0	0	0	0	0	0	0
Volcanic emissions	0	0	0	0	0	0	0	0	0	0	0	0
Total	27120	25785	24960	23789	23426	23189	22514	22207	21780	21218	21033	19263
% change from 2002	-1	-1	0	0	0	0	0	1	1	1		-7

[4] Grey shaded cells contain emission projections expert estimates provided by IIASA (Current Legislation Projections)

Table 1.3: National total emission trends
Emissions of ammonia (1980-1990) used for modelling by the MSC-W (Gg NH_3 per year)[a]

Area/Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Albania	32	32	32	32	32	32	32	32	32	32	32
Armenia	25	25	25	25	25	25	25	25	25	25	25
Austria	**51**	**52**	**52**	**53**	**54**	**54**	**53**	**54**	**51**	**52**	**52**
Azerbaijan	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**
Belarus	142	142	142	142	142	142	142	142	142	142	142
Belgium	89	89	89	89	89	89	**91**	**93**	**95**	**97**	**99**
Bosnia and Herzegovina	31	31	31	31	31	31	31	31	31	31	31
Bulgaria	144	144	144	144	144	144	144	144	144	144	144
Croatia	37	37	37	37	37	37	37	37	37	37	37
Cyprus	4	4	4	4	4	4	4	4	4	4	4
Czech Republic	156	156	156	156	156	156	156	156	156	156	156
Denmark	125	123	120	119	115	**138**	**139**	**135**	**132**	**133**	**133**
Estonia	24	24	24	24	24	24	24	24	24	24	24
Finland	39	40	41	41	42	43	41	45	43	40	38
France	**795**	**804**	**807**	**812**	**799**	**799**	**809**	**806**	**784**	**781**	**779**
Georgia	97	97	97	97	97	97	97	97	97	97	97
Germany	835	821	817	841	853	857	846	845	835	823	**736**
Greece	79	79	79	79	79	79	79	79	79	79	79
Hungary	157	156	154	153	151	150	170	150	160	170	124
Iceland	3	3	3	3	3	3	3	3	3	3	3
Ireland	112	112	112	112	112	112	112	112	112	112	112
Italy	479	475	464	504	481	487	495	497	499	481	466
Kazakhstan	18	18	18	18	18	18	18	18	18	18	18
Latvia	44	44	44	44	44	44	44	44	44	44	44
Lithuania	**110**	**111**	**111**	**112**	**113**	**114**	**114**	**115**	**114**	**111**	**109**
Luxembourg	7	7	7	7	7	7	7	7	7	7	7
Netherlands	234	240	244	244	246	248	258	258	237	232	**232**
Norway	23	23	23	23	23	23	23	23	21	23	**23**
Poland	550	550	550	550	550	550	550	550	550	550	**508**
Portugal	**106**	**106**	**106**	**106**	**106**	**106**	**106**	**106**	**106**	**106**	**106**
Republic of Moldova	53	54	55	56	57	58	56	54	53	51	49
Romania	340	332	327	311	359	343	350	329	339	341	300
Russian Federation	1189	1192	1214	1245	1247	1239	1286	1277	1269	1258	1191
Serbia and Montenegro	90	90	90	90	90	90	90	90	90	90	90
Slovakia	63	63	63	63	63	63	63	63	63	63	63
Slovenia	24	24	24	24	24	24	24	24	24	24	24
Spain	**285**	**276**	**292**	**295**	**299**	**296**	**304**	**330**	**331**	**339**	**327**
Sweden	**54**	**54**	**54**	**54**	**54**	**54**	**54**	**54**	**54**	**54**	**54**
Switzerland	77	73	69	64	60	74	73	73	72	72	72
TFYR of Macedonia	17	17	17	17	17	17	17	17	17	17	17
Turkey	321	321	321	321	321	321	321	321	321	321	321
Ukraine	729	729	729	729	729	729	729	729	729	729	729
United Kingdom	341	341	341	341	341	341	341	341	341	341	341
North Africa	235	235	235	235	235	235	235	235	235	235	235
Remaining Asian areas [b]	**278**	**278**	**278**	**278**	**278**	**278**	**278**	**278**	**278**	**278**	**278**
Baltic Sea	0	0	0	0	0	0	0	0	0	0	0
Black Sea	0	0	0	0	0	0	0	0	0	0	0
Mediterranean Sea	0	0	0	0	0	0	0	0	0	0	0
North Sea	0	0	0	0	0	0	0	0	0	0	0
Remaining N-E Atlantic Ocean	0	0	0	0	0	0	0	0	0	0	0
Natural marine emissions	0	0	0	0	0	0	0	0	0	0	0
Volcanic emissions [c]	0	0	0	0	0	0	0	0	0	0	0
Total	**8670**	**8651**	**8669**	**8752**	**8777**	**8801**	**8897**	**8874**	**8826**	**8794**	**8478**
% change from 2002	**-1**	**-1**	**-1**	**-1**	**-1**	**-1**	**-1**	**-1**	**-1**	**-2**	**-2**

[a] All emission figures are for the part of countries within the EMEP domain of calculation. Emission figures displayed without shading are officially reported to the CLRTAP. Emissions figures in grey shaded cells are expert estimates (see text). Emission figures in bold have changed from last year's emission report.
[b] "Remaining Asian areas" refers to Syria, Lebanon, Israel and parts of Uzbekistan, Turkmenistan, Iran, Iraq and Jordan.
[c] Natural emissions reported by Italy.

Table 1.3 Cont.: National total emission trends
Emissions of ammonia (1991-2001, 2010,) used for modelling by the MSC-W (Gg NH_3 per year)

Area/Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2010[d]
Albania	31	30	29	28	28	29	30	31	32	32	32	35
Armenia	25	25	25	25	25	25	25	25	25	25	25	25
Austria	53	50	56	58	57	56	57	56	55	54	54	70
Azerbaijan	25	25	25	25	25	25	25	25	25	25	25	25
Belarus	142	142	142	142	142	142	142	142	142	142	137	163
Belgium	93	93	97	96	100	99	99	102	100	81	81	97
Bosnia and Herzegovina	29	27	25	24	23	23	23	23	23	23	23	23
Bulgaria	124	111	109	101	99	83	77	66	60	56	54	127
Croatia	32	27	26	24	25	23	23	23	24	23	23	37
Cyprus	4	4	4	4	4	4	4	4	4	4	4	9
Czech Republic	134	115	99	91	86	81	81	80	75	74	77	110
Denmark	129	127	124	120	113	109	109	110	105	104	102	73
Estonia	22	18	13	13	11	10	10	10	8	9	9	29
Finland	40	41	39	37	35	35	38	38	35	33	33	34
France	774	765	756	762	766	777	783	785	787	784	779	791
Georgia	97	97	97	97	97	97	97	97	97	97	97	97
Germany	653	636	615	595	603	608	599	604	604	596	607	589
Greece	78	75	75	73	85	73	71	74	73	73	73	77
Hungary	93	84	77	76	77	78	76	74	71	71	66	139
Iceland	3	3	3	3	3	3	3	3	3	3	3	3
Ireland	115	117	117	119	120	122	123	127	127	122	122	131
Italy	451	440	449	459	461	430	443	438	448	437	437	443
Kazakhstan	18	18	18	18	18	18	18	18	18	18	18	18
Latvia	42	33	33	17	17	16	15	13	12	12	12	35
Lithuania	110	106	105	105	63	61	60	60	54	50	50	81
Luxembourg	7	7	7	7	7	7	7	7	7	7	7	9
Netherlands	228	180	191	166	193	146	188	170	166	152	148	194
Norway	23	25	24	25	26	27	26	26	25	25	25	22
Poland	450	447	382	384	380	364	350	371	341	322	309	561
Portugal	102	107	100	94	100	97	96	98	103	102	102	75
Republic of Moldova	49	44	37	35	33	31	25	25	25	25	25	49
Romania	267	255	223	221	221	221	221	221	221	221	221	304
Russian Federation	1161	1084	903	772	824	749	730	675	657	650	650	913
Serbia and Montenegro	88	85	83	80	78	78	78	78	79	79	79	82
Slovakia	56	47	42	39	40	38	36	32	30	30	28	49
Slovenia	23	24	23	22	22	22	19	20	20	19	19	22
Spain	316	315	296	316	304	338	338	356	368	386	380	390
Sweden	55	55	62	62	62	62	60	60	57	57	54	66
Switzerland	71	71	71	70	69	69	69	68	68	68	68	68
TFYR of Macedonia	17	17	16	16	16	16	16	16	16	16	16	16
Turkey	321	321	321	321	321	321	321	321	321	321	321	321
Ukraine	734	691	620	585	540	518	483	410	364	358	378	665
United Kingdom	343	328	328	329	319	322	326	320	316	297	290	302
North Africa	235	235	235	235	235	235	235	235	235	235	235	235
Remaining Asian areas	278	278	278	278	278	278	278	278	278	278	278	278
Baltic Sea	0	0	0	0	0	0	0	0	0	0	0	0
Black Sea	0	0	0	0	0	0	0	0	0	0	0	0
Mediterranean Sea	0	0	0	0	0	0	0	0	0	0	0	0
North Sea	0	0	0	0	0	0	0	0	0	0	0	0
Remaining N-E Atlantic Ocean	0	0	0	0	0	0	0	0	0	0	0	0
Natural marine emissions	0	0	0	0	0	0	0	0	0	0	0	0
Volcanic emissions	0	0	0	0	0	0	0	0	0	0	0	0
Total	8141	7823	7399	7167	7152	6965	6932	6816	6706	6598	6578	7882
% change from 2002	-2	-2	-4	-5	-5	-6	-6	-7	-7	-7		10

[d] Grey shaded cells contain emission projections expert estimates provided by IIASA (Current Legislation Projections)

Table 1.4: National total emission trends
Emissions of non-methane volatile organic compounds (1980-1990) used for modelling at the MSC-W (Gg NMVOC per year)[a]

Area/Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Albania	31	31	31	31	31	31	31	31	31	31	31
Armenia	26	26	24	24	22	93	98	104	93	90	81
Austria	362	365	367	372	379	382	380	382	373	365	345
Azerbaijan	9	9	9	9	9	9	9	9	9	9	9
Belarus	549	546	543	543	540	516	506	509	535	511	533
Belgium	274	274	274	274	274	274	274	274	274	274	274
Bosnia and Herzegovina	51	51	51	51	51	51	51	51	51	51	51
Bulgaria	309	309	309	309	309	309	309	309	309	263	217
Croatia	105	105	105	105	105	105	105	105	105	105	105
Cyprus	14	14	14	14	14	14	14	14	14	14	14
Czech Republic	275	275	275	275	275	275	308	341	375	408	441
Denmark	203	199	199	202	196	190	189	189	187	184	162
Estonia	81	81	81	81	81	81	83	83	84	87	88
Finland	210	210	210	210	210	210	210	210	225	227	224
France	2613	2613	2613	2613	2613	2613	2613	2613	2706	2674	2473
Georgia	46	47	48	50	49	49	48	48	48	46	46
Germany	3224	3152	3134	3152	3191	3190	3218	3274	3256	3202	3220
Greece	255	255	255	255	255	255	255	255	255	255	255
Hungary	215	218	222	225	229	232	263	228	215	205	205
Iceland	8	8	8	8	8	8	8	12	13	13	13
Ireland	111	111	111	111	111	111	111	111	111	111	111
Italy	2179	2119	2074	2045	2007	1992	2019	2088	2124	2215	2041
Kazakhstan	89	89	89	89	89	89	89	89	89	89	89
Latvia	143	143	143	143	143	143	143	143	143	143	143
Lithuania	100	102	104	105	106	112	108	108	109	109	108
Luxembourg	15	15	15	15	15	15	16	16	17	18	19
Netherlands	579	555	543	526	513	502	489	485	538	468	492
Norway	173	182	189	201	212	231	249	253	249	276	294
Poland	1036	912	889	954	985	1011	1029	1014	1026	1016	831
Portugal	189	189	189	189	189	189	234	275	312	342	371
Republic of Moldova	219	219	219	219	219	219	215	216	216	210	157
Romania	829	810	772	796	812	787	830	884	846	812	772
Russian Federation	3410	3410	3410	3410	3410	3410	3410	3410	3396	3444	3668
Serbia and Montenegro	142	142	142	142	142	142	142	142	142	142	142
Slovakia	262	262	262	262	262	262	262	262	262	262	262
Slovenia	39	39	39	39	39	39	39	39	39	42	44
Spain	1392	1372	1350	1377	1371	1393	1420	1475	1510	1544	1555
Sweden	600	600	600	600	600	600	585	570	515	512	498
Switzerland	323	323	323	324	324	324	318	311	305	298	279
TFYR of Macedonia	19	19	19	19	19	19	19	19	19	19	19
Turkey	359	361	379	387	384	379	403	430	450	453	463
Ukraine	1626	1626	1626	1626	1626	1626	1660	1687	1604	1512	1369
United Kingdom	2160	2137	2175	2197	2250	2259	2308	2366	2430	2464	2425
North Africa	96	96	96	96	96	96	96	96	96	96	96
Remaining Asian areas [b]	204	204	204	204	204	204	204	204	204	204	204
Baltic Sea	8	8	8	8	8	8	8	8	8	8	8
Black Sea	2	2	2	2	2	2	2	2	2	2	2
Mediterranean Sea	34	34	34	34	34	34	34	34	34	34	34
North Sea	15	15	15	15	15	15	15	15	15	15	15
Remaining N-E Atlantic Ocean	25	25	25	25	25	25	25	25	25	25	25
Natural marine emissions	0	0	0	0	0	0	0	0	0	0	0
Volcanic emissions [c]	0	0	0	0	0	0	0	0	0	0	0
Total	25236	24907	24817	24962	25052	25123	25453	25818	25990	25897	25322
% change from 2002	2	3	5	5	4	4	4	0	0	0	1

[a] All emission figures are for the part of countries within the EMEP domain of calculation. Emission figures displayed without shading are officially reported to the CLRTAP. Emissions figures in grey shaded cells are expert estimates (see text). Emission figures in bold have changed from last year's emission report.

[b] "Remaining Asian areas" refers to Syria, Lebanon, Israel and parts of Uzbekistan, Turkmenistan, Iran, Iraq and Jordan.

[c] Natural emissions reported by Italy.

Table 1.4 Cont.: National total emission trends
Emissions of non-methane volatile organic compounds (1991-2001, 2010,) used for modelling by the MSC-W (Gg NMVOC per year)

Area/Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2010[d]
Albania	30	30	29	29	28	29	30	32	33	34	34	41
Armenia	70	31	20	17	23	18	18	17	17	16	28	28
Austria	323	293	282	270	271	269	250	242	237	232	232	159
Azerbaijan	9	9	9	9	9	9	9	9	9	9	9	18
Belarus	546	412	372	366	347	328	345	294	240	225	215	309
Belgium	267	266	265	258	262	242	249	269	248	233	252	144
Bosnia and Herzegovina	49	46	44	41	39	40	40	41	41	42	42	48
Bulgaria	178	179	208	175	173	147	120	132	118	120	122	185
Croatia	87	64	69	75	74	82	80	79	77	80	80	90
Cyprus	14	14	14	14	14	14	14	14	14	14	14	14
Czech Republic	394	366	346	310	292	293	277	242	234	227	220	220
Denmark	164	162	161	158	154	153	145	138	133	129	124	85
Estonia	82	45	42	45	48	50	54	54	42	34	33	49
Finland	210	204	196	194	188	182	175	171	166	161	157	110
France	2453	2399	2288	2158	2079	1993	1919	1857	1785	1726	1674	1100
Georgia	8	4	2	2	2	2	3	11	19	19	19	19
Germany	2796	2539	2326	2159	2021	1893	1822	1735	1663	1605	1606	995
Greece	253	261	270	274	273	284	285	290	291	305	268	261
Hungary	150	142	149	142	150	150	145	141	170	173	166	137
Iceland	14	14	14	14	12	12	10	10	10	10	10	7
Ireland	111	114	109	107	105	112	116	118	98	90	90	55
Italy	1866	1934	1861	1815	1800	1757	1690	1586	1723	1557	1464	1159
Kazakhstan	100	94	93	74	71	63	53	57	51	50	50	50
Latvia	98	79	74	76	79	83	84	83	81	69	81	53
Lithuania	111	66	52	52	77	82	81	79	68	61	71	92
Luxembourg	19	18	18	18	16	16	15	13	15	15	15	7
Netherlands	462	438	405	389	363	362	317	301	291	278	271	192
Norway	294	322	338	352	367	371	368	354	358	367	376	195
Poland	833	805	756	819	769	766	774	730	731	599	576	800
Portugal	398	424	431	431	451	428	485	516	470	463	468	202
Republic of Moldova	151	99	75	66	62	64	69	43	22	22	22	42
Romania	678	627	634	638	638	638	638	638	638	638	638	504
Russian Federation	3361	3297	3062	2924	2857	2622	2386	2376	2451	2450	2450	2787
Serbia and Montenegro	137	132	128	123	118	120	122	124	126	129	129	139
Slovakia	225	188	151	155	159	161	138	132	130	89	90	140
Slovenia	41	40	42	44	44	49	48	42	40	40	40	40
Spain	1582	1564	1471	1524	1474	1454	1451	1499	1487	1453	1440	669
Sweden	478	460	427	408	399	389	354	339	318	304	303	241
Switzerland	261	242	226	213	199	191	182	173	165	159	147	144
TFYR of Macedonia	18	17	16	15	14	15	15	16	16	17	17	19
Turkey	457	479	527	516	677	755	784	803	785	726	726	726
Ukraine	1302	1171	972	1024	811	718	665	254	272	271	269	797
United Kingdom	2356	2262	2153	2103	1971	1904	1829	1693	1526	1418	1336	1200
North Africa	96	96	96	96	96	96	96	96	96	96	96	96
Remaining Asian areas	204	204	204	204	204	204	204	204	204	204	204	186
Baltic Sea	8	8	8	8	8	8	8	8	8	8	8	8
Black Sea	2	2	2	2	2	2	2	2	2	2	2	2
Mediterranean Sea	34	34	34	34	34	34	34	34	34	34	34	34
North Sea	15	15	15	15	15	15	15	15	15	15	15	15
Remaining N-E Atlantic Ocean	25	25	25	25	25	25	25	25	25	25	25	25
Natural marine emissions	0	0	0	0	0	0	0	0	0	0	0	0
Volcanic emissions	0	0	0	0	0	0	0	0	0	0	0	0
Total	23819	22737	21508	20979	20364	19690	19038	18129	17795	17042	16756	14637
% change from 2002	-2	-2	-3	-3	-4	-2	-3	-5	-4	-6		-12

[d] Grey shaded cells contain emission projections expert estimates provided by IIASA (Current Legislation Projections)

Table 1.5: National total emission trends
Emissions of carbon monoxide (1980-1990) used for modelling at the MSC-W (Gg CO per year)[a]

Area/Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Albania	84	84	84	84	84	84	84	84	84	84	84
Armenia	405	405	405	405	405	405	405	417	417	399	304
Austria	1795	1751	1719	1694	1728	1708	1646	1578	1490	1427	1238
Azerbaijan	293	293	293	293	293	293	293	293	293	293	293
Belarus	1654	1654	1654	1654	1654	1654	1605	1601	1590	1615	1722
Belgium	1285	1285	1285	1285	1285	1285	1285	1285	1285	1285	1285
Bosnia and Herzegovina	277	277	277	277	277	277	277	277	277	277	277
Bulgaria	997	997	997	997	997	997	997	997	995	985	891
Croatia	655	655	655	655	655	655	655	655	655	655	655
Cyprus	46	46	49	49	49	49	53	56	60	60	63
Czech Republic	894	900	906	901	895	899	740	738	737	884	1257
Denmark	956	1075	1123	951	973	996	971	988	904	961	713
Estonia	400	400	400	400	400	400	417	423	419	448	434
Finland	660	650	640	630	620	610	600	589	579	569	559
France	15754	14984	14528	14093	14157	13989	13591	13352	12916	12361	10951
Georgia	648	617	632	648	651	637	643	639	648	597	526
Germany	14046	13027	12438	11980	12176	12134	12135	12438	12081	11430	11213
Greece	1298	1298	1298	1298	1298	1298	1298	1298	1298	1298	1298
Hungary	1019	1001	984	996	949	931	942	952	963	980	997
Iceland	44	44	44	43	44	46	48	54	57	57	58
Ireland	401	401	401	401	401	401	401	401	401	401	401
Italy	7588	7478	7527	7432	7590	7692	7607	7674	7581	7735	7824
Kazakhstan	410	410	410	410	410	410	410	410	410	410	410
Latvia	498	498	498	498	498	498	498	498	498	498	498
Lithuania	541	548	543	550	550	545	554	564	578	568	519
Luxembourg	193	193	193	193	193	193	189	186	182	179	175
Netherlands	1530	1418	1374	1354	1357	1381	1252	1192	1179	1131	1120
Norway	909	815	824	816	842	844	872	919	869	910	867
Poland	7406	7406	7406	7406	7406	7406	7406	7406	7406	7406	7406
Portugal	1024	1024	1024	1024	1024	1024	1024	1024	1024	1024	1024
Republic of Moldova	394	392	395	388	387	483	478	474	496	476	453
Romania	3245	3217	3152	3030	3463	3307	3378	3196	3317	3314	3186
Russian Federation	13520	15005	13617	13696	13672	14122	13142	13270	13144	12210	13329
Serbia and Montenegro	672	683	683	693	711	711	711	718	728	725	739
Slovakia	491	491	491	491	491	491	491	491	491	491	533
Slovenia	68	66	63	61	64	68	78	79	75	75	81
Spain	3494	3372	3343	3370	3344	3305	3347	3437	3620	3807	3702
Sweden	1135	1135	1135	1135	1135	1135	1135	1135	1135	1135	1135
Switzerland	1280	1222	1164	1106	1048	990	933	877	820	764	673
TFYR of Macedonia	77	77	77	77	77	77	77	77	77	77	77
Turkey	2934	2961	3110	3141	3141	3121	3305	3477	3610	3505	3585
Ukraine	9832	9832	9832	9832	9832	9832	9722	9269	9085	8794	8141
United Kingdom	7669	7658	7752	7567	7653	7454	7454	7502	7561	7804	7445
North Africa	336	336	336	336	336	336	336	336	336	336	336
Remaining Asian areas [b]	449	449	449	449	449	449	449	449	449	449	449
Baltic Sea	29	29	29	29	29	29	29	29	29	29	29
Black Sea	8	8	8	8	8	8	8	8	8	8	8
Mediterranean Sea	139	139	139	139	139	139	139	139	139	139	139
North Sea	59	59	59	59	59	59	59	59	59	59	59
Remaining N-E Atlantic Ocean	111	111	111	111	111	111	111	111	111	111	111
Natural marine emissions	0	0	0	0	0	0	0	0	0	0	0
Volcanic emissions [c]	0	0	0	0	0	0	0	0	0	0	0
Total	109651	108876	106555	105133	106009	105966	104279	104119	103164	101234	99270
% change from 2002	1	1	1	1	1	1	1	1	1	1	1

[a] All emission figures are for the part of countries within the EMEP domain of calculation. Emission figures displayed without shading are officially reported to the CLRTAP. Emissions figures in grey shaded cells are expert estimates (see text). Emission figures in bold have changed from last year's emission report.

[b] "Remaining Asian areas" refers to Syria, Lebanon, Israel and parts of Uzbekistan, Turkmenistan, Iran, Iraq and Jordan.

[c] Natural emissions reported by Italy.

Table 1.5 Cont.: National total emission trends
Emissions of carbon monoxide (1991-2001,2010) used for modelling at the MSC-W (Gg CO per year)

Area/Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2010[d]
Albania	84	84	84	84	84	88	91	95	98	102	102	160
Armenia	377	195	145	128	174	126	224	124	124	110	104	104
Austria	1246	1198	1167	1117	1030	1050	985	953	907	859	860	727
Azerbaijan	293	293	293	293	293	293	293	293	293	293	293	611
Belarus	1717	1381	1201	1241	1253	1242	1223	1034	786	718	711	837
Belgium	1103	1123	1088	1044	1175	1000	938	1114	1017	1100	1027	306
Bosnia and Herzegovina	259	242	224	207	189	189	189	193	193	193	193	160
Bulgaria	608	768	820	855	846	613	515	650	617	667	521	568
Croatia	565	417	375	369	374	428	431	409	399	402	402	480
Cyprus	56	67	70	70	67	74	74	77	77	81	85	85
Czech Republic	1179	1170	1103	1125	999	1012	944	765	716	648	649	475
Denmark	753	743	746	717	701	706	664	600	565	579	587	358
Estonia	399	208	210	241	242	268	283	281	215	202	177	126
Finland	552	478	457	444	436	461	474	452	547	526	605	644
France	10837	10363	9779	9079	8922	8323	7873	7672	7147	6640	6365	4795
Georgia	441	130	143	149	250	390	429	353	223	223	223	223
Germany	9515	8352	7704	7064	6532	6109	5955	5424	5143	4768	4797	4245
Greece	1290	1320	1285	1264	1254	1354	1356	1489	1386	1531	1366	1237
Hungary	913	836	796	774	761	727	733	737	722	633	592	492
Iceland	59	61	60	60	49	50	39	40	40	40	40	19
Ireland	394	395	350	329	304	307	312	318	285	280	280	204
Italy	8003	7961	7755	7549	7755	6971	6681	6318	6051	5207	5207	3651
Kazakhstan	494	490	450	356	355	363	345	336	297	279	279	279
Latvia	494	483	320	329	390	407	384	376	339	273	382	185
Lithuania	577	350	292	303	286	312	358	358	320	282	229	228
Luxembourg	190	204	219	145	107	103	80	51	50	49	49	42
Netherlands	1025	983	960	907	852	903	749	739	702	679	659	623
Norway	799	778	781	766	734	707	670	633	599	568	548	1552
Poland	7245	7083	8655	5115	4547	4837	4700	4301	4363	3463	3528	2863
Portugal	1092	1179	1164	1146	1133	1113	1077	1077	1046	1032	1004	1794
Republic of Moldova	468	279	218	171	192	170	210	153	100	100	100	192
Romania	2695	2506	2434	2325	2325	2325	2325	2325	2325	2325	2325	1034
Russian Federation	13000	11703	11320	10603	9945	9401	10332	10383	10804	10811	10811	9806
Serbia and Montenegro	699	660	621	582	543	543	546	546	550	553	553	573
Slovakia	478	426	454	413	404	348	352	318	310	290	287	240
Slovenia	78	78	87	93	91	95	93	77	70	68	68	199
Spain	3770	3832	3623	3578	3215	3309	3159	3146	2876	2774	2741	3362
Sweden	1098	1090	1045	1027	1015	1000	899	952	909	833	808	624
Switzerland	629	581	544	516	491	467	443	422	399	394	410	346
TFYR of Macedonia	77	77	77	77	77	77	77	77	77	77	76	214
Turkey	3579	3662	3936	3769	3987	4135	4179	4156	4047	3778	3778	3778
Ukraine	7406	5496	4218	3375	2906	2567	2516	2810	2672	2672	2672	3055
United Kingdom	7214	6895	6384	6048	5695	5666	5280	4902	4591	4025	3737	1924
North Africa	336	336	336	336	336	336	336	336	336	336	336	336
Remaining Asian areas	449	449	449	449	449	449	449	449	449	449	449	131
Baltic Sea	29	29	29	29	29	29	29	29	29	29	29	29
Black Sea	8	8	8	8	8	8	8	8	8	8	8	8
Mediterranean Sea	139	139	139	139	139	139	139	139	139	139	139	139
North Sea	59	59	59	59	59	59	59	59	59	59	59	59
Remaining N-E Atlantic Ocean	111	111	111	111	111	111	111	111	111	111	111	111
Natural marine emissions	0	0	0	0	0	0	0	0	0	0	0	0
Volcanic emissions	0	0	0	0	0	0	0	0	0	0	0	0
Total	94883	87748	84789	76978	74109	71757	70612	68659	66126	62252	61357	54233
% change from 2002	0	1	0	0	0	1	1	1	0	-2		-19

[d] Grey shaded cells contain emission projections expert estimates provided by IIASA (Current Legislation Projections)

Table 1.6: National total emission trends
Emissions of Particulate Matter for 2000, 2001 & 2010 used for modelling at the MSC-W (Mg $PM_{2.5}$ & Mg PM_{10})[a]

	$PM_{2.5}$				PM_{10}		
Area/Year	**2000**	**2001**	**2010**		**2000**	**2001**	**2010**
Albania	**5**	**5**	**5**		**8**	**8**	**6**
Armenia	5	5	5		7	7	7
Austria	27	28	**25**		47	48	**38**
Azerbajan	19	19	19		30	30	30
Belarus	**39**	**39**	**40**		**62**	**62**	**60**
Belgium	36	36	**26**		65	66	**42**
Bosnia and Herzegovina	**19**	**19**	**16**		**46**	**46**	**36**
Bulgaria	**74**	**74**	**72**		**132**	**132**	**132**
Croatia	**16**	**16**	**14**		**25**	**25**	**20**
Cyprus	2	2	2		1	1	1
Czech Republic	**63**	**63**	**39**		**104**	43	**66**
Denmark	13	13	**15**		20	20	**25**
Estonia	**17**	**17**	**11**		**37**	**37**	**17**
Finland	38	38	**19**		48	54	**25**
France	299	303	**127**		545	550	**201**
Georgia	8	8	8		12	12	12
Germany	**156**	**156**	**120**		**239**	**239**	**196**
Greece	**40**	**40**	**40**		**57**	**57**	**60**
Hungary	26	24	**19**		47	43	**32**
Iceland	3	3	3		3	3	3
Ireland	**11**	**11**	**9**		14	14	**16**
Italy	**150**	**150**	**94**		**213**	**213**	**147**
Kazakhstan							
Latvia	**7**	**7**	**4**		**11**	**11**	**7**
Lithuania	**9**	**9**	**7**		1	1	**12**
Luxembourg	**3**	**3**	**2**		**4**	**4**	**3**
Netherlands	37	37	**28**		62	61	**49**
Norway	56	54	**40**		66	64	**45**
Poland	135	142	**128**		282	305	**221**
Portugal	**32**	**32**	**24**		**44**	**44**	**34**
Republic of Moldova	**13**	**13**	**12**		**28**	**28**	**25**
Romania	**118**	**118**	**106**		**187**	**187**	**168**
Russian Federation	**692**	**692**	**629**		**1129**	**1129**	**1063**
Serbia and Montenegro	**39**	**39**	**37**		**86**	**86**	**74**
Slovakia	**24**	**24**	**19**		**44**	**44**	**34**
Slovenia	**8**	**8**	**6**		**13**	**13**	**10**
Spain	**145**	**145**	**94**		**209**	**209**	**145**
Sweden	45	48	**17**		66	69	**27**
Switzerland	**12**	**12**	**10**		26	24	**16**
TFYR of Macedonia	**9**	**9**	**8**		**20**	**20**	**16**
Turkey	223	223	223		420	420	420
Ukraine	**269**	**269**	**227**		**463**	**463**	**397**
United Kingdom	108	108	**85**		178	178	**141**
North Africa							
Remaining Asian areas							
Baltic Sea					**7**	**7**	**7**
Black Sea [b]					1	1	1
Mediterranean Sea					**1**	**1**	**1**
North Sea					**43**	**43**	**43**
Rem. N-E Atlantic Ocean					**63**	**63**	**63**
Natural marine emissions							
Volcanic emissions							
Total	**3097**	**3108**	**2481**		**5217**	**5186**	**4197**

[a] Figures in bold in grey shaded cells are expert estimates from IIASA. Other figures in grey shaded cells are expert estimates from TNO. Figures without shading are officially reported emission values.
[b] PM10: Based on gridded data from ENTEC.

1.3 Emission trends in the EMEP area

Provided that all gaps are filled in the time series of reported emission data, it is possible to calculate the development of total emissions over the EMEP area since 1980. Figures 1.1-1.5 illustrate the emission trends for SO_2, NO_x, NH_3, NMVOC and CO respectively.

European sulphur dioxide emissions (Figure 1.1) show a clear downward trend. Total SO_2 emissions declined 61 per cent between 1980 and 2001. National total emissions of NO_x reported by the Russian Federation for 1980-1987 only include stationary sources, and have this year been completed by MSC-W by adding the contribution from mobile sources reported by the Russian Federation in 1990. This influenced strongly the trends of NO_x in the 1980s in the EMEP area (Figure 1.2). The reduction of NO_x was 25 percent between 1980 and 2001. European emissions of ammonia (Figure 1.3) dropped by 24 percent between 1990 and 2001. The almost constant emission trend before 1990 is mainly the result of assumptions made to fill in missing data for most countries. The total emission level of ammonia has decreased this year compared to last year, notably in the later 1990's, as a result of submission of ammonia emission data from Ukraine, and recalculations by Spain. The NMVOC emissions (Figure 1.4) refer to anthropogenic releases only. The trend is different between 1980 and 1986 than shown in previous years, because attempts have been made to complete the emission data from the Russian Federation that reported incomplete set of emission sources. The reduction between 1980 and 2001 is 33 percent, while the decline from the year 1988 where the emission peak to 2001, is 35 percent. The emission reduction between 1980 and 2001 for CO is 44 percent (Figure 1.5).

Projections for 2010, shown in figures 1.1-1.5, are provided by the Centre for Integrated Assessment Modelling, and their current legislation scenario (CLE) is used for all Parties where available. For other Parties and areas, reported projections or latest year's emission figure is included.

The percentage difference from last year's report is shown at the bottom of each of the tables 1.1-1.5. Generally the percentage changes from last year for the total EMEP area are small ± 1-2%, except for NO_x and NMVOC in the early eighties and NH_3 (see above), and the 2010 projections.

Last year the official reported projections, together with the ceilings from the Gothenburg Protocol and latest year reported, were used to create a complete set of projections for 2010 in the EMEP area. This year we are modelling the CIAM 2010 CLE scenario, and these emissions have been used for the 2010 projections. For all pollutants except NH_3, this change has resulted in a reduction of the total level of emission 2010 in the EMEP area. The total NH_3 emissions for 2010 increased by 10% this year compared to last year, while the emission level of ammonia decreased by up to 7 % from last year. The percentage difference is largest for CO (-19%). For SO_2, NO_x , and NMVOC the percentage reductions are 2, 7 and 12% respectively.

