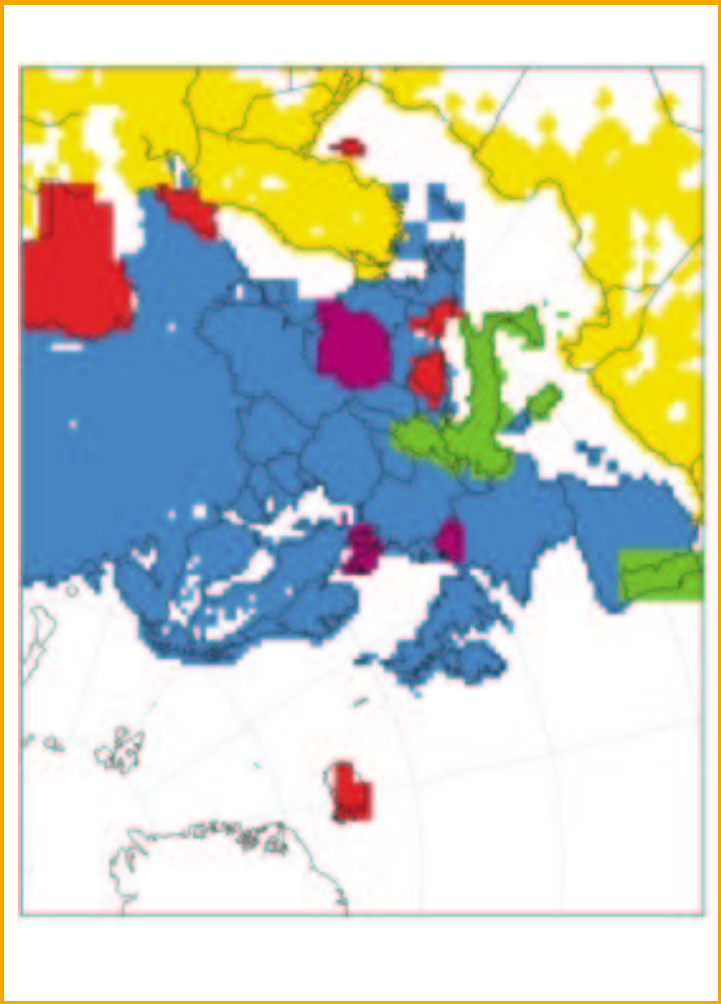
EMEP MSC-W Note 1/01

Date: July 2001

emep

Co-operative programme for monitoring and evaluation of the long range transmission of air pollutants in Europe

Emission data reported to UNECE/EMEP: Evaluation of the spatial distribution of emissions



MSC-W Status Report 2001

Vigdis Vestreng

msc-w

Meteorological Synthesizing Centre - West

Norwegian Meteorological Institute

P.O. Box 43- Blindern, N-0313 Oslo, Norway

EMEP/MSC-W Note 1/2001
Date: July 2001

DET NORSKE METEOROLOGISKE INSTITUTT
Norwegian Meteorological Institute

Research Note no. 56

EMISSION DATA REPORTED TO UNECE/EMEP: EVALUATION OF THE SPATIAL DISTRIBUTION OF EMISSIONS

MSC-W Status Report 2001

by

Vigdis Vestreng

ISSN 0332-9879

Preface & Acknowledgements

This note was prepared to be presented at the twenty-fifth session of the Steering Body to EMEP (Co-operative Programme for Monitoring and Evaluation of the Long-Range Transmission of Air Pollutants in Europe). It presents an overview of the UNECE (United Nations Economic Commission for Europe) /EMEP emission data held at and managed by the Meteorological Synthesizing Centre-West (MSC-W) of EMEP. The note also includes an evaluation of the spatial distribution of emissions.

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. Without them this report would not have been possible.

The author would also like to thank Bjørnar Heide Knudsen for technical support, and Jan Eiof Jonson and Leonor Tarrasón for their contributions to Chapter 4 of this report.

CONTENTS

Preface& Acknowledgements
Contents

1. Introduction 5

2. Official Submissions to the UNECE/EMEP.....5

2.1 Emission Reporting Progress 6
2.2 Overview of data in UNECE/EMEP database..... 8
2.3 Quality Assessment 8

3. Emission Data for the Modelling Assessments at the MSC-W 9

3.1 National and Regional Total Emissions 10
3.2 Source Sector Emissions in the EMEP Area 11
3.3 Temporal and Spatial Distribution of Emissions 17
3.4 Origin and vintage maps of gridded data 20

4. Evaluation of spatial distribution of emissions 23

4.1 Introduction 23
4.2 Emission distribution differences 24
4.3 Effect of emission distribution in calculated ozone levels 24
4.4 Effect of emission level differences in calculated ozone concentrations ... 32
4.5 Comparison of calculated ozone concentrations with measurements..... 34

5. Emission trends and reductions 36

5.1 Emission trends in the EMEP area 36
5.2 Detection of National Emission Reductions 39

6. Summary 42

.

References 43

ANNEX I Official National Anthropogenic Emission Totals, Overviews & Emission Reductions 44

1. Introduction

The emission data held at the MSC-W comprise official national emissions (anthropogenic and natural), estimates of land-based emissions over regions within the EMEP modelling area, marine exhaust emissions and biogenic releases over sea and land. Official national emissions reported every year to the UNECE Secretariat by the Parties to the Convention on Long-Range Transboundary Air Pollution (CLRTAP) are stored and managed in a database system developed at MSC-W. An updated selection of the EMEP emission data, including sector data, is available on the Internet (EMEP web site: *http//www.emep.int)*.

To this date the number of Parties to the Convention are 48: 43 European countries, Canada, Kazakstan, Kyrgyzstan, the United States of America and the European Community. Kazakstan and Kyrgyzstan ratified the CLRTAP 11.01.2001 and 25.05.2000 respectively. All references to Belarus, Bulgaria, Croatia, Cyprus, Ireland, Latvia, Moldova, Slovakia and Slovenia refer to the respective Republics of those names. United States refer to United States of America, Yugoslavia refers to the Federal Republic of Yugoslavia and the FYR of Macedonia refers to the Former Yugoslav Republic of Macedonia.

All the emission data reported to the UNECE by the Parties are quality controlled by MSC-W before loaded into the database. MSC-W has during 2001 focused on improving the content of the database by checking and loading in particular gridded data reported to UNECE. Next year, Parties will be requested to report gridded data for year 2000 emissions, and review gridded data from previous years. We hope that the revision of the gridded data reported here will be useful to the Parties in their reporting of 2000 emission data .

In the following, a summary of the current state of the EMEP emission database is given. Officially reported data as received by the middle of June 2001 is presented first (Chapter 2), followed by a description of the data used in the MSC-W model calculations (Chapter 3). Chapter 4 presents an evaluation of spatial distribution of emissions and analyses the consequences for ozone levels, and emission trends and reductions are discussed in Chapter 5. The section on official submissions includes sulphur oxides (reported as SO_2), nitrogen oxides (reported as NO_2), ammonia (NH_3), non-methane volatile organic compounds (NMVOC), carbon monoxide (CO), carbon dioxide (CO_2), methane (CH_4), heavy metals (HMs) and persistent organic pollutants (POPs). In the section on modelling, discussion concentrates on releases of compounds affecting acidification, eutrophication, ground based ozone and particles. Emissions data for these pollutants are used in the dispersion modelling which is the responsibility of the MSC-W.

2. Official Submissions to UNECE/EMEP

This section is divided into three parts. The first part summarises the progress in reporting over the last four years, the second part gives an overview of all major types of data submitted so far, while the third part summarizes the quality assessment carried out at EMEP/MSC-W. Official information on the present state of emission data can also be found in UNECE note EB.AIR/GE.1/2001/7. Official submissions analysed here are in regard to the procedure outlined in EB.AIR/GE.1/1997/5. Parties should be made aware that draft Guidelines for Estimating and Reporting Emission Data to the UNECE now has been finalized, and is to be discussed for adoption in the twenty-fifth session of the Steering Body in September 2001 (EB.AIR/GE.1/2001/6 and EB.AIR/GE.1/2001/6/Add1).

2.1 Emission Reporting Progress

38 of 48 Parties to the Convention (79%) have submitted emission data in 2001. All Parties, except two, submitted some of their data in electronic format.

Regarding the timeliness of submissions, 33% of the Parties submitted some data within deadline the 31st December 2000 (Figure 2.1). This is an increase of about 10% relative to the previous reporting. The increased timeliness is probably a positive effect of the work performed at MSC-W preparing country specific prefilled tables that were sent out 17th November 2000, together with a letter requesting emission data from the UNECE Secretariat. On the other hand, the model runs and other assessment work performed at MSC-W normally starts 1th March, and only 60% of the Parties had by then provided data. The latest reports were submitted in the end of May, five months after the deadline. It seems difficult for many of the Parties to submit their data within the established deadline. This has been taken into account in the new draft Guidelines for Estimating and Reporting Emission Data, where the deadline for submissions to UNECE has been changed from 31st December to 31st January. Submissions from Parties not respecting this deadline will not be included in the work under the Convention for that year.

This year's reporting included 1999 data, updates for previous years and projections for 2010. As figures 2.2-2.4 illustrate; except for a considerable increase in reporting of POPs (Figure 2.4), reporting remained relatively constant with respect to the previous year. For the traditional pollutants, national total and sector data for 1999 have been reported by approximately 63% of the Parties. Reporting of SO_2 and NO_x is higher than the average, namely 69%. The corresponding figures for Heavy Metals (HM) and Persistent Organic Pollutants (POPs) are 54% and 44%. Only four of the Parties reported sector data at SNAP (Selected Nomenclature for Air Pollution) level 2 and data on production and use of POPs (not shown).
Reporting on the methodology followed by the Parties to estimate emissions is an important means for determining the comparability of the reported data, an issue being highly prioritised. An increased reporting of methodology differing from the recommendations from the EMEP/CORINAIR Guidebook is therefore highly appreciated.

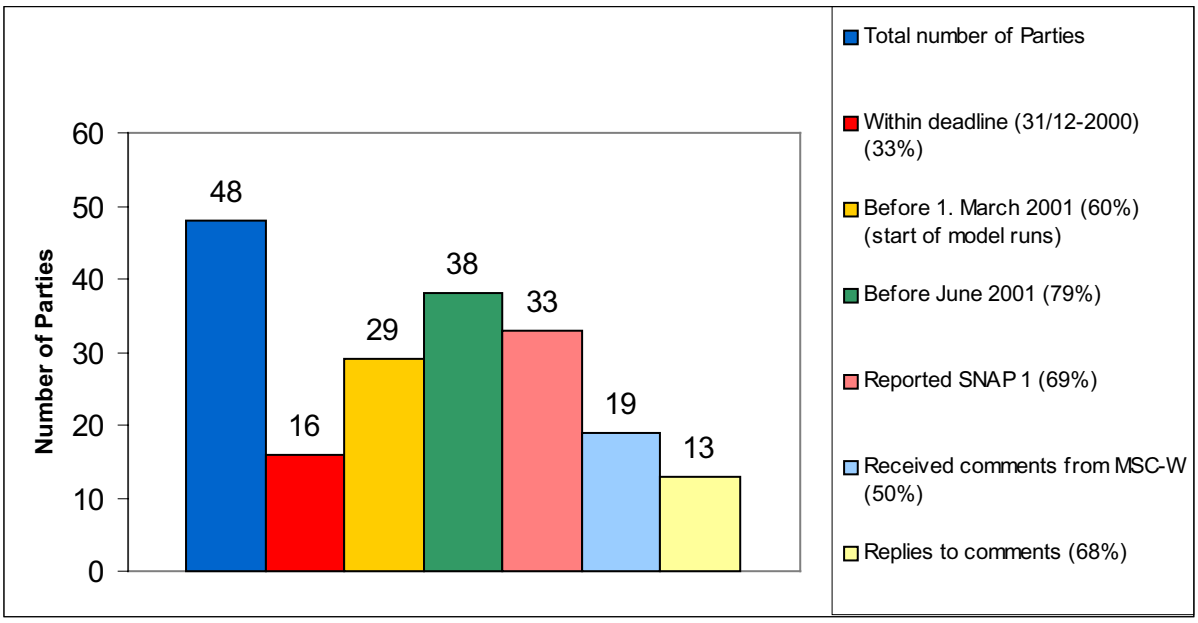


Figure 2. 1 Timeliness of reporting and Quality assessment statistics

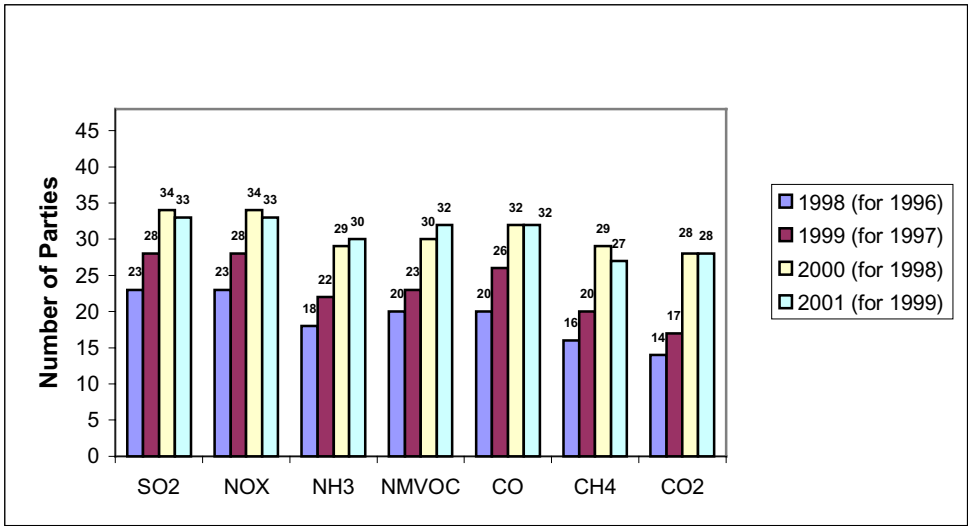


Figure 2. 2 Official submissions of national emission totals.

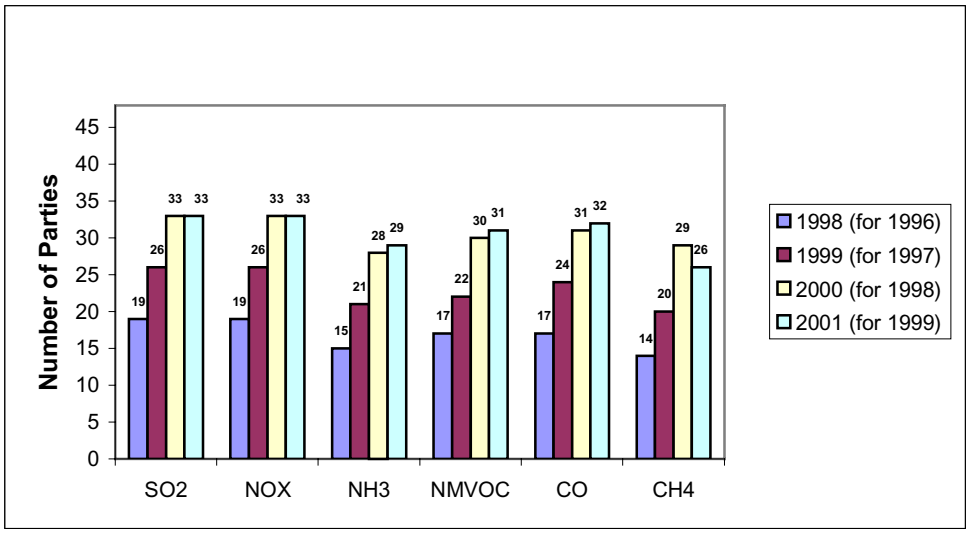


Figure 2. 3 Official submissions of national sector totals (SNAP level 1).