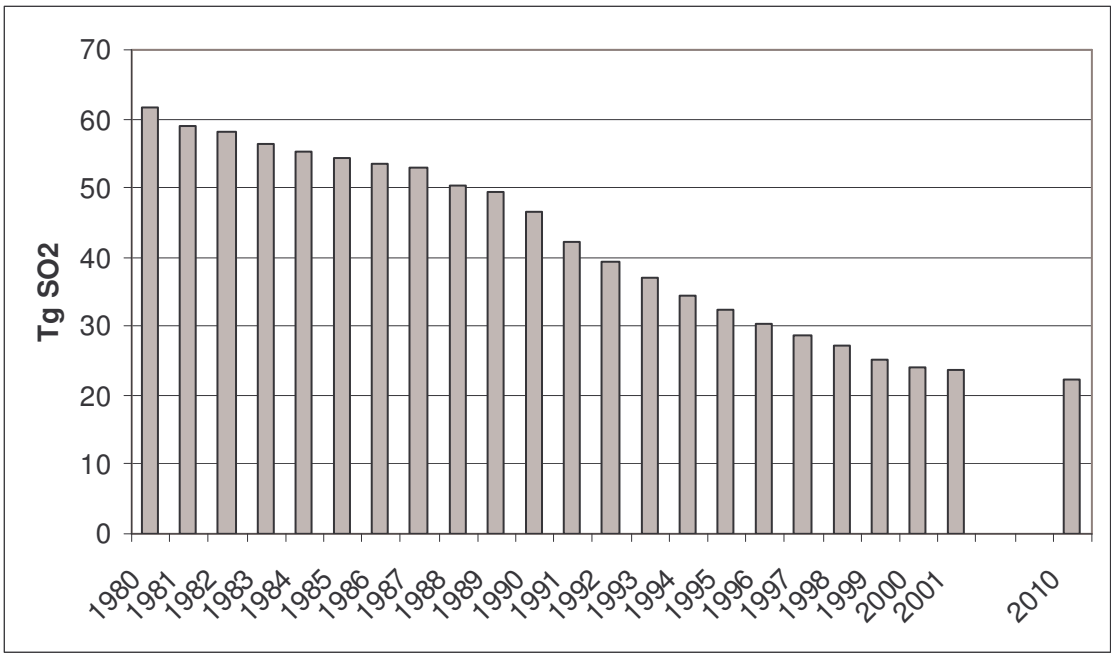

Figure 1.1 Emission trends of sulphur in the EMEP area 1980-2001, 2010

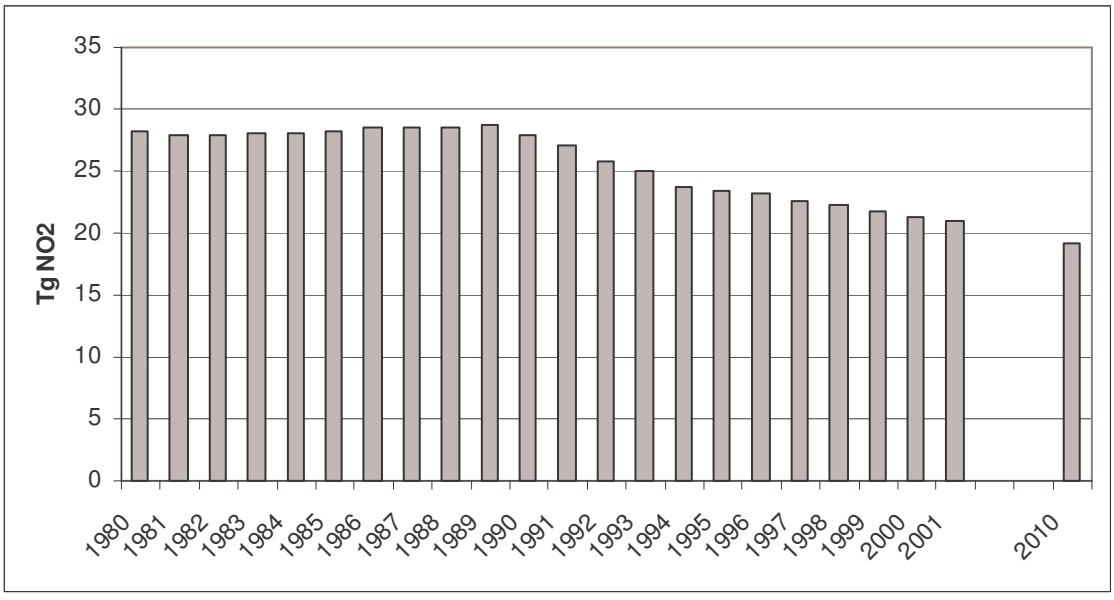

Figure 1.2 Emission trends of nitrogen oxides in the EMEP area 1980-2001, 2010

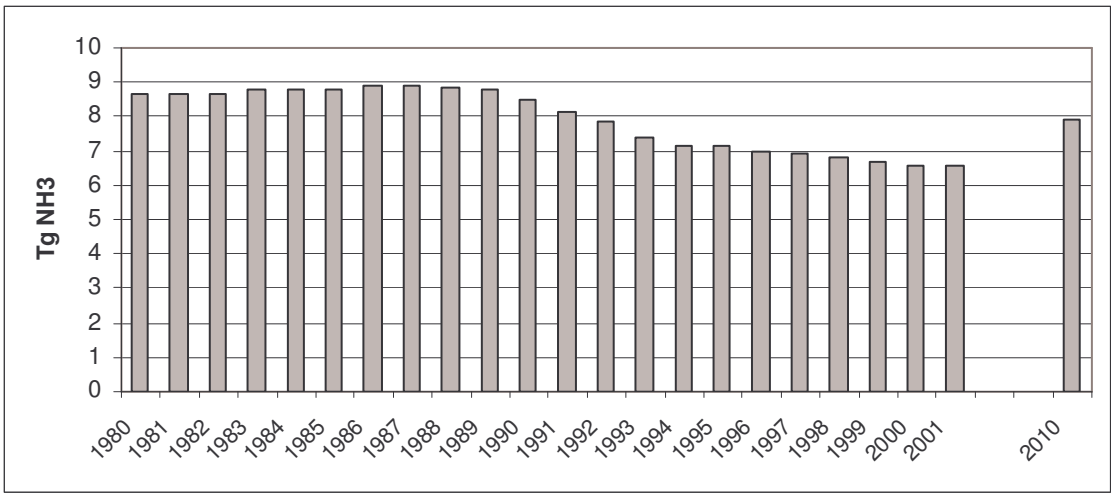

Figure 1.3 Emissions trends of ammonia in the EMEP area 1980-2001, 2010

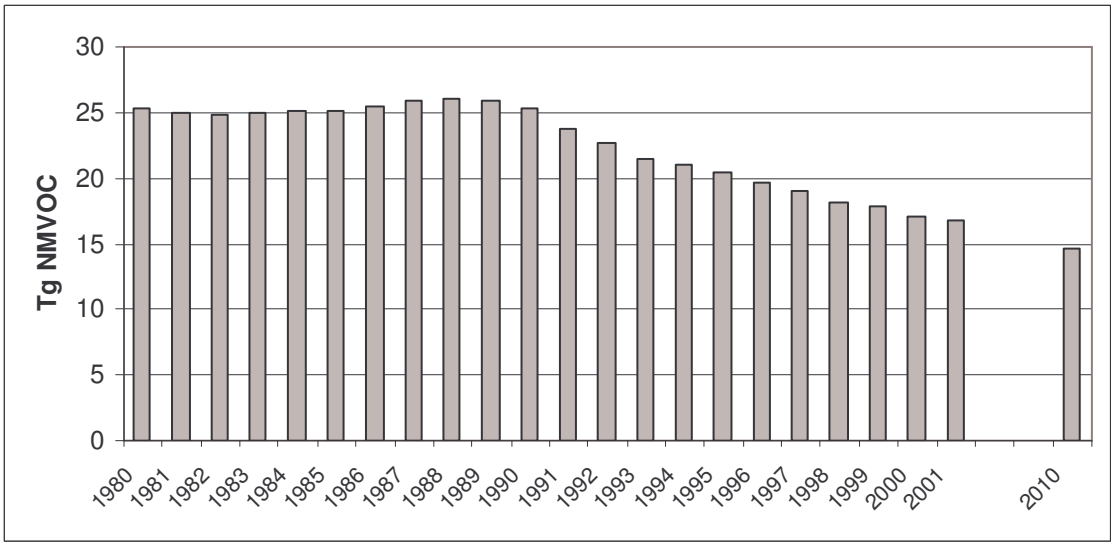

Figure 1.4 Emission trends of volatile organic compounds in the EMEP area 1980-2001, 2010

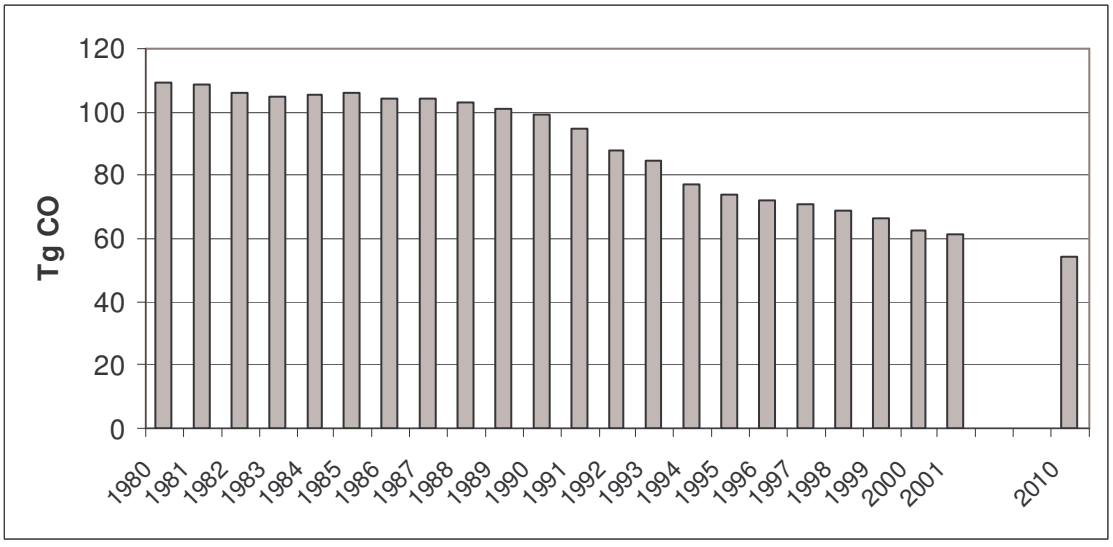

Figure 1.5 Emission trends of carbon monoxide in the EMEP area 1980-2001, 2010

2. Review and revision of gridded sector data

2.1 Introduction

Integrates assessment studies and dispersion modelling requires input of gridded sector emission data (GS). One of many factors contributing to the overall quality of the model results is the horizontal distribution of emissions. That the distribution of emissions in some cases could be as important as the emission level, was documented in EMEP/MSC-W Note 1/2002 (Vestreng and Klein, 2002).

Gridded sector data is requested in the Guidelines, but so far only 11 Parties (22% of all the Parties to the CLRTAP), have officially reported GS where at least all the main sources were included. Hence there is a need in EMEP to create expert estimates of GS data. The old procedure for creating gridded sector data at MSC-W did not take account of position of LPS (Large Point Sources), basically because of lack of such data in the UNECE database. The Guidelines ask for LPS data, but only 10 Parties (20 %) have reported the required information.

This year, the GENEMIS (Generation of European Emission Data for Episodes) project (Friedrich and Reis, in press), kindly provided their LPS database to EMEP. The database covers most of the EMEP domain, and the processing of data and building of a new procedure for creating GS data, scale and QC the output, the EMEP-MODINP, could be initiated, and the first phase implemented. The first phase of the implementation is based on the old SNAP 97 source sectors; because most of the officially reported sector emission data available in the UNECE database follows this nomenclature. When availability of data in the new NFR source categories has become available, the program will be updated to accommodate the new NFRs.

The purpose of the new scaling routines is two folded:

1. it provides a default documented routine to elaborate sector gridded data information when not directly reported to UNECE
2. it constitutes a basis for quality control and evaluation of the comparability of sector gridded data used at MSC-W and distributed via WebDab.

The input data used for the new scaling routines are:

1. Official reports from UNECE: National Totals, National Sector, Gridded Total and Gridded Sector data (from previous years), and LPS data
2. Information of the position of European LPS (GENEMIS, IER)
3. Population maps (IIASA)
4. Information on gridded sector distribution from related pollutants

The proposed methodology for elaboration of gridded sector data constitutes an improvement with respect to previous practice at MSC-W. The previous practice at MSC-W was based only on reported emission data to EMEP and used the principle that the more disaggregated the data, the more unreliable it was. That procedure was developed at the beginning of the 1990s and since that time the effort and resources devoted to the compilation of emission inventories in Europe has increased considerably.

The methodology now developed, makes use of all quality checked data reported to UNECE and is supported by a broader set of information relevant to the spatial distribution of the emissions, such as data on LPS distribution and population maps. It is based on the principle that disaggregated data are more easily verified and therefore preferable to more aggregated data. The methodology allows additional comparability checks of the data across pollutants.

The basic principle is to distribute emissions in sectors S1, "Combustion in energy and transformation industries", S4, "Production Processes" and partially also S3, "Combustion in manufacturing industries" according to LPS distribution and to distribute emissions in the remaining sectors according to population distribution.

2.2 The structure of the EMEP-MODINP

The input data and the methodology followed to create the required output (GS data for the whole of the EMEP domain and scaled to whatever year chosen), is ranked according to the relevance of the input data and the expected quality of the output.

Figure 2.1 shows a simplified picture of how EMEP-MODINP is structured. The input data to the EMEP-MODINP is listed along the y-axis according to their relevance to produce the required output. Highest relevance has the officially reported gridded sector data (GS_{off}), followed by gridded totals (GT_{off}), gridded population data (POP), expert estimated gridded sector data (GS_{exp}), national sector (NS) and national total (NT) data and LPS data. The three latter data types can be either officially reported or expert estimates. They are used in the scaling and or transformation of the input grids (GS, GT or POP), while the gridded data input decides which methodology to follow when producing the gridded sector data output.

There are four distinctive different scaling procedures followed when creating gridded sector data. They are dependant upon and named here after the input data determining the horizontal distribution of emissions. They are visualized in rectangles in the figure and listed in x-axis direction according to the expected output quality. The procedure followed when officially reported gridded sector data is available is expected to produce outputs with higher quality than the GT, POP and GS_{exp} methods. Not shown in the simplified picture, are all the combinations of officially reported data (off) and expert estimates (exp) used to produce the scaled GS data depending on data availability.

As the Parties themselves have much better and more detailed input to produce gridded sector emissions, checked officially reported data for the actual emission year of computation has the highest possible quality. As more and more expert estimates are included, and the input data emission year moves away from the actual year of computation, the quality of the output decreases. In the case where the input is gridded sector data for the year of computation (y_0), and is consistent with the data types used for scaling, not scaling has to take place. This possibility is shown by the dotted line around the "scaling" in figure 2.1.

Also included in the figure is the QC of end results. The data available for QC is marked on the y-axis. Moving along the x-axis, the QC is becoming more limited, as much of the available data used to quality control the end result has already been used in the scaling itself, and cannot be used in the QC.

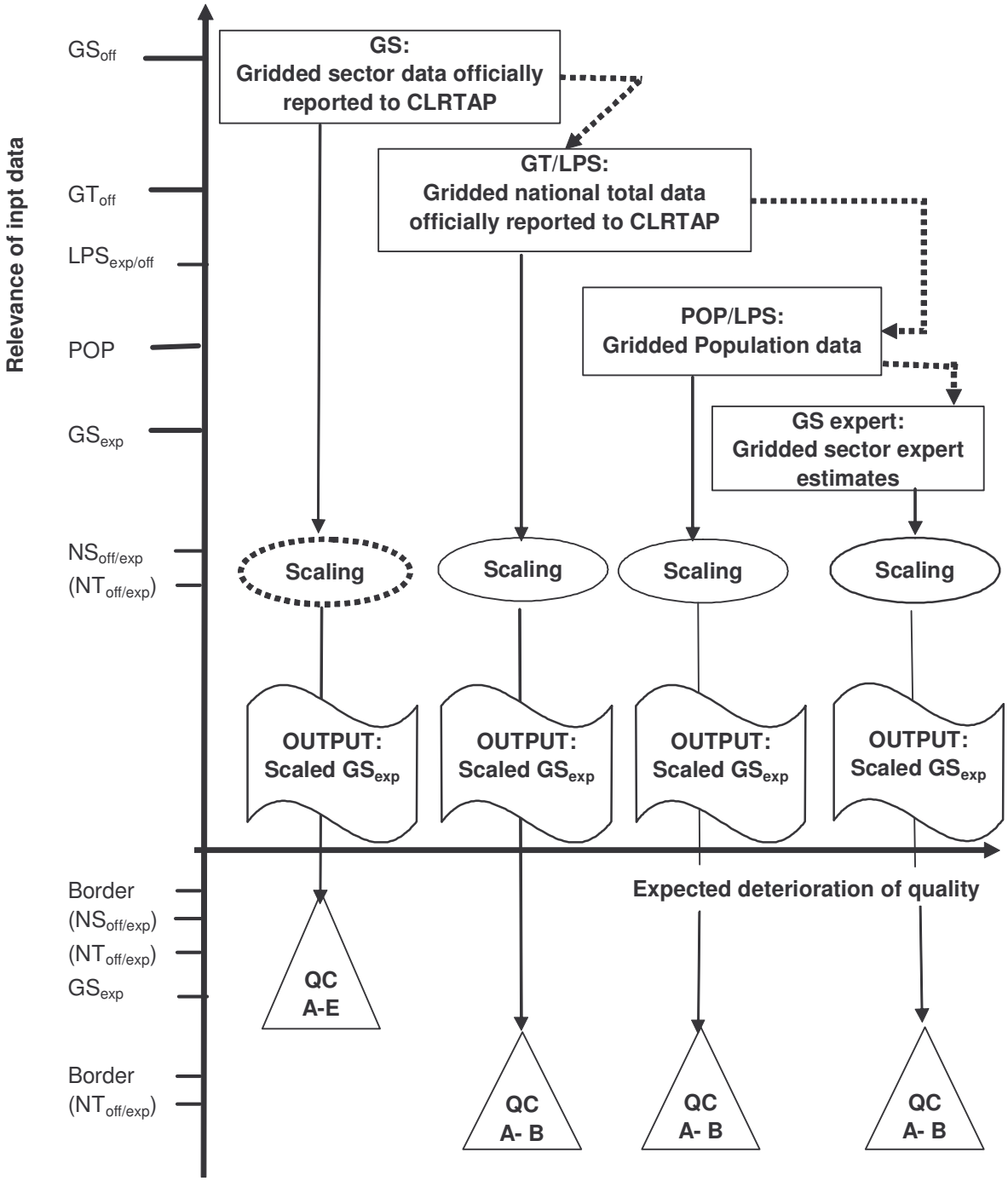

Figure 2.1 Simplified structure of the EMEP-scale

2.3 The EMEP-MODINP equations

The equations used when producing scaled gridded sector emissions for model runs are described below, starting with the method producing the expected highest quality output. The compounds considered are SO_2, NO_x, NH_3, NMVOC, CO, PM_{10} and $PM_{2.5}$.

The following notation is used:
GS: Gridded sector data
GT: Gridded national totals
NS: National sector data
s: National sector 1-10
i, j: Denotes the EMEP 50x50 km^2 grid cell
y_0: The year of computation
$\hat{GS}$: If the GS is marked, this means that it was computed

Items 1.A-1.C only concern scaling of emission data, while items 2, 3 and 4 also concern the creation of expert estimated gridded sector data.

1. Gridded sector data
1. A. Required input: Officially reported $(GS)_{y_0}$

If the emission data is internally consistent, the GS data will not change in the scaling routine. If the GS is inconsistent with the NS by more than 10 percent per sector, the GS will be scaled to the NS following equation (1). The GS will be scaled according to equation (2), if inconsistent with the NT by ± 1 percent.

$$(\hat{GS}_{sij})_{y_0} = \frac{(GS_{sij})_{y_0}}{\sum_{ij}(GS_{sij})_{y_0}} * (NS_s)_{y_0} \qquad \text{, s = 1, ..., 10} \qquad (1)$$

$$(\overline{GS}_{sij})_{y_0} = \frac{(\hat{GS}_{sij})_{y_0}}{\sum_{ij}\sum_{s=1}^{10}(\hat{GS}_{sij})_{y_0}} * (NT)_{y_0} \qquad (2)$$

The implication of this scaling routine is that it is the national totals reported or expert estimated that decides the emission level.

1. B. Required input: - Officially reported $(GS)_{y_{0\pm6}}$

- Officially reported $(NS_s)_{y_0}$

The Guidelines request gridded emission data each 5th year, and initially the EMEP-MODINP took this into account by only allowing gridded data of vintage ± four years from the year of computation as input. The range was however raised to ± six years in order to include more reported data.

$$(\hat{GS}_{sij})_{y_0} = \frac{(GS_{sij})_{y_{0\pm6}}}{\sum_{ij}(GS_{sij})_{y_{0\pm6}}} * (NS_s)_{y_0} \qquad , s = 1, \ldots, 10 \qquad (1')$$

If GS differs from NT by more than ± 1% scale with $(NT)_{y_0}$ as in equation (2) above.

1. C. Required input: - Officially reported $(GS)_{y_{0\pm6}}$

- Officially reported $(NT)_{y_0}$ or expert estimated $(NT)_{y_0}$

Scaling:

$$\left(\overline{GS}_{sij}\right)_{y_0} = \frac{(GS_{sij})_{y_{0\pm6}}}{\sum_{ij}\sum_{s=1}^{10}(GS_{sij})_{y_{0\pm6}}} * (NT)_{y_0} \qquad (2'')$$

2. Gridded total data

2. A. Required input: - Officially reported $(GT)_{y_0\pm n}$, n = 0,1, 2, 3, 4

- Officially reported $(NS)_{y_0}$

- Officially reported LPS or expert estimated LPS

2. A Scaling the GT with $(NS)_{y_0}$ if required, that is n≠0:

$$(\overset{\cup}{GT}_{ij})_{y_0} = (GT_{ij})_{y_{0\pm6}} * \frac{\sum_{S=1}^{10}(NS_s)_{y_0}}{\sum_{ij}(GT_{ij})_{y_{0\pm6}}} \qquad (3)$$

2. B In this first phase of the EMEP-MODINP, only **the positions** of the LPS' are used. By comparing the GT grid with the grid of LPS, a grid containing all cells with LPS is created:

$$\left[(GT_{ij})^{\iota}\right]_{y_0} = (\overset{\cup}{GT}_{ij})_{y_0} * (\delta_{ij})_{LPS} \quad , \quad \text{with } (\delta_{ij})_{LPS} = \begin{cases} 1, \text{ if LPS in gridcell} \\ 0, \text{ otherwise} \end{cases} \qquad (4)$$

2. C Since the LPS expert estimates are not distributed per sector, a Fraction LPS emissions per Sector of total emission (LPS plus area emissions) operator, documented in Appendix C is applied. In EMEP-MODINP, we are assuming that the FS applies for all pollutants.

The LPS part of the GT emissions are hence distributed to different sectors by the FS factor and the NS:

$$FS_s = \begin{cases} 1 & , \quad \text{S1 or S4} \\ 0.5 & , \quad \text{S3} \\ 0 & , \quad \text{otherwise} \end{cases}$$

$$\left[(GS_{sij})_{LPS}\right]_{y_0} = \frac{\left[(GT_{ij})^t\right]_{y0}}{\sum_{ij}\left[(GT_{ij})^t\right]_{y_0}} * \frac{(NS_s)_{y_0}}{\sum_{s=1}^{10}(NS_s)_{y_0}} * FS_s * \sum_{ij}(\overset{\cup}{GT}_{ij})_{y_0}, \text{ s=1, …10} \qquad (5)$$

The first term in the equation (5) denotes the grid cells with LPS, divided by the sum of all these grid cells. The three last terms concerns the scaling and sector distribution of these normalized 'LPS cells' by the NS and the FS.

2. D In order to find the area emission part of the GT, the LPS emissions are subtracted from each "LPS cell". The remaining grid, containing all area sources, are then scaled and sector distributed according to the NS and the FS,

$$\left[(GS_{sij})_{AREA}\right]_{y_0} = (\overset{\cup}{GT}_{ij} - \sum_s\left[(GS_{sij})_{LPS}\right])_{y_0} * \frac{(NS_s)_{y_0}}{\sum_{s=1}^{10}(NS_s)_{y_0}} * (1 - FS_s), \quad s = 1,...,10 \qquad (6)$$

2. E Finally the scaled GS_{LPS} and GS_{AREA} emissions are added together,

$$(\overset{\cup}{GS}_{sij})_{y_0} = [(GS_{sij})_{LPS}]_{y_0} + [(GS_{sij})_{AREA}]_{y_0} \qquad (7)$$

If grid cells' emissions become negative in equation (6), the emissions in these grid cells are set to zero, and $(\overset{\cup}{GS}_{sij})_{y_0}$ rescaled at the end by the NS.

3. Population data

Required input: - Population data $(GP)_y$

- $(NS)_{y_0}$

- Officially reported LPS or expert estimated LPS

$$\left[(GS_{sij})_{AREA}\right]_{y_0} = \frac{(GP_{ij})_y}{\sum_{ij}(GP_{ij})_y} * (NS_s)_{y_0} * (1 - FS_s) \quad (8)$$

The area emission part is computed by scaling the normalized population grid (first term in equation (8)), by the NS_s and FS_s. Thereafter, the LPS emissions are computed from the normalized δ grid which contains only zero or one (see equation (4)), scaled and sector distributed by the NS and FS_s as in equation (9).

$$\left[(GS_{sij})_{LPS}\right]_{y_0} = \frac{(\delta_{ij})_{LPS}}{\sum_{ij}(\delta_{ij})_{LPS}} * (NS_s)_{y_0} * FS_s \quad (9)$$

$$(\hat{GS}_{sij})_{y_0} = [(GS_{sij})_{LPS}]_{y_0} + [(GS_{sij})_{AREA}]_{y_0} \quad (10)$$

4. Gridded sector expert estimates

Required input: - GS expert estimates
- NS or NT

Based on assumptions on similar distribution of different pollutants, and factors estimated from available data in the UNECE database, CO and NMVOC is in the case that non of the above described methods are possible, estimated on the basis of the NO_x grid:

$$GS_{CO} = GS_{NO_x} \quad (11)$$

$$GS_{NMVOC} = GS_{NO_x} \quad (12)$$

The $PM_{2.5}$ distribution from CEPMEIP project/TNO can be used to estimate SO_2 and NO_x distributions:

$$GS_{ij} = GS_{PM_{2.5}\,ij} \quad (13)$$

2.4 QC of input and output from EMEP-MODINP

Dependant upon data available for QC, a set of QC checks is performed.

A. Check of borders:
The gridded input data is compared to a set of grid cells defining each Party's land area within the EMEP domain. The program writes out all cells outside the country border for grids

considered for input to the scaling program. Based on this output, consultation with the relevant Parties will take place, and the gridded data adjusted.

B-D. Internal consistency checks:
These checks are performed both on the input to the EMEP-MODINP, and the output were possible.
B) Check that the GS and the NS data are internal consistent.

$$\sum_{ij}\left(GS_{sij}\right)_{y_0} - \left(NS_s\right)_{y_0} \le 10\% \quad \text{of NS,} \qquad s=1, \ldots 10$$

C) Check that the GS and the GT data are consistent in each grid cell.

$$\sum_{s=1}^{10}(GS_{sij})_{y_0} - (GT_{ij})_{y_0} \le 1\% \quad \text{of } GT_{ij}$$

If the NS_s=0, it is checked if : $\sum_{sij} GS_{sij} \le 1\%$ of $\sum_{s} NS_s$

D) Check that the sum of the gridded sector data over all grid cells is consistent with the sum of the gridded total emissions.

$$\sum_{ij}(GS_{sij})_{y_0} - \sum_{ij}(GT_{ij})_{y_0} \le 1\% \quad \text{of GT,} \qquad s = 1, \ldots, 10$$

E. Manually comparison of $(GS)_{y_0}$ reported with expert estimates of GS created from equations (7) and (10).

If C-D is not true, the data is not sufficiently internal consistent. In the case of output data from EMEP-MODINP, rescaling to the NS and finally to the NT following equation (1) and (2) takes place.

The input data which failed the internal inconsistency tests and or the comparison with expert gridded sector data will be manually corrected or replaced after consultation with the Parties' national experts. First when a set of quality controlled data sets are ready for input to the scaling program, the scaling should take place.

2.5. EMEP-MODINP: Input data for spatial distribution

While the preceding chapter concerned the emission level, this chapter gives an overview of available input data to the EMEP-MODINP to distribute the emission spatially.

2.5.1 Reported gridded sector data and LPS

Eleven Parties have reported gridded sector data. The coverage of reported gridded sector data is displayed in Table 2.1. The latest available emission year is shown in the cells.

Table 2.1 Coverage of reported gridded sector data

	CO	NH_3	NMVOC	NO_x	SO_2
Austria	2000	2000	2000	2000	2000
Denmark	2000	2000	2000	2000	2000
Finland	2000	2000	2000	2000	2000
Germany	1999	1999	1999	1999	1999
Lithuania	1995	1995	1995	1995	1995
Netherlands	2000	2000	2000	2000	2000
Norway	2000	2000	2000	2000	2000
Spain	2000	2000	2000	2000	2000
Sweden	2000	2000	2000	2000	2000
Switzerland	2000	2000	2000	2000	2000
U. Kingdom	2000	2000	2000	2000	2000

Thirteen Parties have provided information on LPS emissions:
Belgium, Bulgaria, Czech Republic, Denmark, Estonia, Finland, Ireland, Monaco, Netherlands, Slovenia, Spain, TFYR of Macedonia and United Kingdom

2.5.2 Expert estimates of LPS, GS and population

The coverage of expert estimated LPS' from GENEMIS/IER is shown in 2.2 (Friedrich and Reis, in press). The coverage of $PM_{2.5}$ expert estimated gridded sector 1 (Combustion in energy and transformation industries) data from the CEPMEIP project (TNO) is shown in Figure 2.3 (EMEP, 2002), and the population data from IIASA is shown in Figure 2.4 and documented in EMEP Report 5/2002 (Tørseth et. al., 2002).

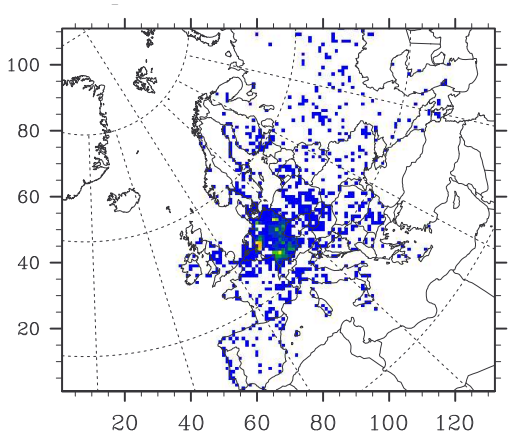

Figure 2.2 Coverage of LPS expert estimates (GENEMIS)

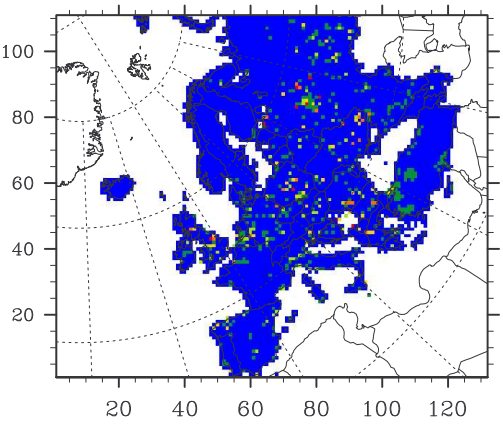

Figure 2.3 Coverage and distribution of $S1,GS_{PM2.5}$ expert estimates (CEPMEIP)

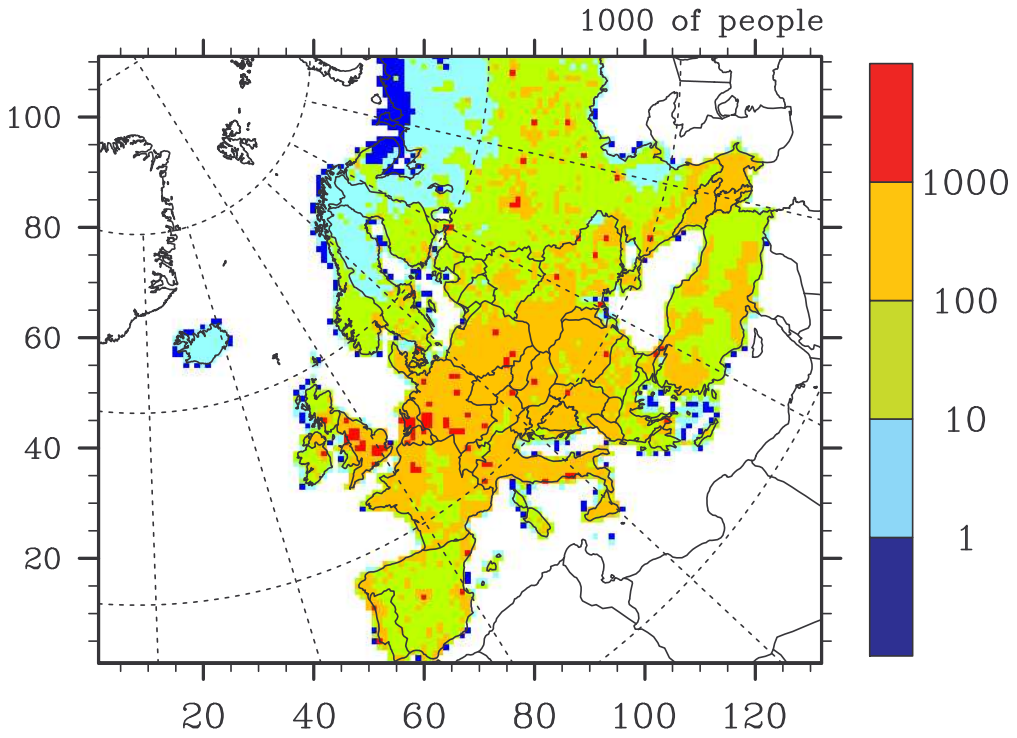

Figure 2.4 Coverage and distribution of population data (IIASA)

The EMEP area is well covered by these, for the results of the EMEP-MODINP, important expert estimates. Well visible is the lack of data for Kazakhstan, Remaining Asian areas and North Africa. There is a lack of expert estimated LPS data also for Albania, Cyprus, Georgia, Iceland and TFYR of Macedonia. TFYR of Macedonia has however reported LPS data, and GS estimates have been created for the other areas based on the 1985 GEIA SO_2 inventories, the NH_3 RIVM global inventory (Bouwman et al, 1997) together with old MSC-W SO_2 estimates based primarily on the knowledge of the location of the coalmines, geographical and economical maps and UN production overviews. Distributions of the other pollutants were based on the SO_2 distribution, with population density and number of cars as correcting factors. The distributions made by MSC-W experts were at that time sent to the respective countries for comments and corrections and updates were made in an iterative process.

2.6 Evaluation and Results of the EMEP-MODINP

The EMEP-MODINP has been evaluated by:

- Comparing results for the different methods used by EMEP-MODINP to create scaled gridded sector expert estimates, with officially reported gridded sector emissions
- Comparing results for year 2000 obtained last year with the old MSC-W routine for production of scaled gridded sector data

2.6.1 Evaluation of EMEP-MODINP methodologies

German reported gridded sector emissions have been picked out to evaluate the EMEP-MODINP. Germany was chosen, because Germany has reported gridded sector data, but no LPS data, and was hence not among the Parties from which the FS factor has been confirmed (See Appendix C, Table 3). Germany has reported gridded sector and total data for 1999 and national sector and totals emissions for year 2000. The reported data from Germany has been compared with the results from EMEP-MODINP for the four different methodologies outlined in Figure 2.1. To evaluate the results for pure scaling and for LPS expert estimates versus reported LPS', Spanish data was used, since Spain has reported GS and LPS data for year 2000.

In order to evaluate the ability of EMEP-MODINP to distribute main source sectors for different pollutant, S7, "Road transport" was chosen for NO_2 and S10, "Agriculture and forestry, land use and wood stock changes" for ammonia. The other tests were performed on SO_2 sector 1, "Combustion in energy and transformation industries", and sector 3, "Combustion in manufacturing industries" emissions.

The first there figures (Figures 2.5-2.7) only concerns input to EMEP-MODINP of officially reported data. Figure 2.5, displaying reported gridded sector data form Spain for year 2000 regarded as the answer. Figure 2.6 shows the result from EMEP-MODINP assuming that only gridded sector data for year 1995 is available $(GS)_{y0\pm6}$. The two pictures are almost identical. Hence it is concluded that the EMEP-MODINP scaling itself works as expected[1].

[1] In Spain it was obviously no changes of S1 sources between 1995 and 2000, but if there are changes in the distribution of sources in a country, these changes would obviously not be

Figure 2.7 shows a situation where we assume that no reported gridded sector data is available, but only gridded totals and reported LPS data for year 2000 (GT/LPS_{off}). The S1 level and distribution is expected to be identical to the reported gridded sector 1 emissions, as the FS factor worked out for Spain (See Appendix C, Table 3) is the FS factor used for S1 in the EMEP-MODINP (See equation (5)-(7)). The gridded sector distributions in Figures 2.5 and 2.7 are indeed identical, and it is concluded that the GT/LPS method at least in this case works excellent.

Figure 2.8 shows again the GT/LPS method, but this time with expert estimated LPS data (LPS_{exp}). The test should only be considered as a check of the expert estimated LPS data. The most obvious difference in results from the GT/LPS_{off} (Figure 2.7), is that the small LPS' (the blue squares) reported by Spain are lost. There are also some LPS' not correctly positioned. Still, the overall impression is that the expert LPS database is reliable in the case of Spain.

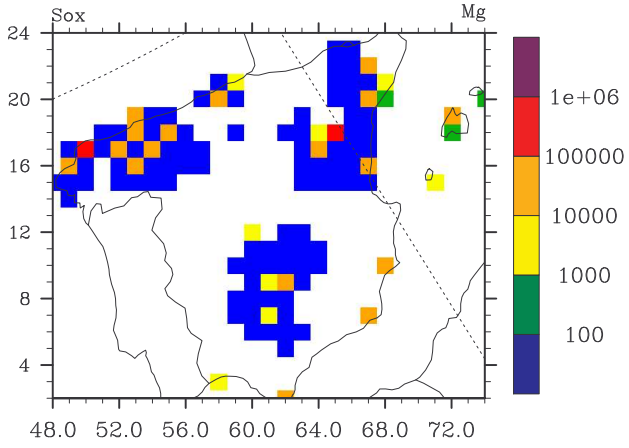

Figure 2.5 Spain: Reported, S1, 2000

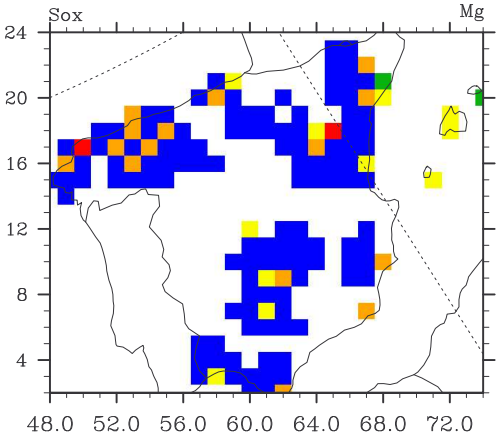

Figure 2.6 Spain: Reported, S1, 1995, scaled to 2000

reflected in the scaling. Therefore it is important that Parties report changes in distribution each 5th year.

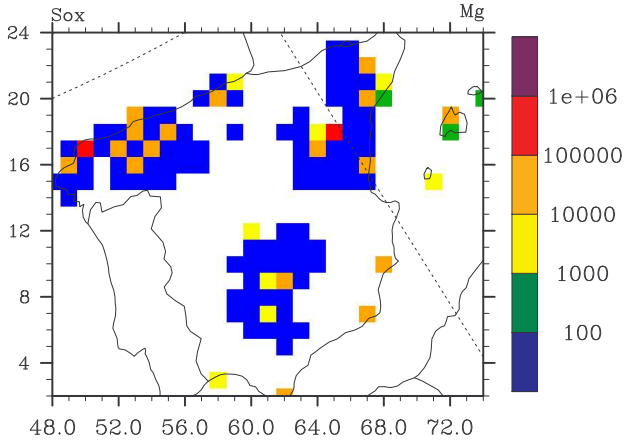

Figure 2.7 Spain: GT&LPS$_{off}$, S1, SO_2, 2000

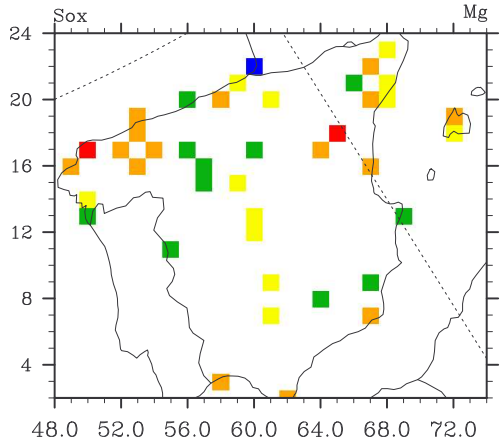

Figure 2.8 Spain: GT&LPS$_{exp}$, S1, S1, SO_2, 2000

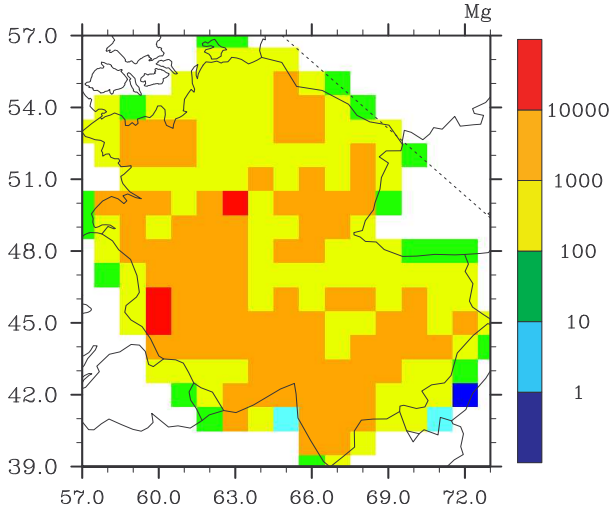

Figure 2.9 Germany: Reported 1999, S1, SO_2, 2000 2000

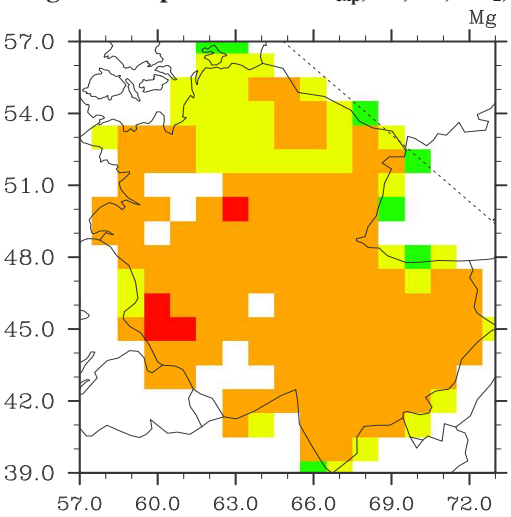

Figure 2.10 Germany: GT/LPS$_{exp}$, S1, SO_2, 2000

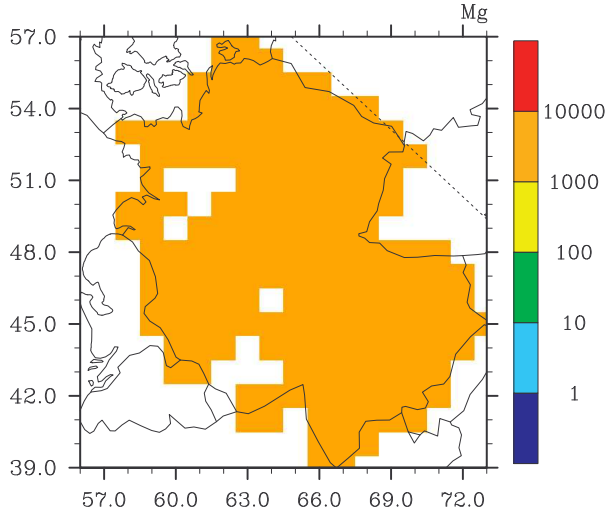

Figure 2.11 Germany: POP/LPS$_{exp}$, S1, SO_2 ,2000

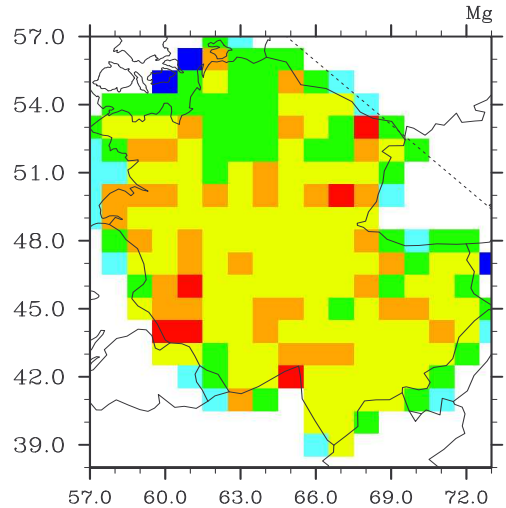

Figure 2.12 Germany: GS$_{exp}$, S1, SO2, 2000

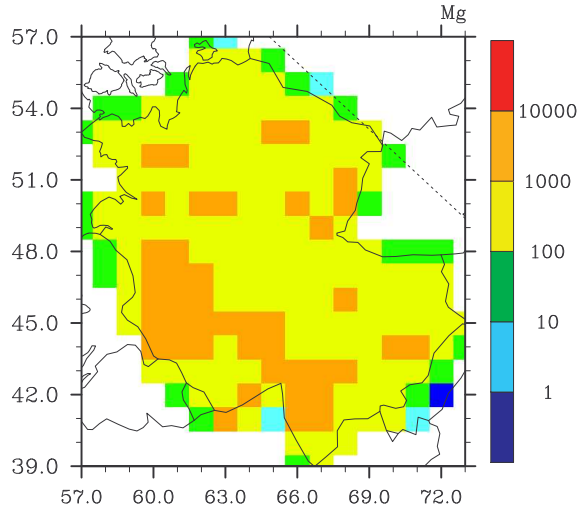

Figure 2.13 Germany: Reported S3, SO_2, 2000

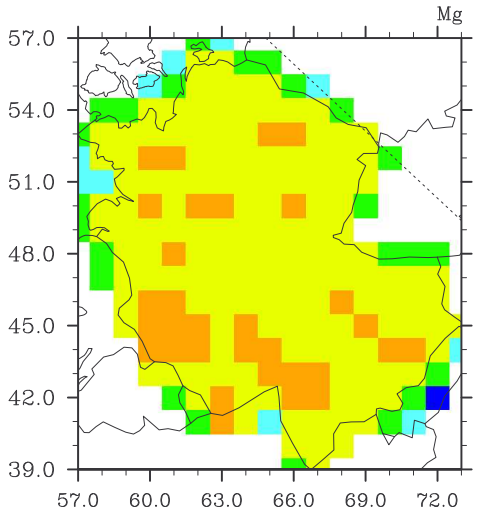

Figure 2.14 Germany: GT/LPS_{exp}, S3, SO_2, 2000

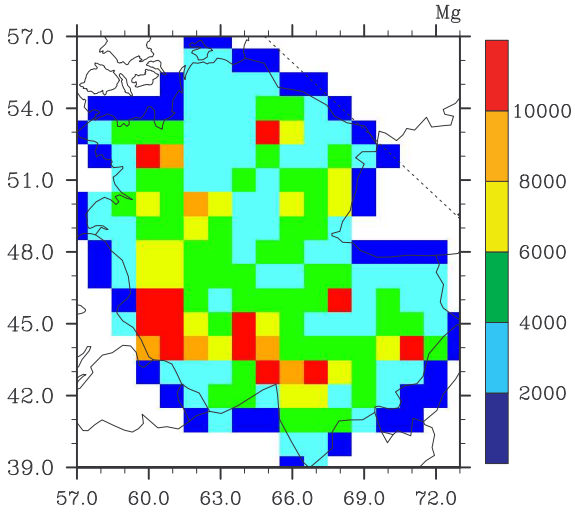

Figure 2.15 Germany: Reported, S7, NO_2, 2000

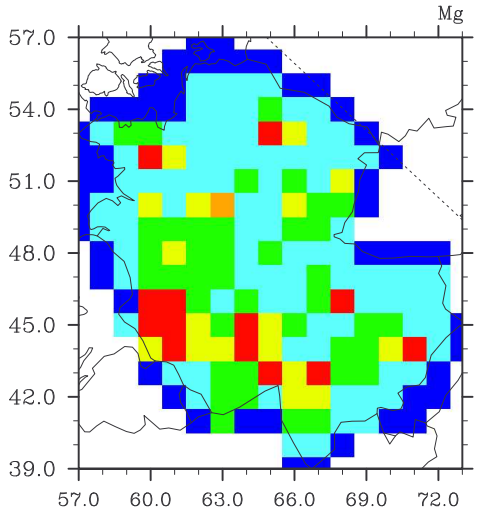

Figure 2.16 Germany: GT/LPS_{exp}, S7, NO_2, 2000

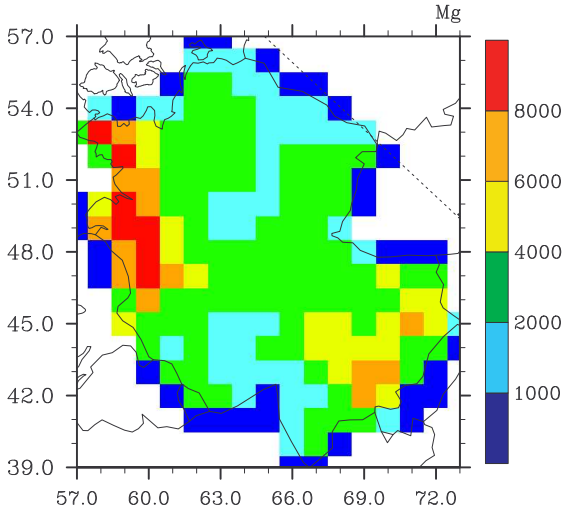

Figure 2.17 Germany: Reported, S10, NH_3, 2000

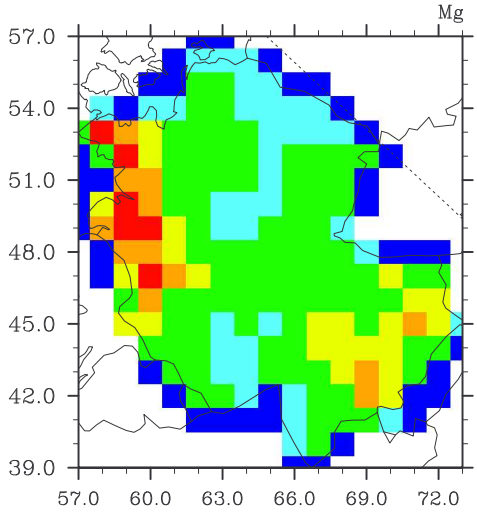

Figure 2.18 Germany: GT/LPS_{exp}, S10 NH3, 2000

The Figures 2.9-2.18 test the EMEP-MODINP gridded sector expert estimates against the German reported gridded sector emissions. The reported sector 1 data from Germany is shown in Figure 2.9 and the EMEP-MODINP results from the GT/LPS_{exp} are displayed in Figure 2.10. Comparing the two figures, we see that we do not manage to reproduce the reported data with the GT/LPS_{exp} method, but the result must be regarded as satisfactory. Figure 2.11 shows the result from the POP/LPS_{exp} method. The result is not at all as good as for the GT/LPS_{exp}, and we will aim at including the size of the LPS' emissions in addition to the position in the next version of the EMEP-MODINP. It should be noted here, that the POP/LPS_{exp} method is rarely used. The result from the GS_{exp} method using the $PM_{2.5}$ sector 1 distribution is displayed in Figure 2.12. None of the highest emission sources seem to be located correctly according to the reported data. Still it is hard to argue that the POP/LPS_{exp} method gave a better result. Which of these two methods EMEP-MODINP chose, is dependant upon the availability of non-gridded input data. In this particular German case, where we have available officially reported NS and NT emissions, the EMEP-MODINP would rank the GS_{exp} method higher than the POP/LPS_{exp}.

In Figure 2.13 and Figure 2.14 we compare the reported and estimates S3, "Combustion in manufacturing industries" emissions. With the GT/LPS_{exp} method we broadly manage to reproduce the reported data. The same conclusion is valid for the next two pairs of tests, the first concerning NO_2 emissions from, sector 7, "Road transport" (Figure 2.15 and 2.16) and the second concerning NH_3 emissions from sector 10, "Agriculture and forestry, land use and wood stock changes" (Figure 2.17 and Figure 2.18).

Taken into account that the quality of results from EMEP-MODINP will vary depending on the availability of reported data and the quality of expert estimates for different countries, it is concluded that the EMEP-MODINP generally produces expert estimates of gridded sector data of reasonable quality, and that the widely used GT/LPS_{exp} method creates high quality expert estimates of gridded sector emissions for all main source sectors.

The POP/LPS_{exp} method should be refined, by inclusion of the size of the LPS emissions. The GS_{exp} method relying on the distribution of $PM_{2.5}$, might lead to significant errors in the emission distribution, and should be used with caution.

2.6.2 Comparison of new and old routines

In order to understand the differences in emission distribution created by the old routine and the EMEP-MODINP, it is necessary to understand how the old MSC-W procedure to create sector gridded data worked.

If no gridded sector distribution was available, the sectors were distributed according to the gridded totals, and emissions in all grid cells were equally distributed on sectors 1-11 according to the national source sectors. If no reported national sector distribution was available, a default distribution was used. In EMEP-MODINP there exists no such default option. Expert estimated national sector emissions have been introduced in the place of the default option, and the gridded totals are in most cases spatially distributed according to the location of LPS'.

Table 2.2 The old MSC-W default sector distribution (% of total emissions))

Component	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11
SO_2	63	6	17	9	2	0	2	1	0	0	0
NO_x	24	6	9	3	1	0	42	14	0	1	0
NH_3	0	0	0	4	0	0	1	0	7	84	4
NMVOC	0	3	1	7	6	11	25	1	0	0	46
CO	1	7	14	5	1	0	68	4	0	0	0

The example below illustrates the kind of differences to be expected between the new and the old routines. The input to the old routine was gridded totals, national sector and national total emissions reported by France for year 2000 emissions. The input to the new routine is the same as for the old, but in addition we make use of the position of LPS' from GENEMIS.

From Figure 2.19 and 2.20 we can see that the sectors 1 and 7 are equally distributed by the old procedure to produce gridded sector emissions. Figure 2.21 and Figure 2.22 show the results of EMEP-MODINP with the GT/LPS_{exp} method, and we see a clear difference in the sector distribution of S1 and S7 as one would expect. The difference between the old and the new routine for production of gridded sector emissions, and how superior the new method is, is even better demonstrated in the Figures 2.23, 2.24, 2.25 and 2.26. In these figures we look at normalized sector emissions in percent. The normalized emission distribution for sector 1 and sector 7 from the old routine is identical (Figures 2.23 and 2.25), while there are significant differences in distribution of emissions from power plant combustion (S1) and road transport (S7) in the results from the new routine (Figure 2.24 and 2.26).

The example shows that the MSC-W expert estimates of gridded sector data has improved considerably with respect to the spatially distribution of emissions. In addition, the source sector distribution has improved. These changes must be taken into account when comparing results from the dispersion modelling for new and old vintages of emission data.

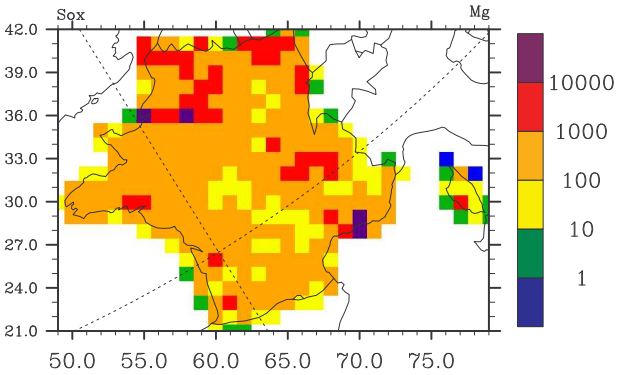

Figure 2.19 France: Old, S1, SO_2

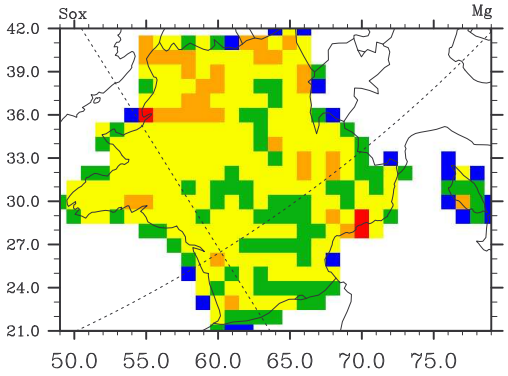

Figure 2.20 France: Old, S7, SO_2

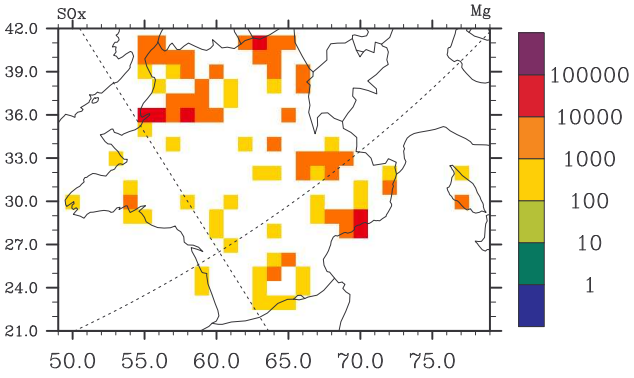

Figure 2.21 France: New, GT/LPS_{off}, S1, SO_2

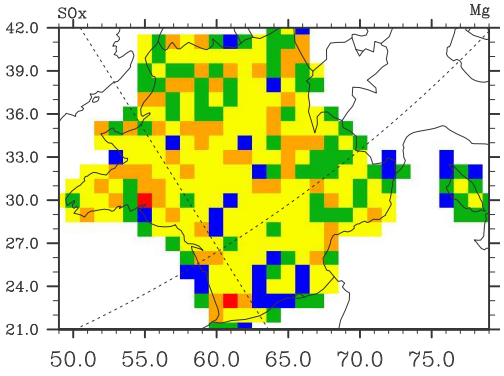

Figure 2.22 France: New, GT/LPS_{off}, S7, SO_2

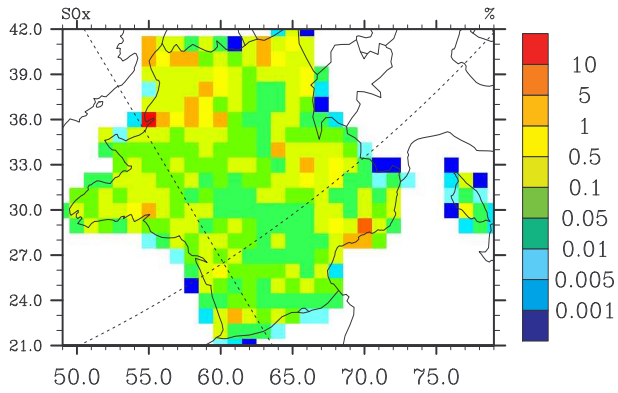

Figure 2.23 France: Old, normalized S1, SO_2

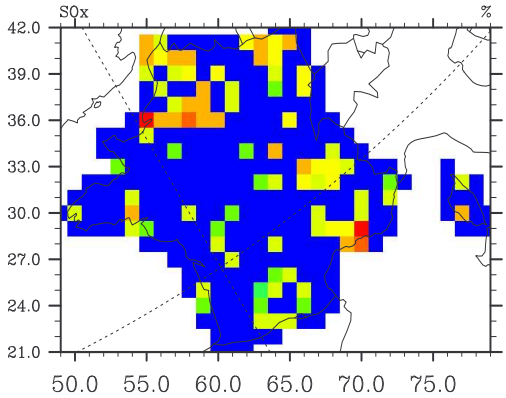

Figure 2.24 France: New, normalized, S1, SO_2

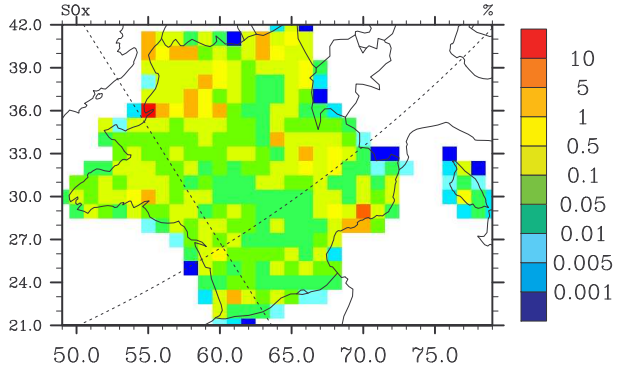

Figure 2.25 France: Old, normalized S7, SO_2

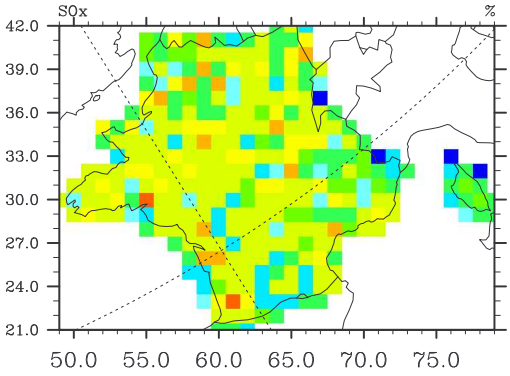

Figure 2.26 France: New, normalized, S7, SO_2

2.7 Implications for year 2000 emissions

The year 2000 emissions prepared last year with the old routine for production of gridded sector data has been compared with the output from EMEP-MODINP for year 2000 emissions. Table 2.3 displays the percentage differences in the year 2000 emission level between 2002 and 2003. Listed are only those countries where the emission figure changed for at lest one of the components, SO_2, NO_2, NH_3, NMVOC and CO. Marked with grey shading is the differences larger or equal to 10%.

Table 2.3 Percentage change in 2000 total emissions between 2003 and 2002 reporting[5]

AREA/YEAR	SO_2 %	NO_X %	NH_3 %	NMVOC %	CO %
Albania	-19	21	0	10	0
Austria	-7	7	-21	-3	-5
Azerbaijan	NA	NA	NA	NA	NA
Belarus	0	0	0	-6	0
Belgium	-9	14	-18	-6	8
Bosnia and Herzegovina	-13	-31	-26	-18	0
Croatia	-36	7	-7	9	20
Cyprus	0	0	0	-37	0
Czech Republic	0	-19	-1	-8	0
Denmark	1	1	3	-3	-8
Finland	0	0	0	1	0
France	-1	1	0	4	0
Germany	-23	-3	-4	-3	-4
Greece	-9	-6	0	-13	6
Hungary	0	-1	0	0	-2
Italy	-18	-8	-2	-7	-14
Kazakhstan	69	-34	0	-34	5
Latvia	-8	4	0	-27	9
Lithuania	0	0	99	0	0
Netherlands	0	-2	0	-1	-3
Norway	1	0	0	1	0
Portugal	-27	4	-1	-4	-6
Remaining Asian areas	-2	-20	-8	-4	-40
Spain	-3	-6	-16	-8	-8
Sweden	-1	2	3	-27	0
TFYR of Macedonia	0	0	-6	-11	0
Ukraine	3	59	-51	-59	-4
United Kingdom	2	15	0	-5	-3
Yugoslavia	0	216	-12	-9	216
EMEP total	**-2**	**1**	**-7**	**-6**	**-2**

[5] % change= 100* ($emis2000_{2003}$-$emis2000_{2002}$)/emis2002

The differences between gridded emissions for year 2000 created in 2003 minus the gridded sector data for the same year created in 2002, are displayed in Figures 2.27-2.29.

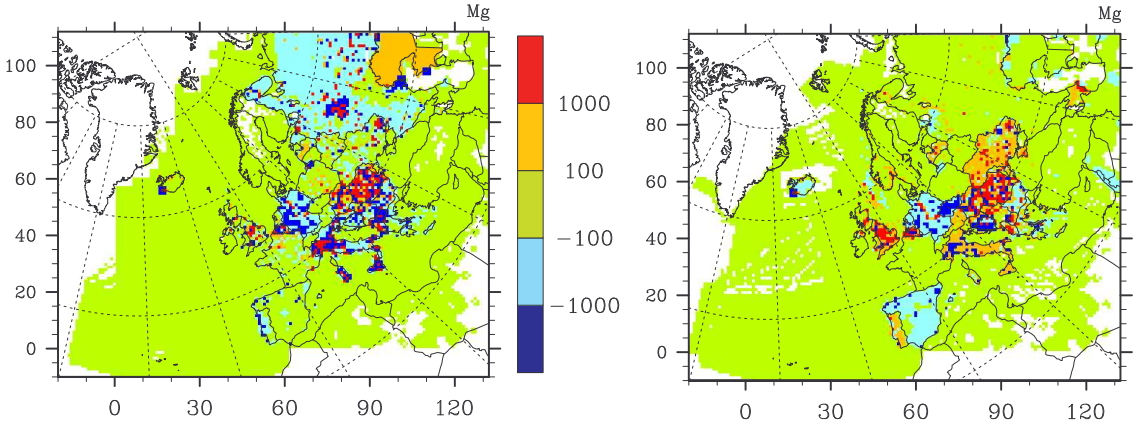

Figure 2.27 EMEP-area: SO_2 (left) and NO_2 (right) difference in model input 2000_{2003}-2000_{2002} (Mg)

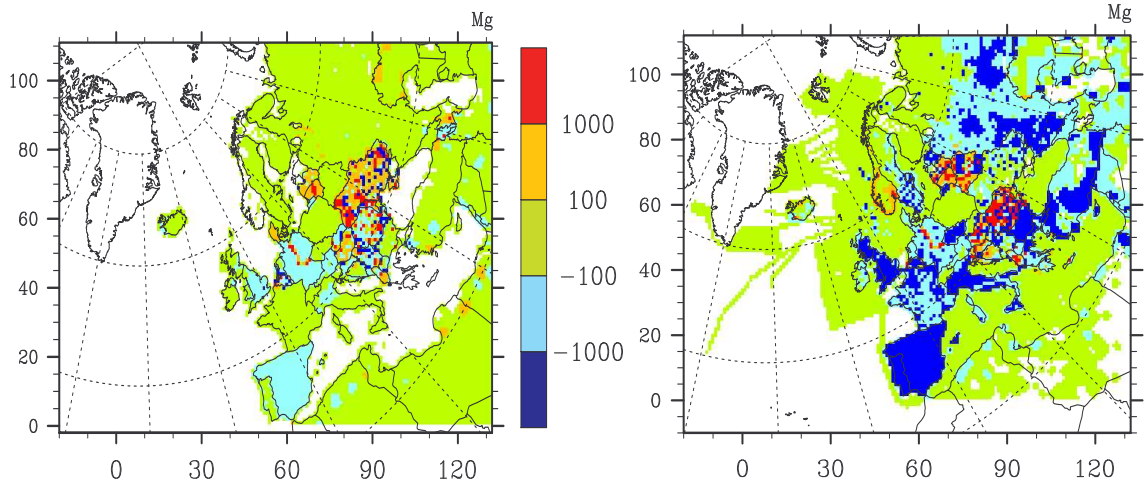

Figure 2.28 EMEP-area: NH_3 (left) and NMVOC (right) difference in model input 2000_{2003}-2000_{2002} (Mg)

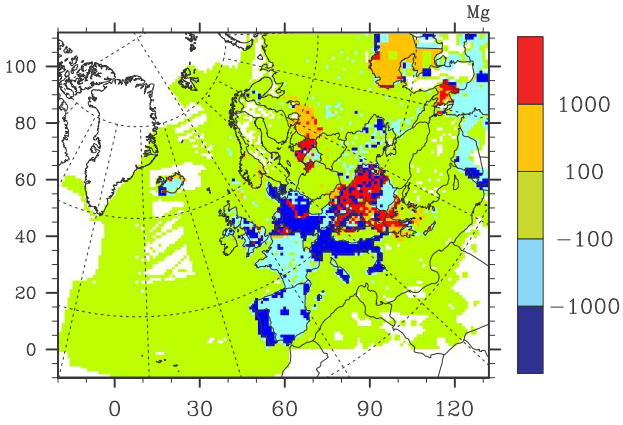

Figure 2.29 EMEP-area: CO difference in model input 2000_{2003}-2000_{2002} (Mg)

For many countries there are substantial differences. By concentrating on the countries with negligible difference in national total emissions (see Table 2.3), we get an impression of the changes introduced by the change in the spatial distribution of emissions.

For SO_2 large differences are seen for i.e. the Russian Federation, Romania, Hungary and Slovakia (Figure 2.27). In the case of NO_2, the largest differences are seen in Romania, Hungary and Germany (Figure 2.27). For NH_3, differences mainly due to different spatial distribution are seen for the Republic of Moldova, Romania, United Kingdom and Germany[1] (Figure 2.28). Differences in NMVOC are large for a large number of countries, while the largest differences in the case of CO are found in Kazakhstan, Latvia, Romania, Hungary and Germany (Figure 2.29).

The changes in emission level are generally not large, hence it is concluded that the differences in many cases are due only to changes in the spatial distribution of emissions.
The implications for dispersion modelling, when introducing a new MSC-W routine for creating expert estimates of gridded sector data is yet to be evaluated. The substantial differences seen in the spatial distribution of emissions, must however be taken into account when comparing results from modelling assessments of different vintages.

3. Temporal and spatial distribution for year 2001 emissions

Temporal variation of emissions has been provided to MSC-W by the GENEMIS project (Generation of European Emission Data for Episodes), and concerns 1994 daily estimates of NO_x per country and SNAP source sectors. MSC-W has processed these data into monthly and hourly variation. The same temporal variation is used for SO_2, NO_x, NH_3, NMVOC, CO and PMs. The monthly and daily factors vary depending on country and source sector, while the hourly data only varies with country. The height distribution used by the EMEP Unified model is available on the web: http*: //www.emep.int/emis2003/height-sonia.html*

The spatial distribution of emissions used in model calculations for 2001 is shown in figures 3.1-3.7. The colour maps shown for SO_2, NO_2, NH_3, NMVOC, CO, $PM_{2.5}$ and PM_{10} (figure 3.1-3.7) are in 50 km resolution and produced by the new MSC-W routine for production of gridded sector data (EMEP-MODINP).

The year 2001 base grid will be made available for scaling to emission years 1980-2001, and 2010 by the database user at: *http://webdab.emep.int/*.

[1] The border between former East and West Germany is easily seen on the maps. For the model calculations, we need to split German emissions in former East and former West Germany. The reason why the boarder show up on the difference maps is that it was an error in the old splitting routine.

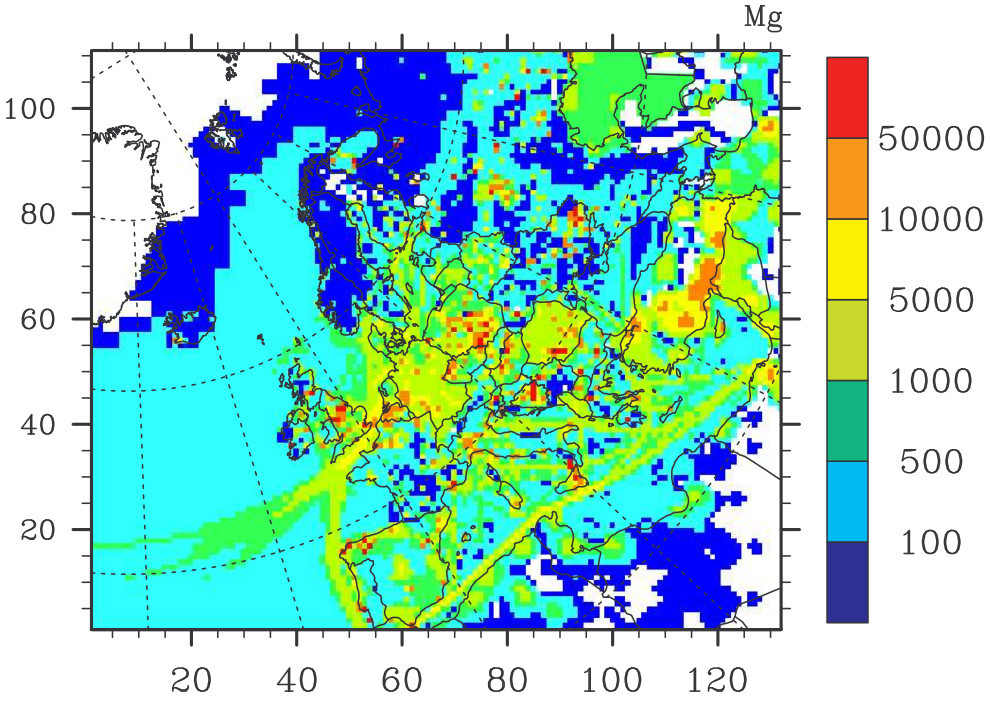

Figure 3.1 Emissions of sulphur in 2001 at 50km resolution (Mg as SO_2)

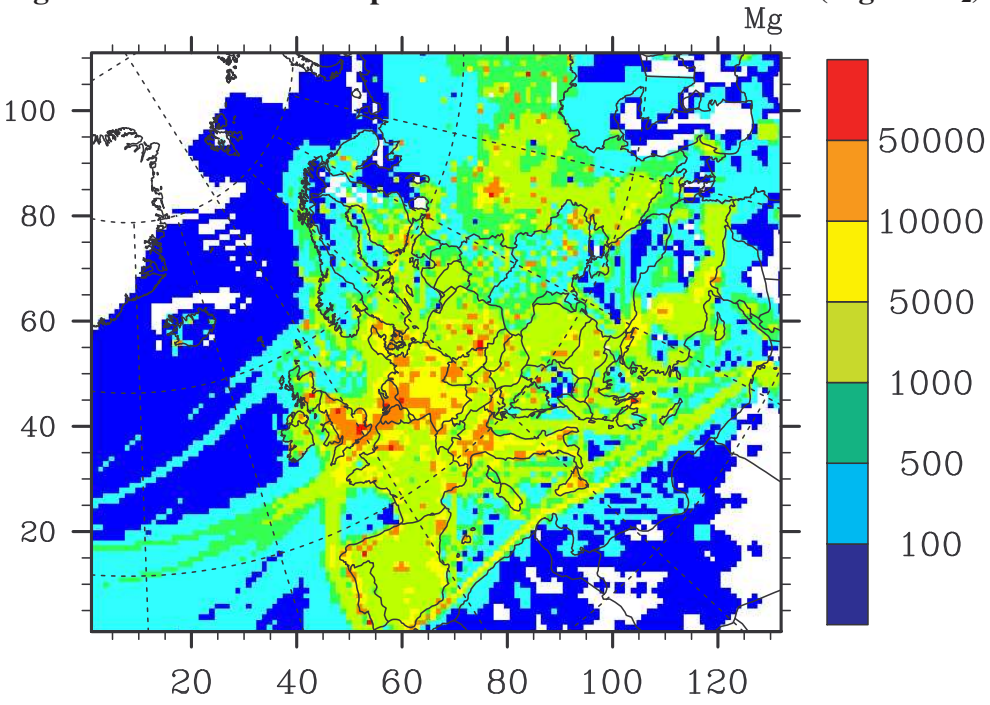

Figure3.2 Emissions of nitrogen oxides in 2001 at 50km resolution (Mg as NO_2)

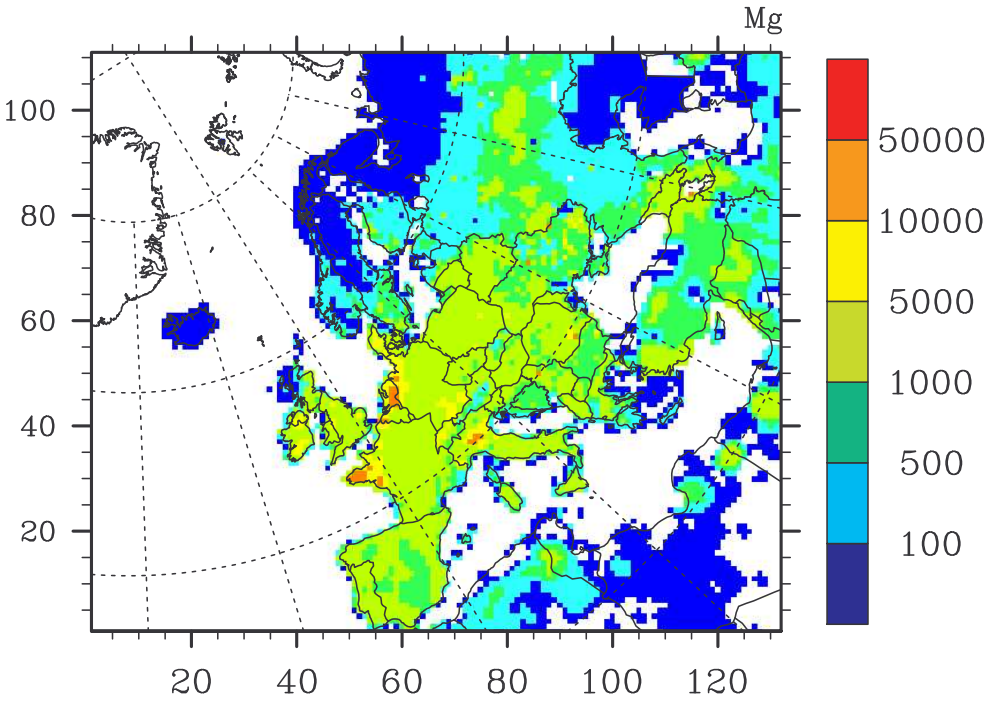

Figure 3.3 Emissions of ammonia in 2001 at 50km resolution (Mg as NH_3)

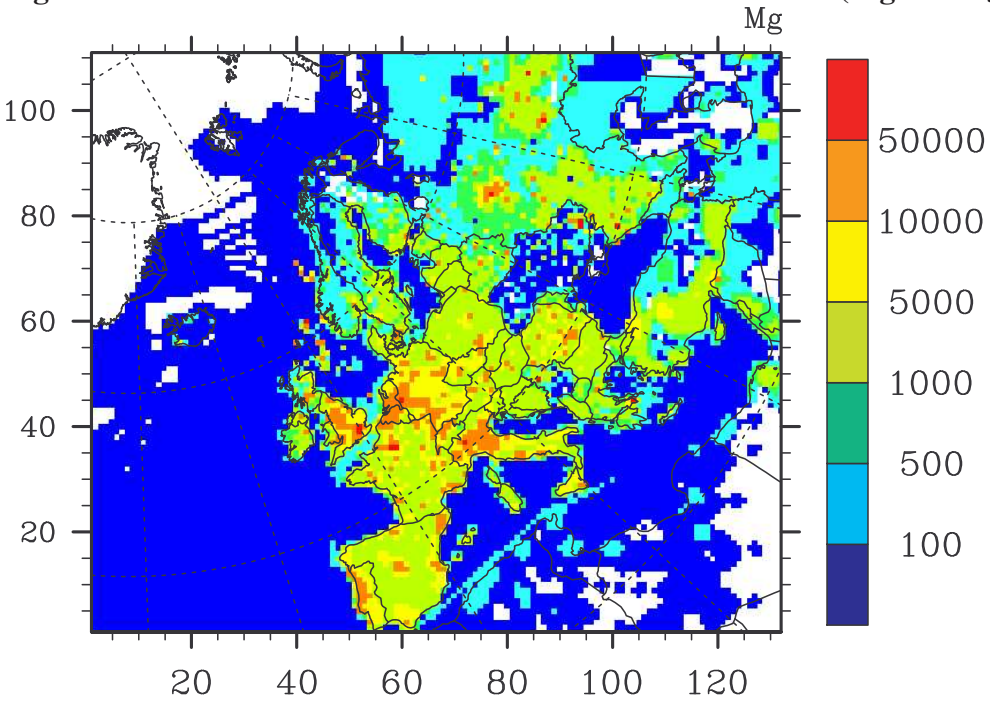

Figure 3.4 Emissions of non-methane volatile organic compounds in 2001 at 50km resolution (Mg as NMVOC)