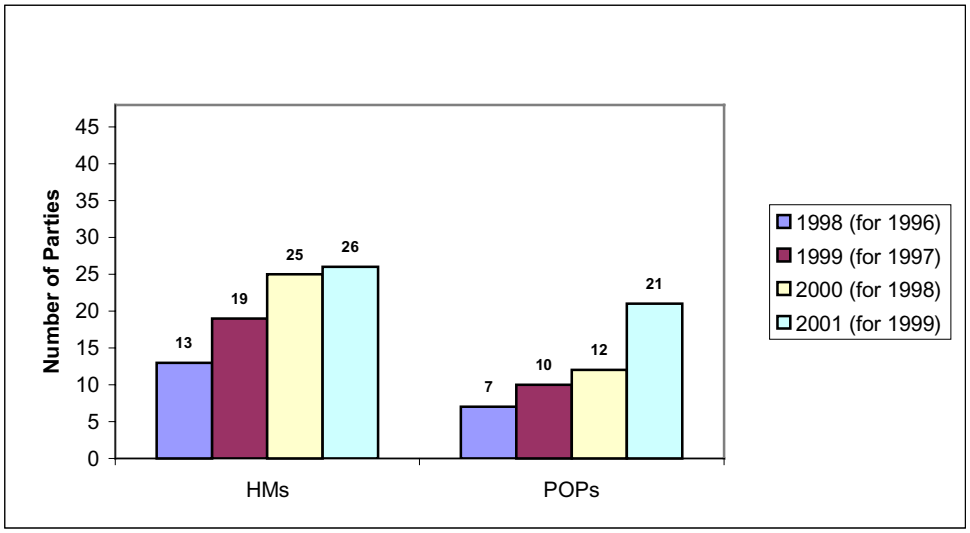


Figure 2. 4 Official submissions of national HM and POP emission totals.

2.2 Overview of data in the UNECE/EMEP database

An overview of reported national total, sector and gridded totals available from the EMEP database for each Party is shown in Annex I, Tables 10-18. Reported national totals, sector data and gridded totals stored at MSC-W are outlined with crosses. Present lack of data are marked with bars. The first position indicates data for national totals, second position corresponds to sector data and the third position corresponds to gridded totals in the 50x50km^2 EMEP grid. An asterisk beneath the country name indicates that the reported data has been submitted in the 150x150km^2 grid. The tables show superior data coverage for SO_2 and NO_x (Tables 10 and 11). For NH_3, NMVOC, CO, CH_4 and CO_2 (Tables 12, 13, 14, 15 and 16), the data gaps are still substantial, especially in the 1980s. POPs and HMs (Tables 17 and 18) with base year 1990, are only available for 50-65% of the Parties, and it has been almost no reporting of gridded data. Parties are kindly requested to complete the time series. Furthermore, any revision of estimation methodologies should involve updating all figures, both national totals, sector and gridded data, reported so far accordingly.

The gridded data plays an important part in the assessment done within EMEP. When Parties fail to report gridded data for emissions in 1995 or later years, older data may be used in the assessments, and the spatial distribution of emissions may not reflect the present situation. This will also affect the evaluation of trends, as spatial distribution of emissions can be relevant for these. Gridded data split into sectors, and information on the height distribution are important elements in the description of transboundary fluxes of air pollution. Up to now, only a maximum of 10 Parties have provided information on sector and height distribution of gridded data. Information on the position and characteristics of Large Point Sources (LPS) is extremely useful in shedding light on issues related to emission patterns, monitoring data and model results. Only 9 Parties have so far reported emissions from LPS.

Reporting of gridded data in the 50x50 km^2 EMEP grid, and the reporting of Large Point Sources (LPS) needs to be strengthened, and it is expected that these tasks will be facilitated as a consequence of the proposed new Guidelines for Estimating and Reporting Emission Data. It is important to note that the new Guidelines include a proposal for changing the numbering of the EMEP grid.

2.3 Quality assessment

It is the responsibility of the Parties to assure that emission data submitted to the UNECE is submitted within deadline, and is transparent, consistent, comparable, complete and accurate. Once the emission data is received from UNECE at the MSC-W, and before loading the data into the database, the MSC-W assists the Parties in their quality control, by checking the consistency and completeness of data reported. Ideally, transparency and comparability of data submitted should be assured by the use of the EMEP/CORINAIR Atmospheric Emission Inventory Guidebook. In praxis, it is sometimes difficult or not desirable for all the Parties to follow the methodology of the Guidebook. Further, Parties often do not recalculate the whole time series nor update both national totals, sector data and gridded data in response to changes in emission estimation methods, all of which leads to inconsistencies that cannot be understood without an accompanying explanation from the Party. The normal procedure is that MSC-W corrects the identified inconsistencies and other irregularities through direct contact with nominated national experts from the reporting Party. Figure 2.1, includes an overview of the communication between MSC-W and the Parties' national experts this year. The figure shows that there is a need for an initial quality check of emission data submitted

by the Parties before loading them into the database. Like for the preceding reporting, 50% of the Parties submitting data to UNECE, received comments from MSC-W (Figure 2.1) . The response of national experts to the MSC-W inquiries for inconsistency was good. Approximately 70% of all inquiries made by MSC-W during spring 2001 received an answer before July 2001, and this is 10% lower than last year.

In spite of the extensive communication with the national experts, the database still contains emission figures that needs to be explained and or corrected. This is particularly true for some of the sector data reported, were the trends look rather peculiar. MSC-W, or any user of the officially reported data in the EMEP database, cannot at present check the accuracy of the submitted data. Sometimes there might be desirable to also have the possibility to assist Parties in assuring the accuracy of the reported data, and this is reflected in the proposed new Guidelines for Emission Reporting, where reporting of activity data is included. We envisage that the Task Force on Emission Inventory and Projection (TFEIP) could be the forum where national experts and the EMEP Centres have the opportunity to discuss the quality of emission data also with respect to accuracy.

3. Emission Data for the Modelling Assessments at the MSC-W

An improvement in emission inventories used for modelling at MSC-W this year is the inclusion of gridded data reported to the UNECE from Germany and Greece. These two countries have reported gridded data for the first time this year (Greece only in the 150x150 km^2 though). Also gridded data reported earlier has now become available in the EMEP database. Overview maps of the origin and vintages of gridded data used in this year's modelling activities are included at the end of this chapter (Figures 3.6-3.10). Efforts have also been made in order to improve the vertical distribution of emissions and are reported in section 3.3.

Last year many Parties had recalculated their emissions. As can be seen in tables 3.1-3.5, a few Parties have recalculated their emissions also this year (emission figures marked in bold). The updates concern both increases and decreases even within the same country, and are mostly below 10% of values reported in year 2000 for all the compounds tabulated here (SO_2, NO_x, NH_3, NMVOC and CO). All updates are smaller than 30%, except for Germany, SO_2, 1998 and Latvia, NMVOC, 1992 . Eleven of the Parties recalculated a part of their NO_x inventory, and only five recalculated parts of their NH_3 inventory (including Estonia that provided NH_3 data including emissions from agriculture for the first time). The number for SO_2 is six, and for NMVOC and CO, nine Parties.

The year 2010 projections estimates for EMEP have been derived the following way, listed in priority sequence: **1**. **Reported emissions** (if equal or smaller than the emission ceilings in the Protocol to the 1979 Convention on Long-Range Transboundary Air Pollution to Abate Acidification, Eutrophication and Ground- level Ozone (The Gothenburg Protocol) , **2. The Gothenburg Protocol Emission Ceilings, 3**. **IIASA, Ref. 8 Scenario**[1] (Amann et al. 2000) (for non-Signatories to the Protocol), **4. Last reported emission figure.**

1) The Reference scenario 8 (REF 8), takes into account the commitments of the Gothenburg Protocol. REF8 takes into account national and international legislation (CLE). Emissions resulting from the CLE estimates were in the scenario replaced by emission ceilings of the Protocol, if they were lower than the CLE estimates.

Emission data for modelling are based on official submissions to the Convention. However, since these do not fully cover the EMEP modelling domain for all years of interest (1980-1999, 2010), data gaps are filled in with estimates from available documented sources, or are derived in collaboration with experts from the MSC-W and CCC (Chemical Co-ordinating Centre) of EMEP. A brief description of the total, sector and gridded data used for modelling is given below.

3.1 National and Regional Total Emissions

Annual totals for missing years are based on linear interpolation of the most recent official values. In the case of projections, the procedure outlined above is used.

The updated national totals for SO_2, NO_x, NH_3, NMVOC and CO used for modelling for the years 1980, 1985-1999 and 2010 are those received at the MSC-W by June 2001 and are displayed in Tables 3.1-3.5. Official values are displayed with no background. Data drawn from other sources or interpolated are shaded grey. Updates from last year's reporting are printed in bold. All national figures refer to anthropogenic emissions only. Volcanic sulphur emissions reported by Italy are listed separately.

Tables displaying data for modelling purposes exclude emissions from Canada, United States, the European Community, Liechtenstein, Monaco and Kyrgyzstan, as they are not used in the model calculations. On the contrary, emissions from Albania (non-Party to the Convention) and Kazakhstan, along with several Asiatic and North African regions, are included in these tables as they are confined to the EMEP modelling domain.

For modelling purposes, German emissions are split into Germany former East and Germany former West based on the 1999 gridded data reported. The Russian Federation emissions reported are divided into the four parts: Kola/Karelia, St. Petersburg/Novgorod-Pskov, Kaliningrad and Rest of the Russian Federation. The split factors used for the Russian Federation are based on the 1996 gridded data reported.

In the absence of any official figures, the emission estimates used for all years are those suggested by IIASA (Amann et al., 2000) for SO_2 (Albania), NO_x (Albania, Bosnia and Herzegovina), and for NH_3 and NMVOC (Albania, Bosnia and Herzegovina, FYR of Macedonia and Yugoslavia). Moreover, emission figures for NH_3 reported by Belarus and Ukraine did not include agriculture, and have therefore also been replaced by IIASA estimates (219 and 729 Ktonnes respectively).

For Albania, Bosnia and Herzegovina, Cyprus and Yugoslavia official emission estimates for CO are missing for all years and are not available in other databases. In these cases it is assumed that CO emissions are equal to 3.5 times the NO_x emissions. This crude assumption is in line with the respective ratios for other countries for which NO_x and CO data are available.

The extension of the EMEP grid to the east has led to inclusion of additional areas in the modelling domain. These are the whole of Azerbaijan, Syria, Lebanon, Israel, and parts of Uzbekistan, Turkmenistan, Iran, Iraq, Jordan and several regions of North Africa. For SO_2 and NO_x emission totals for these areas 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 assumptions described above. Gridded 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.

Total releases of SO_2, NO_x, 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 50x 50 km^2 spatial distribution.

With regard to natural emissions, major contributions are volcanic releases of SO_2 reported by Italy for the period 1980-1999, and estimates of gridded biogenic emissions of sulphur (DMS) over the sea estimated by Tarrasón et al. (1995). These are listed separately in tables 3.1-3.5. Reported natural emissions other than volcanic sulphur are not included in these tables.

3.2 Source Sector Emissions in the EMEP Area

Source sector emissions are available at the EMEP web site**:** *http://www.emep.int/*
The sector categories used in the assessment work is displayed in table 3.6.

Table 3. 6 The CORINAIR/UNECE source category split of emissions

SOURCE CATEGORY	SO_2	NO_x	NH_3	NMVOC	CO
1. Combustion in energy and transformation industries	■	■			
2. Non-industrial combustion plants					
3. Combustion in manufacturing industry	■				■
4. Production processes					
5. Extraction and distribution of fossil fuels and geothermal energy					
6. Solvent and other product use				■	
7. Road transport		■		■	■
8. Other mobile sources and machinery		■			
9. Waste treatment and disposal					
10. Agriculture			■		
11. Other sources and sinks				■	

Dark shaded boxes indicate major (minimum 10% of total) source categories

The gridded sector data prepared at the MSC-W for modelling for 1999 are based on the latest official sector submissions. In the absence of official data, a standard sector split is assumed derived from averaging sector data reported by all Parties. Table 3.7 lists the percentage of the totals distributed between the 11 sectors.

Table 3.7 Default sector split as % of total emissions used at MSC-W

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
NOx	24	6	9	3	1	0	42	14	0	1	0
NH3	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

Table 3.1 Emissions of sulphur (1000 tonnes as SO_2 per year)

Party/Year	1980	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2010
Albania [3]	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	**55**
Armenia [1]	141	100.2	111.2	110.6	104.1	62.7	72	59.5	44.1	5.5	4.2	2.5	1.5	0.4	3.31	**0.84**	**73**
Austria [1, 2]	384.5	190	171.4	152.9	115.1	102.1	91	82.2	63.4	60.3	57	56.4	**52.9**	**50.6**	**46.6**	**42**	39
Belarus [2]	740	690	690	761	720	668	637	652	458	382	324	275	246.3	208.5	190	**163.7**	480
Belgium [1, 2]	828	400	377	367	354	325	372	334	318	297	253	246	240	220	**212**	**186**	106
Bosnia and Herzegovina [3]	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	**415**
Bulgaria [1, 2]	2050	2314	2367	2420	2228	2180	2008	1665	1115	1426	1480	1476	1420	1365	1251	**943**	856
Croatia [1, 2]	150	165	168	171	174	177	180	108	106.7	113.7	89.3	70.4	66.2	80.4	89.5	**90.7**	70
Cyprus [2]	**28**	**35**	**38**	**39**	**42**	42	46	**33**	**39**	**43**	42	**41**	45	47	49	**50**	39
Czech Republic [1, 2]	2257	2277	2177	2164	2066	1998	1876	1776	1538	1419	1270	1091	946	701	443	**269**	283
Denmark [2]	452.1	343.5	292.2	258.8	254.9	197.7	182.6	241.1	188.3	154	156.4	148.5	179.6	110	76.92	**55.91**	50
Estonia [2]	287	254	256	255	254	254	252.1	245.6	187.4	153.8	149.1	118.5	125.2	119	110	**102.5**	**57.4**
Finland [2]	584	382	331	328	302	244	260	194	141	123	114	96	105	99	90	**87**	**110**
France [1, 2]	**3211**	**1479**	**1343**	**1329**	**1220**	**1379**	**1278**	**1389**	**1211**	**1052**	**990**	**934**	**913**	**767**	**808**	**682**	400
Georgia	230.2	273.2	255.3	258.3	255.3	249.1	248.3	194	135.2	71.4	46.9	20.3	30.1	33.1	**20.18**	**8.61**	**8.61**
Germany [1, 2]	7514	7732	7641	7396	6487	6165	5321	3996	3307	2945	2473	**1994**	**1405**	**1127**	**899**	**831**	**550**
Greece [1, 2]	400	500	502	503	504	505	506	549	556	551	526	551	540	531	540	540	546
Hungary [1, 2]	1633	1404	1362	1285	1218	1102	1010	913	827.3	**757.3**	741	705	673.2	658.5	591.8	**590.2**	550
Iceland [2]	17.8	18.1	18.4	16.2	17.5	17.3	24	23.1	23.9	24.5	23.8	23.9	24.1	24.5	26.8	26.8	29.4
Ireland [1, 2]	222	140	162	174	152	162	186	180	172	161	175	161	147	166	176	**157**	42
Italy [1]	3757	1901	1929	2029	1963	1854	1651	1539	1394	1333	1271	1322	**1250**	**1075**	**1039**	**923**	**500**
Kazakhstan	140	140	140	140	140	140	140	140	140	140	140	140	140	140	140	140	140
Latvia [1]	119	119	119	119	119	119	119	90	79	73	86	59	59	44	40	**33**	**107**
Lithuania [2]	311	304	316	316	300	298	222	234	139	125	117	94	93	77	94	**70**	145
Luxembourg [1, 2]	24	16	16	16	16	15	15	15	15	15	13	9	8	6	4	**3.822**	4
Netherlands [1, 2]	490	258	264	263	250	204	202	173	172	164	146	147	135	118	**107**	**100**	50
Norway [1, 2]	137.3	98.2	91.4	73	67.6	58.3	52.7	44.3	36.5	35.2	34.8	33.8	33	30.2	29.8	**28.7**	22
Poland [1, 2]	4100	4300	4200	4200	4180	3910	3210	2995	2820	2725	2605	2376	2368	2181	1897	**1719**	1397
Portugal [1]	266	198	234	218	204	281.7	**359.4**	**345.6**	**409**	**360**	**338.9**	**365.6**	**323.4**	**341.3**	**374.9**	374.9	**170**
Republic of Moldova [1, 2]	308	282	297	317	273	238	265	259.8	168.2	156.4	108.5	64.06	67.03	36.13	32.08	**12.05**	135
Romania [1]	1055	1255	1293	1305	1469	1517	1311	1041	951	928	912	912	912	912	912	912	**918**
Russian Federation [3]	7161	6191	5707	5622	5145	4677	4460	4392	3839	3456	2983	2838	2685	2449	2208	**2003**	**2343**
Slovakia [1]	780	613	604	614	589	573	543	445	380	325	239	239	227	202	179	**171**	**110**
Slovenia [1, 2]	234	241	247	222	210	211	196	180	186	183	177	125	112	118	123	**104**	27
Spain [1]	2836	2393	2267	2139	1787	2122	2049	2050	2040	1919	1875	1721	1498	1498	1498	1498	**774**
Sweden [1, 2]	491	266	272	228	224	160	119	96	88	87	82	79	83	51	49	**63**	67
Switzerland [1, 2]	116	76	68	62	56	49	42	41	38	34	31	34	30	26	27.6	**25.5**	26
The FYR of Macedonia [3]	17	17	17	17	17	17	17	17	17	17	17	17	17	17	**105**	105	**81**
Turkey [2, 4]	204.5	519.8	674.4	**606.4**	**443.1**	**740.7**	**764.7**	**840.6**	**821.3**	**767.8**	**991.5**	**1016**	**1172**	**1234**	**1361**	**1347**	995
Ukraine [3]	3849	3463	3393	3264	3211	3073	3782	2538	2376	2194	1715	1639	1293	1132	1132	1132	**1457**
United Kingdom [2]	**4880**	**3750**	**3910**	**3908**	**3839**	**3720**	**3754**	**3568**	**3447**	**3105**	**2665**	**2348**	**2010**	**1637**	**1567**	**1187**	**612.2**
Yugoslavia [2]	406	478	470	484	502	506	508	446	348	401	424	462	434	522	521	521	1135
North Africa [5]	413	413	413	413	413	413	413	413	413	413	413	413	413	413	413	413	413
Remaining Asian areas [5]	869	869	869	869	869	869	869	869	869	869	869	869	869	869	869	869	869
Baltic Sea	228	228	228	228	228	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	57	57	57	57	57
Mediterranean Sea	1189	1189	1189	1189	1189	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	454	454	454	454	454
Rem. N-E Atlantic Ocean [5]	901	901	901	901	901	901	901	901	901	901	901	901	901	901	901	901	901
Natural marine emissions [5]	743	743	743	743	743	743	743	743	743	743	743	743	743	743	743	743	743
Volcanic emissions [6]	2144	2144	2144	2181	2114	2493	2607	1645	2235	2027	1918	2000	2000	2000	2000	2000	2000
Total	60361	53126	52341	51739	48992	48213	46345	41176	37977	35716	33210	31457	29516	27561	26469	24705	22829