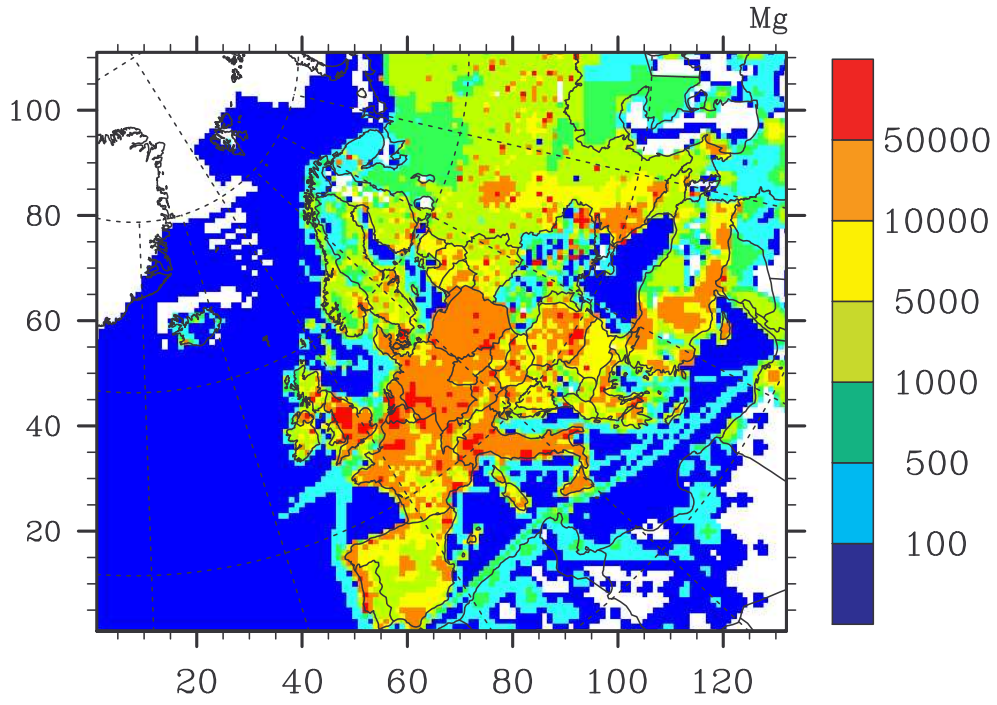

Figure 3.5 Emissions of carbon monoxide in 2001 at 50km resolution (Mg as CO)

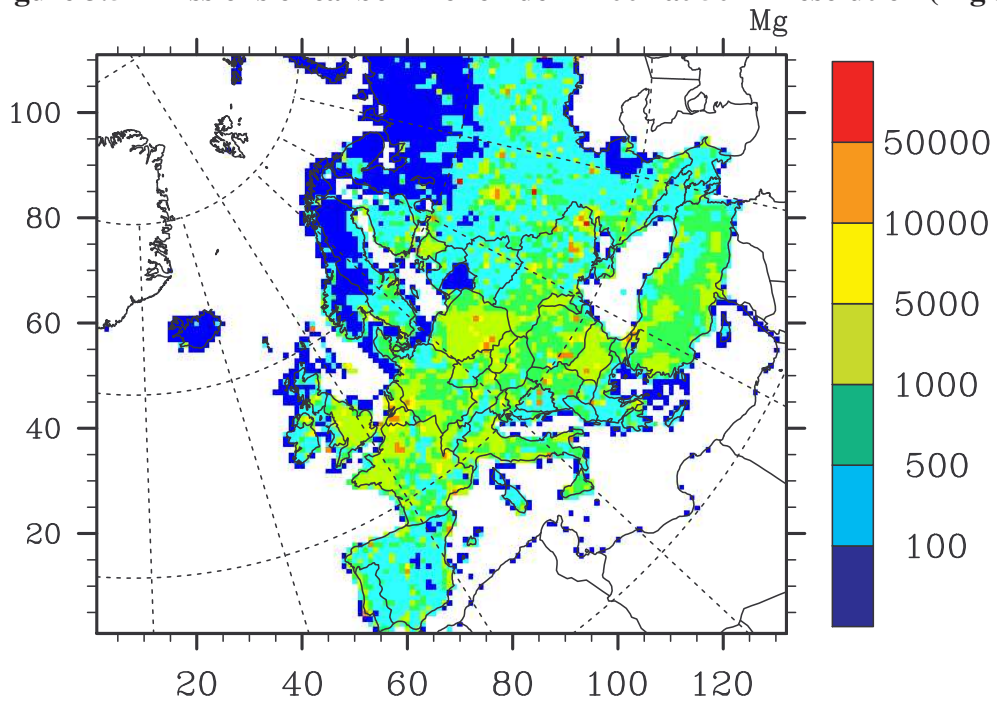

Figure3.6 Emissions of PM_{10} in 2001 at 50km resolution (Mg as PM_{10})

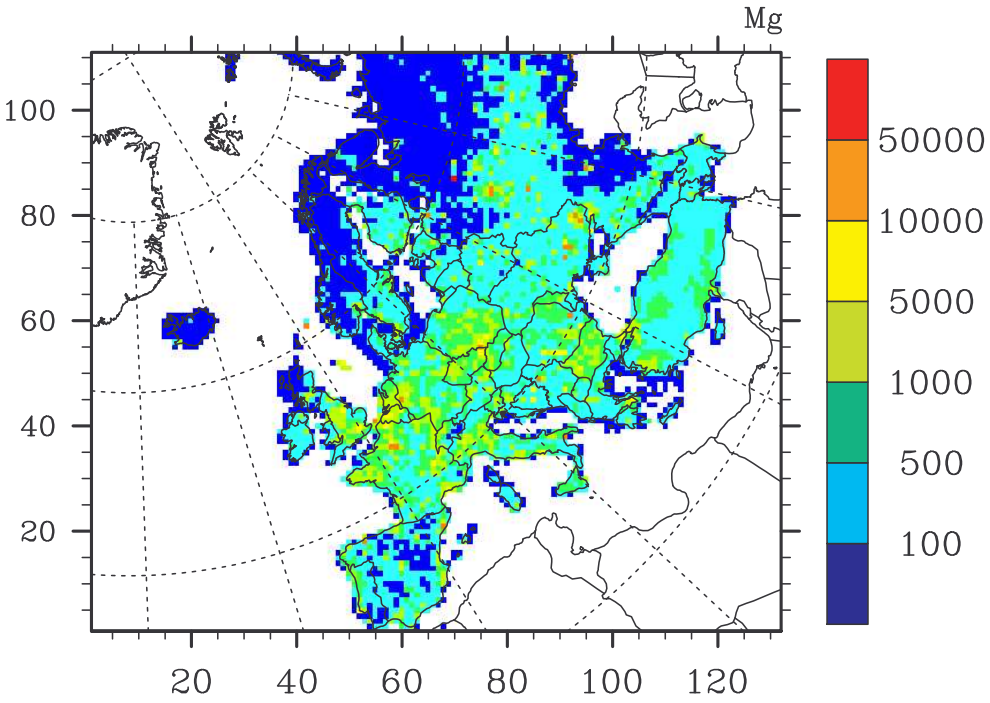

Figure 3.7 Emissions of $PM_{2.5}$ in 2001 at 50km resolution (Mg as $PM_{2.5}$)

Conclusions

Officially reported emission data

- A transparent system for emission data checking (REPDAB), storing&distribution (WEBDAB), production (EMEP-MODINP) and quality assessment is now largely completed within EMEP.
- The new Guidelines have successfully been implemented. More than fifty percent of the Parties reported at least some emission data in the new NFR format.
- It is acknowledged that the Guidelines need to be revised at some points, notably the reporting templates for large point sources (LPS). In addition a clearer definition of the terms "LPS" and "national total" needs to be included.
- The timeliness, the amount of data submitted, the completeness and the internal consistency of this year's submissions have increased compared to previous years
- Emission reporting remained relatively constant, except for particulate matter, where there has been a substantial increase in reporting from last year.
- The submission of informative inventory reports should be considerably improved in order to increase the transparency of the EMEP inventory

MSC-W expert estimates

- A large amount of both national total and sector emissions have been completed and corrected. The largest difference from preceeding years introduced, is the completion of NO_x and NMVOC emissions from the Russian Federation for the time period 1980-1987.
- The quality of the MSC-W expert estimated gridded sector emissions have increased considerably by the introducion of a new routine for creation of gridded sector data, the EMEP-MODINP.
- The EMEP-MODINP generally produces expert estimates of gridded sector data of reasonable quality compared to the officially reported data. There is however clear differences in the quality of the expert gridded sector estimates, depending on the amount and type of expert estimated input required. The frequently applied method requiring officially reported gridded total emissions and expert LPS emissions (GT/LPS_{exp} method), creates high quality expert estimates of gridded sector emissions for all main source sectors. The method requiring population data and LPS_{exp}, should be refined by including of the size of the LPS emissions. The method relying on the distribution of $PM_{2.5}$ (GS_{exp}), might in some cases lead to significant errors in the emission distribution, and should be used with caution.
- The improvements seen between the old and the new routines to produce gridded sector emissions are largest with respect to the spatially distribution of emissions, but also the source sector distribution has improved.
- The differences in emission distribution between expert estimates created with the new and the old routine is significant, and must be taken into account when comparing results from modelling assessments of different vintages.

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Appendix A: Tables of officially reported national total emissions

All emission figures included in this Annex refer to Parties to the LRTAP Convention only. They are drawn from official reports to the UNECE/EMEP Secretariat, that MSC-W received by 1. June 2003.

The emissions figures listed in Tables 1-10 are the emissions reported by the Parties as national totals. Table 11 list the percentage emission reductions (1990-2001) for Parties to the Convention on LRTAP, both Signatories and non Signatories to the Gothenburg Protocol are included.

EMEP emission data is available at: *http://webdab.emep.int.*

Table 1: Anthropogenic emissions of sulphur (1980-1994) in the ECE region (Gg SO_2 per year)

Party/ year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Armenia[a]	141	110.7	101.3	110.3	96.9	100.2	111.2	110.6	104.1	62.7	72	59.5	44.1	5.5	4.2
Austria[b]	343.5	303.6	288.6	216.9	200.8	182.8	163	141.2	105.4	94.29	78.68	71.67	59.09	57.91	51.63
Azerbaijan[c]															
Belarus[d]	740	730	710	710	690	690	690	761	720	668	637	652	458	382	324
Belgium[e]	828	712	694	560	500	400	377	367	354	325	361.5	329.9	315.3	293.9	252.2
Bosnia and Herzegovina											480				
Bulgaria[f]	2050							2420	2228	2180	2008	1665	1115	1426	1480
Canada[g]	4643	4291	3612	3625	3955	3772	3329	3687	3772	3311	3210	3576	3093	2555	2492
Croatia[h]	150										180	108	106.7	113.7	89.3
Cyprus	28	28	33	30	33	35	38	39	42	42	46	33	39	43	42
Czech Republic	2257	2341	2387	2338	2305	2277	2177	2164	2066	1998	1881	1780	1543	1424	1275
Denmark[i]	452.1	370.4	378.7	322.9	305.5	339.4	287.9	255.1	250.2	196.8	179.9	238.7	186	152.1	156
Estonia	287					254	256	255	254	254	252.1	245.6	187.4	153.8	149.1
Finland	584	534	484	372	368	382	331	328	302	244	260	194	141	123	114
France[j]	3261	2564	2458	2024	1806	1508	1378	1361	1256	1419	1323	1440	1276	1110	1056
Georgia[k]	230.2	242.1	250.1	267.3	266.6	273.2	255.3	258.3	255.3	249.1	248.3	194	135.2	71.4	46.9
Germany	7514	7441	7440	7346	7633	7732	7641	7397	6487	6165	5322	3995	3307	2945	2472
Greece	400					500					493	532	546	545	517
Hungary	1633	1580	1545	1480	1440	1404	1362	1285	1218	1102	1010	913	827.3	757.3	741
Iceland[l]	17.8	17.8	17.8	18.2	18.8	18.1	18.4	16.2	17.5	17.3	24	23.1	23.9	24.5	23.8
Ireland	222	192	158	142	142	140	162	174	152	162	185.7	180.2	171.5	160.8	175
Italy[m]	3757	3330	2850	2463	2114	1901	1929	2029	1963	1854	1651	1539	1394	1333	1271
Kazakhstan											1156	1296	1296	1285	1093
Kyrgyzstan												52.1	40.8	31.6	21
Latvia											95.34	71.12	59.1	57.68	70.64
Liechtenstein	0.31	0.29	0.27	0.25	0.23	0.2	0.18	0.17	0.15	0.13	0.113	0.108	0.101	0.094	0.084
Lithuania	311	312	304	310	303	304	316	316	300	298	222	234	139	125	117
Luxembourg	24			14		16					15			15	13
Malta															
Monaco[n]											0.063	0.091	0.094	0.1	0.089
Netherlands[o]	490	464	404	323	299	258	264	263	250	204	202.4	173	172	164	146
Norway[p]	136	128	110.7	103.8	95.8	98.2	91.4	72.13	67.6	57.64	51.88	44.12	36.35	35	34.1
Poland	4100					4300	4200	4200	4180	3910	3210	2995	2820	2725	2605
Portugal[q]	266			306		198	234	218	204		287.8	283.2	342.9	307.7	278.7
Republic of Moldova[r]	308	305	287	284	270	282	297	317	273	238	265	259.8	168.2	156.4	108.5
Romania	1055	1095	1104	1229	1223	1255	1293	1305	1469	1517	1311	1041	951	928	912
Russian Federation[s]	7323	7110	7252	7095	6663	6350	5880	5806	5333	4875	4671	4603	4033	3637	3131
Serbia and Montenegro[t]	406	408	409	440	456	478	470	484	502	506	508	446	396	401	424
Slovakia[u]	780					613	604	614	589	573	542	445	380	325	238
Slovenia	234	254	256	274	250	241	247	222	210	211	196	180	186	183	177
Spain[v]	2913	2848	2811	2828	2583	2448	2323	2193	1845	2178	2182	2168	2138	2008	1956
Sweden[w]	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	105.7	99.28	87.86	78.31	80
Switzerland[x]	116	108	100	92	84	76	68	62	56	49	41.96	41	38	34	31
TFYR of Macedonia[y]															
Turkey[z]	204.5	218	236.7	299.1	360.8	519.8	674.4	606.4	443.1	740.7	764.6	840.6	821.3	767.8	991.5
Ukraine	3849	3492	3427	3498	3470	3463	3393	3264	3211	3073	2783	2538	2376	2194	1715
United Kingdom	4854	4399	4187	3847	3698	3717	3877	3873	3810	3696	3719	3535	3461	3115	2675
United States	23501	22251	20993	20449	21292	21463	20795	20580	21005	21132	21478	20901	20687	20387	19840
European Community[aa]											16363	14825	13652	12429	11277

Table 1 Continued: Anthropogenic emissions of sulphur (1995-2001, 2010, 2015, 2020) in the ECE region (Gg SO_2 per year)

Party/ year	1995	1996	1997	1998	1999	2000	2001	2010	2010	2015	2015	2020	2020
								CLE *	CRP **	CLE	CRP	CLE	CRP
Armenia	2.5	1.5	0.4	3.31	0.84	8.4026	4.395						
Austria	52.0081	51.1628	45.7689	42.9915	38.9898	38.0479	36.6728	39					
Azerbaijan							14.7	48.9		36.9		27.1	
Belarus	275	246.3	208.5	190	163.7	142.75	150.723	480					
Belgium	257.279	240.33	219.24	212.46	180.82	164.724	161.857		99				
Bosnia and Herzegovina													
Bulgaria	1476	1420	1365	1251	943	981.983	845.935	NA	856	NA	702	NA	702
Canada	2633	2534	2538	2558	2528	2460.43	2487.95	2236.82	185.296	2183.57	215.811	2091.41	208.083
Croatia	70.4	66.2	80.4	89.5	90.7	58.1		70					
Cyprus	41	45	47	49	50	50	48.3	39	39		34		30
Czech Republic	1089	944	697	438	268	264	251	245	283	230	NE	225	NE
Denmark	148.48	179.05	109.43	74.36	53.97	27.73	25.33	56		50		50	
Estonia	118.5	125.2	119	110	102.5	95.46	91.7	100		NE		NE	
Finland	96	105	99	90	87	73.5	85.238	97.5		NE		97.1	
France	992.865	967.58	819.825	846.414	723.094	653.627	609.845	375					
Georgia	20.3	30.1	33.1	20.18	8.61								
Germany	1939	1340	1039	835	738	638	650	509					
Greece	541	525	521	528	540	483	485	546					
Hungary	704.96	673.23	658.51	591.79	590.14	486.15	400.48	550				480	
Iceland	23.9	24.1	24.5	26.8				29.4					
Ireland	161.2	147.4	166	176	157.4	131.49		42					
Italy	1322	1250	1075	1039	923	758.158		842					
Kazakhstan	1083.36	804.545	937.875	961.196	880.982	947.986							
Kyrgyzstan	15.7	14	9.9	10.8	8.72								
Latvia	54.547	50.8826	38.607	35.5978	29.4903	16.664	13.3718	21.68	NE	22.54	NE	26.97	NE
Liechtenstein	0.0789	0.0743	0.0689	0.0642	0.06	0.0534	0.0508	0.04		0.04		0.04	
Lithuania	94	93	77	94	70	43.1	48.7741	145					
Luxembourg	9	8	6	4	3.82182	3.0916		4					
Malta													
Monaco	0.085	0.076	0.073	0.071	0.075	0.067	0.065136	0.04	NE	NE	NE	NE	NE
Netherlands	141.498	135	118	108.006	103.209	91.5183	88.9258	50					
Norway	33.3757	32.7593	30.0009	29.5837	28.5251	26.5946	24.7541	29.5					
Poland	2376	2368	2181	1897	1719	1511	1564	1397					
Portugal	318.41	260.688	265.296	299.311	315.306	288.084	301.248	165	NE	NE	NE	NE	NE
Republic of Moldova	64.06	67.03	36.13	32.08	12.05			135					
Romania													
Russian Federation	2969	2774	2524	2275	2062	1997		2400					
Serbia and Montenegro	462	434	522	521	355	387	394.1	1135					
Slovakia	239	227	202	179	171	123.88	128.572	89	89	92	92	95	95
Slovenia	125	112	118	123	104	96		NE	27	NE	NA	NE	NA
Spain	1805.71	1578.65	1745.69	1611.13	1617.55	1516.91	1424.91						
Sweden	72.8744	96.6602	69.7178	67.3931	54.3279	57.2374	56.7658	67					
Switzerland	33.55	30	26	27.6	25.5	19.257	21.079	17.86		17.149		16.995	
TFYR of Macedonia			17	105		105.2	136.53						
Turkey	1006.79	1164.73	1225.4	1353.68	2104.19	1346.96		995					
Ukraine	1639	1293	1132.4	1028.1	1028.7	2310	1844.35	2310					
United Kingdom	2364.52	2029.36	1670.24	1607.98	1228.78	1188.33	1125.33	585	585	532.928	532.928	449.975	449.975
United States	17406	17621	18068	18182	17533	16483	14324.8	15167		14759		14351	
European Community	10198	8885	8071	7665	6932	5750							

* CLE Current Legislation Projections

** CRP Current Reduction Plans

Table 1 Continued: Anthropogenic emissions of sulphur in the ECE region: footnotes

a Reduction of emissions from 1993 onwards is explained by the blocade of communications in Armenia followed by a drop in energy production. The reduction of the SO2 in 1999 can be explained by the fact that in 1999 all heating enterprises used natural gas as fuel.

b 1980-2001 Re-calculations mainly because of revision of energy balance

c 2010 2015 2020 SO2 NATIONAL: The Sulphur projection was calculated according to 1990th baseline and economy development forecast.

d 2000 NFR 8 emissions included in NFR 7

e S90: As relevant informations are lacking for at least one of the three Belgian regions during the period 1980-89 no sector data are given before 1990

f 2000 S7 S8: Emissions are calculated on the base of the total quality of the used fuels by sectors

g Values concern national emissions.
SO2 for the Sulphur oxides management area (SOMA):: (year, value)

1980:	3245	Gg		1988:	2190	Gg		1996:	1206	Gg
1981:	2819	Gg		1989:	2241	Gg		1997:	1210	Gg
1982:	2373	Gg		1990:	1872	Gg		1998:	1247	Gg
1983:	2382	Gg		1991:	1586	Gg		1999:	1149	Gg
1984:	2598	Gg		1992:	1546	Gg		2000:	1221	Gg
1985:	2343	Gg		1993:	1576	Gg		2001:	1196	Gg
1986:	2053	Gg		1994:	1382	Gg				
1987:	2111	Gg		1995:	1227	Gg				

h 1980-1989: Data is missing because Croatia was a part of the Former Yugoslavia in this period.
1990-1998: Distributed according to SNAP90.
1999 & 2000: Distributed according to SNAP97.

i Data included those located within the EMEP area.
1985-2001 Road traffic: New method for estimating the fuel balance.

j 1980-2010 Data include those located within the EMEP area only. National totals do not include the international air traffic and the international sea traffic.
2010 Emissions correspond to the National Emission Ceilings (NEC).

k Calculations are based on Official Statistical data. Due to economical and social difficulties the collection of statistical data within the country is inadequate. Therefore it is assumable that data provided here are not reliable.

l 2/3 of the SO2 emissions are emitted as H2S.
Emissions in 1980 and 1981 are assumed to be similar to 1982 due to lack of data

m Emissions for 1996-2000 estimated according to SNAP97.

n 2001: Sector 1A4a has been included into 1A4bi because data available at the present time do not allow to separate emissions from commercial/institutional sectors and emissions from residential sectors.

o 1990, 1995 & 1998-2001:
1A3e: Other mobile sources such as draglines, building cranes etc
2G: Emissions from industry not attributable to previous 2 categories
3D: Emissions from use of consumer products:
- emissions from smoking cigarettes;
- emissions from foams;
- emissions from (car)service companies

p 1980, 1987 & 1989-2001:
Other:
1 A 2 Manufacturing Industries and Construction: 1 A 2 f Other:
All mining, extraction and manufacturing industries (NACE 10-37) not included in 1A1. Construction.
1 A 3 Transport: 1 A 3 e Other:
1 A 3 e ii includes machinery except in Agriculture / Forestry / Fishing, military and households. Snow scooters and small watercraft are included under 1 A 4 b Residential and 1 A 4 c Agriculture / Forestry / Fishing
1 B 1 Fugitive Emissions from Solid Fuels: 1 B 1 c Other:
No emissions reported.
2 A MINERAL PRODUCTS: 2 A 7 Other including Non Fuel Mining & Construction
Manufacturing of other non-metallic mineral products (NACE 26) not included in 2A1-2A3: glass, plaster, clay products, rock wool. Mining, crushing plants, sand-pits. Construction.
2 B CHEMICAL INDUSTRY: 2 B 5 Other:
Manufacturing of methanol, basic plastics, sulphuric acid, chlorine, explosives, soap, pigments, and paint.
2 TOTAL INDUSTRIAL PROCESSES: 2 G OTHER:
No emissions reported.
3 TOTAL SOLVENT AND OTHER PRODUCT USE: 3 D OTHER including products containing HMs and POPs
In addition to other solvents this item includes mercury emissions by evaporation from products.

q 1990-2001 & 2010-2020
National emission totals include emissions in Portuguese territorial areas that are outside EMEP grid area: Azores and Madeira Islands. 1990-2001: Recalculations reflecting mostly the revision of National Energy Balances under the responsibility of the Economy Ministry.

r Since 1993 emissions located on the left side of Diester River are not included, except for emissions from Moldavian electric station. The drop in emissions between 1991 and 1992 are due to a decrease in national economy. For 1990-1999 emissions have been calculated according to EMEP/CORINAIR Emission Inventory Guidebook and the Greenhouse Gas inventory Reporting Instructions. SOx emissions 1980-1989 do not include mobile sources.

s Figures apply to the European part within EMEP. Since 1980 the SO2 emission data were updated taking into account emissions from mobile sources (agricultural engineering, road-building machinery and railway transportation).

t 1980-2001 Figures refer to stationary sources only

Table 1 Continued: Anthropogenic emissions of sulphur in the ECE region: footnotes

u 1990-2000 S4 emissions included in Sector 3.
2000-2020
Main pollutants, particulate matter and heavy metals:
1A3aii Civil aviation(domestic,LTO) - included emissions from civil aviation (domestic,LTO) and surface operations at the airport

v 1990-2001 Geographical coverage of non-gridded data are for the WHOLE of the Spanish territory (including Canary Islands, Ceuta and Melilla).

w Mobile sector 1990-2000: recalculated.

x Emissions in 2010 corresponds to the national emission ceiling (NEC) in the Gothenburg protocol

y 1997: Referring to Skopje only
1998: Data are for sectors 1-6 only. Data for sectors 7-11 are not yet ready.
2000 & 2001: All sectors included.

z Emissions from all sectors in the fuel combustion were calculated only for 1999.
2010: Sum of reported sector data

aa 1990-2000:For the time series 1990-2000, data as compiled for the EC UNFCCC submission was used
The two time series differ slightly due to different treatment of overseas territories and international bunkers. The EC inventory relies on the availability and submission of Member States data. However, in order to provide a more complete picture, the emissions of air pollutants reported by the EC and its Member States under the UNFCCC (SOX, NOX, CO and NMVOC) have been used.

Table 2: Anthropogenic emissions of nitrogen oxides (1980-1994) in the ECE region (Gg NO_2 per year)

Party/ year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Armenia[a]		15.4	17.2	16.6	15.7	44.8	53	51.5	55.5	51.2	46.2	40	21.8	12.1	11.9
Austria[b]	242.569	227.819	223.989	226.822	226.982	231.61	225.277	223.152	217.271	212.633	203.885	209.16	200.457	196.976	190.631
Azerbaijan															
Belarus	234	235	235	237	240	238	358	263	262	263	285	281	224	207	203
Belgium[c]	442					325	317	338	345	357	333.582	325.54	334.25	330.3	333.16
Bosnia and Herzegovina															
Bulgaria[d]								416	415	411	361	256	230	242	230
Canada	1959	1907	1897	1884	1871	2781	2752	2971	2781	3002	2982	2974	2937	2961	2958
Croatia[e]	60										87.6	65	56.2	59.3	65.5
Cyprus	13	13	14	14	14	14	15	16	17	17	18	16	19	20	20
Czech Republic	937	819	818	830	844	831	826	816	858	920	544	521	496	454	375
Denmark[f]	273.202	243.168	264.062	257.031	0	295.49	315.96	307.19	297.85	280.23	277.43	324.52	280.49	281.05	287.06
Estonia								70	70	69	67.7	63.33	39.35	38.05	41.08
Finland	295	276	271	261	257	275	277	288	293	301	300	290	284	282	282
France[g]	2022.86	1926.25	1894.02	1872.63	1870.21	1845.8	1806.16	1836.74	1840.66	1901.18	1897.3	1963.95	1919.51	1796.41	1747.23
Georgia[h]	121	125.6	130	137.6	137.3	140.4	133.8	134.1	134.6	130.6	129.5	112.5	47.8	32.5	20.8
Germany	3334	3259	3219	3258	3305	3276	3286	3350	3230	3011	2728	2514	2323	2207	2055
Greece[i]						306		285	304		290	298	297	292	299
Hungary	272.9	270	268	266	264	262.5	264.2	264.9	257.8	246.8	238	203.1	183.3	184	187.4
Iceland	21.2	21.2	21.2	21.8	21.7	20.5	22.3	24	24.9	25.3	26.3	26.7	28.4	29.3	29.2
Ireland	73	86	86	85	84	91	100	115	122	127	118.1	119.5	130.4	119.1	115.3
Italy[j]	1638	1604	1605	1583	1596	1614	1690	1811	1854	1917	1938	1984	2010	1990	1789
Kazakhstan											355.698	400.523	377.892	372.248	296.558
Kyrgyzstan												20	8.9	6.5	3.3
Latvia											80.0047	62.6534	50.7568	50.6289	45.8363
Liechtenstein	0.58	0.59	0.59	0.6	0.6	0.6	0.6	0.59	0.59	0.58	0.525	0.5029	0.4788	0.4549	0.4398
Lithuania	152	154	156	158	162	166	169	171	172	173	158	166	98	78	77
Luxembourg	23			21		21		19.768			23			25	23
Malta															
Monaco[k]											0.53	0.636	0.684	0.634	0.623
Netherlands[l]	583	575	562	555	573	589	587	599	602	584	569.552	568	556	535	510
Norway[m]	190.956	177.7	182	186.7	201	212.8	227.9	229.626	224	224.7	223.523	213.306	211.843	221.568	219.373
Poland	1229					1500	1510	1530	1550	1480	1280	1205	1130	1120	1105
Portugal[n]	166			192		96	110	116	122		285.935	301.778	323.854	318.539	322.746
Republic of Moldova[o]	58	57	50	42	44	66	72	71	74	70	100	97	67.3	53	46.2
Romania	523	528	516	542	546	542	559	580	590	579	546	464	357	318	319
Russian Federation[p]	1734	1915	2002	1976	1879	1903	1871	3411	3287	3335	3600	3435	3123	3054	2667
Serbia and Montenegro[q]	47	50	50	53	58	58	58	60	63	62	66	57	49	54	52
Slovakia[r]								197		227	215	194	181	174	165
Slovenia	51	52	52	51	52	53	58	57	59	58	63	58	58	63	66
Spain[s]	1068	982	972	994	1007	979	1001	1059	1092	1185	1270.2	1313.64	1344.52	1316.15	1340.66
Sweden[t]	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	333.771	333.626	318.934	306.654	319.727
Switzerland[u]	170	172	174	175	177	179	176	174	172	169	153.69	146	138	129	124
TFYR of Macedonia[v]															
Turkey[w]	363.94	377.06	407.51	432.99	459.35	483.03	528.26	569.57	570.73	609.24	643.66	649.13	667.27	747.69	730.88
Ukraine	1145	1145	1153	1153	1102	1059	1112	1094	1090	1065	1097	989	830	700	568
United Kingdom	2581.18	2497.46	2488.14	2497.65	2457.65	2537.44	2619.89	2730.57	2786.16	2786.95	2759	2633.35	2553.43	2366.59	2301.41
United States[x]	22121	22397	21819	21704	22581	21045	20480	23442.6	23214.6	23023	23161	22842	22916	23003	22997
European Community[y]								13446	13464	13563	13389	13281	12977	12341	11951

Table 2 Continued: Anthropogenic emissions of nitrogen oxides (1995-2001, 2010, 2015, 2020) in the ECE region (Gg NO_2 per year)

Party/ year	1995	1996	1997	1998	1999	2000	2001	2010	2010	2015	2015	2020	2020
								CLE *	CRP **	CLE	CRP	CLE	CRP
Armenia	14.9	11.4	15.1	10.95	10.61	9.97	13.331						
Austria	188.148	206.635	194.704	203.003	192.547	196.378	199.397	107					
Azerbaijan							43.2	90.1		103.1		113.2	
Belarus	367	172.7	188.5	164	142	134.8	134.825	180					
Belgium	358.858	314.79	305.79	312.08	288.94	328.513	316.586		176				
Bosnia and Herzegovina													
Bulgaria	266	259	225	223	202	184.423	163.67	NA	266	NA	195	NA	195
Canada	2854	2797	2833	2874	2848	2849.28	2792.05	2405.7	104.88	2294.59	182.315	2266.1	222.045
Croatia	65.7	68.6	73.3	76	76.6	76.8		87					
Cyprus	19	21	21	22	22	23	18.07	23	23		21		20
Czech Republic	368	366	349	321	313	321	332	286	286	284	NE	282	NE
Denmark	268.86	311.74	270.93	242.88	227.76	209.02	203.97	146		130		120	
Estonia	42.06	44.36	44.75	46.01	39.62	41.403	37.72	60		NE		NE	
Finland	258	268	260	252	247	235.8	221.87	151		NE		150.8	
France	1708.73	1677.77	1611.47	1592.43	1516.92	1440.52	1411.09	810					
Georgia	26.6	49.6	54.5	42.35	30.14								
Germany	1984	1897	1784	1675	1619	1584	1592	1155					
Greece	296	306	310	334	326	321	331	344					
Hungary	190.07	195.81	199.5	202.62	200.65	185.45	184.53	198				198	
Iceland	28.4	29.6	28.6	27.7				30					
Ireland	115.3	119.9	118.5	121.8	118.5	125.131		65					
Italy	1768	1744	1662	1594	1485	1372.02		1436					
Kazakhstan	282.707	251.954	213.232	228.013	205.179	200.894							
Kyrgyzstan	3.4	3.5	3.5	3.6	2.38								
Latvia	47.1209	43.3617	42.1586	40.4622	38.0876	34.8265	41.9715	34.62	NE	40.41	NE	43.77	NE
Liechtenstein	0.4188	0.404	0.3912	0.3763	0.3618	0.3549	0.3032	0.22		0.2		0.19	
Lithuania	65	65	57	60	54	47.5	55.0378	110					
Luxembourg	21	22	18	17	16.0917	17.0285		11					
Malta													
Monaco	0.579	0.557	0.553	0.518	0.551	0.59	0.715003	NE	NE	NE	NE	NE	NE
Netherlands	486.318	501	453	427.843	429.155	412.559	410.181	260					
Norway	220.706	230.195	232.681	234.555	237.681	223.759	220.731	188.9					
Poland	1120	1154	1114	991	951	838	805	879					
Portugal	335.692	331.106	338.288	362.141	384.596	404.862	396.941	249	NE	NE	NE	NE	NE
Republic of Moldova	38.2	38	36.5	21.7	16.91			90					
Romania													
Russian Federation	2570	2467	2379	2488	2494	2357		3300					
Serbia and Montenegro	59	57	66	66	46	50	50.8	147					
Slovakia	174	132	125	130	118	106.255	105.79	113	113	120	120	128	128
Slovenia	67	70	71	64	58	58	NE	NE	45	NE	NA	NE	NA
Spain	1352.02	1318.23	1356.42	1354.89	1412.32	1432.84	1403.5						
Sweden	296.025	294.907	279.909	266.521	258.578	252.47	248.007	148					
Switzerland	120	113	107	104	99	95.69	91.543	65.953		59.665		58.22	
TFYR of Macedonia			6	15.22		30.4	31.91						
Turkey	800.47	873.04	879.25	862.72	952.09	951.11		2044					
Ukraine	531	467	455.2	557.5	542.5	561.1	1090.82	1094					
United Kingdom	2173.83	2163.61	2011.55	1918.31	1810.08	1736.96	1680.32	1167	1167	1180.75	1180.75	1132	1132
United States	22639	22423	22552	22152	21540	21547	20275	17498		15930		14362	
European Community	11567	11360	10896	10556	10215	9497							

* CLE Current Legislation Projections

** CRP Current Reduction Plans

Table 2 Continued: Anthropogenic emissions of nitrogen oxides in the ECE region: footnotes

a Reduction of emissions from 1992 onwards is explained by the blocade of communications in Armenia followed by a drop in energy production.

b 1980-2001 Re-calculations mainly because of revision of energy balance

c As relevant informations are lacking for at least one of the three Belgian regions during the period 1980-89 no sector data is given before 1990.

d 2000 S7 S8: Emissions are calculated on the base of the total quality of the used fuels by sectors

e 1980-1989: Data is missing because Croatia was a part of the Former Yugoslavia in this period.
1990-1998: Distributed according to SNAP90.
1999-2000: Distributed according to SNAP97.

f Data include those located within the EMEP area only
1985-2001 Road traffic: New method for estimating the fuel balance.

g Data include those located within the EMEP area only. National totals do not include the international air traffic and the international sea traffic.
2010 Emissions corresponds to the National Emission Ceilings (NEC)

h Calculations are based on Official Statistical data. Due to economical and social difficulties the collection of statistical data within the country is inadequate. Therefore it is assumable that data provided here are not reliable

i 1987: Based on emission figures for the 1990-2000 period

j Emissions for 1996-2000 estimated according to SNAP97

k 2001: Sector 1A4a has been included into 1A4bi because data available at the present time do not allow to separate emissions from commercial/institutional sectors and emissions from residential sectors.

l 1990,1995 & 1998-2001
1A3e: Other mobile sources such as draglines, building cranes etc
2G: Emissions from industry not attributable to previous 2 categories
3D: Emissions from use of consumer products:
- emissions from smoking cigarettes;
- emissions from foams;
- emissions from (car)service companies

m 1980, 1987 & 1989-2001
Other:
1 A 2 Manufacturing Industries and Construction: 1 A 2 f Other
All mining, extraction and manufacturing industries (NACE 10-37) not included in 1A1. Construction.
1 A 3 Transport: 1 A 3 e Other
1 A 3 e ii includes machinery except in Agriculture / Forestry / Fishing, military and households. Snow scooters and small watercraft are included under 1 A 4 b Residential and 1 A 4 c Agriculture / Forestry / Fishing
1 B 1 Fugitive Emissions from Solid Fuels: 1 B 1 c Other
No emissions reported.
2 A MINERAL PRODUCTS: 2 A 7 Other including Non Fuel Mining & Construction
Manufacturing of other non-metallic mineral products (NACE 26) not included in 2A1-2A3: glass, plaster, clay products, rock wool. Mining, crushing plants, sand-pits. Construction.
2 B CHEMICAL INDUSTRY: 2 B 5 Other
Manufacturing of methanol, basic plastics, sulphuric acid, chlorine, explosives, soap, pigments, and paint.
2 TOTAL INDUSTRIAL PROCESSES: 2 G OTHER
No emissions reported.
3 TOTAL SOLVENT AND OTHER PRODUCT USE: 3 D OTHER including products containing HMs and POPs
In addition to other solvents this item includes mercury emissions by evaporation from products.

n 1990-2020 National emission totals include emissions in Portuguese territorial areas that are outside EMEP grid area: Azores and Madeira Islands. 1990-2001: Recalculations reflecting mostly the revision of National Energy Balances under the responsibility of the Economy Ministry.

o Since 1993 emissions located on the left side of Diester River are not included, except for emissions from Moldavian electric station. The drop in emissions between 1991 and 1992 are due to a decrease in national economy. For 1990-1999 emissions have been calculated according to EMEP/CORINAIR Emission Inventory Guidebook and the Greenhouse Gas inventory Reporting Instructions. NOx emissions 1980-1984 do not include mobile sources

p Figures apply to the European part within EMEP.
Since 1987 the NOx emissions have been updated according to the instruction of the Ministry of natural resources of Russia for a such sources as road transport, other mobile sources etc. NOx emissions data for earlier period (before 1987) have not been corrected does not include mobile sources.