Footnotes 1-3 concerning the year 2010 projections: 1) The Gothenburg Protocol emission ceiling. 2) Officially reported by the Party 3) IIASA, REF 8 scenario (Amann et al. 2000).
4) Sum of sector data 5) The part inside the EMEP domain of calculation. "Remaining Asian areas" refers to Azerbaijan, Syria, Lebanon, Israel and parts of Uzbekistan, Turkmenistan, Iran, Iraq and Jordan. 6) Natural emissions reported by Italy.
Updates from MSC-W Note 1/00 (Vestreng and Støren, 2000) are marked in bold. Emission figures inside grey boxes are drawn from open sources (see text) or interpolated by MSC-W. All other figures are as reported from the Parties to the CLRTAP.

Table 3.2 Emissions of nitrogen oxides (1000 tonnes as NO_2 per year)

Party/Year	1980	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2010
Albania [3]	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	**36**
Armenia [1]	15.4	44.8	53	51.5	55.5	51.2	46.2	40	21.8	12.1	11.9	14.9	11.4	15.1	10.95	**10.61**	46
Austria [1,2]	227.8	216.7	212.7	209.1	201.9	194.4	192.6	196.2	186.7	174.7	181.7	**170.4**	**165.6**	**172.3**	**170.8**	**170.8**	107
Belarus [2]	234	238	258	263	262	263	285	281	224	207	203	195	172.7	188.5	164	**142**	180
Belgium [1, 2]	442	325	317	338	345	357	339	335	343	341	342	336	316	306	**312**	**292**	181
Bosnia and Herzegovina [3]	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	**60**
Bulgaria [1, 2]	416	416	416	416	415	411	361	**256**	**230**	242	230	266	259	225	223	**202**	266
Croatia [1, 2]	60	74	77	80	82	85	87.6	65	56.2	59.3	65.5	65.7	68.6	73.3	76	**71.1**	87
Cyprus [2]	**13**	14	**15**	16	**17**	**17**	18	16	19	20	20	19	21	21	22	**22**	23
Czech Republic [1, 2]	937	831	826	816	858	920	742	725	698	574	435	412	432	423	413	**390**	286
Denmark [1]	273.2	**292**	**321.8**	**304.7**	**295.1**	**276.7**	**271.7**	**314.5**	**268.4**	**267**	**270.7**	**251.4**	**291.7**	**250.2**	231.9	**210.2**	**127**
Estonia [3]	70	70	70	70	70	69	67.7	63.33	39.35	38.05	41.08	42.06	44.36	44.75	46.01	**39.62**	**73**
Finland [1, 2]	295	275	277	288	293	301	300	290	284	282	282	258	268	260	252	**247**	**170**
France [1, 2]	**2014**	**1817**	**1776**	**1807**	**1808**	**1858**	**1865**	**1930**	**1886**	**1772**	**1731**	**1700**	**1684**	**1633**	**1592**	**1530**	860
Georgia	121	140.4	133.8	134.1	134.6	130.6	129.5	112.5	47.8	32.5	20.8	26.6	49.6	54.5	**42.35**	**30.14**	30.14
Germany [1, 2]	3334	3276	3286	3327	3208	2989	**2706**	**2493**	**2303**	**2189**	**2038**	**1967**	**1877**	**1781**	**1709**	**1637**	**1081**
Greece [1, 2]	306	306	**313**	**320**	**322**	**324**	326	333	334	331	342	341	378	361	382	382	344
Hungary [1, 2]	272.9	262.5	264.2	264.9	257.8	246.8	238	203.1	183.3	184	187.4	190.1	195.8	199.5	**202.6**	**221**	198
Iceland [2]	21.2	20.5	22.3	24	24.9	25.3	26.3	26.7	28.4	29.3	29.2	28.4	29.6	28.6	27.7	27.7	30
Ireland [1, 2]	73	91	100	115	122	127	118	120	130	119	115	115	120	118	122	**119**	65
Italy [1]	1638	1614	1690	1811	1854	1917	1938	1984	2010	1990	1789	1768	**1744**	**1662**	**1594**	**1485**	**1000**
Kazakhstan	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76
Latvia [2]	**102**	**102**	**102**	**102**	**102**	**102**	**102**	**74**	**63**	**56**	48	42	35	44	42	**39**	81
Lithuania [2]	152	166	169	171	172	173	158	166	98	78	77	65	65	57	60	**54**	110
Luxembourg [1, 2]	23	21	21	22	22	23	23	23	**24**	**25**	23	21	22	18	17	**16.09**	11
Netherlands [2]	583	589	587	599	602	584	580	568	556	535	510	498	501	453	**423**	**408**	**260**
Norway [1, 2]	**189.6**	**212.8**	**227.9**	**228.6**	**224**	**222.7**	219.2	210	208.2	216.7	213.8	**214.2**	**223.1**	**223.9**	**225**	**230.6**	156
Poland [1, 2]	1229	1500	1510	1530	1550	1480	1280	1205	1130	1120	1105	1120	1154	1114	991	**953**	879
Portugal [1]	166	96	110	116	122	214	**317**	**332.7**	**354.4**	**341.8**	**344.9**	**357.8**	**354.4**	**360.9**	**369.3**	**369.3**	**260**
Republic of Moldova [1, 2]	58	66	72	71	74	70	100	97	67.3	53	46.2	38.2	38	36.5	21.7	**16.91**	90
Romania [1]	523	542	559	580	590	579	546	464	357	318	319	319	319	319	319	319	**437**
Russian Federation [3]	1734	1903	1871	2653	2358	2553	3600	3325	3093	3054	2685	2570	2467	2379	2488	**2494**	**2653**
Slovakia [1]	197	197	197	197	212	227	226	**205**	**191**	**184**	**174**	**182**	130	**125**	130	**118**	**130**
Slovenia [1, 2]	51	53	58	57	59	58	63	58	58	63	66	67	70	71	64	**58**	45
Spain [1]	1019	934	957	1003	1030	1131	1156	1210	1240	1202	1214	1216	1194	1194	1194	1194	**847**
Sweden [1, 2]	404	426	432	437	432	418	338	339	329	324	331	301	302	270	257	**261**	148
Switzerland [1, 2]	170	179	**176**	174	172	**169**	**154**	**146**	**138**	**129**	**124**	**120**	**113**	**107**	**104**	**99**	79
The FYR of Macedonia [3]	**39**	**39**	**39**	**39**	**39**	**39**	**39**	**39**	**39**	**39**	**39**	**39**	**39**	6	**15.22**	15.22	**29**
Turkey [2, 4]	**355.6**	**474.1**	**518.3**	**559.7**	**556.5**	**597.4**	**628**	**633**	**651.2**	**730.5**	**715**	**776.5**	**847.4**	**852.4**	**833.8**	**911**	2044
Ukraine [2]	1145	1059	1112	1094	1090	1065	1097	989	830	700	568	531	467	455.2	455.2	455.2	1094
United Kingdom [2]	**2580**	**2539**	**2620**	**2729**	**2783**	**2786**	**2756**	**2631**	**2552**	**2358**	**2260**	**2088**	**2013**	**1844**	**1732**	**1603**	1167
Yugoslavia [2]	47	58	58	60	63	62	66	57	50	54	52	59	57	66	66	66	147
North Africa [5]	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96
Remaining Asian areas [5]	212	212	212	212	212	212	212	212	212	212	212	212	212	212	212	212	212
Baltic Sea	352	352	352	352	352	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	86	86	86	86	86
Mediterranean Sea	1639	1639	1639	1639	1639	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	648	648	648	648	648
Rem. N-E Atlantic Ocean [5]	1266	1266	1266	1266	1266	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	0	0	0	0	0
Volcanic emissions	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	26010	25959	26304	27557	27357	27595	27985	27035	25801	24924	23729	23270	23018	22292	21880	21388	20292

Footnotes 1-3 concerning the year 2010 projections: 1) The Gothenburg Protocol emission ceiling. 2) Officially reported by the Party 3) IIASA, REF 8 scenario (Amann et al. 2000).
4) Sum of sector data 5) The part inside the EMEP domain of calculation. "Remaining Asian areas" refers to Azerbaijan, Syria, Lebanon, Israel and parts of Uzbekistan, Turkmenistan, Iran, Iraq and Jordan.
Updates from MSC-W Note 1/00 (Vestreng and Støren, 2000) are marked in bold. Emission figures inside grey boxes are drawn from open sources (see text) or interpolated by MSC-W. All other figures are as reported from the Parties to the CLRTAP.

Table 3.3 Emissions of ammonia (1000 tonnes as NH_3 per year)

Party/Year	1980	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2010
Albania [3]	**32**	**32**	**32**	**32**	**32**	**32**	**32**	**32**	**32**	**32**	**32**	**32**	**32**	**32**	**32**	**32**	**35**
Armenia [1, 2]	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
Austria [1, 2]	**78.4**	**81.4**	**81**	**80.2**	**79**	79.9	79.9	79.2	76.4	76.2	75.9	74.2	72.6	72.1	71.8	**70.3**	66
Belarus [3]	219	219	219	219	219	219	219	219	219	219	219	219	219	219	219	219	**158**
Belgium [1, 2]	89	89	92	95	98	101	107	93	92	97	96	97	99	99	**102**	**103**	74
Bosnia and Herzegovina [3]	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	**23**
Bulgaria [1, 2]	144	144	144	144	144	144	144	124	111	109	101	99	83	77	66	**60**	108
Croatia [1, 2]	37.1	37.1	37.1	37.1	37.1	37.1	37.1	31.7	26.8	25.5	24.2	24.9	23.4	23	23.3	**24.4**	30
Cyprus	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Czech Republic [1, 2]	156	156	156	156	156	156	156	134	115	99	91	86	81	81	80	**75**	**101**
Denmark [1]	125	**134.9**	**135**	**131.4**	**127.8**	**128.3**	**127.9**	**123.6**	**120.7**	**116.9**	**112.2**	**105.2**	**100.6**	**100**	**100.9**	**95.99**	**69**
Estonia [3]	**24.25**	**24.25**	**24.25**	**24.25**	**24.25**	**24.25**	**24.25**	**22.24**	**18.47**	**13.36**	**12.59**	**10.97**	**9.55**	**9.74**	**9.76**	**8.47**	29
Finland [1, 2]	39	**43**	41	**45**	**42**	**40**	38	**39.5**	**41**	**39**	**37**	35.2	35	38	37.8	**35.2**	**31**
France [1, 2]	**805**	**807**	**812**	**807**	**788**	**788**	**790**	**787**	**776**	**768**	**774**	**781**	**795**	**803**	**807**	**805**	780
Georgia	97	97	97	97	97	97	97	97	97	97	97	97	97	97	97	97	97
Germany [1, 2]	835	857	846	845	835	823	765	673	649	638	639	635	635	625	**632**	**624**	550
Greece [1, 2]	79	79	79	79	79	79	79	78	75	75	73	85	73	71	74	74	73
Hungary [1, 2]	157	150	170	150	160	170	124	93	84	77	76	77	78	76	73.53	**71.09**	90
Iceland	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Ireland [1, 2]	112	112	112	112	112	112	112	115	117	117	119	120	122	123	127	**127**	116
Italy [1]	479	487	495	497	499	481	466	451	440	449	459	461	**430**	**443**	**438**	**448**	**419**
Kazakhstan	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
Latvia [1]	44	44	44	44	44	44	44	42	33	20	17	17	16	15	13	**12**	44
Lithuania [2]	85	89	89	90	89	86	84	85	81	80	80	38	36	35	35	**29**	84
Luxembourg [1, 2]	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	**7.288**	7
Netherlands [1, 2]	234	248	258	258	237	232	226	228	180	191	166	146	146	188	**170**	**175**	128
Norway [1, 2]	22.5	23	23	23	21.3	22.8	22.9	23.9	25	24.8	24.9	25.9	26.5	26.3	27.1	**26.6**	23
Poland [1, 2]	550	550	550	550	550	550	508	450	447	382	384	380	364	350	371	**341**	468
Portugal [1]	**104.6**	**104.6**	**104.6**	**104.6**	**104.6**	**104.6**	**104.6**	**100.1**	**106.6**	**99.3**	**92.7**	**101.7**	**99.1**	**100.5**	**103**	103	**108**
Republic of Moldova [1, 2]	52.7	57.9	56	54	53	50	49	49	44	37	35	33	31	25	25	**24.8**	42
Romania [1]	340	343	350	329	339	341	300	267	255	223	221	221	221	221	221	221	**210**
Russian Federation [3]	1189	1239	1286	1277	1269	1258	1191	1161	1084	903	772	824	749	730	675	**657**	**894**
Slovakia [1]	62.9	62.9	62.9	62.9	62.9	62.9	62.9	59.2	51	45.2	42.6	41.2	41.4	38.4	34.7	**36.1**	**39**
Slovenia [1, 2]	24	24	24	24	24	24	24	23	23	23	22	22	22	19	**20**	**20**	20
Spain [1]	396	420	435	474	475	487	472	468	468	448	470	467	517	517	517	517	**353**
Sweden [1, 2]	54	54	54	54	54	**53**	**51**	51	61	61	61	61	61	59	59	**55**	57
Switzerland [1, 2]	77	73.7	74	73	73	72	71.5	61	62	63	63	69.2	71	71	**68.3**	**68.3**	63
The FYR of Macedonia [3]	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	**16**
Turkey	321	321	321	321	321	321	321	321	321	321	321	321	321	321	321	321	321
Ukraine [3]	729	729	729	729	729	729	729	729	729	729	729	729	729	729	729	729	592
United Kingdom [1]	365.3	365.3	365.3	365.3	365.3	365.3	365.3	360	**343.8**	**343.3**	**345.4**	**337.1**	334.8	**341.1**	349.4	**348.3**	**297**
Yugoslavia [3]	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	**82**
North Africa [4]	235	235	235	235	235	235	235	235	235	235	235	235	235	235	235	235	235
Remaining Asian areas [4]	303	303	303	303	303	303	303	303	303	303	303	303	303	303	303	303	303
Baltic Sea	0	0	0	0	0	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	0	0	0	0	0
Mediterranean Sea	0	0	0	0	0	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	0	0	0	0	0
Rem. N-E Atlantic Ocean	0	0	0	0	0	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	0	0	0	0	0
Volcanic emissions	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	8892	9031	9131	9117	9073	9047	8757	8403	8138	7775	7554	7607	7504	7508	7463	7387	7285

Footnotes 1-3 concerning the year 2010 projections: 1) The Gothenburg Protocol emission ceiling. 2) Officially reported by the Party 3) IIASA, REF 8 scenario (Amann et al. 2000). Armenia, Belarus and Ukraina have reported more emission figures, but emissions from agriculture were not included in the estimates.