q Figures refer to stationary sources only

r 1990-2000 S4 emissions included in Sector 3
2000-2020 Main pollutants, particulate matter and heavy metals
1A3aii Civil aviation(domestic,LTO) - included emissions from civil aviation (domestic,LTO) and surface operations at the airport

s 1990-2001 Geographical coverage of non-gridded data are for the WHOLE of the Spanish territory (including Canary Islands, Ceuta and Melilla).

t Mobile sector 1990-2000: recalculated.

u Emissions in2010 corresponds to the national emission ceiling (NEC) in the Gothenburg protocol.

v 1997 Reffering to Skopje only
1998 Data are for sectors 1-6 only. Data for sectors 7-11 are not yet ready.
2000& 2001 For all sectors.

w 2010 Sum of reported sector data

x The NO2 emissions for the base year, 1978, is 21839 Gg

Table 2 Continued: Anthropogenic emissions of nitrogen oxides in the ECE region: footnotes

y	1987-1989:	For the time series 1987-1989, data as submitted under the Environmental Information and Observation Network (EIONET) have been used. As no officially agreed data gap filling procedure exists, data gaps were filled by EMEP data and EEA interpolations.
	1990-2000:	For the time series 1990-2000, data as compiled for the EC UNFCCC submission was The two time series differ slightly due to different treatment of overseas territories and international bunkers. The EC inventory relies on the availability and submission of Member States data. However, in order to provide a more complete picture, the emissions of air pollutants reported by the EC and its Member States under the UNFCCC (SOX, NOX, CO and NMVOC) have been used

Table 3: Anthropogenic emissions of ammonia (1980-1994) in the ECE region (Gg NH_3 per year)

Party/ year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Armenia[a]		3.1	3.1	3	2.8	2	1.7	1.7	2	0.2	25	0.11	0.05	0.01	0.006
Austria[b]	51.3521	52.1311	52.4146	53.3958	53.8275	53.572	52.9989	53.9468	51.3341	52.4392	52.2702	53.4142	49.9206	56.4532	57.5314
Azerbaijan															
Belarus[c]											4				4
Belgium[d]						89					99.2961	93.12	92.64	97.38	96.31
Bosnia and Herzegovina															
Bulgaria[e]											144	124	111	109	101
Canada															
Croatia[f]											37.1	31.7	26.8	25.5	24.2
Cyprus															
Czech Republic											156	134	115	99	91
Denmark[g]	125	123	120	119	115	138.14	138.71	135.3	132.18	132.72	133.16	129.08	127.21	123.71	119.7
Estonia											24.25	22.24	18.47	13.36	12.59
Finland	39	0	0	0	0	43	41	45	0	0	38	0	41	0	0
France[h]	795.272	804.13	807.35	811.894	798.531	799.282	808.697	805.526	784.17	780.726	779.147	774.387	764.978	756.487	762.09
Georgia															
Germany	835	821	817	841	853	857	846	845	835	823	736	653	636	615	595
Greece											79	78	75	75	73
Hungary	157					150	170	150		170	124	93	84	77	76
Iceland															
Ireland											112.4	114.5	117	116.9	118.6
Italy[i]	479	475	464	504	481	487	495	497	499	481	466	451	440	449	459
Kazakhstan											0.49	0.42	0.69	0.61	0.39
Kyrgyzstan															
Latvia[j]											43.8453	41.7651	32.9407	19.72	16.7508
Liechtenstein	0.22				0.17						0.2047	0.205	0.2049	0.2048	0.2057
Lithuania[k]	85	86	86	87	88	89	89	90	89	86	84	85	81	80	80
Luxembourg											7			7	7
Malta															
Monaco[l]											0.001	0.001	0.001	0.002	0.003
Netherlands[m]	234	240	244	244	246	248	258	258	237	232	232	228	180	191	166
Norway[n]	22.5668	23	23	23	23	23	23	23.1096	21.3	22.9034	22.5887	22.9528	24.5404	24.2834	24.5681
Poland	550					550	550	550	550	550	508	450	447	382	384
Portugal[o]											111.598	106.967	112.182	105.407	98.9256
Republic of Moldova[p]	52.7					57.9					49	49	44	37	35
Romania	340	332	327	311	359	343	350	329	339	341	300	267	255	223	221
Russian Federation[q]	1189	1192	1214	1245	1247	1239	1286	1277	1269	1258	1191	1161	1084	903	772
Serbia and Montenegro															
Slovakia[r]											63	56.3	47	41.6	38.7
Slovenia											24	23	24	23	22
Spain[s]	285	276	292	295	299	296	304	330	331	339	329.611	319.016	316.809	297.804	318.107
Sweden[t]	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	54.4452	54.7853	54.9384	61.521	61.8269
Switzerland[u]	77				60	73.7					71.5	71	71	71	70
TFYR of Macedonia															
Turkey[v]															
Ukraine											729	733.7	690.5	620	585.4
United ingdom	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	341.415	343.362	327.999	327.524	328.741
United States						1685					3925	3977	4028	4093	4157
European Community[w]											3780				

Table 3 Continued: Anthropogenic emissions of ammonia (1995-2001, 2010, 2015, 2020) in the ECE region (Gg NH_3 per year)

Party/ year	1995	1996	1997	1998	1999	2000	2001	2010	2010	2015	2015	2020	2020
								CLE *	CRP **	CLE	CRP	CLE	CRP
Armenia	0.006	0.004	0.004	0.002	0.003	0.002	0.0038						
Austria	56.8794	55.5351	56.8645	56.1402	54.944	53.7153	53.7217	66					
Azerbaijan													
Belarus	4.6	4.4	4.05	4.4	4.16	142.06	137.385	150					
Belgium	100.274	98.91	98.83	102.34	99.74	81.4013	223.853		74				
Bosnia and Herzegovina													
Bulgaria	99	83	77	66	60	56.228	54.355	NA	108	NA	100.5	NA	100.5
Canada	540												
Croatia	24.9	23.4	23	23.3	24.4	22.6		30					
Cyprus							8.54	9	9		8		8
Czech Republic	86	81	81	80	75	74	76.607	62	101	60	NE	57	NE
Denmark	113.16	109.23	108.9	110.12	104.95	104.45	102.27	83		83		83	
Estonia	10.97	9.55	9.74	9.76	8.47	8.764	8.97	29		NE		NE	
Finland	35.2	35	38	37.8	35.2	33.1	33.173	31		NE		NE	
France	766.231	777.443	783.012	784.993	787.097	784.157	778.954	780					
Georgia													
Germany	603	608	599	604	604	596	607	579					
Greece	85	73	71	74	73			73					
Hungary	77	78	76	73.53	71.09	70.81	66.3	90				90	
Iceland													
Ireland	119.6	121.9	123.4	127.4	127	122.44		116					
Italy	461	430	443	438	448	437.347		449					
Kazakhstan	0.32	0.07	0.07	0.26	0.27	0.27							
Kyrgyzstan					59.114								
Latvia	16.8202	15.5364	14.5139	13.3585	11.9518	11.6108	12.35	11.78	NE	12.81	NE	13.82	NE
Liechtenstein	0.3864	0.2058	0.2061	0.3884	0.2066	0.2066	0.1755	0.17		0.17		0.17	
Lithuania	38	36	35	35	29	25.2	50.2586	84					
Luxembourg	7	7	7	7	7.28799	7.23336		7					
Malta													
Monaco	0.003	0.004	0.005	0.005	0.006	0.006	0.006097	NE	NE	NE	NE	NE	NE
Netherlands	192.765	146	188	170.388	166.499	152.127	147.579	128					
Norway	26.0813	26.5383	25.9819	25.9052	25.4811	25.4371	24.6393	25.3					
Poland	380	364	350	371	341	322	309	468					
Portugal	105.66	102.521	101.037	102.969	108.694	107.223	107.665	88	NE	NE	NE	NE	NE
Republic of Moldova	33	31	25	25	24.8			42					
Romania													
Russian Federation	824	749	730	675	657	650		800					
Serbia and Montenegro							NE						
Slovakia	39.6	38	36.1	32.1	30.2	29.6185	28.4465	37	37	36	36	37	37
Slovenia	22	22	19	20	20	19	NE	NE	20	NE	NA	NE	NA
Spain	306.376	340.128	340.074	358.676	370.702	388.828	383.177						
Sweden	61.5167	61.753	59.5154	59.7529	56.8136	57.2761	53.9813	57					
Switzerland	69.2	69	69	68.3	68.3	68.29	67.513	65.893		65.893		65.893	
TFYR of Macedonia													
Turkey	0.009	0.008	0.006	0.007	0.007	0.007							
Ukraine	540.3	517.8	482.7	410.1	363.5	358.4	378.176	23					
United Kingdom	319.263	322.308	326.484	320.013	316.478	297.185	290.37	297	297	284.395	284.395	287.721	287.721
United States	4225	4258	4342	4433	4458	4503	4532.17	4506		4605		4704	
European Community	3549	3527	3587	3582									

* CLE Current Legislation Projections

** CRP Current Reduction Plans

Table 3 Continued: Anthropogenic emissions of ammonia in the ECE region: footnotes

a 1980-2001:Emissions from agriculture was only included in 1990.

b 1980-2001 Re-calculations mainly because of revision of energy balance

c Without emissions from agriculture.

d As relevant information are lacking for at least one of the three Belgian regions during the period 1980-89 no sector data are given before 1990.

e 2000 S7 S8: Emissions are calculated on the base of the total quality of the used fuels by sectors

f 1980-1989: Data is missing because Croatia was a part of the Former Yugoslavia in this period.
1990-1998: Distributed according to SNAP90.
1999-2000:Distributed according to SNAP97

g Data include those located within the EMEP area only.
1985-2001 Road traffic: New method for estimating the fuel balance

h Data include those located within the EMEP area only. National totals do not include the international air traffic and the international sea traffic
2010 Emissions corresponds to the National Emission Ceilings (NEC).

i Emissions for 1996-2000 estimated according to SNAP97

j In 1993 number of livestock decreased compared to 1992

k NH3 emissions in sector S10 increased in 2001 because for the first time contribution of nitrogen fertilisers was evaluated.

l 2001: Sector 1A4a has been included into 1A4bi because data available at the present time do not allow to separate emissions from commercial/institutional sectors and emissions from residential sectors.

m 1990,1995 & 1998-2001
1A3e: Other mobile sources such as draglines, building cranes etc
2G: Emissions from industry not attributable to previous 2 categories
3D: Emissions from use of consumer products:
- emissions from smoking cigarettes;
- emissions from foams;
- emissions from (car)service companies

n 1980, 1987 & 1989-2001:
Other:
1 A 2 Manufacturing Industries and Construction: 1 A 2 f Other:
All mining, extraction and manufacturing industries (NACE 10-37) not included in 1A1. Construction.
1 A 3 Transport: 1 A 3 e Other:
1 A 3 e ii includes machinery except in Agriculture / Forestry / Fishing, military and households. Snow scooters and small watercraft are included under 1 A 4 b Residential and 1 A 4 c Agriculture / Forestry / Fishing
1 B 1 Fugitive Emissions from Solid Fuels: 1 B 1 c Other:
No emissions reported.
2 A MINERAL PRODUCTS: 2 A 7 Other including Non Fuel Mining & Construction
Manufacturing of other non-metallic mineral products (NACE 26) not included in 2A1-2A3: glass, plaster, clay products, rock wool. Mining, crushing plants, sand-pits. Construction.
2 B CHEMICAL INDUSTRY: 2 B 5 Other:
Manufacturing of methanol, basic plastics, sulphuric acid, chlorine, explosives, soap, pigments, and paint.
2 TOTAL INDUSTRIAL PROCESSES: 2 G OTHER:
No emissions reported.
3 TOTAL SOLVENT AND OTHER PRODUCT USE: 3 D OTHER including products containing HMs and POPs
In addition to other solvents this item includes mercury emissions by evaporation from products.

o National emission totals include emissions in Portuguese territorial areas that are outside EMEP grid area: Azores and Madeira Islands. 1990-2001: Recalculations reflecting mostly the revision of National Energy Balances under the responsibility of the Economy Ministry.

p 1993 emissions located on the left side of Diester River are not included, except for emissions from Moldavian electric station. The drop in emissions between 1991 and 1992 are due to a decrease in national economy. For 1990-1999 emissions have been calculated according to EMEP/CORINAIR Emission Inventory Guidebook and the Greenhouse Gas inventory Reporting Instructions.

q Figures apply to the European part within EMEP.
NH3 figures for 1980-1986 refer to agricultural sector only. Since 1987 NH3 figures include emissions from industrial sources.

r 2000-2020
Main pollutants, particulate matter and heavy metals
1A3aii Civil aviation(domestic,LTO) - included emissions from civil aviation (domestic,LTO) and surface operations at the airport

s 1990-2001 Geographical coverage of non-gridded data are for the WHOLE of the Spanish territory (including Canary Islands, Ceuta and Melilla).

t Mobile sector 1990-2000: recalculated

u Emissions in 2010 corresponds to the national emission ceiling (NEC) in the Gothenburg protocol.

v Sector 4 emissions only

w 1990-2000:For the time series 1990-2000, data as compiled for the EC UNFCCC submission was
The two time series differ slightly due to different treatment of overseas territories and international bunkers. The EC inventory relies on the availability and submission of Member States data. However, in order to provide a more complete picture, the emissions of air pollutants reported by the EC and its Member States under the UNFCCC (SOX, NOX, CO and NMVOC) have been used

Table 4: Anthropogenic emissions of non-methane volatile organic compounds (1980-1994) in the ECE region (Gg NMVOC per year)

Party/ year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Armenia[a]		25.7	24.3	23.8	21.7	92.7	98.1	104.3	92.5	90.2	81	69.9	30.9	19.9	17.1
Austria[b]	361.96	365.381	367.26	372.207	378.911	381.533	379.88	382.326	373.115	364.543	344.785	322.722	293.171	282.021	269.971
Azerbaijan															
Belarus	549	546	543	543	540	516	506	509	535	511	533	546	412	372	366
Belgium[c]						688					273.704	267.36	266.47	264.56	257.87
Bosnia and Herzegovina															
Bulgaria[d]									309.188		217	178	179	208	175
Canada	2099					3104	3026	2988	3104	3002	2997	2958	2921	2647	2691
Croatia[e]											105	86.5	63.7	69.3	74.7
Cyprus															
Czech Republic						275					441	394	366	346	310
Denmark[f]	203	199	199	202	0	190.42	188.59	188.53	186.56	183.99	162.02	163.87	162.17	161.17	158.23
Estonia						81	83	83	84	87	88.4	81.9	45.4	41.6	44.65
Finland[g]								210	224.9	227.4	223.9	209.8	203.7	195.9	193.6
France[h]									2705.86	2673.84	2473.06	2453.15	2398.64	2287.79	2157.94
Georgia[i]	45.5	46.8	47.8	49.8	49.3	48.5	47.6	48.2	47.8	46	46.4	8.2	3.9	2.2	1.7
Germany[j]	3224	3152	3134	3152	3191	3190	3218	3274	3256	3202	3220	2796	2539	2326	2159
Greece[k]						614					255	253	261	270	274
Hungary[l]	215					232	263	228	215	205	205	149.6	141.8	149	142.4
Iceland	7.7	7.7	7.7	7.6	7.7	8	8.4	11.9	12.6	12.6	12.8	14.3	14.1	13.6	14.2
Ireland											111.107	111.057	114.33	108.548	107.454
Italy	2179	2119	2074	2045	2007	1992	2019	2088	2124	2215	2041	1866.41	1933.8	1860.82	1814.98
Kazakhstan[m]											0.394	0.465	0.558	0.565	0.7
Kyrgyzstan												8	6.9	4	2.5
Latvia											142.55	97.8473	79.0404	73.6064	76.1656
Liechtenstein	1.14	1.15	1.15	1.15	1.15	1.15	1.13	1.1	1.08	1.06	0.9879	0.9322	0.868	0.8108	0.7606
Lithuania	100	102	104	105	106	112	108	108	109	109	108	111	66	52	52
Luxembourg						15					19			18	18
Malta															
Monaco[n]											0.702	0.806	0.928	0.829	0.823
Netherlands[o]	579	555	543	526	513	502	489	485	538	468	492.328	462	438	405	389
Norway[p]	173.29	181.7	188.6	201.3	212.3	231.4	249.4	252.974	249	276.364	294.393	293.623	321.829	337.806	352.081
Poland[q]	1036	912	889	954	985	1011	1029	1014	1026	1016	831	833	805	756	819
Portugal[r]						199					390.341	418.778	446.1	453.357	453.648
Republic of Moldova[s]						105	101	102	102	96	157	151.2	99	74.5	65.6
Romania	829	810	772	796	812	787	830	884	846	812	772	678	627	634	638
Russian Federation[t]	2843	2843	2582	2444	2390	2496	2338	3410	3396	3444	3668	3361	3297	3062	2924
Serbia and Montenegro															
Slovakia[u]											262	NE	NE	151	NE
Slovenia									39		44	41	40	42	44
Spain[v]	1392	1372	1350	1377	1371	1393	1420	1475	1510	1544	1633.02	1657.68	1641.74	1540.9	1600.31
Sweden[w]	NE	NE	NE	NE	NE	NE	NE	NE	514.829	511.561	497.838	477.582	460.226	427.302	408.237
Switzerland[x]	323				324	324	318	311	305	298	278.8	261	242	226	213
TFYR of Macedonia															
Turkey[y]	359.02	360.95	379.26	387.44	383.86	378.97	403.01	430.31	449.82	453.02	462.87	457.16	478.55	527.1	515.54
Ukraine						1626	1660	1687	1604	1512	1369	1302	1171	972	1024
United Kingdom	2159.75	2136.64	2175.27	2196.63	2250.06	2258.52	2307.64	2366.16	2429.5	2464.2	2424.92	2356.12	2262.48	2153.11	2103.27
United States	23221	21786	20943	21865	22957	21904	20953	20726	20965	20120	18421	18878	18777	18948	19327
European Community[z]											16231	15687	15187	14540	14376

Table 4 Continued: Anthropogenic emissions of non-methane volatile organic compounds (1995-2001, 2010, 2015, 2020) in the ECE region (Gg NMVOC per year)

Party/ year	1995	1996	1997	1998	1999	2000	2001	2010	2010	2015	2015	2020	2020
								CLE *	CRP **	CLE	CRP	CLE	CRP
Armenia	23.4	17.8	35.1	16.94	17.47	15.96	28.277						
Austria	271.131	268.685	249.86	242.487	236.865	231.513	232.252	159					
Azerbaijan							8.5	17.7		20.3		22.3	
Belarus	195	327.7	344.7	294	239.9	225	215.4	321					
Belgium	262.461	241.69	248.53	269.09	247.98	233.136	251.501		139				
Bosnia and Herzegovina													
Bulgaria	173	147	120	132	118	120.408	289.12	NA	408	NA	400.9	NA	400.9
Canada	2639	2554	2533	2491	2528	2492.52	2476.25	2556.86	76.0502	2636.77	91.8026	2710.65	101.037
Croatia	74.1	81.5	79.5	78.5	77.4	79.8		90					
Cyprus							14.42	14	14		12		11
Czech Republic	292	293	277	242	234	227	220	209	220	206	NE	200	NE
Denmark	153.59	152.52	145.32	138.33	132.74	128.59	123.9	83		80		75	
Estonia	47.5	50.2	53.92	53.7	42.33	33.691	33.27	49		NE		NE	
Finland	187.8	181.6	175.2	170.8	165.9	161.3	157.092	130		NE		NE	
France	2079.17	1992.61	1918.68	1856.68	1784.62	1726.18	1673.65	1050					
Georgia	1.5	2.4	2.8	10.84	18.63								
Germany	2021	1893	1822	1735	1663	1605	1606	1192					
Greece	273	284	285	290	291	305	268	261					
Hungary	150.3	150.1	145.4	140.6	169.84	172.68	166.06	137				137	
Iceland	12	12	9.8	10				6.6					
Ireland	105.35	111.85	115.7	117.635	98.407	90.266		55					
Italy	1800.35	1757.39	1689.94	1585.71	1723	1557	1464	1440					
Kazakhstan	1.222	0.132	0.083	0.026	0.041	0.22							
Kyrgyzstan	2.8	2.4	2.4	2.4	2.32								
Latvia	79.3733	82.8406	83.9275	83.3335	80.7952	69.3438	80.867	66.56	NE	66.66	NE	79.22	NE
Liechtenstein	0.7103	0.672	0.6346	0.5963	0.5568	0.5274	0.6383	0.53		0.53		0.53	
Lithuania	77	82	81	79	68	60.8	70.5983	84					
Luxembourg	16	16	15	13	14.92	14.9247		9					
Malta													
Monaco	0.751	0.696	0.636	0.578	0.562	0.518	0.50675	NE	NE	NE	NE	NE	NE
Netherlands	362.992	362	317	301.451	290.875	278.003	270.938	185					
Norway	367.133	371.462	368.233	353.997	358.206	367.449	375.813	170.3					
Poland	769	766	774	730	731	599	873.385	804					
Portugal	474.529	450.192	510.538	543.126	495.164	487.673	492.404	240	NE	NE	NE	NE	NE
Republic of Moldova	61.7	64.4	68.8	42.9	22.14			100					
Romania													
Russian Federation	2857	2622	2386	2376	2451	2450		3500					
Serbia and Montenegro							NE						
Slovakia	159	161	138	132	130	88.997	89.7673	76	76	79	79	81	81
Slovenia	44	49	48	42	40	40	NE	NE	40	NE	NA	NE	NA
Spain	1549.46	1534.17	1534.42	1584.53	1584.83	1547.99	1533.15						
Sweden	398.762	388.558	354.292	338.875	318.499	304.223	303.359	241					
Switzerland	199.4	191	182	173	165	158.82	147.137	122.638		121.792		121.991	
TFYR of Macedonia													
Turkey	677.29	754.5	784.31	803.33	785.36	725.63		1925					
Ukraine	811	718	665	253.9	272.4		269.487	1369					
United Kingdom	1971.03	1904.28	1829.35	1692.7	1526.21	1418.11	1335.94	1200	1200	1194.96	1194.96	1220.73	1220.73
United States	18824	17700	17680	17180	16572	16252	15407.8	12606		12546		12486	
European Community	13043	13525	13336	12511	12103	11562							

* CLE Current Legislation Projections

** CRP Current Reduction Plans

Table 4 Continued: Anthropogenic emissions of non-methane volatile organic compounds in the ECE region: footnotes

a Reduction of emissions from 1993 onwards is explained by the blocade of communications in Armenia followed by a drop in energy production.

b 1980-2001 Re-calculations mainly because of revision of energy balance

c The NMVOC figure for 1985 includes CH4 emissions
As relevant informations are lacking for at least one of the three Belgian regions during the period 1980-89 no sector data are given before 1990.

d 2000 S7 S8: Emissions are calculated on the base of the total quality of the used fuels by sectors.

e 1980-1989: Data is missing because Croatia was a part of the Former Yugoslavia in this period.
1990-1998: Distributed according to SNAP90.
1999-2000: Distributed according to SNAP97

f Data include those located within the EMEP area only
1985-2001: Road traffic: New method for estimating the fuel balance

g 1990-1999:NMVOC sector 3 emissions are included in sector 8.

h 1980-2010 Data include those located within the EMEP area only. National totals do not include the international air traffic and the international sea traffic.
2010 Emissions corresponds to the National Emission Ceilings (NEC)

i Calculations are based on Official Statistical data. Due to economical and social difficulties the collection of statistical data within the country is inadequate. Therefore it is assumable that data provided here are not reliable

j NMVOC emissions by source categories do not include biogenic NMVOC emissions of managed forests since only anthropogenic emissions were requested. .

k 1985: Includes CH4.

l There are two main reasons that caused the considerable NMVOC decrease from 1990 to 1991. One is the change in the calculation methods. Before 1991 a top-down calculation was used, since 1991 a bottom-up method on the basis of a detailed survey has been applied. The second reason is the sudden, rapid recession in the economy including lower industrial production, less fuel and solvent consumption resulting less VOC emission.

m CH4 included

n 2001: Sector 1A4a has been included into 1A4bi because data available at the present time do not allow to separate emissions from commercial/institutional sectors and emissions from residential sectors..

o 1990, 1995 & 1998-2001:
1A3e: Other mobile sources such as draglines, building cranes etc
2G: Emissions from industry not attributable to previous 2 categories
3D: Emissions from use of consumer products:
- emissions from smoking cigarettes;
- emissions from foams;
- emissions from (car)service companies

p 1980, 1987 & 1989-2001:
Other:
1 A 2 Manufacturing Industries and Construction: 1 A 2 f Other:
All mining, extraction and manufacturing industries (NACE 10-37) not included in 1A1. Construction.
1 A 3 Transport: 1 A 3 e Other:
1 A 3 e ii includes machinery except in Agriculture / Forestry / Fishing, military and households. Snow scooters and small watercraft are included under 1 A 4 b Residential and 1 A 4 c Agriculture / Forestry / Fishing
1 B 1 Fugitive Emissions from Solid Fuels: 1 B 1 c Other:
No emissions reported.
2 A MINERAL PRODUCTS: 2 A 7 Other including Non Fuel Mining & Construction
Manufacturing of other non-metallic mineral products (NACE 26) not included in 2A1-2A3: glass, plaster, clay products, rock wool. Mining, crushing plants, sand-pits. Construction.
2 B CHEMICAL INDUSTRY: 2 B 5 Other:
Manufacturing of methanol, basic plastics, sulphuric acid, chlorine, explosives, soap, pigments, and paint.
2 TOTAL INDUSTRIAL PROCESSES: 2 G OTHER:
No emissions reported.
3 TOTAL SOLVENT AND OTHER PRODUCT USE: 3 D OTHER including products containing HMs and POPs
In addition to other solvents this item includes mercury emissions by evaporation from products.

q 2001 & 2010: Other includes: NFR 2 B 5: Carbon black (SNAP040409) and processes in org. chem. industry (SNAP 0405). NFR 3D: Other use of solvents (SNAP 0604). NFR 7: Nature (SNAP 11) Includes 297 Gg from source sector SNAP 11

r 1990- 2020National emission totals include emissions in Portuguese territorial areas that are outside EMEP grid area: Azores and Madeira Islands. 1990-2001: Recalculations reflecting mostly the revision of National Energy Balances under the responsibility of the Economy Ministry.

s Since 1993 emissions located on the left side of Diester River are not included, except for emissions from Moldavian electric station. The drop in emissions between 1991 and 1992 are due to a decrease in national economy.
For 1990-1999 emissions have been calculated according to EMEP/CORINAIR Emission Inventory Guidebook and the Greenhouse Gas inventory Reporting Instructions.

t Figures apply to the European part within EMEP
NMVOC: Natural sources not included. Since 1987 NMVOCs emission data were updated taking into account emissions from railway transportation, agricultural engineering and road-building machinery..

Table 4 Continued: Anthropogenic emissions of non-methane volatile organic compounds in the ECE region: footnotes

u 2000-2020
Main pollutants, particulate matter and heavy metals
1A3aii Civil aviation(domestic,LTO) - included emissions from civil aviation (domestic,LTO) and surface operations at the airport
6C Waste incineration - total waste incineration
7 Other - biomass on-site burning and forest fires
1A3ai(i) International Aviation (LTO) - included in 1A3aii(i)
1A3ai(ii) International Aviation (cruise) - included in 1A3aii(ii)
1A3di International Navigation - included in 1A3dii

v 1990-2001
Geographical coverage of non-gridded data are for the WHOLE of the Spanish territory (including Canary Islands, Ceuta and Melilla).

w Mobile sector 1990-2000: recalculated.

x Emissions in 2010 corresponds to the national emission ceiling (NEC) in the Gothenburg protocol.

y 2010 Sum of reported sector data

z 1990-2000:For the time series 1990-2000, data as compiled for the EC UNFCCC submission was
The two time series differ slightly due to different treatment of overseas territories and international bunkers. The EC inventory relies on the availability and submission of Member States data. However, in order to provide a more complete picture, the emissions of air pollutants reported by the EC and its Member States under the UNFCCC (SOX, NOX, CO and NMVOC) have been used

Table 5: Anthropogenic emissions of carbon monoxide (1980-1994) in the ECE region (Gg CO per year)

Party/ year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Armenia[a]		26.6	30	30.4	30.9	404.9	405.1	416.5	417.1	398.9	304.3	377.2	195.1	145.1	128
Austria[b]	1794.77	1751.13	1718.79	1694.12	1727.95	1708.11	1646.2	1578.36	1489.78	1426.69	1237.96	1246.3	1197.55	1166.5	1116.76
Azerbaijan															
Belarus						1654	1605	1601	1590	1615	1722	1717	1381	1201	1241
Belgium											1284.57	1103.17	1122.6	1087.53	1043.84
Bosnia and Herzegovina															
Bulgaria[c]								997	995	985	891	608	768	820	855
Canada	10273					12564	12463	13065	12564	12828	12712	12392	12227	11630	11642
Croatia[d]											655.2	565.3	416.5	375.4	369.4
Cyprus															
Czech Republic	894		906		895	899	740	738	737	884	1257	1179	1170	1103	1125
Denmark[e]	956.342	1075.12	1122.71	950.602	0	996.21	970.7	988.29	903.51	961.39	712.81	752.84	742.74	746.06	717.12
Estonia						400	417	423	419	448	434.1	399.2	207.8	210.2	241.1
Finland	660										559	552	478	457	444
France[f]	15753.9	14984	14528.2	14092.9	14157.1	13988.5	13590.9	13351.9	12916.3	12361	10950.6	10836.5	10362.7	9779.36	9079.11
Georgia[g]	648.3	617.3	632.2	647.8	651.3	636.5	642.9	638.9	647.7	597.3	526.4	441.4	129.5	142.5	148.5
Germany	14046	13027	12438	11980	12176	12134	12135	12438	12081	11430	11213	9515	8352	7704	7064
Greece											1298	1290	1320	1285	1264
Hungary	1019					931.1			963.1		997	913.4	835.8	796.1	774.29
Iceland	44.2	44.2	44.2	43.2	44.1	45.5	48.2	53.6	57.1	57	58.2	59.2	60.7	59.9	60.3
Ireland											400.9	394.4	394.6	350.3	329.2
Italy[h]	7588	7478	7527	7432	7590	7692	7607	7674	7581	7735	7824	8003	7961	7755	7549
Kazakhstan											1639.9	1975.3	1959.5	1801.36	1425.86
Kyrgyzstan												26.2	21.3	13.2	9.5
Latvia											497.969	494.35	482.748	319.844	329.264
Liechtenstein	5.02	4.79	4.56	4.34	4.11	3.88	3.66	3.44	3.21	3	2.637	2.4979	2.3248	2.1816	2.0805
Lithuania	541	548	543	550	550	545	554	564	578	568	519	577	350	292	303
Luxembourg						193					175			219	145
Malta															
Monaco[i]											3.025	3.477	3.942	3.469	3.407
Netherlands[j]	1530	1418	1374	1354	1357	1381	1252	1192	1179	1131	1119.68	1025	983	960	907
Norway[k]	909.203	815.1	823.7	815.8	842	844.2	872.3	918.55	868.9	910.025	866.67	799.341	778.33	780.949	766.129
Poland											7406		7083	8655	5115
Portugal[l]											1078.29	1149.02	1241.42	1225.71	1205.86
Republic of Moldova[m]	55	53	56	49	48	483	478	474	496	476	453.2	468.4	279.2	218.4	170.9
Romania	3245	3217	3152	3030	3463	3307	3378	3196	3317	3314	3186	2695	2506	2434	2325
Russian Federation[n]	13520	15005	13617	13696	13672	14122	13142	13270	13144	12210	13329	13000	11703	11320	10603
Serbia and Montenegro															
Slovakia[o]										491	533	478	426	454	413
Slovenia	68	66	63	61	64	68	78	79	75	75	81	78	78	87	93
Spain[p]	3494	3372	3343	3370	3344	3305	3347	3437	3620	3807	3798.08	3867.9	3933.19	3712.65	3674.47
Sweden[q]	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	1134.88	1097.53	1090.44	1045.15	1026.56
Switzerland	1280	1222	1164	1106	1048	990	933	877	820	764	672.6	629	581	544	516
TFYR of Macedonia[r]															
Turkey[s]	2933.9	2961.41	3110.36	3140.59	3140.63	3121.39	3304.57	3477.15	3609.75	3505.33	3584.74	3578.82	3662.39	3935.99	3769.27
Ukraine						9832	9722	9269	9085	8794	8141	7406	5496	4218	3375
United Kingdom	7669.06	7658.29	7751.74	7567.24	7652.81	7454.18	7454.36	7502.21	7560.58	7804.19	7444.73	7214.05	6895.18	6384.22	6048.03
United States	101641	97724	96799	100470	100999	103472	97183	94855	95593	93832	84544	89239	88301	89091	90353
European Community[t]											50205	48326	46474	44154	42041

Table 5 Continued: Anthropogenic emissions of carbon monoxide (1995-2001, 2010, 2015, 2020) in the ECE region (Gg CO per year)

Party/ year	1995	1996	1997	1998	1999	2000	2001	2010	2015	2020
Armenia	173.6	125.5	223.6	124.4	123.7	109.66	104.248			
Austria	1029.68	1050.23	985.352	953.085	907.178	858.745	859.738			
Azerbaijan							293.1	611.3	699.2	767.9
Belarus	1253	1241.8	1223.2	1034	786.4	717.5	710.76	1404		
Belgium	1174.82	1000.12	938.34	1113.95	1016.8	1099.62	1026.81			
Bosnia and Herzegovina										
Bulgaria	846	613	515	650	617	667.27	521.365	750		666
Canada	11207	10800	10603	10313	9885	9368.93	9174.17	10550		10360
Croatia	373.6	428.4	430.9	408.6	398.9	402.1		660		
Cyprus							84.53			
Czech Republic	999	1012	944	765	716	648	649			
Denmark	700.74	706.21	663.68	600.29	564.58	578.57	587.29	331		
Estonia	242.3	267.7	282.8	280.7	215.3	201.66	177.45			
Finland	436	461	474	452	547	526.3	605.04			
France	8922.47	8322.88	7873.4	7672.17	7147.38	6639.58	6364.67			
Georgia	249.5	390.2	429.2	353.3	222.5					
Germany	6532	6109	5955	5424	5143	4768	4797			
Greece	1254	1354	1356	1489	1386	1531	1366			
Hungary	761.29	726.87	733.36	736.93	721.62	633.04	591.83	600		700
Iceland	49.4	49.9	38.9	39.8				19.41		
Ireland	304.4	306.8	312.1	317.7	285.1	279.571		322		
Italy	7755	6971	6681	6318	6051	5207.2		4213		
Kazakhstan	1421.92	1450.55	1378.8	1345.42	1187.39	1114.27				
Kyrgyzstan	7.5	5.5	4.6	5	3.68					
Latvia	389.725	407.17	384.031	375.985	339.258	272.926	381.557	258.456	260.508	243.4
Liechtenstein	1.9864	1.896	1.8177	1.7313	1.6519	1.6361	1.5857	1.22	1.16	1.16
Lithuania	286	312	358	358	320	281.5	228.57	400		
Luxembourg	107	103	80	51	49.8041	48.9385		33		
Malta										
Monaco	3.072	2.751	2.661	2.264	2.214	2.108	2.09309			
Netherlands	852.467	903	749	739.239	701.911	678.579	658.99			
Norway	733.826	706.522	669.813	632.962	599.302	568.181	548.224			
Poland	4547	4837	4700	4301	4363	3463	3528			
Portugal	1192.36	1172.1	1134.15	1133.29	1101.48	1086.5	1056.47			
Republic of Moldova	192	170.3	210.2	153.4	100.2			150		
Romania										
Russian Federation	9945	9401	10332	10383	10804	10811		16650		
Serbia and Montenegro							NR			
Slovakia	404	348	352	318	310	290.139	286.791			
Slovenia	91	95	93	77	70	68	NE	53		
Spain	3301.8	3423.97	3266.83	3249.98	2996.89	2885.59	2857.16			
Sweden	1014.8	999.609	899.401	952.044	908.893	832.962	808.45	426		
Switzerland	490.9	467	443	422	399	393.9	409.529	316.229	300.088	299.112
TFYR of Macedonia			23	25.8		76.94	76.1			
Turkey	3986.51	4135.15	4178.82	4156.05	4046.76	3778.2		10986		
Ukraine	2906	2567	2516	2810.4	2671.8		3107.31	8141		
United Kingdom	5694.9	5665.62	5280.25	4901.88	4590.5	4025.05	3737.12	2837.5		
United States	83993	90741	90054	89456	85240	82939	103079	83482	88038	92593
European Community	40490	39029	37423	35673	33848	30817				

Table 5 Continued: Anthropogenic emissions of carbon monoxide in the ECE region: footnotes

a Reduction of emissions from 1992 onwards is explained by the blocade of communications in Armenia followed by a drop in energy production.

b Re-calculations mainly because of revision of energy balance

c 2000 S7 S8: Emissions are calculated on the base of the total quality of the used fuels by sectors

d 1980-1989: Data is missing because Croatia was a part of the Former Yugoslavia in this period.
1990-1998: Distributed according to SNAP90.
1999-2000: Distributed according to SNAP97

e Data include those located within the EMEP area only
1985-2001 Road traffic: New method for estimating the fuel balance.

f Data include those located within the EMEP area only

g Calculations are based on Official Statistical data. Due to economical and social difficulties the collection of statistical data within the country is inadequate. Therefore it is assumable that data provided here are not reliable

h Emissions for 1996-2000 estimated according to SNAP97

i 2001 : Sector 1A4a has been included into 1A4bi because data available at the present time do not allow to separate emissions from commercial/institutionnal sectors and emissions from residential sectors.

j 1990, 1995 & 1998-2001:
1A3e: Other mobile sources such as draglines, building cranes etc
2G: Emissions from industry not attributable to previous 2 categories
3D: Emissions from use of consumer products:
- emissions from smoking cigarettes;
- emissions from foams;
- emissions from (car)service companies

k 1980, 1987 & 1989-2001
Other:
1 A 2 Manufacturing Industries and Construction: 1 A 2 f Other
All mining, extraction and manufacturing industries (NACE 10-37) not included in 1A1. Construction.
1 A 3 Transport: 1 A 3 e Other
1 A 3 e ii includes machinery except in Agriculture / Forestry / Fishing, military and households. Snow scooters and small watercraft are included under 1 A 4 b Residential and 1 A 4 c Agriculture / Forestry / Fishing
1 B 1 Fugitive Emissions from Solid Fuels: 1 B 1 c Other
No emissions reported.
2 A MINERAL PRODUCTS: 2 A 7 Other including Non Fuel Mining & Construction
Manufacturing of other non-metallic mineral products (NACE 26) not included in 2A1-2A3: glass, plaster, clay products, rock wool. Mining, crushing plants, sand-pits. Construction.
2 B CHEMICAL INDUSTRY: 2 B 5 Other
Manufacturing of methanol, basic plastics, sulphuric acid, chlorine, explosives, soap, pigments, and paint.
2 TOTAL INDUSTRIAL PROCESSES: 2 G OTHER
No emissions reported.
3 TOTAL SOLVENT AND OTHER PRODUCT USE: 3 D OTHER including products containing HMs and POPs
In addition to other solvents this item includes mercury emissions by evaporation from products.

l National emission totals include emissions in Portuguese territorial areas that are outside EMEP grid area: Azores and Madeira Islands. 1990-2001: Recalculations reflecting mostly the revision of National Energy Balances under the responsibility of the Economy Ministry.

m Since 1993 emissions located on the left side of Diester River are not included, except for emissions from Moldavian electric station. The drop in emissions between 1991 and 1992 are due to a decrease in national economy. For 1990-1999 emissions have been calculated according to EMEP/CORINAIR Emission Inventory Guidebook and the Greenhouse Gas inventory Reporting Instructions.

n Figures apply to the European part within EMEP. CO emission data from 1987 onwards were updated taking into account emissions from railway transportation, agricultural engineering and road-building machinery.

o Sector 4: Emissions included in Sector 3
2000-2020
Main pollutants, particulate matter and heavy metals
1A3aii Civil aviation(domestic,LTO) - included emissions from civil aviation (domestic,LTO) and surface operations at the airport

p 1990-2001 Geographical coverage of non-gridded data are for the WHOLE of the Spanish territory (including Canary Islands, Ceuta and Melilla). .

q Mobile sector 1990-2000: recalculated.

r 1997: Referring to Skopje only
1998: Data are for sectors 1-6 only. Data for sectors 7-11 are not yet ready.
2000 & 2001: All sectors included.

s 2010: Sum of reported sector data

t 1990-2000:For the time series 1990-2000, data as compiled for the EC UNFCCC submission was used
The two time series differ slightly due to different treatment of overseas territories and international bunkers. The EC inventory relies on the availability and submission of Member States data. However, in order to provide a more complete picture, the emissions of air pollutants reported by the EC and its Member States under the UNFCCC (SOX, NOX, CO and NMVOC) have been used.