4) The part inside the EMEP domain of calculation. "Remaining Asian areas" refers to Azerbaijan, Syria, Lebanon, Israel and parts of Uzbekistan, Turkmenistan, Iran, Iraq and Jordan.

Updates from MSC-W Note 1/00 (Vestreng and Støren, 2000) are marked in bold. Emission figures inside grey boxes are drawn from open sources (see text) or interpolated by MSC-W. All other figures are as reported from the Parties to the CLRTAP.

Table 3.4 Emissions of non-methane volatile organic compounds (1000 tonnes as NMVOC per year)

Party/Year	1980	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2010
Albania [3]	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	41
Armenia [1]	25.7	92.7	98.1	104.3	92.5	90.2	81	69.9	30.9	19.9	17.1	23.4	17.8	35.1	16.94	**17.47**	81
Austria [1, 2]	**353.2**	**359.8**	**373.3**	**376.1**	**378.3**	**367.8**	**344.7**	**314.2**	280.4	**269**	**259.2**	**260.2**	**249.4**	**245.6**	**236.3**	**230.7**	159
Belarus [2]	549	516	506	509	535	511	533	546	412	372	366	367	327.7	344.7	294	**239.9**	321
Belgium [1, 2]	688	688	621	554	488	420	354	313	313	311	305	294	274	270	**277**	**271**	144
Bosnia and Herzegovina [3, 6]	**51**	**51**	**51**	**51**	**51**	**51**	**51**	**51**	**51**	**51**	**51**	**51**	**51**	**51**	**51**	***101***	**48**
Bulgaria [1, 2]	309	309	309	309	309	263	217	178	179	208	175	173	147	120	132	**118**	185
Croatia [1, 2]	105	105	105	105	105	105	105	86.5	63.7	69.3	74.7	74.1	81.5	79.5	**78.5**	**72.9**	90
Cyprus	**13**	**14**	**15**	**16**	**17**	**17**	**18**	**16**	**19**	**20**	**20**	**19**	**21**	**21**	**22**	**22**	23
Czech Republic [1, 2]	275	275	307	339	371	403	435	398	359	338	310	286	284	272	269	**248**	220
Denmark [2]	203	**196.7**	**198.5**	**199.4**	**195.5**	**194.3**	**169.3**	**167.2**	**161.7**	**158.6**	**150.9**	**146.9**	**146.5**	**136.8**	**133.9**	**128**	73
Estonia [2]	81	81	83	83	84	87	88.4	81.9	45.4	41.6	44.65	47.5	50.2	53.92	53.7	**42.33**	**44.2**
Finland [1, 2]	210	210	210	210	213	211	209	**206**	**203**	195	**188**	185	**173**	**173**	**172**	**168**	**130**
France [1, 2]	**2707**	**2707**	**2707**	**2707**	**2707**	**2671**	**2459**	**2438**	**2389**	**2266**	**2133**	**2055**	**1991**	**1914**	**1860**	**1784**	1100
Georgia	45.5	48.5	47.6	48.2	47.8	46	46.4	8.2	3.9	2.2	1.7	1.5	2.4	2.8	**10.84**	**18.63**	18.63
Germany [1, 2]	3224	3190	3218	3273	3255	3202	3221	2796	2539	2326	2158	2024	1896	1805	1723	1653	995
Greece [1, 2]	334	334	334	334	334	334	334	338	340	348	357	362	376	384	397	397	261
Hungary [1, 2]	215	232	263	228	215	205	205	149.6	141.8	149	142.4	150.3	150.1	145.4	140.6	**149**	137
Iceland [2]	7.7	8	8.4	11.9	12.6	12.6	12.8	14.3	14.1	13.6	14.2	12	12	9.8	10	10	6.6
Ireland [1, 2]	110	110	110	110	110	110	110	111	114	108	107	104	110	114	115	**95**	55
Italy [1]	2179	1992	2019	2088	2124	2215	2213	2293	2338	2344	2349	2368	**1934**	**1861**	**1764**	**1671**	**1159**
Kazakhstan	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76
Latvia [1]	**179**	**179**	**179**	**179**	**179**	**179**	**179**	**116**	**84**	**113**	**101**	**64**	**48**	**74**	**67**	**64**	**136**
Lithuania [2]	100	**112**	108	**108**	**109**	**109**	**108**	**111**	**66**	**52**	**52**	77	82	81	79	**68**	84
Luxembourg [1, 2]	15	15	16	16	17	18	19	19	18	18	18	16	16	15	13	**14.92**	9
Netherlands [2]	579	502	489	485	538	468	502	462	438	405	389	365	362	317	**298**	**282**	**185**
Norway [1, 2]	**176**	**231.4**	**249.4**	**256**	**249**	**275.8**	**301.7**	**294.9**	**323.5**	**339.6**	**354.2**	**368.8**	**373.2**	**368.5**	**350.3**	**350.6**	195
Poland [1]	1036	1011	1029	1014	1026	1016	831	833	805	756	819	769	766	774	730	**731**	800
Portugal [1]	199	199	**235**	**271**	**308**	**344**	**379.9**	**408.7**	**436.3**	**444**	**442.7**	**461.6**	**437.3**	**498.8**	**483.7**	483.7	**202**
Republic of Moldova [1, 2]	105	105	101	102	102	96	157	151.2	99	74.5	65.6	61.7	64.4	68.8	42.9	**22.14**	100
Romania [1]	829	787	830	884	846	812	772	678	627	634	638	638	638	638	638	638	**523**
Russian Federation [3]	2843	2496	2338	2807	2790	3715	3566	3259	3204	2979	2861	2507	2576	2338	2332	**2355**	**2786**
Slovakia [1]	148	148	148	148	148	148	148	136	**124**	122	108	107	104	**90**	**87**	**79**	**140**
Slovenia [1, 2]	39	39	39	39	39	42	44	41	40	42	44	44	49	48	42	**40**	40
Spain [1]	2572	2594	2622	2679	2711	2759	2790	2737	2649	2485	2697	2635	2515	2515	2515	2515	**669**
Sweden [1]	600	600	585	570	555	541	526	517	485	483	478	457	458	417	413	**421**	241
Switzerland [1, 2]	323	324	318	311	305	298	**279**	**261**	**242**	**226**	**213**	**200**	**191**	**182**	**173**	**165**	144
The FYR of Macedonia [3, 6]	**19**	**19**	**19**	**19**	**19**	**19**	**19**	**19**	**19**	**19**	**19**	**19**	**19**	**19**	**19**	***3***	**19**
Turkey [2, 4]	359	**379**	**403**	**430.3**	**449.8**	**453**	**462.2**	**457.2**	**478.6**	**527.1**	**515.5**	**581.3**	**613.1**	**619.7**	**614.6**	**613**	1925
Ukraine [3]	1626	1626	1660	1687	1604	1512	1369	1302	1171	972	1024	811	718	665	665	665	**797**
United Kingdom [1]	**2373**	**2475**	**2531**	**2594**	**2662**	**2693**	**2657**	**2592**	**2491**	**2387**	**2340**	**2215**	**2152**	**2050**	**1917**	**1744**	**1200**
Yugoslavia [3]	**142**	**142**	**142**	**142**	**142**	**142**	**142**	**142**	**142**	**142**	**142**	**142**	**142**	**142**	**142**	**142**	**139**
North Africa [5]	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96
Remaining Asian areas [5]	212	212	212	212	212	212	212	212	212	212	212	212	212	212	212	212	212
Baltic Sea	8	8	8	8	8	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	2	2	2	2	2
Mediterranean Sea	34	34	34	34	34	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	15	15	15	15	15
Rem. N-E Atlantic Ocean	25	25	25	25	25	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	0	0	0	0	0
Volcanic emissions	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	26449	26004	26113	26870	26904	27604	26959	25477	24440	23330	23045	22044	21118	20460	19877	19331	16092

Footnotes 1-3 concerning the year 2010 projections: 1) The Gothenburg Protocol emission ceiling. 2) Officially reported by the Party 3) IIASA, REF 8 scenario (Amann et al. 2000).
4) Sum of sector data 5) The part inside the EMEP domain of calculation. "Remaining Asian areas" refers to Azerbaijan, Syria, Lebanon, Israel and parts of Uzbekistan, Turkmenistan, Iran, Iraq and Jordan. 6) The 1999 totals used for scaling of the grids for Bosnia and Herzegovina and The FYR Macedonia were by a mistake not correct.
Updates from MSC-W Note 1/00 (Vestreng and Støren, 2000) are marked in bold. Emission figures inside grey boxes are drawn from open sources (see text) or interpolated by MSC-W. All other figures are as reported from the Parties to the CLRTAP.

Table 3.5 Emissions of carbon monoxide (1000 tonnes as CO per year)

Party/Year	1980	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2010
Albania [1]	84	84	84	84	84	84	84	84	84	84	84	84	84	84	84	84	**126**
Armenia	404.9	404.9	405.1	416.5	417.1	398.9	304.3	377.2	195.1	145.1	128	173.6	125.5	223.6	124.4	**123.7**	**124**
Austria	1711	1548	1643	1602	1552	1486	1307	1287	1206	1177	1151	1049	**1024**	**1024**	**970.3**	864.9	**865**
Belarus [2]	1654	1654	1605	1601	1590	1615	1722	1717	1381	1201	1241	1253	1242	1223	1034	**786.4**	1404
Belgium	1112	1112	1112	1112	1112	1112	1112	1120	1138	1104	1054	1032	1009	949	966	**944**	944
Bosnia and Herzegovina [1]	280	280	280	280	280	280	280	280	280	280	280	280	280	280	280	280	**210**
Bulgaria	997	997	997	997	995	985	891	608	768	**820**	**855**	846	613	515	650	**617**	750
Croatia	655.2	655.2	655.2	655.2	655.2	655.2	655.2	565.3	416.5	375.4	369.4	345.8	388.8	365.6	344.9	**334.3**	660
Cyprus [3]	**45.5**	**49**	**52.5**	56	**59.5**	**59.5**	**63**	**56**	**66.5**	**70**	**70**	**66.5**	**73.5**	**73.5**	77	**77**	80.5
Czech Republic	894	899	740	738	737	884	1055	1102	1045	967	1026	874	886	877	767	**686**	**686**
Denmark [2]	956.3	**993.1**	**998.1**	**1019**	**937.8**	**1000**	**704**	**718.3**	**687.3**	**662.1**	**621.7**	**604.9**	**623.9**	**567.1**	**601.1**	**541.3**	331
Estonia	400	400	417	423	419	448	434.1	399.2	207.8	210.2	241.1	242.3	267.7	282.8	280.7	**215.3**	**215**
Finland	660	608	598	587	577	566	559	552	478	457	444	436	461	474	452	**547**	**547**
France	**15737**	**13935**	**13522**	**13267**	**12843**	**12288**	**10774**	**10645**	**10221**	**9657**	**8981**	**8862**	**8277**	**7854**	**7614**	**7178**	**7178**
Georgia	648.3	636.5	642.9	638.9	647.7	597.3	526.4	441.4	129.5	142.5	148.5	249.5	390.2	429.2	**353.3**	**222.5**	**222.5**
Germany	14046	12134	12135	12438	12080	11430	**11213**	**9515**	**8351**	**7704**	**7065**	**6667**	**6234**	**5832**	**5341**	**4952**	**4952**
Greece	1328	1328	1328	1328	1328	1328	1328	1369	1318	1317	1309	1340	1385	1405	1500	1500	**1500**
Hungary [2]	1019	931.1	**942**	**952**	**963.1**	**980**	997	**913.4**	**835.8**	796.1	774.3	761.3	726.9	733.4	**736.9**	**755.1**	800
Iceland [2]	44.2	45.5	48.2	53.6	57.1	57	58.2	59.2	60.7	59.9	60.3	49.4	49.9	38.9	39.8	39.8	19.41
Ireland [2]	**401**	**401**	**401**	**401**	**401**	**401**	**401**	394	395	350	329	304	307	312	318	**285**	322
Italy [2]	7588	7692	7607	7674	7581	7735	7824	8003	7961	7755	7549	7755	**6971**	**6681**	**6318**	**6051**	4213
Kazakhstan	266	266	266	266	266	266	266	266	266	266	266	266	266	266	266	266	266
Latvia [2]	**499**	**499**	**499**	**499**	**499**	**499**	**499**	**823**	**555**	**612**	307	454	176	354	326	**296**	330
Lithuania [2]	541	545	554	564	578	568	**519**	**577**	***350***	292	303	286	312	358	358	**320**	400
Luxembourg [2]	193	193	189	185	182	178	175	168	160	153	145	107	103	80	51	**49.8**	33
Netherlands	1530	1381	1252	1192	1179	1131	1143	1025	983	960	907	892	903	749	**722**	**679**	**679**
Norway	822.1	844.2	872.3	832	868.9	823.2	820.8	760.1	751.2	746.1	737.7	700.6	670.2	635.2	600.6	565.4	565.4
Poland	7406	7406	7406	7406	7406	7406	7406	7245	7083	8655	5115	4547	4837	4700	4301	**4365**	**4365**
Portugal	1114	1114	1114	1114	1114	1114	**1114**	**1189**	**1284**	**1269**	**1234**	**1201**	**1178**	**1143**	**1095**	1095	**1095**
Republic of Moldova [2]	55	483	478	474	496	476	453.2	468.4	279.2	218.4	170.9	192	170.3	210.2	153.4	**100.2**	150
Romania	3245	3307	3378	3196	3317	3314	3186	2695	2506	2434	2325	2325	2325	2325	2325	2325	2325
Russian Federation	13520	14122	13142	13119	12988	12054	13174	12869	11574	11193	10495	9846	9312	10262	10284	10701	10701
Slovakia	491	491	491	491	491	491	**535**	**485**	**430**	**456**	**446**	**435**	**360**	**352**	**318**	**310**	**310**
Slovenia [2]	68	68	78	79	75	75	81	78	78	87	93	91	95	93	77	**70**	53
Spain	3670	3475	3526	3633	3824	4000	3898	3992	4078	3885	3859	3448	3662	3662	3662	3662	3662
Sweden [2]	1210	1210	1210	1210	1210	1210	1210	1212	1176	1148	1142	1088	1082	962	1004	**924**	**426**
Switzerland [2]	1280	990	933	877	820	764	**673**	**629**	**581**	**544**	**516**	**491**	**467**	**443**	**422**	**399**	370
The FYR of Macedonia	23	23	23	23	23	23	23	23	23	23	23	23	23	23	**25.8**	**25.8**	**25.8**
Turkey [2, 4, 6]	**2563**	**2725**	**2867**	**3041**	**3143**	**3155**	**3130**	**3110**	**3225**	**3460**	**3363**	**3552**	**3684**	**3722**	**3644**	**3607**	3607
Ukraine [6]	9832	9832	9722	9269	9085	8794	8141	7406	5496	4218	3375	2906	2567	2516	2516	2516	2516
United Kingdom [2]	**7647**	**7192**	**7193**	**7233**	**7289**	**7517**	**7155**	**6956**	**6633**	**6140**	**5847**	**5492**	**5468**	**5184**	**4960**	**4760**	**2838**
Yugoslavia [3]	164.5	203	203	210	220.5	217	231	199.5	175	189	182	206.5	199.5	231	231	231	514.5
North Africa [5]	336	336	336	336	336	336	336	336	336	336	336	336	336	336	336	336	336
Rem. Asian areas [5]	741	741	741	741	741	741	741	741	741	741	741	741	741	741	741	741	741
Baltic Sea	29	29	29	29	29	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	8	8	8	8	8
Mediterranean Sea	139	139	139	139	139	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	59	59	59	59	59
Rem. N-E Atlantic Ocean [5]	111	111	111	111	111	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	0	0	0	0	0
Volcanic emissions	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	108117	104469	102921	102548	101703	99777	97437	93694	86224	83595	75945	73136	70591	69807	67506	65664	62693

1) CO= IIASA NO_2 year 1990 and 2010 ref 8 scenario (Amann et al. 2000) multiplied by 3.5 (see text), 2) Officially reported by the Party 3) CO quals NO_2 reported multiplied by 3.5 4) Sum of reported sector data 5) The part inside the EMEP domain of calculation. "Remaining Asian areas" refers to Azerbaijan, Syria, Lebanon, Israel and parts of Uzbekistan, Turkmenistan, Iran, Iraq and Jordan. 6) Turkey and Ukraine and have reported in 2000 and 1996 respectively very high 2010 projection values:Turkey 10986 kilo tonnes and Ukraine 8141 kilo tonnes for carbon monoxide. No information has been obtained to explain these values, and latest reported values have been used instead. **Updates from MSC-W Note 1/00 (Vestreng and Støren, 2000) are marked in bold.** Emission figures inside grey boxes are drawn from open sources (see text) or interpolated by MSC-W. All other figures are as reported from the Parties to the CLRTAP.

3.3 Temporal and Spatial Distribution of Emissions

The temporal variation of emissions has been provided to MSC-W by the GENEMIS project (Generation of European Emission Data for Episodes) and concerns 1990 daily national estimates for SO_2, NO_x, NMVOC and CO. These data refer to both national emission totals and source sectors at SNAP level 1.

The spatial distribution of emissions used in model calculations for 1999 is shown in Figures 3.1-3.5. For each Party the latest reported emission distribution is used. The gridded data are then scaled according to the most recent totals reported. The colour maps shown for SO_2, NO_2, NH_3, NMVOC and CO (figure 3.1-3.5) are in 50 km resolution. Grid elements appearing in groups of nine indicate that the 50x 50 km^2 distribution was not available for the corresponding country and that the 150x150 km^2 grid has been used instead. The actual emission figures comprising the basis for the maps can be downloaded from the EMEP web site: *http://www.emep.int*.

In the absence of officially submitted spatial distribution of emissions, information is drawn either from the CORINAIR (The Core Inventory of Air Emissions in Europe)1990 inventory or from relevant national statistics and available data on the distribution of sources. These data are based on national administrative units and have been converted to the 50x50 km^2 grid by MSC-W for the EMEP modelling activities.

As few countries submit information of the height distribution (See Section 2.2), a default distribution per sector based on Radunsky and Ritter (1996), is used. If not otherwise reported, a percentage of the emissions are assumed to be high in the EMEP acid deposition model. The default distribution depends on the sectors as follows:

SO_2: Combustion in energy and transformation industries (SNAP1): 75%
Combustion in manufacturing industries (SNAP3): 19%
Production Processes (SNAP4): 2%
NO_x: Combustion in energy and transformation industries (SNAP1): 72%
Combustion in manufacturing industries (SNAP3): 21%
Production Processes (SNAP4): 4%
Other mobile sources and machinery (SNAP8): 3%
CO: Combustion in energy and transformation industries (SNAP1): 70%
Combustion in manufacturing industries (SNAP3): 26%
Production Processes (SNAP4): 3%
NH_3: Only low emissions
NMVOC: Only low emissions

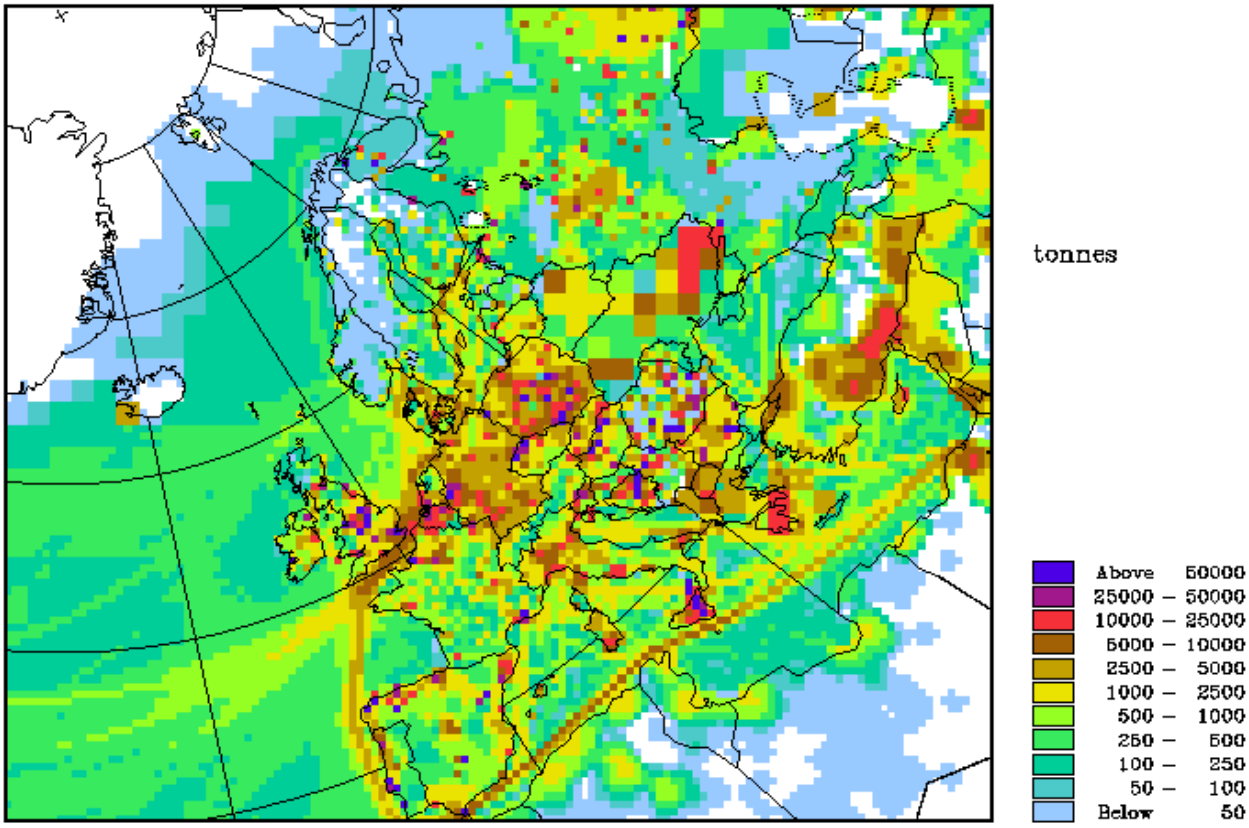


Figure 3.1 Emissions of sulphur in 1999 at 50km resolution (tonnes as SO_2)

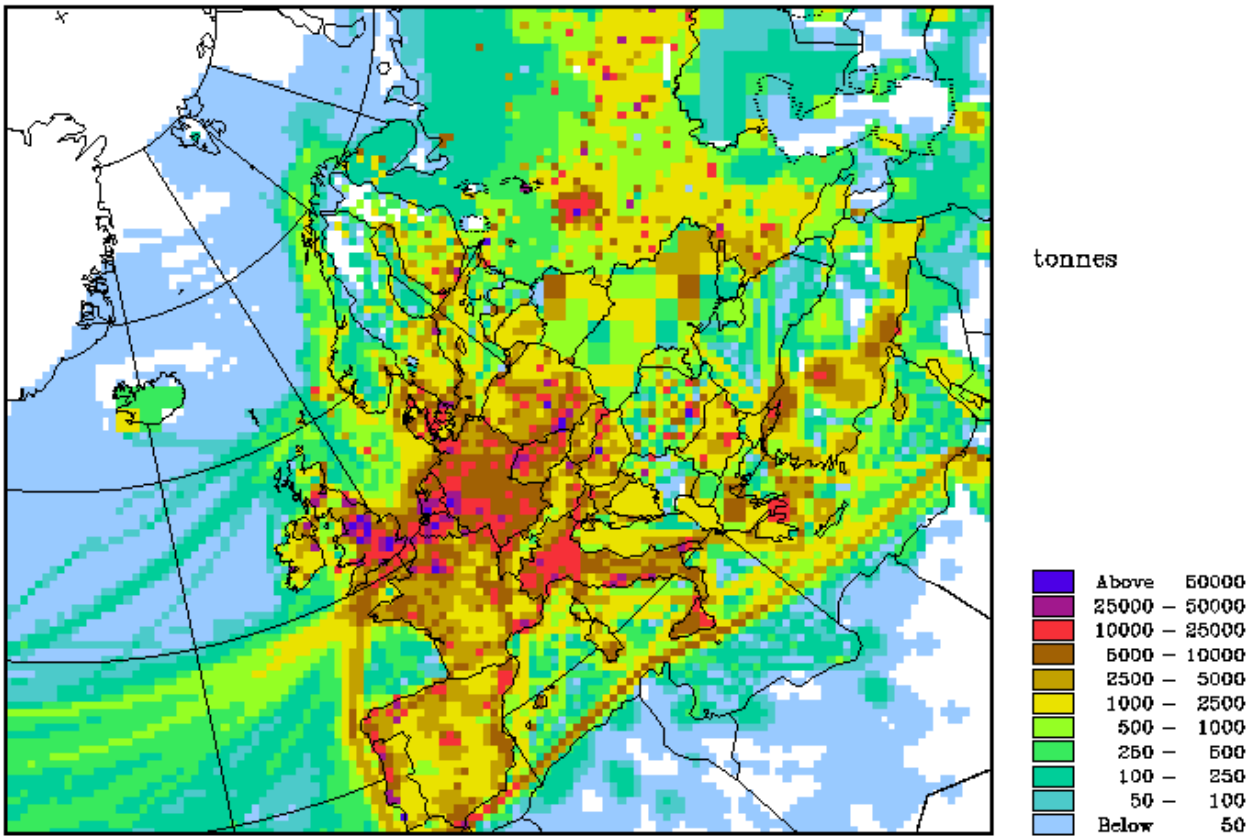


Figure 3.2 Emissions of nitrogen oxides in 1999 at 50km resolution (tonnes as NO_2)

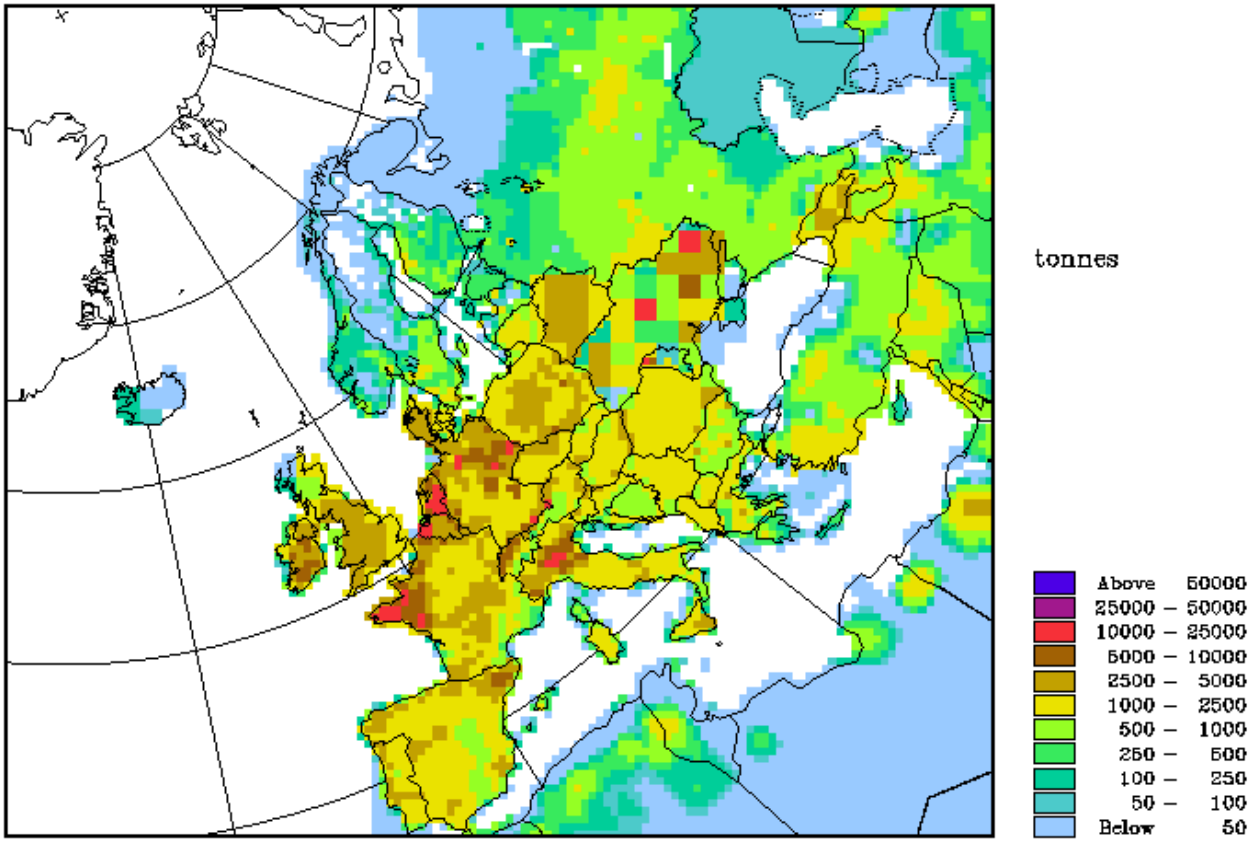


Figure 3.3 Emissions of ammonia in 1999 at 50km resolution (tonnes as NH_3)