Table 6: Anthropogenic emissions of Total Suspended Matter (1980-1994) in the ECE region (Mg TSP per year)

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Armenia															
Austria[a]	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	73962.3	NE	NE	NE	NE
Azerbaijan															
Belarus															
Belgium											NE				
Bosnia and Herzegovina															
Bulgaria															
Canada											640162	599274	508125	448224	353680
Croatia															
Cyprus															
Czech Republic[b]															
Denmark[c]															
Estonia[d]						334000	294100	300500	278500	262000	268500	277800	240728	189022	161492
Finland															
France[e]											1623460	1662290	1568180	1476200	1441030
Georgia															
Germany[f]															
Greece															
Hungary											197000	191750	154200	150300	149570
Iceland															
Ireland															
Italy															
Kazakhstan											1268120	1218990	1163740	1070340	8864040
Kyrgyzstan															
Latvia											28144.8	27663.4	13882.7	9514.18	13105.3
Liechtenstein															
Lithuania															
Luxembourg															
Malta															
Monaco[g]											10.046	11.121	12.714	11.583	10.548
Netherlands[h]											110979				
Norway[i]											88577.9	81604.8	77550.6	84261.3	83091.3
Poland															
Portugal											NE	NE	NE	NE	NE
Republic of Moldova															
Romania															
Russian Federation															
Serbia and Montenegro															
Slovakia[j]															
Slovenia															
Spain											0	0	0	0	0
Sweden[k]	82141.9	73119.2	77591.9	157218	166363	179383	168330	155077	148077	140501	139828	134426	128603	124333	116780
Switzerland															
TFYR of Macedonia															
Turkey															
Ukraine															
United Kingdom	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
United States															
European Community															

Table 6 Continued: Anthropogenic emissions of Total Suspended Matter (1995-2001, 2010, 2015, 2020) in the ECE region (Mg TSP per year)

	1995	1996	1997	1998	1999	2000	2001	2010	2015	2020
Armenia										
Austria	76257.5	NE	NE	NE	80160.1	78460.8	79682.3			
Azerbaijan										
Belarus										
Belgium	NE					277241	277262			
Bosnia and Herzegovina										
Bulgaria							NE			
Canada	14888400	14804500	15066900	15130900	14852500	16613100	16864700			
Croatia										
Cyprus										
Czech Republic	202157	178028	126930	84388	66477	57182	53851			
Denmark						42403.4	42872.8			
Estonia	113144	98930	78277	69851	70463	78538.7	77462.5			
Finland	50043					73587	80144.4			
France	1435220	1519180	1515610	1538100	1535130	1485720	1510260			
Georgia										
Germany						250000	247000	NE		NE
Greece										
Hungary	154500	140650	136530	127410	127610	128500	122290	108000	107000	106000
Iceland										
Ireland										
Italy										
Kazakhstan	9123770	7828800	6662030	617602	5860110	5859670				
Kyrgyzstan										
Latvia	12465.2	11829.8	12320.7	11123	12146	9500.23	13285	NE	NE	NE
Liechtenstein							NE			
Lithuania						12719	10991.2			
Luxembourg										
Malta										
Monaco	9.473	8.921	8.345	7.422	6.737	6.181	8.29336			
Netherlands	83896.8			53575.9	72747	72237.3	71099.4			
Norway	82150.7	85662.2	89450.8	82750.2	79692.1	82127.1	79897.8			
Poland						463923	496338			
Portugal	NE	NE	NE	NE	NE	NE	NE			
Republic of Moldova										
Romania										
Russian Federation										
Serbia and Montenegro							NE			
Slovakia						52444.6	49765.9			
Slovenia							NE			
Spain										
Sweden	114865	109729	100507	95291.1	87676.3	86166.1	90550.1			
Switzerland	41976									
TFYR of Macedonia										
Turkey										
Ukraine							867478			
United Kingdom	NE	NE	NE	NE	NE	NE	NE			
United States										
European Community										

Table 6 Continued: Anthropogenic emissions of Total Suspended Matter in the ECE region (Mg TSP per year: footnotes

a 1980-2001 Re-calculations mainly because of revision of energy balance

b NFR 1A2 - without SNAP 08 08 (a), this emission are included in NFR 1A3e ii
NFR 1A4b - without SNAP 08 09, this emission are included in NFR 1A3e ii
NFR1A5a - this emission are included in NFR 1A4a
NFR1A5b - this emission are included in NFR 1A3e ii

c Emissions within EMEP area
1985-2001 Road traffic: New method for estimating the fuel balance. PM emissions: Other fuels than disel are included.

d 1980-2000 TSP: The TSP emissions are dust only

e Data include those located within the EMEP area only

f TSP: The national total TSP emissions contain transshipments of bulk goods and these emissions are listed in detail in sector 11, other sources and sinks.

g 2001 : Sector 1A4a has been included into 1A4bi because data available at the present time do not allow to separate emissions from commercial/institutionnal sectors and emissions from residential sectors. .

h Specification of emissions included in the "other" categories:
1A3e: Other mobile sources such as draglines, building cranes etc
2G: Emissions from industry not attributable to previous 2 categories
3D: Emissions from use of consumer products:
- emissions from smoking cigarettes;
- emissions from foams;
- emissions from (car)service companies

i Other:
1 A 2 Manufacturing Industries and Construction: 1 A 2 f Other
All mining, extraction and manufacturing industries (NACE 10-37) not included in 1A1. Construction.
1 A 3 Transport: 1 A 3 e Other
1 A 3 e ii includes machinery except in Agriculture / Forestry / Fishing, military and households. Snow scooters and small watercraft are included under 1 A 4 b Residential and 1 A 4 c Agriculture / Forestry / Fishing
1 B 1 Fugitive Emissions from Solid Fuels: 1 B 1 c Other
No emissions reported.
2 A MINERAL PRODUCTS: 2 A 7 Other including Non Fuel Mining & Construction
Manufacturing of other non-metallic mineral products (NACE 26) not included in 2A1-2A3: glass, plaster, clay products, rock wool. Mining, crushing plants, sand-pits. Construction.
2 B CHEMICAL INDUSTRY: 2 B 5 Other
Manufacturing of methanol, basic plastics, sulphuric acid, chlorine, explosives, soap, pigments, and paint.
2 TOTAL INDUSTRIAL PROCESSES: 2 G OTHER
No emissions reported.
3 TOTAL SOLVENT AND OTHER PRODUCT USE: 3 D OTHER including products containing HMs and POPs
In addition to other solvents this item includes mercury emissions by evaporation from products.

j 1A3aii Civil aviation(domestic,LTO) - included emissions from civil aviation (domestic,LTO) and surface operations at the airport.

k Mobile sector 1990-2000: recalculated.

Table 7: Anthropogenic emissions of Particulate Matter (1980-1994) in the ECE region (Mg PM_{10} per year)

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Armenia															
Austria[a]	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	46532.4	NE	NE	NE	NE
Azerbaijan															
Belarus															
Belgium											NE				
Bosnia and Herzegovina															
Bulgaria															
Canada															
Croatia															
Cyprus															
Czech Republic[b]															
Denmark[c]															
Estonia															
Finland															
France[d]											629930	668013	636275	605374	573635
Georgia															
Germany															
Greece															
Hungary															
Iceland															
Ireland															
Italy															
Kazakhstan															
Kyrgyzstan															
Latvia											NE	NE	NE	NE	NE
Liechtenstein											89.2				
Lithuania															
Luxembourg															
Malta															
Monaco[e]															
Netherlands[f]											89726				
Norway[g]											70240.1	64495.6	61579.6	68107.9	69127.4
Poland															
Portugal											NE	NE	NE	NE	NE
Republic of Moldova															
Romania															
Russian Federation															
Serbia and Montenegro															
Slovakia[h]															
Slovenia															
Spain															
Sweden[i]	61592.6	54032.4	58116.1	129601	137476	149127	139683	127770	120545	113967	113192	109269	104041	100319	93665.8
Switzerland											32130				
TFYR of Macedonia															
Turkey															
Ukraine															
United Kingdom	358310	342838	335759	331975	291649	329755	343468	340369	335654	321872	309177	307223	296236	283666	269234
United States															
European Community															

Table 7 Continued: Anthropogenic emissions of Particulate Matter (1995-2001, 2010, 2015, 2020) in the ECE region (Mg PM_{10} per year)

	1995	1996	1997	1998	1999	2000	2001	2010	2015	2020
Armenia										
Austria	46859.9	NE	NE	NE	48352.9	47416.1	47982.7			
Azerbaijan										
Belarus										
Belgium	NE					65434.6	65599.6			
Bosnia and Herzegovina										
Bulgaria							NE			
Canada	4663390	4629490	4672900	4673350	4640020	5121780	5197580			
Croatia										
Cyprus							574			
Czech Republic							43105.2			
Denmark						19905.2	20018.5			
Estonia	33268						NE			
Finland	30028					48240	53861.9			
France	572584	593629	574659	580548	567425	545352	550388			
Georgia										
Germany										
Greece										
Hungary	60240	53000	50830	48140	46410	47040	43360			
Iceland										
Ireland						13573				
Italy										
Kazakhstan										
Kyrgyzstan										
Latvia	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
Liechtenstein	80					73.7	53.609	51	51	51
Lithuania							637			
Luxembourg										
Malta										
Monaco							NE			
Netherlands	69792.6			43738	62971.1	62475.4	61315.7			
Norway	67635.2	70359.1	74016.8	67560.3	64696.9	65873.1	64412.6			
Poland						281885	305471			
Portugal	NE	NE	NE	NE	NE	NE	NE			
Republic of Moldova										
Romania										
Russian Federation										
Serbia and Montenegro							NE			
Slovakia						NE	NE			
Slovenia							NE			
Spain										
Sweden	91804.8	87297.8	79349.6	74266.9	66948.7	66083.8	69292.7			
Switzerland	28222					26402	23910.7	22727	22727	22727
TFYR of Macedonia										
Turkey										
Ukraine							NO			
United Kingdom	238627	233026	213469	207437	196072	177955	178485			
United States						20901300	21266069			
European Community										

Table 7 Continued: Anthropogenic emissions of Particulate Matter in the ECE region (Mg PM10 per year): footnotes

a Re-calculations mainly because of revision of energy balance

b TABLE IV 1A: National sector emissions: Main pollutants, particulate matter and heavy metals
NFR 1A2 - without SNAP 08 08 (a), this emission are included in NFR 1A3e ii
NFR 1A4b - without SNAP 08 09, this emission are included in NFR 1A3e ii
NFR1A5a - this emission are included in NFR 1A4a
NFR1A5b - this emission are included in NFR 1A3e ii

c Emissions within EMEP area.
1985-2001 Road traffic: New method for estimating the fuel balance. Other fuels than disel are included.

d Data include those located within the EMEP area only.

e 2001 : Sector 1A4a has been included into 1A4bi because data available at the present time do not allow to separate emissions from commercial/institutional sectors and emissions from residential sectors.

f Specification of emissions included in the "other" categories:
1A3e: Other mobile sources such as draglines, building cranes etc
2G: Emissions from industry not attributable to previous 2 categories
3D: Emissions from use of consumer products:
- emissions from smoking cigarettes;
- emissions from foams;
- emissions from (car)service companies

g Other:
1 A 2 Manufacturing Industries and Construction: 1 A 2 f Other
All mining, extraction and manufacturing industries (NACE 10-37) not included in 1A1. Construction.
1 A 3 Transport: 1 A 3 e Other
1 A 3 e ii includes machinery except in Agriculture / Forestry / Fishing, military and households. Snow scooters and small watercraft are included under 1 A 4 b Residential and 1 A 4 c Agriculture / Forestry / Fishing
1 B 1 Fugitive Emissions from Solid Fuels: 1 B 1 c Other
No emissions reported.
2 A MINERAL PRODUCTS: 2 A 7 Other including Non Fuel Mining & Construction
Manufacturing of other non-metallic mineral products (NACE 26) not included in 2A1-2A3: glass, plaster, clay products, rock wool. Mining, crushing plants, sand-pits. Construction.
2 B CHEMICAL INDUSTRY: 2 B 5 Other
Manufacturing of methanol, basic plastics, sulphuric acid, chlorine, explosives, soap, pigments, and paint.
2 TOTAL INDUSTRIAL PROCESSES: 2 G OTHER
No emissions reported.
3 TOTAL SOLVENT AND OTHER PRODUCT USE: 3 D OTHER including products containing HMs and POPs
In addition to other solvents this item includes mercury emissions by evaporation from products.

h 1A3aii Civil aviation(domestic,LTO) - included emissions from civil aviation (domestic,LTO) and surface operations at the airport.

i Mobile sector 1990-2000: recalculated.

Table 8: Anthropogenic emissions of Particulate Matter (1980-1994) in the ECE region (Mg $PM_{2.5}$ per year)

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Armenia															
Austria[a]	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	27576.7	NE	NE	NE	NE
Azerbaijan															
Belarus															
Belgium											NE				
Bosnia and Herzegovina															
Bulgaria															
Canada															
Croatia															
Cyprus															
Czech Republic															
Denmark[b]															
Estonia															
Finland															
France											368990	403844	381714	411667	335530
Georgia															
Germany															
Greece															
Hungary															
Iceland															
Ireland															
Italy															
Kazakhstan															
Kyrgyzstan															
Latvia											NE	NE	NE	NE	NE
Liechtenstein															
Lithuania															
Luxembourg															
Malta															
Monaco[c]															
Netherlands[d]											54283.2				
Norway[e]											58684.6	53583.7	51172.9	57204.5	59497
Poland															
Portugal											NE	NE	NE	NE	NE
Republic of Moldova															
Romania															
Russian Federation															
Serbia and Montenegro															
Slovakia[f]															
Slovenia															
Spain															
Sweden[g]	40331.5	33503.4	37601.5	100757	107934	118470	110561	100010	93482.8	86724.4	86068.9	82610.8	78133.5	75114.2	69122.4
Switzerland															
TFYR of Macedonia															
Turkey															
Ukraine															
United Kingdom	213212	205416	201772	200359	184935	199269	206113	206228	205895	197452	190369	188138	180194	169094	162983
United States															
European Community															

Table 8 Continued: Anthropogenic emissions of Particulate Matter (1995-2001, 2010, 2015, 2020) in the ECE region (Mg $PM_{2.5}$ per year)

	1995	1996	1997	1998	1999	2000	2001	2010	2015	2020
Armenia										
Austria	27514.3	NE	NE	NE	27754.3	27435.2	27778.9			
Azerbaijan										
Belarus										
Belgium	NE					35993.8	36240.9			
Bosnia and Herzegovina										
Bulgaria							NE			
Canada	924952	914740	910791	908387	912585	989259	999135			
Croatia										
Cyprus										
Czech Republic										
Denmark						13290.1	13172.8			
Estonia	13693						NE			
Finland	22016					37663	38272.4			
France	334903	347847	327134	329673	316993	299274	303110			
Georgia										
Germany										
Greece										
Hungary	27780	27940	26790	25170	20210	25720	24430			
Iceland										
Ireland										
Italy										
Kazakhstan										
Kyrgyzstan										
Latvia	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
Liechtenstein							NE			
Lithuania										
Luxembourg										
Malta										
Monaco							NE			
Netherlands	42501.7			33853.2	37439.8	37263.8	36601.6			
Norway	58527.3	60381.3	63815.3	58272.5	55576.8	56199.8	54457.6			
Poland						135317	142050			
Portugal	NE	NE	NE	NE	NE	NE	NE			
Republic of Moldova										
Romania										
Russian Federation										
Serbia and Montenegro							NE			
Slovakia						NE	NE			
Slovenia							NE			
Spain										
Sweden	67645.9	63936.9	57623.7	52495.6	45844.1	44950.4	47507.7			
Switzerland	15479									
TFYR of Macedonia										
Turkey										
Ukraine							NO			
United Kingdom	148206	145333	163940	125710	118787	108239	108351			
United States						6060620	6153844			
European Community										

Table 8 Continued: Anthropogenic emissions of Particulate Matter in the ECE region (Mg PM2.5 per year): footnotes

a Re-calculations mainly because of revision of energy balance

b Emissions within EMEP area.
1985-2001 Road traffic: New method for estimating the fuel balance. Other fuels than disel are included.

c 2001 : Sector 1A4a has been included into 1A4bi because data available at the present time do not allow to separate emissions from commercial/institutionnal sectors and emissions from residential sectors.

d Specification of emissions included in the "other" categories:
1A3e: Other mobile sources such as draglines, building cranes etc
2G: Emissions from industry not attributable to previous 2 categories
3D: Emissions from use of consumer products:
- emissions from smoking cigarettes;
- emissions from foams;
- emissions from (car)service companies

e Other:
1 A 2 Manufacturing Industries and Construction: 1 A 2 f Other
All mining, extraction and manufacturing industries (NACE 10-37) not included in 1A1. Construction.
1 A 3 Transport: 1 A 3 e Other
1 A 3 e ii includes machinery except in Agriculture / Forestry / Fishing, military and households. Snow scooters and small watercraft are included under 1 A 4 b Residential and 1 A 4 c Agriculture / Forestry / Fishing
1 B 1 Fugitive Emissions from Solid Fuels: 1 B 1 c Other
No emissions reported.
2 A MINERAL PRODUCTS: 2 A 7 Other including Non Fuel Mining & Construction
Manufacturing of other non-metallic mineral products (NACE 26) not included in 2A1-2A3: glass, plaster, clay products, rock wool. Mining, crushing plants, sand-pits. Construction.
2 B CHEMICAL INDUSTRY: 2 B 5 Other
Manufacturing of methanol, basic plastics, sulphuric acid, chlorine, explosives, soap, pigments, and paint.
2 TOTAL INDUSTRIAL PROCESSES: 2 G OTHER
No emissions reported.
3 TOTAL SOLVENT AND OTHER PRODUCT USE: 3 D OTHER including products containing HMs and POPs
In addition to other solvents this item includes mercury emissions by evaporation from products.

f 1A3aii Civil aviation(domestic,LTO) - included emissions from civil aviation (domestic,LTO) and surface operations at the airport

g Mobile sector 1990-2000: recalculated.

Table 9: Anthropogenic emissions of persistent organic pollutants in the ECE region
(Kg per year,. except for dioxins and furans which are g I-Teq per year; PAHs are Mg per year)

		ANNEX I									ANNEX II			ANNEX III							OTHER	
															PAHs							
Party	Year	Aldrin	Chlor-dan	Chlor-decone	Dieldrin	Endrin	Hepta-chlor	Hexa-bromo-biphenyl	Mirex	Toxa-phene	HCH	DDT	PCBs	Dioxins and furans	benzo(a) pyrene	benzo(b)-flour-anthene	benzo(k)-flour-anthene	Indeno (1.2.3-cd) pyrene	Total 1-4	HCB	PCP	SCCP
Austria[a]	**1980**													0					0	0		
	1981													0					0	0		
	1982													0					0	0		
	1983													0					0	0		
	1984													0					0	0		
	1985	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	187.671	NE	NE	NE	NE	28.3475	105.974	NE	NE
	1986	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	186.784	NE	NE	NE	NE	27.6365	103.5	NE	NE
	1987	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	188.624	NE	NE	NE	NE	27.5588	106.191	NE	NE
	1988	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	175.383	NE	NE	NE	NE	26.1367	99.0276	NE	NE
	1989	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	165.964	NE	NE	NE	NE	25.6995	95.1762	NE	NE
	1990	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	160.02	NE	NE	NE	NE	17.5143	91.7571	NE	NE
	1991	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	134.42	NE	NE	NE	NE	18.1347	83.9964	NE	NE
	1992	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	75.2806	NE	NE	NE	NE	13.5564	68.1712	NE	NE
	1993	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	66.7256	NE	NE	NE	NE	10.3895	63.7631	NE	NE
	1994	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	55.8894	NE	NE	NE	NE	9.51287	51.4996	NE	NE
	1995	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	58.1564	NE	NE	NE	NE	9.82836	52.8062	NE	NE
	1996	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	59.2607	NE	NE	NE	NE	10.9049	55.462	NE	NE
	1997	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	59.2664	NE	NE	NE	NE	9.49922	51.6515	NE	NE
	1998	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	55.2666	NE	NE	NE	NE	9.08084	48.5647	NE	NE
	1999	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	51.383	NE	NE	NE	NE	8.73965	45.8396	NE	NE
	2000	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	49.5866	NE	NE	NE	NE	8.16229	42.324	NE	NE
	2001	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	52.2537	NE	NE	NE	NE	8.89243	46.3583	NE	NE
Belarus	**1997**													16.4								
	1998													15.68								
	1999													15.19								
	2000													18.344								
	2001													22.49	10.23	20.325	5.515	5.667	41.721			
Belgium[b]	**1990**	0	0	0	0	0	0	0	0	0	163	0	NE	624.719	IE	IE	IE	IE	190.784	NE	0	0
	1993																		294.11			
	1994													147.566					235.174	30		
	1995	0	0	0	0	0	0	0	0	0	164.7	0.0066	0.00514	467.997	IE	IE	IE	IE	31.6178	NE	0	0
	1996										9765			108.13					184.96	21	6	
	1997										9600			122.84					187.38	25	7	
	1998										9600			122.86					187.19	25	7	
	1999													129.22					104.74			
	2000	0	0	0	0	0	0	0	0	0	167	0	0	162.682	IE	IE	IE	IE	59.0567	54.06	15.56	0
	2001	0	0	0	0	0	0	0	0	0	170	0	0	163.575	IE	IE	IE	IE	57.6827	53.94	15.04	

Table 9: Continued anthropogenic emissions of persistent organic pollutants in the ECE region
(Kg per year,. except for dioxins and furans which are g I-Teq per year; PAHs are Mg per year)

		ANNEX I									ANNEX II			ANNEX III							OTHER	
															PAHs							
Party	Year	Aldrin	Chlor-dan	Chlor-decone	Dieldrin	Endrin	Hepta-chlor	Hexa-bromo-biphenyl	Mirex	Toxa-phene	HCH	DDT	PCBs	Dioxins and furans	benzo(a) pyrene	benzo(b)-flour-anthene	benzo(k)-flour-anthene	Indeno (1.2.3-cd) pyrene	Total 1-4	HCB	PCP	SCCP
Bulgaria	**1990**												258.44	554.196					677.32	544	49.3	
	1995												382.19	456					443.43	79	10.72	
	1996												261.73	340.935					409.509	87	10.61	
	1997												226.99	309.576					364.3	47	7.54	
	1998												252.8	288.43					384.024	75.6	9.07	
	1999												247.44	245.28					286	46	6.36	
	2000												228.5	232.528					118.079	54	2.6334	
	2001	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	196.09	181.482	NE	NE	NE	NE	86.2571	24	1.785	NE
	2010												453.9	425.3					621.4	109	9.8	
	2020												483.3	394.3					678.9	101	6.8	
Croatia[c]	**1990**										9400			178.64					15.11	0.3	8500	1458970
	1996										12800			97.35					9.3	0	0	1636000
	1997										3100			95.04					9.17	0		
	1998										5000			110.77					8.59	0		
	1999										5000			97.96					7.93	0		
	2000										6983			109.04					9.07	0		
Cyprus	**1990**													772							0.7	
Czech Republic[d]	**1990**												772.9	1252					751.6			
	1991												772	1220					747			
	1992												741.3	1220					1131			
	1993												643.6	1140					1115			
	1994												629.8	1135					951.4			
	1995												622.9	1135					1357			
	1996												554.5	921.5					971.4			
	1997												447.8	830.2					657.4			
	1998												457.7	766.7					656.7			
	1999												485.4	643.2					556.6			
	2000												474.07	743.8					487.59			
	2001	0	0	0	0	0	0	0	0	0	0	0	406.561	620.414	0	0	0	0	459.987	0	0	0
Denmark[e]	**1990**	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NE	NE	1.64517	2.16484	0.721832	1.41919		NO	NO	NE
	1991	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NE	NE	1.89477	2.48486	0.813692	1.66842		NO	NO	NE
	1992	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NE	NE	1.88549	2.48728	0.829409	1.59149		NO	NO	NE
	1993	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NE	NE	2.02508	2.68445	0.893206	1.67537		NO	NO	NE
	1994	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NE	NE	1.98069	2.62712	0.880245	1.6537		NO	NO	NE
	1995	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NE	NE	1.96939	2.63452	0.893931	1.58852		NO	NO	NE
	1996	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NE	NE	2.09149	2.82753	0.963655	1.6241		NO	NO	NE
	1997	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NE	NE	2.0765	2.81075	0.96113	1.59357		NO	NO	NE

Table 9: Continued anthropogenic emissions of persistent organic pollutants in the ECE region (Kg per year,. except for dioxins and furans which are g I-Teq per year; PAHs are Mg per year)

		ANNEX I									ANNEX II			ANNEX III							OTHER	
															PAHs							
Party	Year	Aldrin	Chlor-dan	Chlor-decone	Dieldrin	Endrin	Hepta-chlor	Hexa-bromo-biphenyl	Mirex	Toxa-phene	HCH	DDT	PCBs	Dioxins and furans	benzo(a) pyrene	benzo(b)-flour-anthene	benzo(k)-flour-anthene	Indeno (1.2.3-cd) pyrene	Total 1-4	HCB	PCP	SCCP
	1998	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NE	92.34	1.84132	2.49407	0.861684	1.39302		NO	NO	NE
	1999	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NE	NE	1.84701	2.52468	0.860996	1.39609		NO	NO	NE
	2000	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NE	NE	2.37632	3.20041	1.08815	1.77177		NO	NO	NE
	2001	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NE	81.17	2.74532	3.69666	1.24224	2.04757		NO	NO	NE
Estonia	**1990**																		0.308			
	1991																		0.29			
	1992																		0.172			
	1993																		0.182			
	1994																		0.183			
	1995																		0.188			
	1996																		0.191			
	1997																		0.197			
	1998																		0.213			
	2000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA							2.963			
	2001												NE	0.09	2.07	0.02	0.01	0.01	2.11	NE		
Finland	**1990**													30					15.76			
	1991													33.2					15.33			
	1992													31.2					15.45			
	1993												5300	31.9					15.724			
	1994												1100	32.7					15.637			
	1995												15800	33.8					16.921			
	1996													31.7					15.84			
	1997													32					16.053			
	1998													32.12					16.25			
	1999													32.2					15.9			
	2000													30.69					15.16			
	2001	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NA	30.571	IE	IE	IE	IE	16.316	NA		
France[f]	**1990**	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	60.955	1859.09	NE	NE	NE	NE	309.508	1654.87	NE	NE
	1991	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	67.6738	1932.86	NE	NE	NE	NE	336.264	1674.14	NE	NE
	1992	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	66.8871	1958.46	NE	NE	NE	NE	310.228	1698.77	NE	NE
	1993	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	67.0894	2023.34	NE	NE	NE	NE	303.897	1633.13	NE	NE
	1994	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	63.8149	2014.4	NE	NE	NE	NE	279.765	1790.96	NE	NE
	1995	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	59.7048	1808.88	NE	NE	NE	NE	273.848	1788.1	NE	NE
	1996	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	60.0592	1591.92	NE	NE	NE	NE	281.333	1701.27	NE	NE
	1997	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	49.2212	1105.33	NE	NE	NE	NE	270.75	1718.34	NE	NE
	1998	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	49.3922	957.217	NE	NE	NE	NE	275.47	1699.67	NE	NE
	1999	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	45.2591	658.134	NE	NE	NE	NE	267.531	1697.61	NE	NE
	2000	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	42.6067	559.911	NE	NE	NE	NE	261.134	1800.47	NE	NE
	2001	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	42.586	467.706	NE	NE	NE	NE	266.962	1763.23	NE	NE

Table 9: Continued anthropogenic emissions of persistent organic pollutants in the ECE region (Kg per year,. except for dioxins and furans which are g I-Teq per year; PAHs are Mg per year)

		ANNEX I									ANNEX II			ANNEX III							OTHER	
															PAHs							
Party	Year	Aldrin	Chlor-dan	Chlor-decone	Dieldrin	Endrin	Hepta-chlor	Hexa-bromo-biphenyl	Mirex	Toxa-phene	HCH	DDT	PCBs	Dioxins and furans	benzo(a) pyrene	benzo(b)-flour-anthene	benzo(k)-flour-anthene	Indeno (1.2.3-cd) pyrene	Total 1-4	HCB	PCP	SCCP
Germany[g]	**1990**												43579	1196					420	86		
	1994										15000		30894						396		752	2100300
	1995													309								
Hungary	**1980**												180.63	199.362					135.157	0.620	0.0465	
	1985												169.32	207.256					155.888	0.486	0.03645	
	1990										9281		134.91	156.844					132.034	0.304	0,0228	
	1991										60		119.6	150.875					121.619	0.506	0.03795	
	1992										12		107.82	126.080					86.879	0.678	0.05085	
	1993										462		106.36	121.833					80.7	0.632	0.0474	
	1994										798		104.45	104.069					73.337	0.476	0.0357	
	1995										1650		101.11	116.480					67.623	0.66	0.0495	
	1996										2400		98.79	108.198					63.249	0.66	0.0495	
	1997										31		95.6	103.296					60.48	0.678	0.05085	
	1998										22		92.18	93.641					53.504	0.712	0.0534	
	1999												93.02	92.845					54.587	0.700	0.0525	
	2000												88.29	99.400					55.656	0.712	0.0522	
	2001													103.726					55.459	0.7058	0.0529	
	2010												79	70					47			
	2015												79	65					43			
	2020												79	57					38			
Iceland	**1990**	0																				
Kyrgyzstan	**1992**										0.04								1.824			
	1993										0.038								4.363			
	1994										4.898								0.27			
	1995																		0.129			
	1996																		0.544			
	1997										0.003								0.2			
	1998										0.003								0.202			
	1999																		0.089			
Lithuania	**1997**												12.45	5.62					71.21			
	1998												14.2	5.97					53.14			
	1999												12.69	5.03					44.49			
	2000												10.753	4.277					34.022			
	2001												14.8614	12.7468					87.0927	0.0203		
Luxembourg	**1990**													40								
	1994													23					1.1			
	1995													24					0.6			
	1996													16					0.7			
	1997													16					0.4			

Table 9: Continued anthropogenic emissions of persistent organic pollutants in the ECE region
(Kg per year,. except for dioxins and furans which are g I-Teq per year; PAHs are Mg per year)

		ANNEX I									ANNEX II			ANNEX III							OTHER	
															PAHs							
Party	Year	Aldrin	Chlor-dan	Chlor-decone	Dieldrin	Endrin	Hepta-chlor	Hexa-bromo-biphenyl	Mirex	Toxa-phene	HCH	DDT	PCBs	Dioxins and furans	benzo(a) pyrene	benzo(b)-flour-anthene	benzo(k)-flour-anthene	Indeno (1.2.3-cd) pyrene	Total 1-4	HCB	PCP	SCCP
	1998													8					0.3			
	1999																		0			
Monaco[h]	1990												0.277	2.385					0.008			
	1991												0.282	2.428					0.008			
	1992												0.31	2.675					0.009			
	1993												0.338	2.912					0.009			
	1994												0.367	3.165					0.01			
	1995												0.366	3.155					0.01			
	1996												0.392	3.376					0.011			
	1997												0.441	3.804					0.012			
	1998												0.415	3.577					0.011			
	1999												0.419	3.614					0.012			
	2000												0.433	3.736					0.012			
	2001	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.45941	3.9604	NE	NE	NE	NE	NE	NE	NE	NE
Netherlands[i]	1990	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	611.034	NE	NE	NE	NE	1759.13	NO	34000	NO
	1992	0	0	0	0	0	0	0	0	0	0	0	0.251	505					142		30000	
	1994	0	0	0	0	0	0	0	0	0	0	0	0.283	143					139	0	0	5631000
	1995	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	66.6061	NE	NE	NE	NE	925.282	NO	29000	NO
	1996										0			60.7					109	0	0	4036600
	1997										0			55.3					107	2.1	0	3533200
	1998	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	43.9678	NE	NE	NE	NE	713.221	NO	26000	+
	1999	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	28.1908	NE	NE	NE	NE	509.518	NO	25000	NO
	2000	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	30.618	NE	NE	NE	NE	636.329	NO	24000	NO
	2001	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	28.1298	NE	NE	NE	NE	614.175	NO	23350	NO
Norway[j]	1990	0	0	0	0	0	0	0	0	0		0		129.615					14.4822			
	1991	0	0	0	0	0	0	0	0	0		0		97.625					13.9085			
	1992	0	0	0	0	0	0	0	0	0	0	0		95.7197					13.2115	120		
	1993	0	0	0	0	0	0	0	0	0	0	0		95.1178					13.9007	135		
	1994	0	0	0	0	0	0	0	0	0	0	0		93.5736					13.7363	125		
	1995	0	0	0	0	0	0	0	0	0	0	0		70.2636					13.818	80	63	
	1996	0	0	0	0	0	0	0	0	0	0	0		49.4868					14.3113	50	100	766800
	1997	0	0	0	0	0	0	0	0	0	0	0		40.7967					14.2029	60	100	
	1998	0	0	0	0	0	0	0	0	0	0	0		34.7227					14.0656	50		
	1999	0	0	0	0	0	0	0	0	0	0	0		39.4317					13.0138	40		
	2000													34.0876					13.5987			
	2001													33.7128					14.8631			
Poland	1990	0	0	0	0	0	0		0	0		0	2425	529.1					159.2	62.1		
	1991												2367	535.4					174.3	38.6		

Table 9: Continued anthropogenic emissions of persistent organic pollutants in the ECE region (Kg per year,. except for dioxins and furans which are g I-Teq per year; PAHs are Mg per year)

		ANNEX I									ANNEX II			ANNEX III							OTHER	
															PAHs							
Party	Year	Aldrin	Chlor-dan	Chlor-decone	Dieldrin	Endrin	Hepta-chlor	Hexa-bromo-biphenyl	Mirex	Toxa-phene	HCH	DDT	PCBs	Dioxins and furans	benzo(a) pyrene	benzo(b)-flour-anthene	benzo(k)-flour-anthene	Indeno (1.2.3-cd) pyrene	Total 1-4	HCB	PCP	SCCP
	1992												2322	517.1					171.7	39.1		
	1993												2348	591.8					253.2	42.5		
	1994												2330	519.5					231.4	38.1		
	1995	0	0	0	0	0	0		0	0		0	2323	514.5					237.3	50.7		
	1996	0	0	0	0	0	0		0	0		0	2348	484.2					224.9	48		
	1997	0	0	0	0	0	0		0	0		0	2342	439.5					195.2	51.1		
	1998	0	0	0	0	0	0		0	0		0	2353	381.3					176.2	43.2		
	1999	0	0	0	0	0	0		0	0		0	2331	381.1					175.9	39.5		
	2000												2265	333.4					167.3	46.3		
	2001												2327	447.5					163.6	8.4		
Republic of Moldova	1990																		6.171			
	1991																		4.879			
	1992																		3.993			
	1993																		3.282			
	1994																		3.12			
	1995																		4.261			
	1996																		3.595			
	1997																		5.058			
	1998																		4.76			
	1999																		4.35			
Russian Federation[k]	1990										923			991	18.26					1.637		
	1991													947	17.3					1.637		
	1992													901	15.6					1.637		
	1993													878	15.29					1.687		
	1994													825	15.45					1.6		
	1995													769	15.28					1.3		
	1996													637	15.02					1.1		
	1997													614	14.95					0.979		
	1998													606	14.71					0.95		
	1999													625	15.32					0.98		
	2000													631	15.43					1.1		
	2010													900	20					1.7		
Slovakia[l]	1990												163.5	189.4					42			
	1995												138.1	156.9					19.4			
	1997												137.4	124.6					18.5			
	1998												138.6	138.1					16			

Table 9: Continued anthropogenic emissions of persistent organic pollutants in the ECE region
(Kg per year,. except for dioxins and furans which are g I-Teq per year; PAHs are Mg per year)