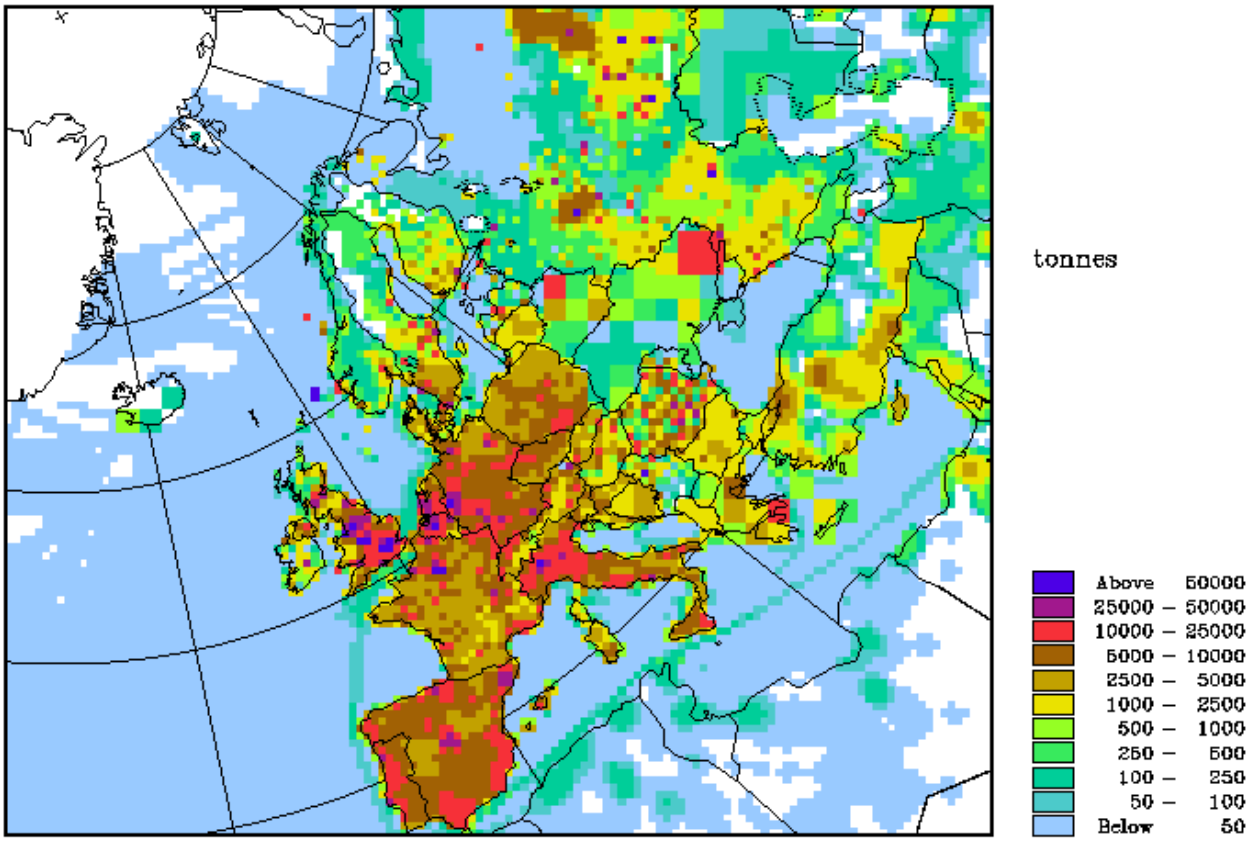


Figure 3.4 Emissions of non-methane volatile organic compounds in 1999 at 50km resolution (tonnes as NMVOC)

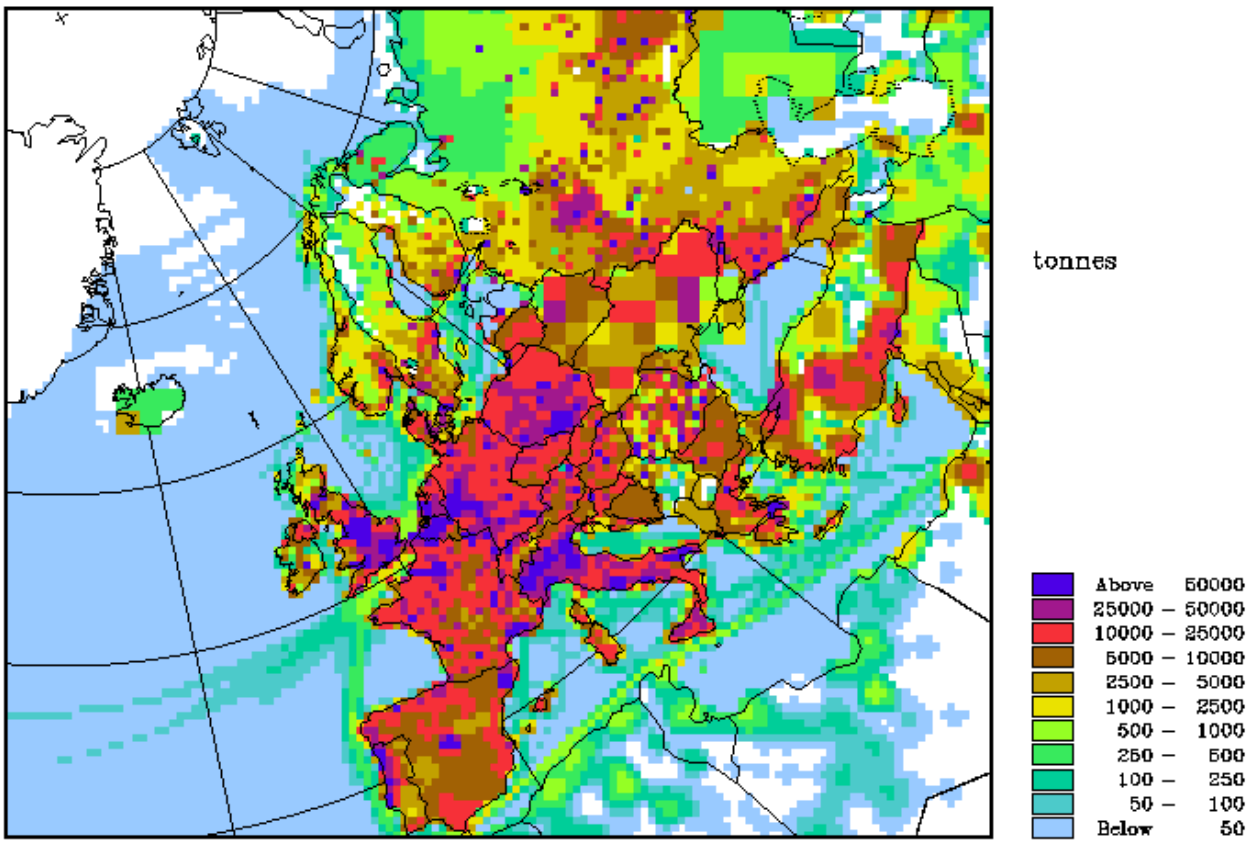


Figure 3. 5 Emissions of carbon monoxide in 1999 at 50km resolution (tonnes as CO)

3.4 Origin and vintage maps of gridded data

In order to increase the transparency of the spatial distribution used for modelling purposes at MSC-W, overview maps of the origin and vintage of gridded data available in the EMEP database for use in the 1999 model runs have been produced. Only land areas within the EMEP domain are included.

The colour code for the figures 3.6-3.10 is as follows:

- Blue: Gridded data of vintage 1995 or later reported to the UNECE
- Green: Gridded data of vintage 1990-1994 reported to the UNECE
- Lilac: CORINAIR 1990
- Yellow: GEIA /RIVM 1990 and 1985
- Red: Gridded data of 1980 vintage made by MSC-W
- **White:** In the case of NMVOC and CO, the NO_x grid has been used for countries and areas showing up in white

Figures 3.6-3.10 show that gridded data of several different origins and vintages had to be used for Parties to the Convention of LRTAP in the 1999 model runs, since reported data was not available. The lack of reported data is most pronounced for ammonia (figure 3.8), where gridded data of 1980 vintage made by MSC-W was extensively used.

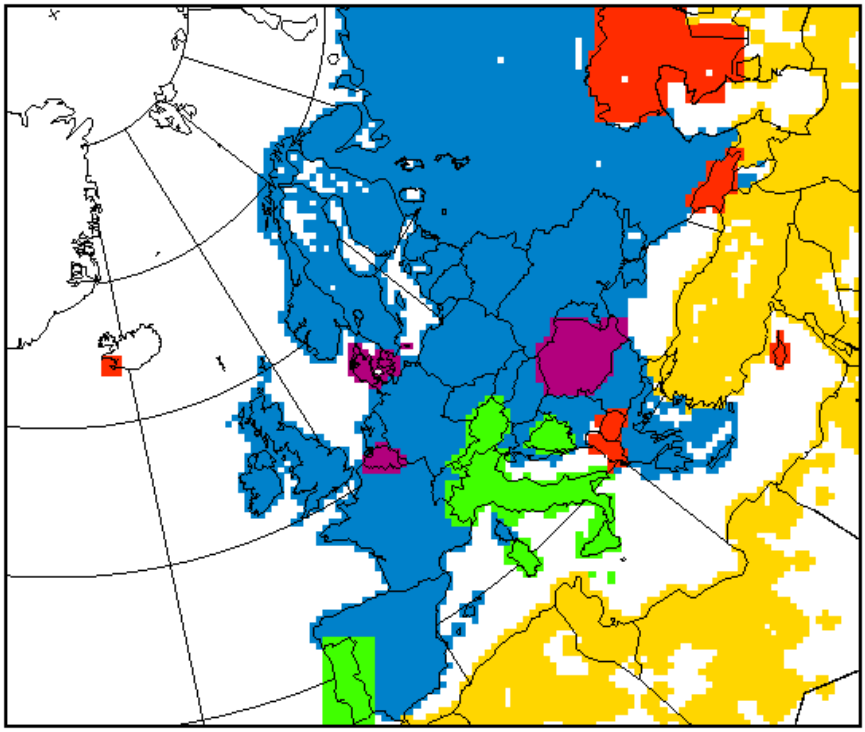


Figure 3.6 Sulphur: Origin and vintage of gridded data used for 1999 calculations (See text for explanation of colour codes)

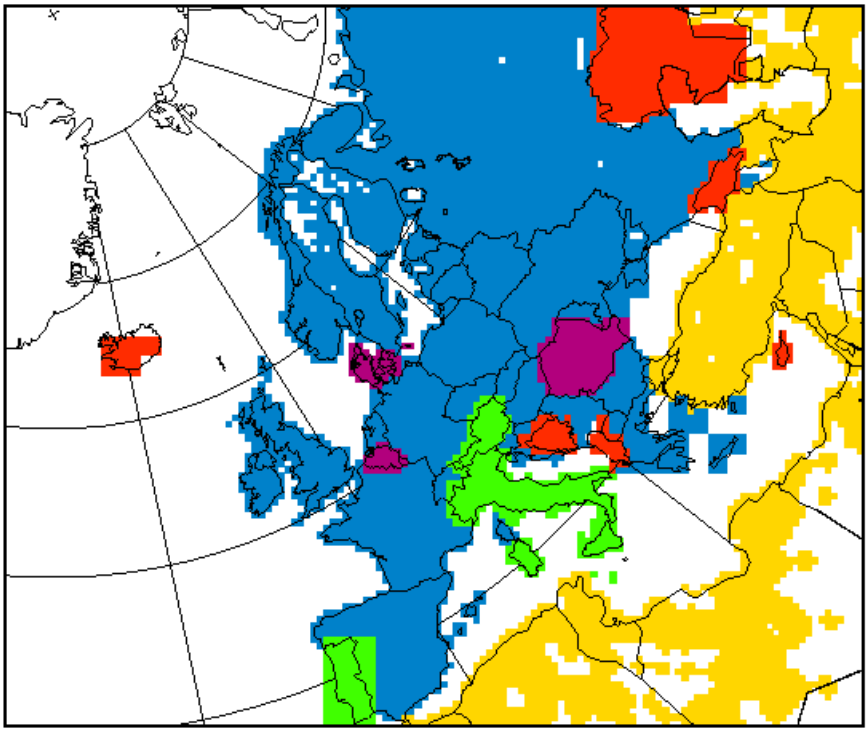


Figure 3.7 Nitrogen oxides: Origin and vintage of gridded data data used for 1999 calculations (See text for explanation of colour codes)

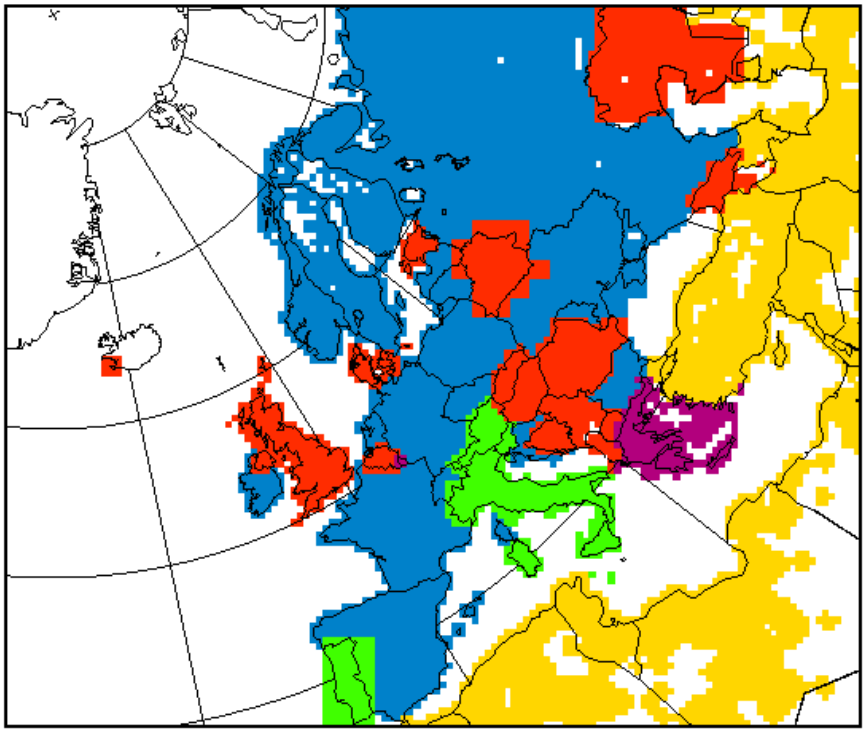


Figure 3.8 Ammonia: Origin and vintage of gridded data used for 1999 calculations (See text for explanation of colour codes)

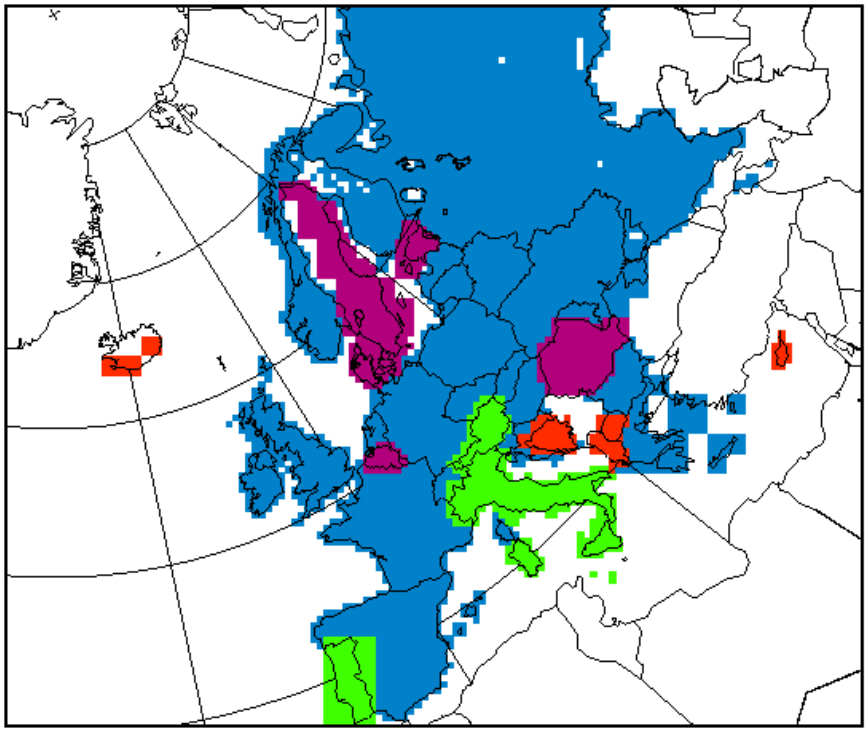


Figure 3.9 Non-methane volatile organic compounds: Origin and vintage of gridded data used for 1999 calculations (See text for explanation of colour codes)

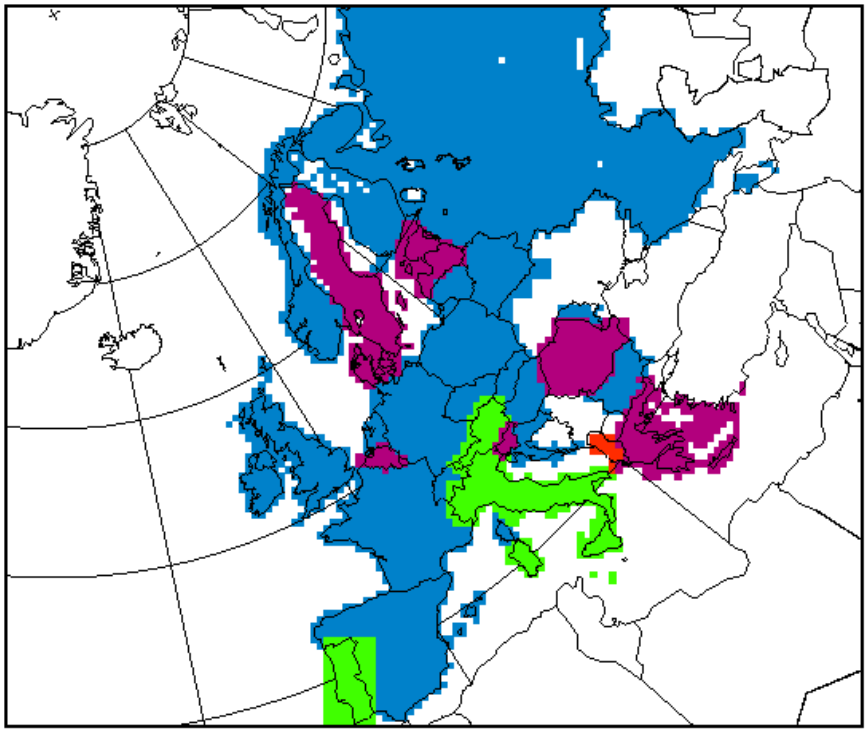


Figure 3.10 Carbon monoxide: Origin and vintage of gridded data used for 1999 calculations (See text for explanation of colour codes)

4. Evaluation of spatial distribution of emissions

4.1 Introduction

This chapter analyses the importance of the distribution of emissions for the determination of air concentrations of ozone. Based on gridded data reported by the countries to the UNECE and data otherwise available to MSC-W (see previous chapter), two sets of emission distributions have been prepared.