		ANNEX I									ANNEX II			ANNEX III							OTHER	
															PAHs							
Party	Year	Aldrin	Chlor-dan	Chlor-decone	Dieldrin	Endrin	Hepta-chlor	Hexa-bromo-biphenyl	Mirex	Toxa-phene	HCH	DDT	PCBs	Dioxins and furans	benzo(a) pyrene	benzo(b)-flour-anthene	benzo(k)-flour-anthene	Indeno (1.2.3-cd) pyrene	Total 1-4	HCB	PCP	SCCP
	1999												136.2	126.8					16.7			
	2000	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	129.311	144.521	6.05509	2.45613	7.21599	1.95954	17.5	NE	NE	NE
	2001	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	136.712	129.927	5.92063	2.21763	7.17605	1.79036		NE	NE	NE
Slovenia	1990												357	8.6					23.53	0	0	
	1994												265	5.67					17.99	0	0	
	1995												235	4.94					16.98	0	0	
	1996												214	4.91					17.28	0	0	
	1997												194	3.82					18.87	0	0	
	1998												184	3.53					18.18	0	0	
	1999												105	3.51					18.3	0	0	
	2000												143	2.9					22.658	0	0	
	2001	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
Spain[m]	1990	0	0	0	0	0	0	0	0	0	9204	0	0	185.52	0	0	0	0	337.088	6646.52	69.6948	0
	1991	0	0	0	0	0	0	0	0	0	9204	0	0	194.759	0	0	0	0	340.92	6204.36	70.3502	0
	1992	0	0	0	0	0	0	0	0	0	6705	0	0	205.505	0	0	0	0	326.225	5369.11	73.8925	0
	1993	0	0	0	0	0	0	0	0	0	5917	0	0	200.458	0	0	0	0	326.001	5107.82	74.5184	0
	1994	0	0	0	0	0	0	0	0	0	10650	0	0	192.186	0	0	0	0	321.496	5562.69	74.8429	0
	1995	0	0	0	0	0	0	0	0	0	9598	0	0	162.114	0	0	0	0	278.382	4894.03	76.0121	0
	1996	0	0	0	0	0	0	0	0	0	9730	0	0	159.273	0	0	0	0	281.866	5416.8	72.8303	0
	1997	0	0	0	0	0	0	0	0	0	9992	0	0	131.53	0	0	0	0	260.896	6069.63	89.0993	0
	1998	0	0	0	0	0	0	0	0	0	9992	0	0	134.281	0	0	0	0	252.319	6118.8	94.5256	0
	1999	0	0	0	0	0	0	0	0	0	9992	0	0	140.914	0	0	0	0	270.609	6072.32	96.6141	0
	2000	0	0	0	0	0	0	0	0	0	9992	0	0	145.67	0	0	0	0	297.752	6100.04	102.764	0
	2001	0	0	0	0	0	0	0	0	0	9992	0	0	142.122	0	0	0	0	302.824	6162.49	107.973	0
Sweden[n]	1980	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	194.41	NE	NE	NE	NE	7.3481	NE	NE	NE
	1981	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	107.43	NE	NE	NE	NE	0.164	NE	NE	NE
	1982	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	139.75	NE	NE	NE	NE	6.5686	NE	NE	NE
	1983	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	139.19	NE	NE	NE	NE	106.566	NE	NE	NE
	1984	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	156.62	1.85712	4.08566	NE	0.92856	107.661	NE	NE	NE
	1985	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	166.69	1.64346	3.61561	NE	0.821729	108.857	NE	NE	NE
	1986	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	148.06	1.314	2.8908	NE	0.657	103.383	NE	NE	NE
	1987	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	121.29	0.979	1.282	0.166	0.312	96.3887	NE	NE	NE
	1988	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	92.6	1.402	2.377	0.134	0.557	88.5864	NE	NE	NE
	1989	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	75.36	1.793	3.172	0.146	0.739	82.2203	NE	NE	NE
	1990	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	69.8257	1.56282	2.61335	0.156619	0.61362	38.296	NE	NE	NE
	1991	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	62.9716	1.94632	3.40368	0.166752	0.794514	37.7789	NE	NE	NE
	1992	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	54.781	1.26248	1.87189	0.171944	0.447033	33.4422	NE	NE	NE
	1993	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	57.0952	1.17031	1.67648	0.170543	0.402445	30.9958	NE	NE	NE

Table 9: Continued anthropogenic emissions of persistent organic pollutants in the ECE region (Kg per year,. except for dioxins and furans which are g I-Teq per year; PAHs are Mg per year)

		ANNEX I									ANNEX II			ANNEX III							OTHER	
															PAHs							
Party	Year	Aldrin	Chlor-dan	Chlor-decone	Dieldrin	Endrin	Hepta-chlor	Hexa-bromo-biphenyl	Mirex	Toxa-phene	HCH	DDT	PCBs	Dioxins and furans	benzo(a) pyrene	benzo(b)-flour-anthene	benzo(k)-flour-anthene	Indeno (1.2.3-cd) pyrene	Total 1-4	HCB	PCP	SCCP
	1994	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	51.7804	1.344	2.061	0.17	0.49	28.3724	NE	NE	NE
	1995	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	49.2621	1.553	2.509	0.172	0.592	28.1446	NE	NE	NE
	1996	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	47.0858	1.804	3.088	0.1766	0.784	27.7254	NE	NE	NE
	1997	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	43.8358	1.412	2.378	0.1756	0.8	23.5046	NE	NE	NE
	1998	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	43.0798	1.851	3.154	0.1756	0.751	22.2826	NE	NE	NE
	1999	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	41.6698	2.35	4.291	0.1756	1.053	39.5442	NE	NE	NE
	2000	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	44.0879	1.496	2.379	0.1816	0.62	23.5586	NE	NE	NE
	2001	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	45.2633	1.843	3.295	0.1817	1.009	27.962	NE	NE	NE
Switzerland	1990	0	0	0	0	0	0	0		0		0								0	0	
	1991	0	0	0	0	0	0	0		0		0								0	0	
	1992	0	0	0	0	0	0	0		0		0								0	0	
	1993	0	0	0	0	0	0	0		0		0								0	0	
	1994	0	0	0	0	0	0	0		0		0								0	0	
	1995	0	0	0	0	0	0	0	0	0		0								0	0	
	1996	0	0	0	0	0	0	0	0	0		0								0	0	
	1997	0	0	0	0	0	0	0	0	0		0								0	0	
	1998	0	0	0	0	0	0	0	0	0		0								0	0	
	1999	0	0	0	0	0	0	0	0	0		0								0	0	
Ukraine	1997																		2.948			
	1998																		0.77			
United Kingdom	1990	0	0	0	0	0	0	0	0	0	100013	0	7126.96	1180.99	67.2011	81.562	41.6459	33.995	224.34	1408.15	538370	47.6133
	1991	0	0	0	0	0	0	0	0	0	86189	0	6545.91	1161.03	61.621	76.1295	38.6645	32.2726	208.623	1375.09	538351	45.4336
	1992	0	0	0	0	0	0	0	0	0	74756	0	6050.8	1136.13	52.938	69.2328	34.9242	29.2018	186.232	1372.78	538350	43.2538
	1993	0	0	0	0	0	0	0	0	0	65250	0	5553.58	1089.49	33.787	55.0874	27.6919	21.2117	137.713	1178.31	529954	41.0741
	1994	0	0	0	0	0	0	0	0	0	57301	0	4990.77	1002.24	30.5366	52.1955	25.9883	19.2605	127.915	1012.93	518960	30.1393
	1995	0	0	0	0	0	0	0	0	0	50616	0	4439.52	873.677	24.2904	41.8553	20.7553	15.6516	102.489	1017.75	506214	23.9874
	1996	0	0	0	0	0	0	0	0	0	44963	0	3899.09	644.069	12.9592	17.5541	8.84621	9.39303	48.6929	992.204	493643	18.1677
	1997	0	0	0	0	0	0	0	0	0	40158	0	3404.49	471.05	11.1935	12.5483	6.27202	7.54953	37.5054	894.01	481342	12.7229
	1998	0	0	0	0	0	0	0	0	0	35926	0	2839.98	411.473	9.71255	8.23799	5.27014	5.87494	29.0383	907.532	467424	7.70389
	1999	0	0	0	0	0	0	0	0	0	33334	0	2166.4	394.603	8.61991	6.87925	4.0364	5.89581	25.3745	596.109	455703	5.82583
	2000	0	0	0	0	0	0	0	0	0	30308	0	1643.12	345.609	6.6916	5.93487	3.18872	4.27793	20.0357	594.851	449211	3.41193
	2001	0	0	0	0	0	0	0	0	0	26964	0	1561.23	341.279	7.2074	5.86893	3.11789	5.28633	21.4238	591.259	442937	0.5474
United States[o]	1990												102	2366					24745	1450		
	1996		300				83			1	235		195						18834	281		

Table 9: Continued anthropogenic emissions of persistent organic pollutants in the ECE region : footnotes

a 1985-2001 Re-calculations mainly because of revision of energy balance

b 1990 DIOX, & PAH: Referring to Flanders only.
1993 PAH: Referring to Flanders only.
1995-1998 HCH: Referring to Wallonia only.
1994 1996-1998 HCB: Referring to Wallonia only.
1996-1998 PCP: Referring to Wallonia only.
1994 DIOX: Referring to Brussels and Wallonia only.

c 1990 & 1996 SCCP includes TCM, TRI, PER, TCE
1980-1989:Data is missing because Croatia was a part of the Former Yugoslavia in this period.
1990-1998: Distributed according to SNAP90.
1999-2000:Distributed according to SNAP97

d NFR 1A2 - there are included SNAP 03 01(a), 03 03 01, 03 03 02, 03 03 03, 03 03 10, without SNAP 08 08 (a), this emission are included in NFR 1A3e ii
NFR 1A4b - without SNAP 08 09, this emission are included in NFR 1A3e ii
NFR1A5a - this emission are included in NFR 1A4a
NFR1A5b - this emission are included in NFR 1A3e ii
NFR 2C - this emission are included in NFR 1A2
NFR 6C - there are included SNAP 09 02 01, 09 02 02, 09 02 08 only

e 1990-2000 PAH S7 S8: Emissions are calculated with COPERT. Data include those located within the EMEP area only.
All other compounds:
1985-2001 Road traffic: New method for estimating the fuel balance.

f Data include those located within the EMEP area only

g PAH: Figures include only Benzo(ghi)perylene and Flouranthene
S6 SCCP: Very rough estimate
S8 POP: Emissions included in Table 3-G Road transport
S11 PCB: Rough estimation (electrical equipment)
S11 PCP: Very rough estimation (import of treated leather clothing)

h 2001 : Sector 1A4a has been included into 1A4bi because data available at the present time do not allow to separate emissions from commercial/institutional sectors and emissions from residential sectors.

i 1990, 1995, 1998-2001
Specification of emissions included in the "other" categories:
1A3e: Other mobile sources such as draglines, building cranes etc
2G: Emissions from industry not attributable to previous 2 categories
3D: Emissions from use of consumer products:
- emissions from smoking cigarettes;
- emissions from foams;
- emissions from (car)service companies

j 1996 SCCP
TRI only
1990-2001:
1 A 2 Manufacturing Industries and Construction: 1 A 2 f Other
All mining, extraction and manufacturing industries (NACE 10-37) not included in 1A1. Construction.
1 A 3 Transport: 1 A 3 e Other
1 A 3 e ii includes machinery except in Agriculture / Forestry / Fishing, military and households. Snow scooters and small watercraft are included under 1 A 4 b Residential and 1 A 4 c Agriculture / Forestry / Fishing
1 B 1 Fugitive Emissions from Solid Fuels: 1 B 1 c Other
No emissions reported.
2 A MINERAL PRODUCTS: 2 A 7 Other including Non Fuel Mining & Construction
Manufacturing of other non-metallic mineral products (NACE 26) not included in 2A1-2A3: glass, plaster, clay products, rock wool. Mining, crushing plants, sand-pits. Construction.
2 B CHEMICAL INDUSTRY: 2 B 5 Other
Manufacturing of methanol, basic plastics, sulphuric acid, chlorine, explosives, soap, pigments, and paint.
2 TOTAL INDUSTRIAL PROCESSES: 2 G OTHER
No emissions reported.

Table 9: Continued anthropogenic emissions of persistent organic pollutants in the ECE region : footnotes

3 TOTAL SOLVENT AND OTHER PRODUCT USE: 3 D OTHER including products containing HMs and POPs
In addition to other solvents this item includes mercury emissions by evaporation from products.

1990-1999:

1992-1999 HCB: Only data for sector 4:Production processes, no data for other sectors. ECE-4 is used for the PAH-data.

k All figures apply to the European part within EMEP.

l 2000 & 2001: (except for PAH total (1-4))

Other:
1 A 2 Manufacturing Industries and Construction: 1 A 2 f Other
All mining, extraction and manufacturing industries (NACE 10-37) not included in 1A1. Construction.
1 A 3 Transport: 1 A 3 e Other
1 A 3 e ii includes machinery except in Agriculture / Forestry / Fishing, military and households. Snow scooters and small watercraft are included under 1 A 4 b Residential and 1 A 4 c Agriculture / Forestry / Fishing
1 B 1 Fugitive Emissions from Solid Fuels: 1 B 1 c Other
No emissions reported.
2 A MINERAL PRODUCTS: 2 A 7 Other including Non Fuel Mining & Construction
Manufacturing of other non-metallic mineral products (NACE 26) not included in 2A1-2A3: glass, plaster, clay products, rock wool. Mining, crushing plants, sand-pits. Construction.
2 B CHEMICAL INDUSTRY: 2 B 5 Other
Manufacturing of methanol, basic plastics, sulphuric acid, chlorine, explosives, soap, pigments, and paint.
2 TOTAL INDUSTRIAL PROCESSES: 2 G OTHER
No emissions reported.
3 TOTAL SOLVENT AND OTHER PRODUCT USE: 3 D OTHER including products containing HMs and POPs
In addition to other solvents this item includes mercury emissions by evaporation from products.

m Geographical coverage of non-gridded data are for the WHOLE of the Spanish territory (including Canary Islands, Ceuta and Melilla)

n Mobile sector 1990-2000: recalculated.

o PAH: PAHs are defined as the sum of 16-PAH, which includes: Benz(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoroanthene, Benzo(k)fluoranthene, Chrysene,Dibenz(a,h)anthracene, Indeno(1,2,3-cd)pyrene, Acenaphthene, Acenaphthylene, Anthracene, Benzo(ghi)perylene, Fluoroanthene, Fluorene, Naphthalene, Phenanthrene, Pyrene

The 1990 dioxins and furan inventory was developed using methodologies applied on a national level basis. Data development for subsequent years includes application of facility-specific information and is expected to include additional sources.

DIOX :A reassessment of the dioxins and furan inventorydata and estimation methodologies is being conducted. Data developed since the 1990 inventory includes facility-specific information and is expected to include more sources.

The PCB 1996 national value reflects that reported to the US EPA Toxic Release Inventory (TRI) and is suspected to contain an error in industry reporting.

Table 10: Anthropopogenitc emissions of heavy metals in the ECE region (Mg per year)

		PRIORITY METALS			OTHER METALS					
Party	**Year**	**Lead**	**Cadium**	**Mercury**	**Arsenic**	**Chromium**	**Copper**	**Nickel**	**Selenum**	**Zinc**
Armenia[a]	**1983**	91		0.01	30					
	1984	61		0.01	95					
	1985	44		0.01	62		5			
	1986	87					5			
	1987	46			62	0.2	5	0.3		
	1988	57			66		5	0.003		0.1
	1989	22		0.03	22	5	2	0.1		
	1990	11		0.01		4	2.5	0.1		
	1991	0.82		0.01		5.97	1.6	0.24		
	1992	0.61		0.008		1.8	0.068	0.239		
	1993	0.79		0.009		1.04	0.036	0.074		
	1994	0.34		0.001		0.34	0.002	0.003		
	1995	0.334		0.001		0.101	0.001	0.009		
	1996	0.009		0.0008	0.0003	0.466	0.009	0.02		0.016
	1997	0.009				0.019	0.65	0.003		
	1998	0.01				0.008	0.005	0.007		0.001
	1999	0.0053				0.073	0.008	0.004		0.021
	2000	0				0.006	0.00043	0		0
Austria[b]	**1980**	NE	NE	NE	NE	NE	NE	NE	NE	NE
	1981	NE	NE	NE	NE	NE	NE	NE	NE	NE
	1982	NE	NE	NE	NE	NE	NE	NE	NE	NE
	1983	NE	NE	NE	NE	NE	NE	NE	NE	NE
	1984	NE	NE	NE	NE	NE	NE	NE	NE	NE
	1985	330.89	4.8861	4.32983	NE	NE	NE	NE	NE	NE
	1986	316.817	4.38156	3.89974	NE	NE	NE	NE	NE	NE
	1987	305.648	3.7593	3.32761	NE	NE	NE	NE	NE	NE
	1988	275.504	3.25216	2.83537	NE	NE	NE	NE	NE	NE
	1989	242.242	3.01148	2.59097	NE	NE	NE	NE	NE	NE
	1990	205.617	2.58752	2.50374	NE	NE	NE	NE	NE	NE
	1991	170.467	2.50422	2.39282	NE	NE	NE	NE	NE	NE
	1992	118.606	2.1812	2.03028	NE	NE	NE	NE	NE	NE
	1993	86.3397	2.20732	1.88696	NE	NE	NE	NE	NE	NE
	1994	60.8344	1.8953	1.61991	NE	NE	NE	NE	NE	NE
	1995	18.5608	1.66785	1.56601	NE	NE	NE	NE	NE	NE
	1996	18.1234	1.71265	1.51741	NE	NE	NE	NE	NE	NE
	1997	17.2003	1.73344	1.54546	NE	NE	NE	NE	NE	NE
	1998	15.6218	1.68442	1.37423	NE	NE	NE	NE	NE	NE
	1999	14.7572	1.57522	1.27034	NE	NE	NE	NE	NE	NE
	2000	13.853	1.42699	1.15116	NE	NE	NE	NE	NE	NE
	2001	14.3036	1.53223	1.16081	NE	NE	NE	NE	NE	NE
Belarus[c]	**1990**	797.63	7.59	0.48	13.15	29.24	34.98	601.89		210.48
	1995	148.35	3.48	0.265	4.48	14.1	19.11	246.36		121.66
	1996	46.34	1.2	0.297	3.66	8.68	13.89	202.74		122.26
	1997	42.2	1.25	0.31	3.07	8.27	15.1	167.05		159.28
	1998	41.24	1.45	0.392	2.96	7.91	13.64	154.28		177.87
	1999	37.52	1.42	0.38	2.64	7.19	13.19	128.92		180.11
	2000	46.121	1.378	0.358	3.33	6.295	11.778	94.43		196.486
	2001	40.674	1.78	0.522	2.112	6.538	11.659	92.535		204.662
Belgium	**1990**	535.484	7.58965	8.86276	5.57222	46.4982	35.9999	83.6548	30.8801	NE
	1991	218	3	2	1	12	6	10	0	135
	1992	230	4	3	3	11	20	9	0.1	97
	1993	230	1	1	2	22	22	11	3	86
	1994	325.44	4.4	5.82	4.63	26.82	45.69	52.64	23.46	241.59
	1995	273.803	6.08702	3.76053	5.97265	24.182	37.842	64.2886	18.2581	243.747
	1996	302.6	4.62	5.55	5.22	32.15	33.19	57.68	7.66	219.93
	1997	287.19	4.6	3.32	4.67	25.48	28.08	46.36	10.19	177.45
	1998	203.02	3.26	3.5	4.86	22.47	29.52	67.72	9.99	186.36
	1999	173.68	2.9	2.06	4.43	4.33	30.54	66.36	5.56	170.8
	2000	123.037	2.34266	2.87909	2.92671	17.6919	23.05	49.5506	3.77563	150.328
	2001	99.5735	2.21416	2.56026	3.01557	17.7271	21.4997	55.6947	4.10854	147.37
Bulgaria[d]	**1990**	435.85	28.25	13.2	0	0	0	0	0	0
	1995	297.49	12.82	6.88	0	0	0	0	0	0
	1996	278.81	14.33	4.7	0	0	0	0	0	0
	1997	231.24	14.23	4.31						
	1998	250.78	14.87	4.69	0	0	0	0	0	0
	1999	223.51	13.57	4.06						
	2000	213.359	10.987	4.186						

Table 10: Continued: Anthropopogenitc emissions of heavy metals in the ECE region (Mg per year)

		PRIORITY METALS			OTHER METALS					
Party	**Year**	**Lead**	**Cadium**	**Mercury**	**Arsenic**	**Chromium**	**Copper**	**Nickel**	**Selenum**	**Zinc**
	2001	133.257	9.8104	3.6424	NE	NE	NE	NE	NE	NE
	2010	176.7	11.9	5.8						
	2020	202.8	13.3	6.9						
Croatia[e]	**1990**	466	1.61	1.15	2.28	13	14.64	45.76	0.91	84.21
	1995	264	0.95	0.29						
	1996	268	1.04	0.3						
	1997	190	1.03	0.32	1.25	5.19	10.21	30.39	0.41	64.67
	1998	183	1.06	0.32	1.33	5.63	10.31	31.42	0.42	68.29
	1999	178	1.05	0.31	1.32	5.65	10.72	31.83	0.38	68.4
	2000	146.9	1.02	0.41	1.07	4.31	9.79	26.55	0.63	61.06
Cyprus	**1990**	81	0.2	0.3	0.6	1.6	1.2	1.7		1.8
	1991	63								
	1992	66								
	1993	69								
	1994	68								
	1995	67								
	1996	67								
	1997	72								
	1998	69								
	1999	75								
	2000	74								
	2001	58.7								
Czech Republic[f]	**1990**	269.4	4.34	7.52						
	1991	240	3.92	7.42						
	1992	247	3.61	7.28						
	1993	232	3.48	7.46						
	1994	202.5	3.52	7.17						
	1995	179.7	3.55	7.4						
	1996	165.4	2.94	5.86						
	1997	179.7	3	5.54						
	1998	169.2	2.65	5.16						
	1999	157	2.72	3.66						
	2000	107.71	2.85	3.84						
	2001	46.7003	2.60519	3.26736	3.45924	12.3785	15.7503	15.4502	8.39387	155.622
Denmark[g]	**1990**	119.85	1.12	3.09	1.45	6.44	10.12	25.64	4.21	24.15
	1991	96.3	1.23	3.25	1.94	5.62	10.52	32.26	1.41	24.64
	1992	87.28	1.21	3.09	1.75	5.24	10.26	31.42	1.27	23.62
	1993	45.84	1.13	3.07	1.71	4.9	10.24	27.62	1.22	23.86
	1994	19.92	1.37	3.1	2	5.26	10.6	38.7	1.37	23.91
	1995	16.82	0.95	2.55	1.44	3.93	9.8	25.87	2.09	24.99
	1996	15.62	0.87	2.61	1.12	4.13	9.86	24.85	3.61	25.05
	1997	7.91	0.8	2.07	0.91	3.22	9.64	22.52	3.18	20.94
	1998	7.11	0.71	1.88	0.86	2.68	9.4	18.75	2.77	20.52
	1999	6.62	0.69	1.92	0.85	2.63	9.46	15.07	2.59	20.67
	2000	6.95	0.7	1.96	0.86	2.29	9.12	13.93	1.99	21.44
	2001	6.06	0.72	1.87	0.71	2.38	9.26	12.78	1.63	23.13
Estonia	**1990**	232.5	1.612	1.292	8.1	8.2	1.7	4.4	0.2	29.3
	1991	208.4	1.493	1.183	7.7	7.9	1.7	4.2	0.2	27.5
	1992	120.9	1.118	0.98	7.2	7.795	1.648	3.9	0.2	26.77
	1993	100.4	0.885	0.75	5.6	6.195	1.241	3.1	0.1	21.47
	1994	106.7	0.937	0.798	4.8	5.078	1.033	2.651	0.1	17.64
	1995	87.56	0.899	0.751	4	3.982	0.841	2.167	0.1	16.76
	1996	80.16	0.941	0.778	4.3	4.236	2.344	2.352	0.1	16.34
	1997	73.08	0.978	0.773	3.8	3.874	2.255	2.068	0.1	14.33
	1998	54.66	0.829	0.664	3.5	3.368	2.158	1.929	0.1	13.23
	1999	45.04	0.776	0.611						
	2000	40.73	0.68	0.553	9.668	9.686	3.482	7.865	0.006	52.963
	2001	37	0.62	0.5	8.61	8.76	3.3	7.24	NA	48.77
Finland	**1990**	326.1	6.3	1.1	33.2	31.6	94.4	67	0	570.5
	1991	247.4	3.4	0.9	22.1	41.4	90.7	45.1	0	381.4
	1992	174.7	2.9	0.8	17.5	31.2	65.5	37.1	0	283.7
	1993	99.7	2.9	0.6	14.3	20.5	54.1	25.9	0	259.6
	1994	60.1	2.4	0.7	10.7	19.6	48.9	33.6	0	315.7
	1995	56.6	1.7	0.7	3.5	21.7	26.7	33.8	0	321.7
	1996	35	1.5	0.8	7.2	21.2	54.5	25.1	0	191.4
	1997	18.5	1.1	0.6	12.3	20.5	72.3	27.8	0	70.3
	1998	20.3	1.3	0.5	12.4	18.2	27.4	20.8	0	71.2

Table 10: Continued: Anthropopogenitc emissions of heavy metals in the ECE region (Mg per year)

		PRIORITY METALS			OTHER METALS					
Party	**Year**	**Lead**	**Cadium**	**Mercury**	**Arsenic**	**Chromium**	**Copper**	**Nickel**	**Selenum**	**Zinc**
	1999	14	0.6	0.4	3.6	18.5	4.1	16.9		57.7
	2000	37.5	1.4	0.6	4.6	28	18.7	33.3		70.7
	2001	37.513	1.647	0.729	5.16	26.065	19.336	32.958	NE	69.117
France[h]	**1980**	0	0	0	0	0	0	0	0	0
	1981	0	0	0	0	0	0	0	0	0
	1982	0	0	0	0	0	0	0	0	0
	1983	0	0	0	0	0	0	0	0	0
	1984	0	0	0	0	0	0	0	0	0
	1985	0	0	0	0	0	0	0	0	0
	1986	0	0	0	0	0	0	0	0	0
	1987	0	0	0	0	0	0	0	0	0
	1988	0	0	0	0	0	0	0	0	0
	1989	0	0	0	0	0	0	0	0	0
	1990	4191.56	16.9558	26.9056	24.5892	377.237	89.5003	300.893	10.9184	1949.22
	1991	2794.78	17.3422	28.1304	24.3896	320.239	92.0941	348.825	11.3498	1789.09
	1992	2019.4	16.8174	27.0839	23.8455	270.253	92.3323	292.864	11.128	1629.53
	1993	1764.98	15.8947	24.4485	19.9475	210.163	92.1945	248.739	10.2797	1428.34
	1994	1569.25	15.0886	23.6264	21.859	184.669	92.3164	239.875	10.8102	1352.81
	1995	1392.42	14.1265	22.4366	21.4679	195.126	91.077	248.617	11.3499	1301.13
	1996	1216.63	14.0285	22.1064	20.3306	199.15	91.6339	249.889	11.2628	1318.24
	1997	1067.21	12.675	17.3344	20.6205	228.228	89.0513	240.126	11.6506	1409.4
	1998	954.589	12.1768	16.9071	22.3649	234.301	88.9408	260.598	12.0934	1404.95
	1999	719.5	11.2421	15.1235	21.6751	224.818	86.6312	229.195	11.6641	1306.34
	2000	196.036	11.507	14.8716	22.1987	243.617	87.9705	220.118	11.9805	1380.75
	2001	174.692	11.1181	13.7571	21.0084	236.915	87.254	232.659	11.8339	1332.01
Germany	**1985**	5028	45	154	221	344	459	440		1900
	1990	2323	31	113	122	253	361	278	27	1323
	1995	632	11	31	32	115	79	158	25	451
	2010	294	11	24						
Greece	**1996**	470	3	13	4	10	14	101	0.2	52
Hungary	**1980**	574.43	7.49	8.71	21.68	22.25	38.72	66.94	4.93	97.64
	1985	528.94	6.78	8.34	22.45	22.41	36.71	74.13	4.78	99.96
	1990	680.48	5.52	6.28	15.94	16.42	28.07	42.48	3.39	96.59
	1991	487.559	4.699	5.826	14.522	14.828	23.798	48.959	3.191	70.826
	1992	207.654	4.034	4.991	10.225	11.787	18.345	48.717	2.807	62.017
	1993	187.1	4.14	5	10.1	12.21	18.18	57.24	2.89	67.64
	1994	155.464	4.077	4.724	9.656	11.831	16.696	54.084	2.777	46.14
	1995	126.553	3.782	4.829	8.791	10.878	15.759	50.066	2.466	48.259
	1996	99.822	3.41	4.667	8.341	10.039	14.502	42.873	2.254	45.691
	1997	89.733	3.26	4.474	7.252	9.185	14.692	46.601	2.107	44.952
	1998	82.202	3.082	4.278	6.118	7.404	14.614	45.92	1.902	39.368
	1999	38.548	2.993	4.247	6.126	7.257	15.559	43.046	1.842	39.859
	2000	36.954	2.746	4.21	5.709	6.657	15.229	37.235	1.62	40.146
	2001	50.536	3.05	4.355	6.06	8.175	17.313	38.64	1.69	82.157
	2015	30	2.7	2.6						
	2010	30	2.7	3.1						
	2020	30	2.7	2.1						
Iceland	**1990**	12.2								
	1991	8.9								
	1992	6.8								
	1993	5.3								
	1994	4.6								
	1995	3.9								
	1996	1.7								
	1997	0.4								
	1998	0.4								
Italy	**1990**	4299.8	53.786	19.975						
	1994	2173.8	29.898	13.228						
Kazakhstan	**1990**				1600		1800			
	1991				1700		1500			
	1992				1800		1100			
	1993				2100		1400			
	1994				1700		620			
	1995				3100		2670			
Kyrgyzstan	**1999**	0.005				0.169				
Latvia	**1990**	109.062	2.23264	1.03187	2.38013	10.5265	6.78466	86.0463	3.41088	64.4078
	1991	49.2117	1.53645	0.830671	1.64731	7.27528	4.57048	59.1561	2.39218	44.2703

Table 10: Continued: Anthropopogenitc emissions of heavy metals in the ECE region (Mg per year)

		PRIORITY METALS			OTHER METALS					
Party	**Year**	**Lead**	**Cadium**	**Mercury**	**Arsenic**	**Chromium**	**Copper**	**Nickel**	**Selenum**	**Zinc**
	1992	43.206	1.17617	0.535672	1.26925	5.20488	3.42501	46.7057	1.94113	29.3549
	1993	57.0376	1.07861	0.364836	1.16385	5.2744	3.77773	40.6631	0.906936	34.7137
	1994	53.1388	1.21992	0.46286	1.2968	5.89117	3.91471	46.2782	0.943402	38.1731
	1995	48.1474	0.916247	0.351913	0.96819	4.72353	3.48401	33.5879	1.06096	32.4022
	1996	36.7056	0.8793	0.402098	0.92977	4.78195	3.42638	31.3074	1.13	34.0261
	1997	30.5686	0.850619	0.310793	0.90134	6.12131	4.24854	24.3942	0.683955	52.9993
	1998	27.2686	0.805372	0.359388	0.8527	6.09881	4.20795	21.9586	0.815094	53.7981
	1999	8.73199	0.736982	0.299401	0.77981	6.02246	4.17247	18.3779	0.844089	55.0029
	2000	8.38402	0.592023	0.214789	0.62773	5.78211	4.10053	11.0534	0.636689	56.6718
	2001	8.52528	0.55875	0.141284	0.5919	5.70326	4.39907	9.37111	0.442788	57.1504
	2010	9.73839	0.605108	0.134948	0.65977	6.65089	4.87317	8.35312	0.379357	68.0736
	2015	10.3689	0.639535	0.1729	0.69749	7.16298	5.15825	8.3587	0.37949	73.668
	2020	11.5664	0.687629	0.168019	0.77572	7.73057	5.8396	8.83385	0.394267	79.5694
Lithuania	**1990**	46.7	3.8	0.018	3.4	7.4	11.7	95.6		59.1
	1991	48.8	2.8	0.016	2.1	4.6	10.5	57.4		55.2
	1992	32.4	2.5	0.011	2.1	4.6	6.8	59.9		30
	1993	28.2	2.3	0.014	2	4.4	5.7	57		13.2
	1994	33	2.1	0.013	1.9	4.3	3.7	57.8		8.9
	1995	30.2	2.1	0.153	1.7	4.2	6.8	51.6		50.1
	1996	17.8	2.2	0.159	1.7	4.5	7.5	54.4		56.9
	1997	19.5	2.2	0.232	1.5	4.1	8.3	49.4		71
	1998	21.78	2.59	0.245	1.85	5.07	9.18	62.4		78.71
	1999	19.25	2.008	0.253	1.366	3.813	7.872	46.1		72.84
	2000	15.917	1.351	0.252	0.782	2.31	6.398	26.562		61.814
	2001	14.69	1.16722	0.516321	0.8829	2.37674	3.25801	28.3437	1.20003	37.3704
Luxembourg	**1990**	77.4	0.6	0.3						
	1994	52.5	0.5	0.2						
	1995	29.8	0.4	0.1						
	1996	26.1	0.4	0.1						
	1997	17.7	0.3	0.1						
	1998	6.8	0.2	0.1						
	1999	2.34	0.054	0.286	0.082	0.373	1.205	0.79	0.015	35.466
	2000	1.61462	0.05079	0.27492	0.07902	0.34196	1.25015	0.67962	0.02365	36.6958
Monaco[i]	**1990**	2.181	0.005	0.052		0.001	0.018	0.001	0	0.01
	1991	2.256	0.005	0.053		0.001	0.019	0.001	0	0.011
	1992	2.285	0.005	0.059		0.001	0.02	0.001	0	0.012
	1993	1.917	0.006	0.064		0.001	0.025	0.001	0	0.014
	1994	1.653	0.006	0.07		0.001	0.025	0.001	0	0.015
	1995	0.624	0.006	0.069		0.001	0.024	0.001	0	0.014
	1996	0.537	0.007	0.074		0.001	0.024	0.001	0	0.014
	1997	0.481	0.008	0.084		0.001	0.024	0.001	0	0.014
	1998	0.403	0.007	0.079		0.001	0.023	0.001	0	0.014
	1999	0.364	0.007	0.08		0.001	0.025	0.001	0	0.014
	2000	0.06	0.008	0.082		0.001	0.025	0.001	0	0.015
	2001	0.063366	0.00808094	0.0871288	NE	0.000800681	0.0272232	0.00112095	0.000160136	0.0160136
Netherlands[j]	**1990**	332.56	1.95013	3.02965	1.47436	11.2154	19.4005	84.4189	0.421306	220.937
	1991	251	2.33	2.74		11.5	46.9	85.7		325
	1992	233	2.33	2.75	1.5	11.3	48.7	96.5	0.4	317
	1993	213	1.84	2.57		13.8	49.9	90.3		270
	1994	164	1.68	1.54	1.81	10.4	50.7	95.6	0.3	277
	1995	158.932	1.01132	1.0681	1.20108	8.22556	20.4616	96.3039	0.369407	143.924
	1996	106	1.83	1.04	1.29	7.51	43.4	95.6	0.541	267
	1997	72.1	1.88	0.759	1.37	6.32	47	85.1	0.332	251
	1998	43.9202	1.15276	0.559431	1.23725	5.39541	21.3608	52.5792	0.11777	100.319
	1999	44	1.15186	0.559404	1.24883	5.48614	23.0309	52.3025	0.119584	101.98
	2000	44.1249	1.15848	0.577732	1.25817	5.55793	21.2052	53.1663	0.121663	103.451
	2001	44.1562	1.16019	0.57804	1.26326	5.59706	21.4158	53.0484	0.122449	104.26
Norway[k]	**1980**	482.344								
	1981	577								
	1982	651								
	1983	559								
	1984	401								
	1985	406	1.1							
	1986	341	0							
	1987	227.836	0							
	1988	293	0							
	1989	212.305	1.2							

Table 10: Continued: Anthropopogenitc emissions of heavy metals in the ECE region (Mg per year)