The first set of emission distributions of SO_2, NO_x, NMVOC, NH_3 and CO is regarded as representative of the 1980s, the second set is considered to be representative of the 1990s.

These two sets of emission distributions are both scaled to 1996 emission level, and serve as input to two model runs with the EMEP Eulerian Photo-oxidant model. The influence on calculated ground level ozone concentrations and levels is analysed below.

A second sensitivity test is also run, this time to evaluate the changes in ozone levels when the emission values are changed from 1996 to 1980 levels while the distribution remaines the same, namely the 1990s distribution. The importance of emission distribution relative to emission level on calculated ozone levels is evaluated.

The study shows that differences in the spatial distribution of emission can have significant consequences in the levels of ozone exposure in Europe. This is a benchmark for the Parties to the LRTAP Convention when they are to review emission distribution data by their reporting at the end of January 2002.

4.2 Emission distribution differences

Figure 4.1 shows the NO_x emission distribution representative for the 1980s on the top and the 1990s distribution on the bottom based on available data. Both distributions are scaled to 1996 emission level. As can be noted, the 1980s distribution in the upper panel is coarser than the 1990s distribution in the lower panel. The 1980s distribution was mostly made by experts at MSC-W in the original 150x150 km^2 EMEP grid, with the exception of: ships' emissions where Lloyd's 1990 estimates are used, emissions from North Africa where GEIA/RIVM 1985 estimates are used, Remaining Asian Areas where GEIA/RIVM 1985 estimates are used, Turkey where GEIA/RIVM 1985 estimates are used and Armenia where 1997 emissions reported to UNECE are used. The 1990s distribution is mostly based on gridded data in the 50x50 km^2 EMEP grid reported by the Parties to the Convention as displayed in the previous section (figure 3.7), but it should be noted that neither ships' emissions, nor emission distribution for Albania, Armenia, Bosnia and Herzegovina, Cyprus, FYR Macedonia, Georgia, Island, Kazakhstan, Turkey, North Africa and Remaining Asian Areas change for this sensitivity test. This is due to lack of availability of data to include more recent, or in the case of Armenia older, estimates.

The benefit of the finer resolution in the 1990s distribution is obvious. Large sources of NO_x, as major cities, offshore and other industrial activity are much better resolved in the 50x50 km^2 grid.

Figure 4.2, upper panel, shows the difference between the distributions in Figure 4.1. That is the 1990s NO_x distribution minus the 1980s NO_x distribution. Reddish colours representing an emission increase while green and blue represents a decrease. Increases of the order of 10 ktonnes NO_2 are seen in major cities and were offshore and land based industrial activities are located. Compared to the NO_x emission levels per grid square in Figure 4.1, mainly between 1 and 25 ktonnes, the increase caused by distribution differences alone is up to 40% in cities like Marseille, Lyon, Hamburg, Stockholm and Gda sk. Decreases are often seen as a result of reallocations (large blue/green squares or large blue/green square associated with a smaller red square). Examples of reallocation of large point sources, are La Coru a in the western part of Spain and Andorra (Teruel) in north east Spain. These large NO_x sources were somewhat misplaced in the 1980s distribution. Around the city areas of Lisbon, Barcelona, Genoa and Rome decreases in NO_x can be identified mostly because the 1990s distribution has finer resolution than the 1980s distribution.

It is evident that the interpretation of results on the basis of emission distribution alone is hampered by the difference in resolution between the two distributions. Parties are encouraged to aid to eliminate this obstacle by strengthening the reporting of gridded data in the 50x50 km^2 EMEP grid.

4.3 Effect of emission distribution in calculated ozone levels

The EMEP Eulerian Photo-oxidant model was run for the 1980s and the 1990s emission distributions. Figure 4.2, lower panel, shows the difference in calculated mean ground level ozone concentration (middle value for July) resulting from these two runs (1990s minus the 1980s distribution). Reddish colours represent an increase and blue/green a decrease. An ozone concentration increase of more than 9 ppb is seen outside the west coast of Portugal and Spain, while decreases of more than 6 ppb are estimated along the Mediterranean coast.

Figure 4.3, upper panel shows the average ozone concentration for July calculated for the 1990s distribution scaled to 1996. Concentrations of more than 50 ppb are seen over the Mediterranean Sea outside Italy and Greece. The ozone concentration level is above 40 ppb in Southern Europe, decreasing northwards towards 20 ppb. The differences in ozone concentrations due to difference in distributions alone are relatively large, compared to level of ground level ozone shown in figure 4.3. Up to 20% increase is seen outside the west coast of Portugal and Spain, and up to 17% decrease along the Mediterranean coast.

Further work is necessary in order to fully explain the difference in ozone concentrations. Additional model runs should be made in order to study the sensitivity of the O_3 concentrations and levels by changing the distribution separately for each relevant compound, notably NO_x, NMVOC and CO. Still the large increase in ozone concentration along the Portuguese coast, can be connected to the reallocation of NO_x emissions from the Spanish large point source, La Coruna, and the city of Lisbon, together with increases in NO_x along the Portuguese coast north of Lisbon. On the other hand, increases in NO_x, possibly due to increased traffic along the Mediterranean coast, seem to be accompanied by ozone concentration decreases. In areas with high NO_x emissions, a decrease of NO_x levels can result in increases of O_3 levels while an increase of NO_x emissions can be positive for the reduction of O_3.

The importance of the emission differences caused by changes in the spatial distribution is further highlighted in Figures 4.4, showing the AOT60 levels and in figure 4.5 displaying the $AOT40_f$ levels. The definition of these indicators is as follows:

AOT40 - the accumulated amount of ozone over the threshold value of 40 ppb, i.e..
$AOT40= \int max(O_3 - 40\ ppb,\ 0.0)\ dt$ where the *max* function ensures that only ozone values exceeding 40 ppb are included. The integral is taken over time, namely – the growing season as defined at the Bern and Kuopio critical level workshops. For forests a six month period is used (April-September), denoted here as $\mathbf{AOT40_f}$. For crops and natural vegetation AOT40 is taken over three months (May-July) (not included in this report). In both cases only daylight hours are included.

AOT60- the accumulated amount of ozone over the threshold value of 60 ppb, i.e..
$AOT60= = \int max(O_3 - 60\ ppb,\ 0.0)\ dt$ – in this case the integral is taken over six months, and only daytime ozone is included.

The AOT40 levels reflect interest in long-term ozone exposure which is considered important for vegetation – critical levels of 10000 ppb.h have been suggested for forests and 3000 ppb.h for crops and natural vegetation. The AOT60 measure reflects the reviced WHO guidelines which sets 120 μgm^{-3} (60 ppb at 20ºC and 1013 mb) as the 8-hour moving average. The UNECE workshop on "health effects of ozone and nitrogen oxides in an integrated assessment of air pollution" agreed that a simple statistics such as AOT60 could be used as a preliminary indicator for ozone levels above the recommended WHO guideline for integrated assessment modelling purposes. The justification for this is that AOT60 is a statistic which incorporates both the amount of ozone above 60 ppb and the frequency of exceedance, both of which are known to be important. However, it is clear that this statistic cannot be directly coupled to health impact assessments, and it should be noted that AOT values are very sensitive to systematic bias in both modelled and observed data, especially when ozone concentrations lie just below or above the threshold limit.

In the upper panel of Figure 4.4, the AOT60 for the 1980s distribution is displayed. The largest concentrations are found in the Po valley and along the Mediterranean coast, but the AOT60 reaches more than 1200 ppb.h over parts of Southern and Central Europe. The lower panel shows the AOT60 for the 1990s distribution. Increases in AOT60 relative to the 1980s distribution of more than 750 ppb.h are seen in Portugal, Spain and the South-Eastern part of Germany, while reductions of more than 1000 ppb.h is seen along the Mediterranean coast and in the South-Eastern part of Poland.

It should again be noted that the AOT indicators are very sensitive to ozone levels just above or below threshold, and caution should be made drawing firm conclusions. Even so, this study indicates that the spatial distribution alone might alter the results from modelling assessments for the risk of health effects.

The upper panel of figure 4.5 shows the $AOT40_f$ levels for the 1980s distribution. Recalling that critical levels of 10000 ppb.h have been suggested for forests, it is seen that most of Eastern, Central and Southern Europe have levels above 10000 ppb.h. The lower panel of figure 4.5 shows the $AOT40_f$ levels for the 1990s distribution. The differences relative to the 1980s distribution are rather small. Reductions of the highest time concentrations are seen in Spain, while increases are seen in the Southern part of Germany.

This study indicates that in the case of $AOT40_f$, differences in spatial distribution are of relatively little importance.

Figure 4.6 may serve as a summary of the results regarding effects of emission distribution on calculated ozone levels. In this figure, the calculated ozone daily maximum concentrations for the two distributions are shown at Tortosa. Tortosa is located at the European part of the Mediterranean coast, in the North Easten part of Spain. The average concentration for April-September is 55 ppb for the 1980s distribution and 51 ppb for the 1990s distribution, in accordance with the decrease in mean ozone concentration seen in figure 4.2, lower panel. The ozone peaks are often higher for the 1980s distribution than for the 1990s distribution, in agreement with the lower AOT60 levels seen along the Mediterranean coast for the 1990s distribution relative to the 1980s distribution (Figure 4.4). In the period April-September, the ozone concentration very rarely drop below 40 ppb, and when it does, there are almost no difference seen between the two distributions, illustrating why the differences in $AOT40_f$ (figure 4.5) are so small.

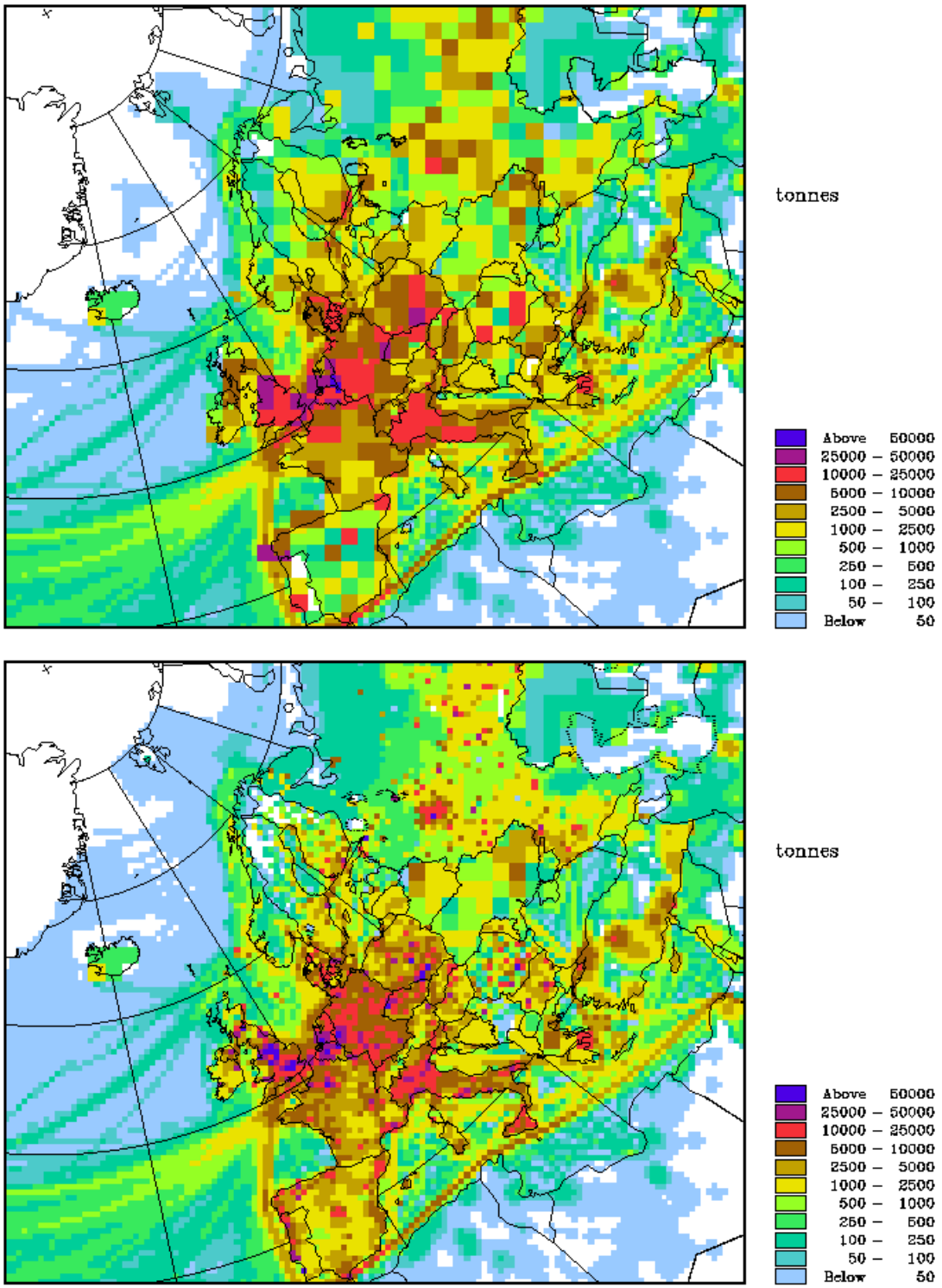
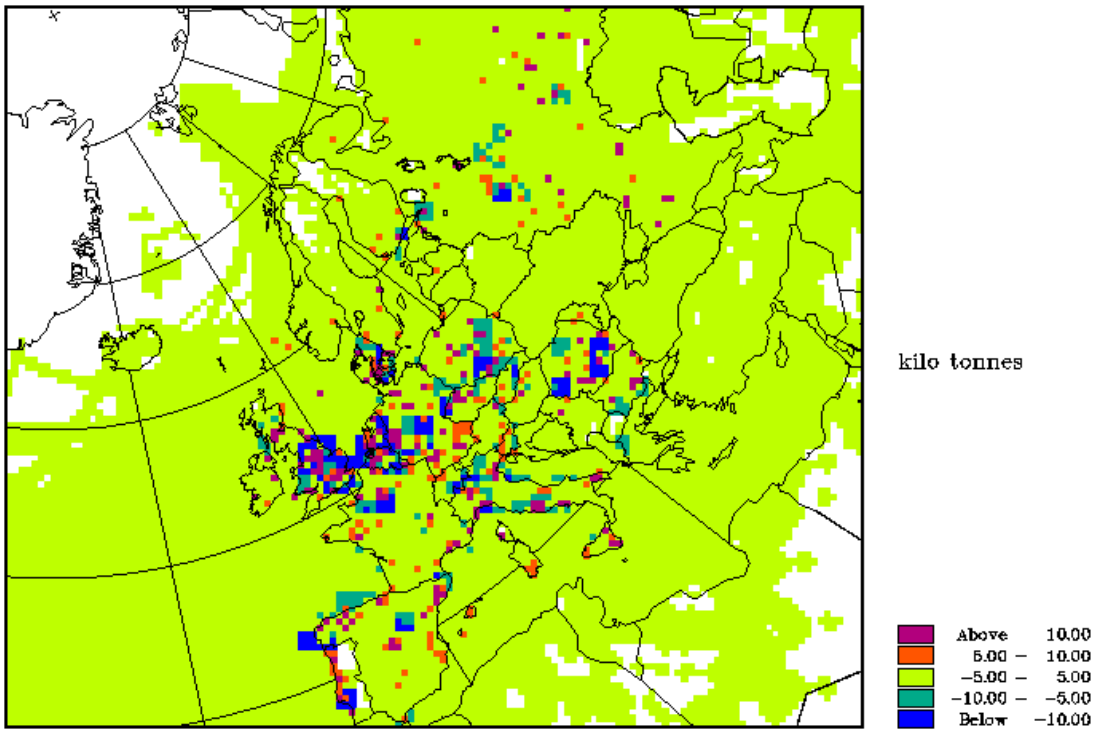


Figure 4.1 NO_x 1980s distribution (top) and 1990s distribution (bottom).
Both distributions scaled to 1996 emission level (Unit: tonnes/year as NO_2).