		PRIORITY METALS			OTHER METALS					
Party	**Year**	**Lead**	**Cadium**	**Mercury**	**Arsenic**	**Chromium**	**Copper**	**Nickel**	**Selenum**	**Zinc**
	1990	186.023	1.64431	1.70351	3.09792	12.7973	21.8821			
	1991	142.725	1.57281	1.58252	2.99735	12.7183	19.0097			
	1992	125.785	1.56702	1.42082	2.96755	12.5952	19.2901			
	1993	85.8498	1.63717	1.12017	3.1512	12.3481	19.3026			
	1994	22.5106	1.18249	1.17094	3.55788	11.654	17.8482			108.086
	1995	20.7303	1.01173	1.08788	2.8965	11.3668	18.6477			109.2
	1996	8.89528	1.05156	1.11833	2.99901	11.4376	18.887			103.7
	1997	8.30151	1.07346	1.12959	2.82282	12.3737	19.3753			
	1998	8.30755	1.13815	1.09689	3.28516	11.8859	20.3625			
	1999	7.46087	0.977778	1.15488	3.28621	11.2872	20.5303			
	2000	6.03525	0.725489	0.996307	2.45685	8.81434	19.3292			
	2001	5.15661	0.696441	0.949836	2.16483	7.08285	19.6583			
Poland	**1990**	1371.7	91.6	33.3	82.1	154.6	599.4	370		3091.5
	1991	1335.6	85	32.7	79.8	133.5	530.4	354.8		2780.9
	1992	986	84.1	31.9	78.9	121.6	497.3	349.8		2677.5
	1993	996.9	91.9	32.5	82.4	127.8	511	352.9		2829.9
	1994	966.1	85.8	32.4	76.2	120	478.3	322.5		2623.7
	1995	936.6	82.6	32.3	73.4	118.3	464.9	312.3		2580.2
	1996	959.7	91.2	33.6	75.6	117	494.8	328.3		2749
	1997	895.8	85.8	33	71	116	475.1	364.9		2579.6
	1998	736	55.4	29.5	54.3	89.8	388.7	251.3		2191.4
	1999	745	61.7	27.1	58.8	89.8	420.9	259.8		2377.1
	2000	647.5	50.4	25.6	50.4	84.3	374.5	251.4		2173
	2001	609.8	52.5	23.2	52.6	64.1	394.3	287.3		1709
Portugal	**1990**	NE	NE	NE	NE	NE	NE	NE	NE	NE
	1991	NE	NE	NE	NE	NE	NE	NE	NE	NE
	1992	NE	NE	NE	NE	NE	NE	NE	NE	NE
	1993	NE	NE	NE	NE	NE	NE	NE	NE	NE
	1994	NE	NE	NE	NE	NE	NE	NE	NE	NE
	1995	NE	NE	NE	NE	NE	NE	NE	NE	NE
	1996	NE	NE	NE	NE	NE	NE	NE	NE	NE
	1997	NE	NE	NE	NE	NE	NE	NE	NE	NE
	1998	NE	NE	NE	NE	NE	NE	NE	NE	NE
	1999	NE	NE	NE	NE	NE	NE	NE	NE	NE
	2000	NE	NE	NE	NE	NE	NE	NE	NE	NE
	2001	NE	NE	NE	NE	NE	NE	NE	NE	NE
Republic of Moldova	**1990**	253.194	3.078	4.253	5.136	9.088	10.006	100.748	0.518	12.511
	1991	220.264	3.493	3.81	3.199	7.3	7.467	83.493	0.239	8.381
	1992	102.567	1.693	3.29	2.869	4.911	4.465	59.627	0.072	5.384
	1993	71.199	1.415	1.849	1.671	4.189	3.633	48.328	0.113	4.589
	1994	23.161	0.819	1.287	1.487	2.681	2.848	27.327	0.072	3.781
	1995	33.898	0.594	0.894	1.536	2.015	2.785	16.998	0.162	3.1
	1996	27.899	0.659	0.954	1.551	1.631	2.748	19.58	0.057	3.007
	1997	22.357	0.364	0.571	0.908	1.397	2.033	12.016	0.038	2.052
	1998	7.898	0.328	0.406	0.596	1.037	1.389	9.667	0.065	1.371
	1999	11.207	0.148	0.18	0.21	0.479	0.796	4.374	0.007	0.628
Russian Federation[l]	**1990**	3591	79.4	15.6						
	1991	3553	68.2	13.4						
	1992	3095	68.8	11.4						
	1993	3276	59	11.8						
	1994	2643	56.6	10.4						
	1995	2426	57.4	10.4						
	1996	2304	51	10.1						
	1997	2247	50.4	9.6						
	1998	2262	49	9.4						
	1999	2339	50.9	9.9						
	2000	2352	50.5	10						
	2010	550	55	14						
Serbia and Montenegro	**2001**	NE	NE	NE	NE	NE	NE	NE	NE	NE
Slovakia[m]	**1990**	151.66	9.97	12.53	154.35	79.27	103.46	80.19	7.17	112.08
	1992	148.59	11.31	6.15	85.58	70.98	79.64	67.02	9.7	92.1
	1994	84.03	7.19	3.86	46.16	12.13	52.49	36	7.38	75.59
	1995	81.14	10.57	3.95	39.48	12.62	50.88	37.81	7.78	75.39
	1996	78.39	9.62	3.41	47.44	10.51	62.98	38.64	10.36	72.68
	1997	78.67	10.82	3.74	46.97	9.85	64.63	35.68	8.67	74.81
	1998	67.17	8.47	4.1	40.44	9.68	53.98	35.17	7.41	68.09

Table 10: Continued: Anthropopogenitc emissions of heavy metals in the ECE region (Mg per year)

		PRIORITY METALS			OTHER METALS					
Party	**Year**	**Lead**	**Cadium**	**Mercury**	**Arsenic**	**Chromium**	**Copper**	**Nickel**	**Selenum**	**Zinc**
	1999	55.38	7.34	3.72	13.31	9.8	24.89	30.7	4.6	58.75
	2000	74.3425	7.24753	4.37091	11.2192	8.05893	23.6853	23.5717	7.07545	59.1896
	2001	64.7536	7.19938	3.85533	15.2525	8.07962	26.4726	27.6682	7.47575	53.6889
Slovenia	**1990**	460.2	1.68	0.76						
	1991	386								
	1992	390								
	1993	398								
	1994	405.6	1.66	0.61						
	1995	195.5	1.71	0.65						
	1996	99	1.77	0.59						
	1997	80.38	1.75	0.61						
	1998	60.47	1.67	0.63						
	1999	50.2	1.62	0.6						
	2000	37.15	1.54	0.58						
	2001	NE	NE	NE	NE	NE	NE	NE	NE	NE
Spain[n]	**1990**	2832.78	14.9229	21.4549	34.7811	38.9455	145.377	265.563	43.7422	1380.25
	1991	1918.27	15.8108	22.0254	37.8649	41.0418	158.662	283.272	46.5174	1415.62
	1992	1302.27	16.7152	22.7013	43.0818	43.5026	162.488	316.195	47.255	1451.95
	1993	1195.09	15.6343	20.7199	41.5074	40.0627	160.607	283.766	45.3741	1471.47
	1994	1180.44	16.1842	21.1357	43.7654	42.2349	163.598	300.581	50.2607	1534.34
	1995	974.587	16.7031	21.0509	43.2292	43.8431	157.831	325.36	52.7927	1556.71
	1996	971.115	15.8152	19.3813	47.016	40.7304	184.605	273.049	52.2935	1617.24
	1997	909.213	16.1781	18.7582	49.9772	42.9746	195.015	269.082	55.7278	1659.44
	1998	851.51	17.564	20.9173	52.5787	45.2218	208.763	293.13	58.9854	1822.54
	1999	799.184	19.1416	22.8016	54.2393	48.9867	218.345	329.392	61.5223	1907.18
	2000	672.492	19.7912	23.3784	57.3362	50.0765	225.479	322.573	62.9806	2024.97
	2001	583.913	23.2646	23.8257	61.9797	50.9171	231.722	312.859	68.7121	2080.56
Sweden[o]	**1980**	NE	NE	NE	NE	NE	NE	NE	NE	NE
	1981	NE	NE	NE	NE	NE	NE	NE	NE	NE
	1982	NE	NE	NE	NE	NE	NE	NE	NE	NE
	1983	NE	NE	NE	NE	NE	NE	NE	NE	NE
	1984	NE	NE	NE	NE	NE	NE	NE	NE	NE
	1985	NE	NE	NE	NE	NE	NE	NE	NE	NE
	1986	NE	NE	NE	NE	NE	NE	NE	NE	NE
	1987	NE	NE	NE	NE	NE	NE	NE	NE	NE
	1988	NE	NE	NE	NE	NE	NE	NE	NE	NE
	1989	NE	NE	NE	NE	NE	NE	NE	NE	NE
	1990	474.246	2.47078	1.56188	6.73086	22.9194	34.3186	32.4852	0.557022	178.123
	1991	397.794	2.01589	1.39551	5.71255	19.3445	32.7193	30.0571	0.630769	158.071
	1992	355.465	1.70579	1.27096	5.02811	17.1656	40.1154	30.1513	0.647328	136.408
	1993	275.699	1.65763	1.14486	3.67742	17.254	29.6573	32.1414	0.647155	137.616
	1994	45.3415	1.36923	1.1289	5.15669	15.4793	19.9844	34.4351	0.668132	136.964
	1995	23.8227	1.34172	1.12257	2.48082	12.2322	19.2086	34.2332	0.708763	126.894
	1996	21.2996	1.34532	1.11124	1.96346	10.6975	20.1246	30.3913	0.752613	121.689
	1997	20.2414	1.20804	0.919402	1.87218	8.69098	20.5102	29.1936	0.611074	111.509
	1998	18.7393	1.17368	0.881782	2.19377	7.49021	18.5564	29.3284	0.635543	109.758
	1999	17.7899	0.999077	0.888938	1.30264	6.30221	16.2368	24.4947	0.597038	99.4625
	2000	15.4394	0.927736	0.805334	1.09157	6.89745	17.0228	15.7804	0.569994	90.3573
	2001	15.2722	1.11166	0.687017	1.41225	7.23563	15.7098	22.0618	0.685421	105.701
Switzerland	**1980**	1760	6.35	7.93						1280
	1985	768	4.74	7.84						925
	1990	520	4.2	6.8						841
	1991	461	3.9	6.1						814
	1992	401	3.6	5.4						767
	1993	341	3.1	4.7						719
	1994	287	2.7	4						674
	1995	226	2.5	3.3						607
	1996	199.7	2.3	3.1						609.2
	1997	173.9	2.2	2.9						589.6
	1998	148.6	2.18	2.63						547.3
	1999	131.2	2.18	2.63						553.4
	2000	113.569	2.176	2.63						558.287
	2001	100.903	2.088	2.524						499.317
	2010	86.125	1.858	2.375						528.062
	2015	86.125	1.863	2.375						551.062
	2020	86.125	1.867	2.375						568.062

Table 10: Continued: Anthropopogenitc emissions of heavy metals in the ECE region (Mg per year)

TFYR of Macedonia	**1998**	3.02	0.167	0.048						162.74
	2000	3.02	0.167	0.048						
	2001	20.89	2.224	0.048			3.9			
Ukraine	**2001**	663.076	10.451	25.051	221.109	451.374	1024.89	237.567	14.84	2515.85
United Kingdom	**1980**	8150.72	20.5737	35.1786	97.8009	177.451	145.259	703.422	132.336	947.44
	1981	7356.43	20.044	34.016	93.1057	174.209	139.062	614.859	125.039	971.576
	1982	7457.77	20.0227	33.6324	91.8916	167.743	134.27	592.446	119.96	936.739
	1983	7574.14	19.8543	32.5972	89.987	166.572	134.923	529.791	118.734	941.731
	1984	7772.92	22.0113	30.4244	77.0614	146.174	117.116	630.822	98.6539	917.311
	1985	7172.87	20.4674	33.2903	91.639	163.041	128.783	514.62	114.904	938.679
	1986	3497.43	19.9925	32.4657	92.3873	168.593	133.279	500.571	126.349	924.213
	1987	3587.13	19.7504	31.4125	88.6938	166.554	132.789	429.774	116.534	934.67
	1988	3727.8	19.9707	32.1961	89.6647	167.082	132.927	470.525	118.949	980.826
	1989	3224.24	19.8787	31.5317	84.0645	164.06	127.852	429.102	119.136	968.878
	1990	2780.22	20.333	31.6223	80.8648	154.387	126.899	420.497	113.368	935.816
	1991	2527.12	19.9364	32.4266	83.3491	148.124	120.55	439.829	106.973	880.973
	1992	2309.17	19.6116	30.343	82.9415	149.013	115.026	443.317	110.395	893.855
	1993	2088.05	13.8279	19.9768	79.5994	142.038	108.579	430.654	104.063	889.512
	1994	1842.68	13.4055	19.472	73.5685	134.282	103.412	395.041	94.1792	887.187
	1995	1535.06	12.0041	19.0372	64.7042	111.979	87.9449	329.334	76.9624	813.283
	1996	1297.3	9.53636	14.4566	60.3873	101.638	87.0557	296.005	70.3272	714.418
	1997	1147.46	8.02538	12.155	53.1703	89.5802	65.2277	224.015	54.6783	636.379
	1998	886.492	6.55221	11.18	49.9353	83.9066	63.3917	197.81	51.5119	568.869
	1999	525.797	6.1309	8.97664	46.07	70.9858	57.4063	158.796	34.4532	428.146
	2000	192.842	7.24858	8.79333	38.0224	69.354	48.1831	125.288	28.8494	413.184
	2001	193.652	5.07425	8.8171	40.9365	74.953	42.6301	137.505	31.0212	392.956
	2010	340	12.3	12.3						
United States	**1990**	2996	180	187	394	1003		1205	504	
	1991	3781.49								
	1992	3455.05								
	1993	3548.32								
	1994	3667.83								
	1995	3577.3		146						
	1996	2383	142	170	323	953		1086	782	

Table 10: Continued: Anthropopogenitc emissions of heavy metals in the ECE region (Mg per year): footnotes

a 1999 - 2000, Pb: Road transport not included
b 1980-2001:Re-calculations mainly because of revision of energy balance
c 2000: NFR 8 emissions included in NFR 7
d 2000 S7 S8: Emissions are calculated on the base of the total quality of the used fuels by sectors
e 1980-1989: Data is missing because Croatia was a part of the Former Yugoslavia in this period.
1990-1998: Distributed according to SNAP90.
1999: Distributed according to SNAP97
f NFR 1A2 - there are included SNAP 03 01(a), 03 03 01, 03 03 02, 03 03 03, 03 03 10, 03 03 11, 03 03 12, 03 03 17, without SNAP 08 08 (a), this
emission are included in NFR 1A3e ii
NFR 1A4b - without SNAP 08 09, this emission are included in NFR 1A3e ii
NFR1A5a - this emission are included in NFR 1A4a
NFR1A5b - this emission are included in NFR 1A3e ii
NFR 2C - this emission are included in NFR 1A2
NFR 6C - there are included SNAP 09 02 01, 09 02 02, 09 02 08 only
g Data included those located within the EMEP area.
1985-2001 Road traffic: New method for estimating the fuel balance.
h Data included those located within the EMEP area
i 2001:
Table 1a: Sector 1A4a has been included into 1A4bi because data available at the present time do not allow to separate emissions from commercial/institutional sectors and emissions from residential sectors..
j 1990, 1995 & 1998-2001:
1A3e: Other mobile sources such as draglines, building cranes etc
2G: Emissions from industry not attributable to previous 2 categories
3D: Emissions from use of consumer products:
- emissions from smoking cigarettes;
- emissions from foams;
- emissions from (car)service companies
k 1990-2001
1 A 2 Manufacturing Industries and Construction: 1 A 2 f Other:
All mining, extraction and manufacturing industries (NACE 10-37) not included in 1A1. Construction.
1 A 3 Transport: 1 A 3 e Other:
1 A 3 e ii includes machinery except in Agriculture / Forestry / Fishing, military and households. Snow scooters and small watercraft are included under 1 A 4 b Residential and 1 A 4 c Agriculture / Forestry / Fishing
1 B 1 Fugitive Emissions from Solid Fuels: 1 B 1 c Other:
No emissions reported.
2 A MINERAL PRODUCTS: 2 A 7 Other including Non Fuel Mining & Construction
Manufacturing of other non-metallic mineral products (NACE 26) not included in 2A1-2A3: glass, plaster, clay products, rock wool. Mining, crushing plants, sand-pits. Construction.
2 B CHEMICAL INDUSTRY: 2 B 5 Other:
Manufacturing of methanol, basic plastics, sulphuric acid, chlorine, explosives, soap, pigments, and paint.
2 TOTAL INDUSTRIAL PROCESSES: 2 G OTHER:
No emissions reported.
3 TOTAL SOLVENT AND OTHER PRODUCT USE: 3 D OTHER including products containing HMs and POPs

In addition to other solvents this item includes mercury emissions by evaporation from products
l Figures apply to the European part within EMEP.
m 2000-2001
Main pollutants, particulate matter and heavy metals
1A3aii Civil aviation(domestic,LTO) - included emissions from civil aviation (domestic,LTO) and surface operations at the airport
n Geographical coverage of non-gridded data are for the WHOLE of the Spanish territory (including Canary Islands, Ceuta and Melilla)
o 1990-2001 Mobile sector: recalculated.

Table 11 Percentage reduction (1990-2001) of 1990 level (A negative number indicates an increase)[1]

PARTY to CLRTAP	SO_2			NO_2			NH_3			NMVOC		
	1990	2001	Reduction	1990	2001	Reduction	1990	2001	Reduction	1990	2001	Reduction
Units	Gg SO_2		%	Gg NO_2		%	Gg NH_3		%	Gg NMVOC		%
Signatories to the Gothenburg Protocol (as of 3 January 2003)												
Armenia	72	4	94	46	13	71				81	28	65
Austria	79	37	53	204	199	2	52	54	-3	345	232	33
Belgium	362	162	55	334	317	5				274	252	8
Bulgaria	2008	846	58	361	164	55	144	54	62			
Canada[2]	3210	2488	22	2982	2792	6				2997	2476	17
Canada SOMA	1872	1196	36									
Czech Republic	1881	251	87	544	332	39	156	77	51	441	220	50
Denmark	180	25	86	277	204	26	133	102	23	162	124	24
Finland	260	85	67	300	222	26	38	33	13	224	157	30
France	1323	610	54	1897	1411	26	779	779	0.025	2473	1674	32
Germany	5322	650	88	2728	1592	42	736	607	18	3220	1606	50
Greece	493	485	2	290	331	-14				255	268	-5
Hungary	1010	400	60	238	185	22	124	66.3	47	205	166	19
Italy										2041	1464	28
Latvia	95	13	86	80	42	48	44	12.35	72	143	81	43
Liechtenstein	0.113	0.051	55	0.525	0.3032	42	0.205	0.176	14	0.988	0.638	35
Netherlands	202	89	56	570	410	28	232	148	36	492	271	45
Norway	52	25	52	224	221	1	23	25	-9	294	376	-28
Poland	3210	1564	51	1280	805	37	508	309	39	831	576	31
Portugal	288	301	-5	286	397	-39	112	108	4	390	492	-26
Slovakia	542	129	76	215	106	51	63	28	55	262	90	66
Spain	2182	1425	35	1270	1404	-10	330	383	-16	1633	1533	6
Sweden	106	57	46	334	248	26	54	54	0.852	498	303	39
Switzerland	42	21	50	154	92	40	72	68	6	279	147	47
Ukraine	2783	1844	34	1097	1091	1	729	378	48	1369	269	80
United Kingdom	3719	1125	70	2759	1680	39	341	290	15	2425	1336	45
United States[2]	21478	14325	33	23161	20275	12	3925	4532	-15	18421	15408	16
NON Signatories to the Gothenburg Protocol (as of 3 January 2003)												
Belarus	637	151	76	285	135	53				533	215.4	60
Cyprus	46	48	-5	18	18	-0.389						
Estonia	252	92	64	68	38	44	24	9	63	88	33	62
Lithuania	222	49	78	158	55	65	84	50	40	108	71	35
Monaco[3]	0.063	0.065	-3	0.53	1	-35	0.001	0.006	-510	0.702	0.507	28
Serbia and Montenegro	508	394	22	66	51	23						

[1] Only Parties reporting emissions including main sources both for 1990 and 2001 for at least one component are listed here

[2] Special notes for NH3 and NMVOC are stated in the Gothenburg protocol

[3] The NH3 reduction (increase) is not included in the NH3 reduction histogram

Appendix B: Short presentation of the RepDab

REPDAB

REPDAB is available on: *http://webdab.emep.int/repdab.html*

INTRODUCTION TO REPDAB:

REPDAB is an electronic tool to check the *format, completeness and internal consistency* of submissions of non-gridded emission data submitted to the secretariat of the Convention on Long-range Transboundary Air Pollution (CLRTAP) and submitted to the European Commission (ETC-ACC/EC) under the National Emissions Ceilings (NEC) directive. REPDAB is intended to assist Parties in their reporting of emissions to the Convention on LRTAP. It is also intended to ensure that the data submitted is in the correct format, complete, and free from internal inconsistencies.

In this first trial version of REPDAB, format and completeness checks are performed for national and sector emission data and for activity data information as specified in the revised Guidelines for Estimating and Reporting Emissions Data (EB.AIR/GE.1/2002/7 and Corrigendum 1). For gridded emission data, only file formats are currently checked. The recommended formats for submission of air pollution emission data can found on the *EMEP web site* in downloadable *templates*. The template files are protected to allow insertion of data only in required fields. Though it is technically possible to override this protection, this is strongly discouraged because REPDAB will fail to read files with additional columns or rows.

HOW TO USE REPDAB:

- Prepare your submission report as a ZIP or EXCEL file using the requested templates;
- Type in the e-mail address where you want the output file from REPDAB (REPDAB Report) to be sent;
- Type in the file name of the ZIP or EXCEL file you want to check/process or select the file through the Browse button;
- Click on the "Send File" button;
- After approximately 15 minutes you should receive a REPDAB Report in your e-mail inbox.

HOW REPDAB WORKS:

The file you enter into REPDAB will be tested at a number of different levels. A colour code is assigned to indicate problems with: *the format (red), completeness (blue) and internal inconsistency (yellow),* as indicated in brackets after each test described below.

Test 0: Unpack ZIP File

Test 0.1: This test checks the zip-file for viruses and unzips it.
Test 0.2: This test is applied to all tables (1A, 1B, 2A, 2B, 2C, 2D, 2E, 3A, 3B, 3C). Aborts on failure.

Test 1: Format check (Red)

Test 1.1: File Type test. The files must be in Excel. The file might include more than one worksheet.
Test 1.2: File Name test. This test checks that the official table-name and correct version are used in the first two fields.
Test 1.3: Year and Country check. This test checks for the existence of the "Year" and the ISO2 country code in the table. For table 2A (projections for 2010, 2015, and 2020), the reporting year is used as a dummy for "Year".
Test 1.4: Number of columns and rows test. The tables must be exactly the same as in the template file (do not override the protection!). For Tables 3A, 3B, 3C, only the explanatory rows are checked, since these tables can have arbitrary numbers of rows.
Test 1.5: Number Check. Cells cannot contain values which are not a number, and not one of the following codes: NE, NA, NO, IE, C.
Test 1.6: Number Check. Longitude, latitude and height must be one number for each row in table 3C (Large Point Sources).

These 5 tests are done for all tables. If a table fails to pass sub-tests other than Test 1.3, REPDAB is aborted and no further testing is performed. REPDAB will continue testing even if the file fails Test 1.3.

Test 2: Internal Consistency Check (Yellow)

In accordance with the revised Guidelines for Estimating and Reporting Emissions Data (EB.AIR/GE.1/2002/7 and Corr.1), Parties may report aggregated levels or detailed levels. This test consists of the following steps:
Test 2.1: Conversion of code names in cells:
NE, C => not reported, incomplete
NO, NA, IE => 0
Test 2.2: Sums up detailed levels, if all detailed levels are reported.
Test 2.3: Internal consistency check:

- Adds detailed sums as aggregation, if aggregated level not reported.
- Compares detailed sums and aggregated levels including national totals. Differences of 0.1% of detailed sums are allowed between detailed sums and aggregated level.

This test applies only to Tables 1A and 1B. Continues on failure.

Test 3: Completeness Check (Blue)

Test 3.1: Checks if table exists and that there are at least some entries in table cells. This test applies to all tables. Aborts on failure.

Test 3.2: Tests for each table required entries and determines completeness. (Blue) This test is applied to Tables 1A, 1B, 2A, 2B, 2C, 2D, 2E. If all aggregated values for Tables 1A, 1B, 2D and 2E exist, these tables are defined as complete. For Tables 2A, 2B, 2C, there must be entries in all the applicable cells in order for the table to be defined as complete. Aborts on failure.

REPDAB REPORT DESCRIPTION*:*

- At the top of the REPDAB Report, you will see which file you have processed, the processing date, followed by a colour-coded overview of the results of the REPDAB tests. The vertical axis of the table lists non-empty reporting tables that passed Tests 1.1 and 1.2; the horizontal axis lists all the years 19xx-latest year plus reporting year (for Table 2A) processed. If the emission year was not found on the file, "Year1?", "Year2?", etc. will appear.
- Thereafter, information is given on: file(s) that were not in the correct format and/or file(s) that were empty.
- Finally, you will be given additional information on: format, completeness and internal consistency of the file(s), with scroll-down tables containing explanations per table and per year on the reason(s) the table did not pass one or more REPDAB tests. The results of the format check are given first, followed by the results of the completeness and internal consistency checks.
- When you have corrected your file(s) according to the feedback from REPDAB, all Tables (1A-B, 2A-E and 3A-C) should appear in green in the overview table.

EXAMPLE OF REPDAB REPORT

Repdab Report on file: testall.zip

Date: 20.12.2002

Overview

Colour Codes
Table passed all RepDab tests
Table is incomplete
Table contains inconsistent data
Table is not in the correct format

	1993	1995	1998	1999	2000	2001	2002
Table1A							
Table1B							
Table2A							
Table2B							
Table2C							
Table2D							
Table2E							
Table3A							
Table3B							
Table3C							

Additional Files, Covering Notes
The following files are not EXCEL-files:

- Covernote.doc

Excel Files with Unreadable Format
The following EXCEL-Files are not readable by Repdab:

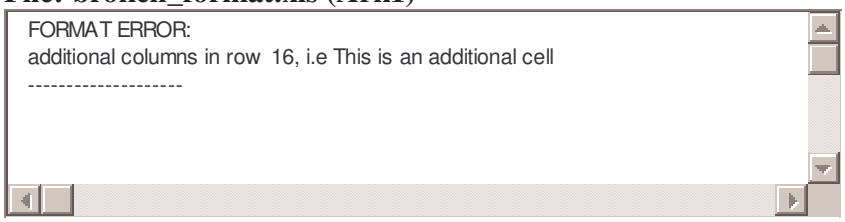
- broken_format.xls (Ark1)
- table2bempty.xls (Sheet2)
- table2bempty.xls (Sheet3)

Empty Tables
The following Tables contain no data at all:

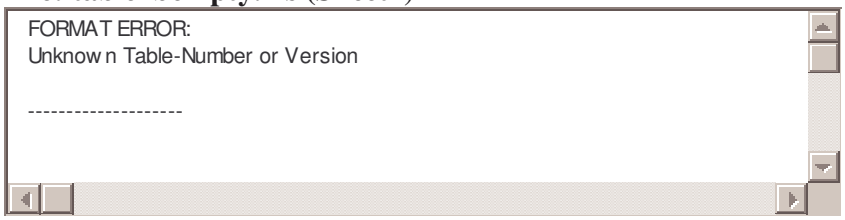
- table2bempty.xls (Sheet1)

Detailed information on format, completeness and internal consistency

File: broken_format.xls (Ark1)



File: table2bempty.xls (Sheet2)



File: table2bempty.xls (Sheet3)

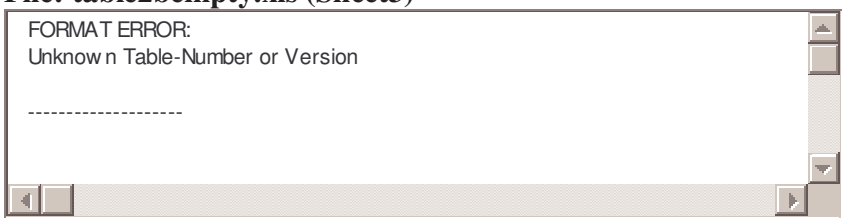


Table1A - 2000: test1a.xls (Sheet1)

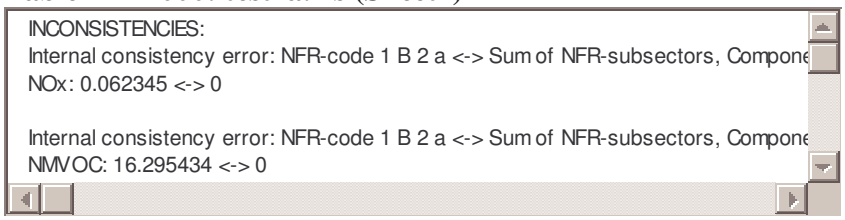


Table1B - 1999: test1b.xls (Sheet1)

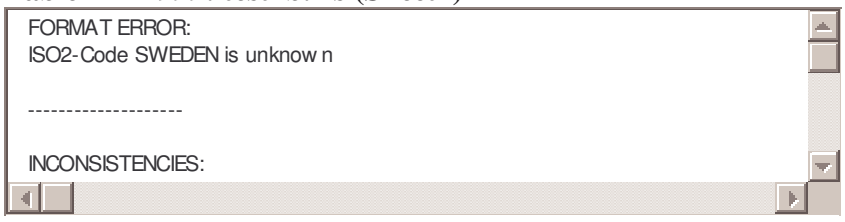


Table2A - 2002: test2a.xls (Ark1)

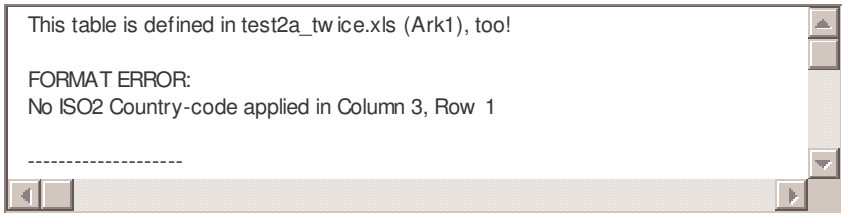


Table2B - 1993: test2b.xls (Ark1)

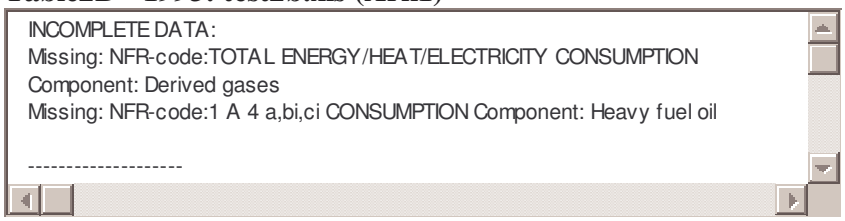


Table2C - 1995: test2c.xls (Ark1)

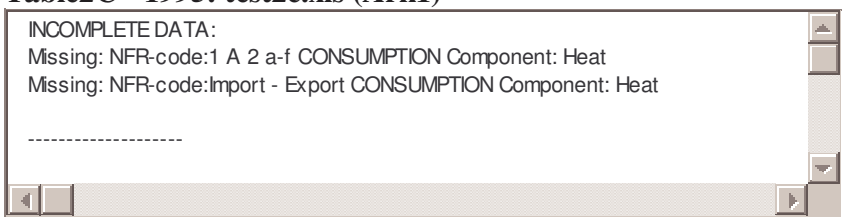


Table2D - 2001: test2d.xls (Ark1)

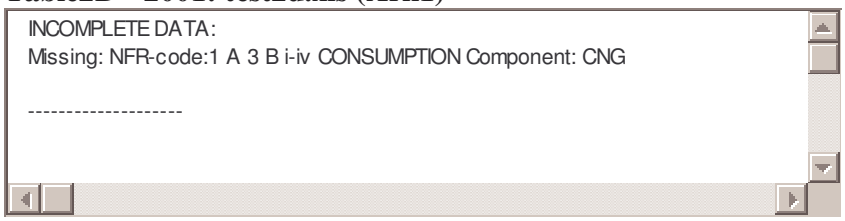


Table3A - 2001: test3a.xls (Sheet1)

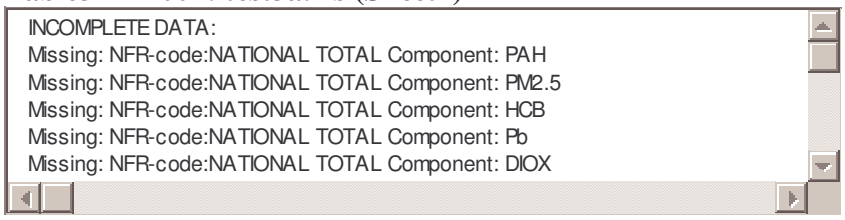
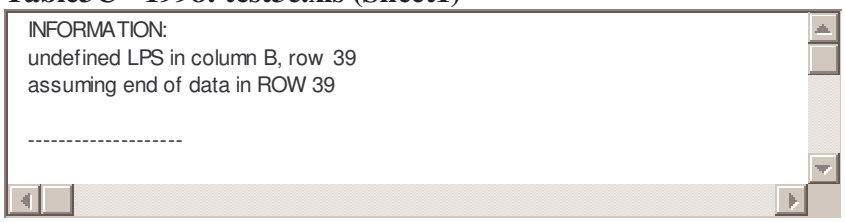


Table3C - 1998: test3c.xls (Sheet1)



FUTURE DEVELOPMENT OF REPDAB:

1. Aggregation test on Table 2B, 2C, 2D, 2E: Technical implementation is difficult, due to sums of unknown values (grey fields exist in the template). Solution: adding a tag to next year's formats in the grey fields (i.e. NA) to simplify parsing.
2. Completeness-tests of grids: Test grids against countries' area of emissions (which might be bigger than the land area). Map of area of emissions needed.
3. Table of inter-comparison tests:
    a. National Totals (From Tables1A and 1B) = grid sums (3A)
    b. Aggregated Sectors (From Tables1A and 1B) = sector grid sums (3B)
    c. Total grid (3A) = sum of sectors per grid (3B)
    d. Sum of aggregated sectors per grid cell (3B)=emission per grid cell (3A)

Historical Information on Changes and Updates in Repdab
14.04.2003
Due to a bug in the implementation of WEBDAB, test 1.5 has been marked as blue (Inconsistency) instead of red (Format error). This is now fixed. In addition, checks of longitude, latitude and height of Large Point Sources are now included for Table3C as test 1.6.

Appendix C: Sector distribution of LPS data – the FS factor

In order to make use of the LPS data from GENEMIS in combination with the reported gridded total emissions, a small study on reported LPS data was carried out.

1. LPS emissions of total emissions

Based on Large Point Source (LPS) data officially reported by Bulgaria, Czech Republic, Denmark, Ireland, Netherlands, Spain and United Kingdom for year 2000 in 2002, the share of LPS emissions in the total emission was estimated.

Total LPS emissions in percent of the total emissions reported, exceeded 10 percent for two of the compounds included in the EMEP Unified model, namely SO_2 and NO_x. The percentage LPS contribution to total emissions for SO_2 varies between 52 to 92 percent, with an average of 72 percent. For NO_x the corresponding contribution varies between 17 and 43 percent, with an average of 29 percent (Table 1).

This result corresponds well with the results found in EEA, 1996, CORINAIR 90; Summary report no. 3, Large Point sources, and the report The worst and the best, Atmospheric emissions from Large Point Sources in Europe, Mark Barrett, 2000 (Table 1).

Table1. Average European LSP emissions in percent of total emissions for SO_2 and NO_x for three different emission years (1990, 1997, 2000).

Reference	SO_2	NO_x
EMEP, 2000	72	29
Barrett, 1997	74	27
CORINAIR, 1990	68	27

The results shown in Table 1 clearly demonstrate that the percentage contribution of LPS emissions to total emissions is large, particularly for SO_2, 72%, but also for NO_x, 29%, and has remained nearly constant in the ten year time period 1990-2000.

2. Sector distribution of LPS emissions

The sector distribution of LPS emissions for SO_2 and NO_x varied between Parties that officially submitted LSP data in 2002. An average of 84 percent of SO_2 emissions from LPS comes from "Combustion in energy and transformation industries" (Sector 1). The contribution is relatively constant between countries, but varies between 78 (United Kingdom) and 93 (Spain) percent between the six countries studied. 12 percent of SO_2 emissions from LPS come from "Combustion in manufacturing industries" (Sector 3), with a variation from 9 (Bulgaria) to 20 (Czech Republic) percent. 4 percent comes from sector 4, "Production processes", with a variation between 0 (Czech Republic and Ireland) and 12 percent (United Kingdom).

In the case of NO_x, an average of 73 percent of the LPS comes from "Combustion in energy and transformation industries" (Sector 1). The contribution varies from 59 (Netherlands) to 90 (Spain) percent between the six countries studied. 18 percent of the LPS emission comes from sector 3, "Combustion in manufacturing industries", with a variation between 5 (Spain) and 41 (Netherlands) percent. Sector 4, "Production processes", contributes 6 percent, with a variation between 0 (Czech Republic, Ireland and Netherlands) and 24 (Bulgaria) percent.

No clear differences in the sector distribution of LPS emissions between East and West Europe could be seen from this study.

In the CORINAIR 1990 summary report 3, LPS data from 29 countries all over Europe were analysed. It was found that 75% of the SO_2 European emissions from LPS came from S1 and 17% from S3, while the corresponding figures for NO_x was 72 and 20%. Barrett gives 86% SO_2 in S1 and 14% in S3 (Table 2).

Table 2. LPS emissions per sector as percent of total LPS emissions

Reference	SO_2				NO_x			
Sector	1	3	4	Volcanoes	1	3	4	Other
EMEP, 2000	84	12	4	-	76	18	6	1
Barrett, 1997	86	14	-	-	-	-	-	-
CORINAIR, 1990	75	17	4	4	72	20	5	3

The part of SO_2 emissions from LPS in Sector 1 seems to have increase from 1990 to 2000. On the other hand, natural emissions from Volcanoes are included in the CORINAIR total European LPS, and this is the most likely reason for the lower percentage contribution in S1. The results for SO_2 in this study and the study from Barrett are almost identical. According to this study and the CORINAIR study, the percentage sector distribution of LPS NO_x emissions have remained relatively constant between 1990 and 2000.

3. LPS fraction of total emission per sector

The next step was to split the emissions per sector in LPS and area sources. The split between area and large point sources was worked out based on reported data from four countries that had provided both LPS and gridded sector data. The result of this study is presented in Table 3. The four countries included in the study were Denmark, Netherlands, Spain and United Kingdom. Gridded sector data was available for year 2000 for all the countries, while LPS data was only available for 1999 for Netherlands and United Kingdom. This is the reason why the Netherlands has a fraction larger than 1 for SO_2.

The study concludes that in average all SO_2 emissions in Sector 1, "Combustion in energy and transformation industries", come from large point sources. The LPS fraction

of this sector in the case of NO_x emissions varies more between countries (0.7-0.98). Average fraction of LPS of total Sector 1 emissions is 0.84.

In Sector 4, "Production processes", all countries except the Netherlands report a large fraction, about 100 percent of both the SO_2 and NO_x emissions from LPS. In Sector 3, "Combustion in manufacturing industries", the fraction varies considerably between countries (0.1 – 1) for both compounds. The average fraction for SO_2 is 0.52, while the average fraction for NO_x is 0.57. Since the split between area and LPS emissions vary considerably in this sector, the recommendation was to use a simple 50/50 split, to reflect the large uncertainty when applying this factor.

Table 3. Fraction of LPS of total emission per sector.

	SPAIN		DENMARK		NETHERLANDS		UNITED KINGDOM (Area)	
Sector	SO2 LPS fraction	NOx LPS fraction	SO2 LPS fraction	NOx LPS fraction	SO2 LPS fraction	NOx LPS fraction	SO2 LPS fraction	NOx LPS fraction
1	1.00	0.98	0.93	0.78	1.07	0.70	0.99	0.88
3	0.10	0.10	0.19	0.69	0.81	0.64	0.99	0.86
4	0.91	0.77	1.00	1.00	0.41	0.19	1.00	1.00

Based on the analysis above, the FS (Fraction LPS emissions per Sector of total emission (LPS plus area emissions) operator was invented. All emissions in sector 1 and 4 and half of emissions in sector 3 was assumed to come from LPS. Emissions from other sectors were considered area sources. The implication is that emissions for all compounds is distributed horizontally according to the position of the LPS' in combination with the gridded totals or population data, and by sector according to the FS factor and the national sector data in the EMEP-MODINP.