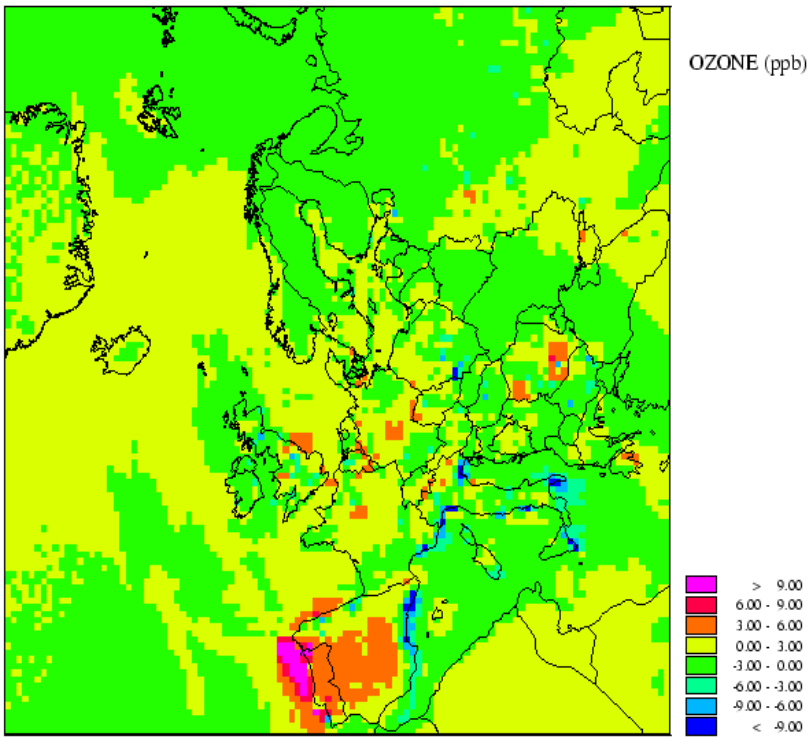


Figure 4.2 Difference in NO_x emissions caused by difference in spatial distribution (top). Unit: 1000 tonnes/year as NO_2.
Difference in calculated O_3 concentrations (average for July) (bottom). Unit: ppb.

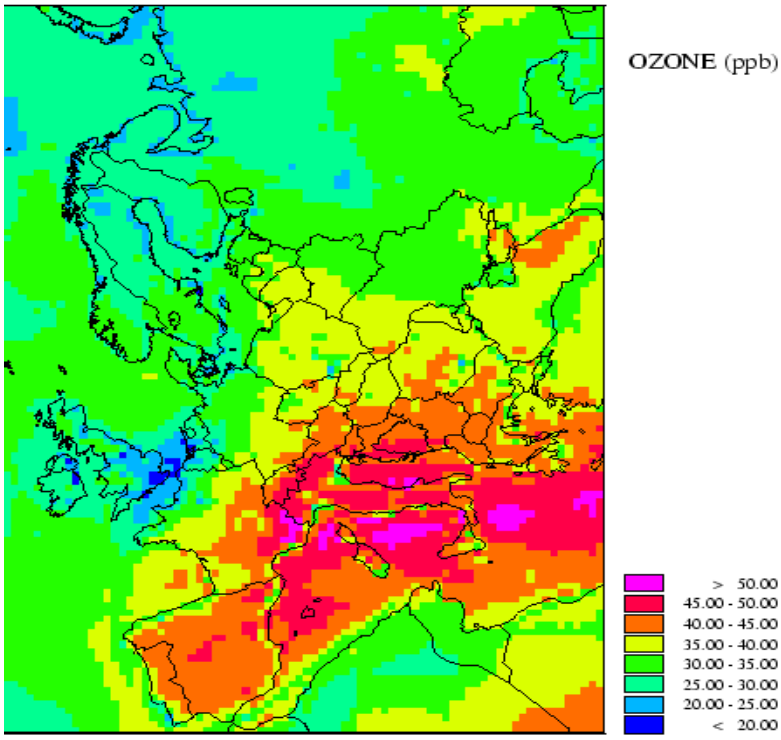


Figure 4.3 European level of calculated O_3 concentrations (middle value for July). Unit: ppb.

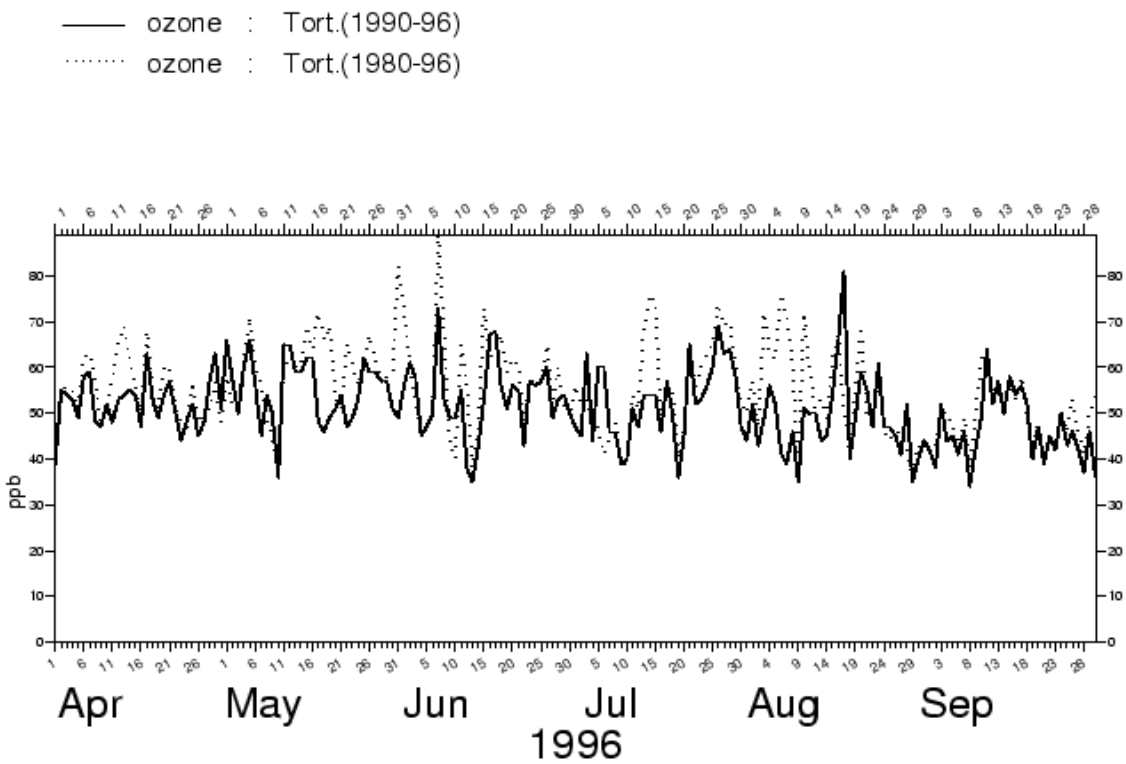


Figure 4.6 Daily maximum ozone concentration at Tortosa as simulated with the EMEP Eularian Photo-oxidant modell. Solid line: using 1990s emission distribution. Dotted line: using 1980s emission distribution. Units: vertical axis: ppb, horizontal axis: days.

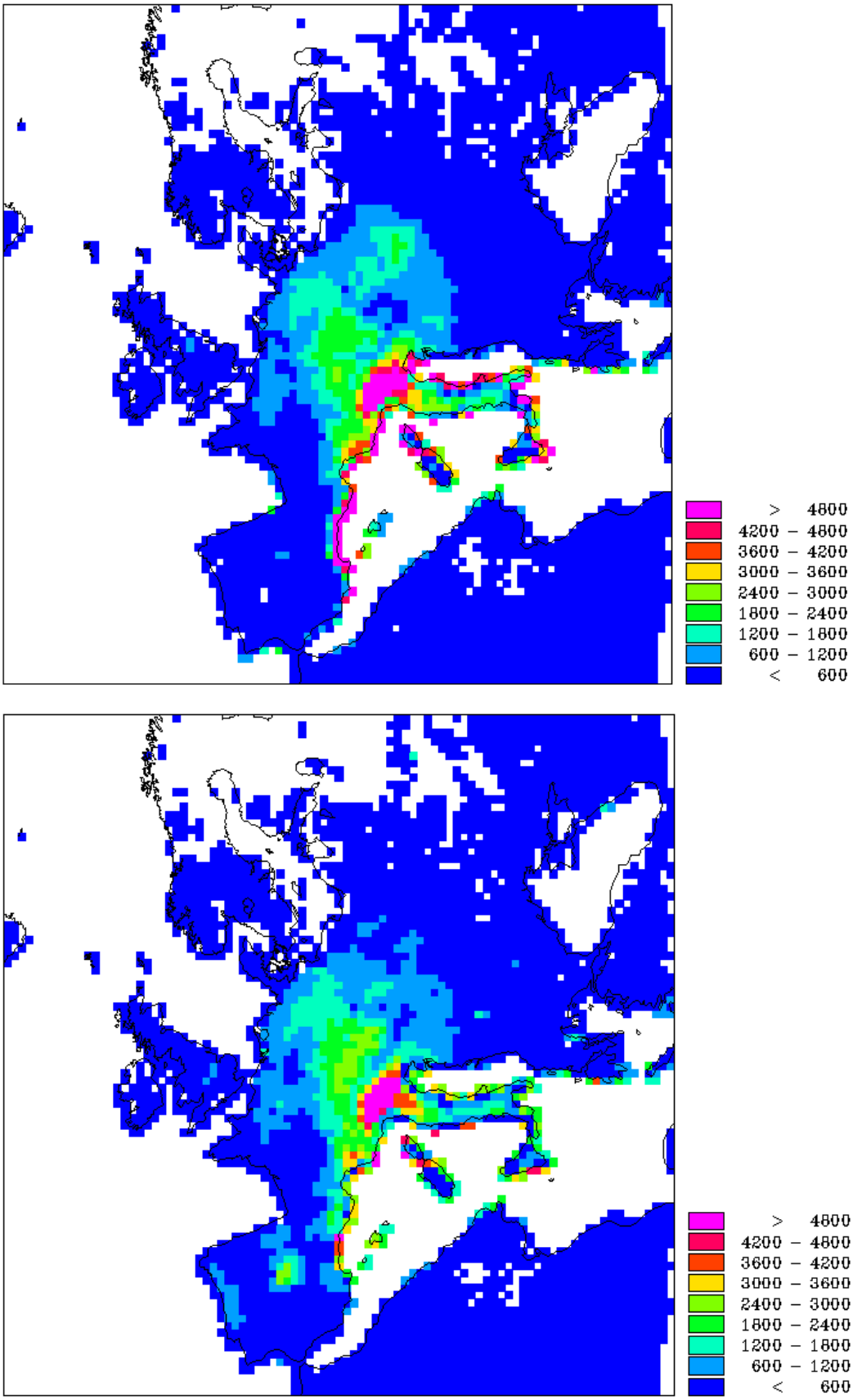
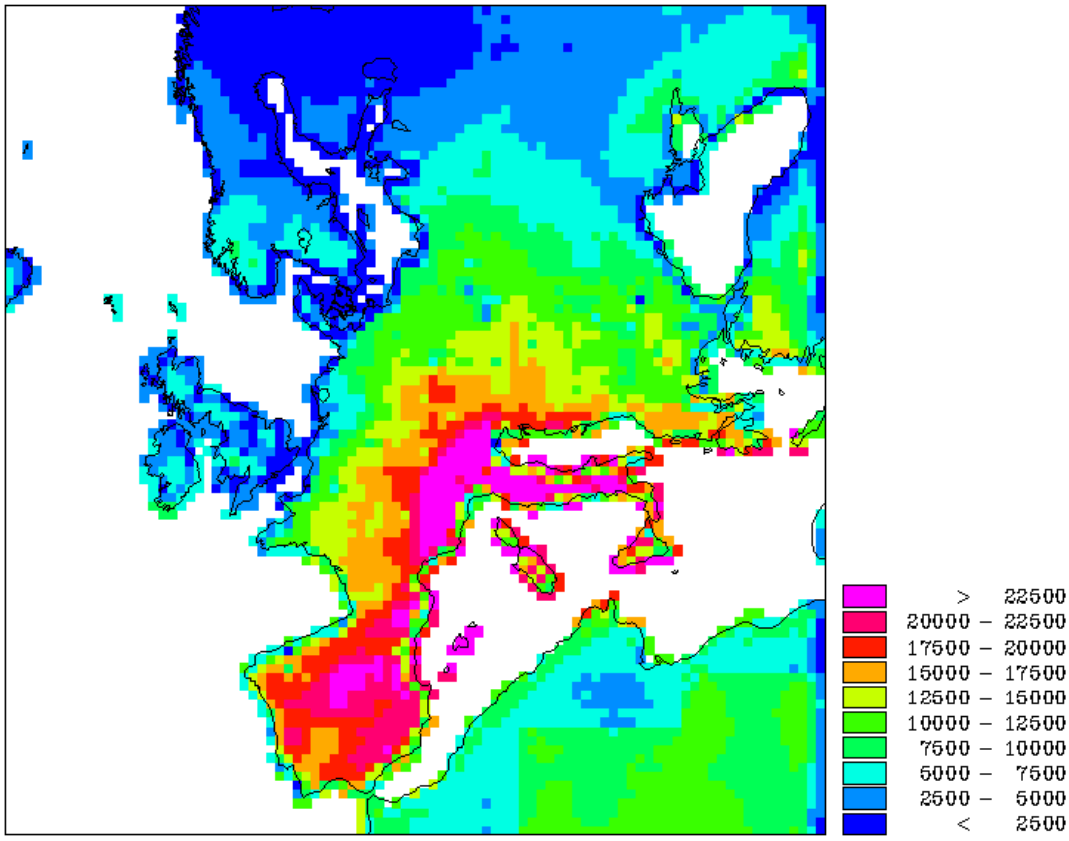


Figure 4.4 AOT60 calculated with 1980s emission distribution (top) and 1990s emission distribution (bottom). Emissions are scaled to 1996 in both cases. Unit: ppb.h



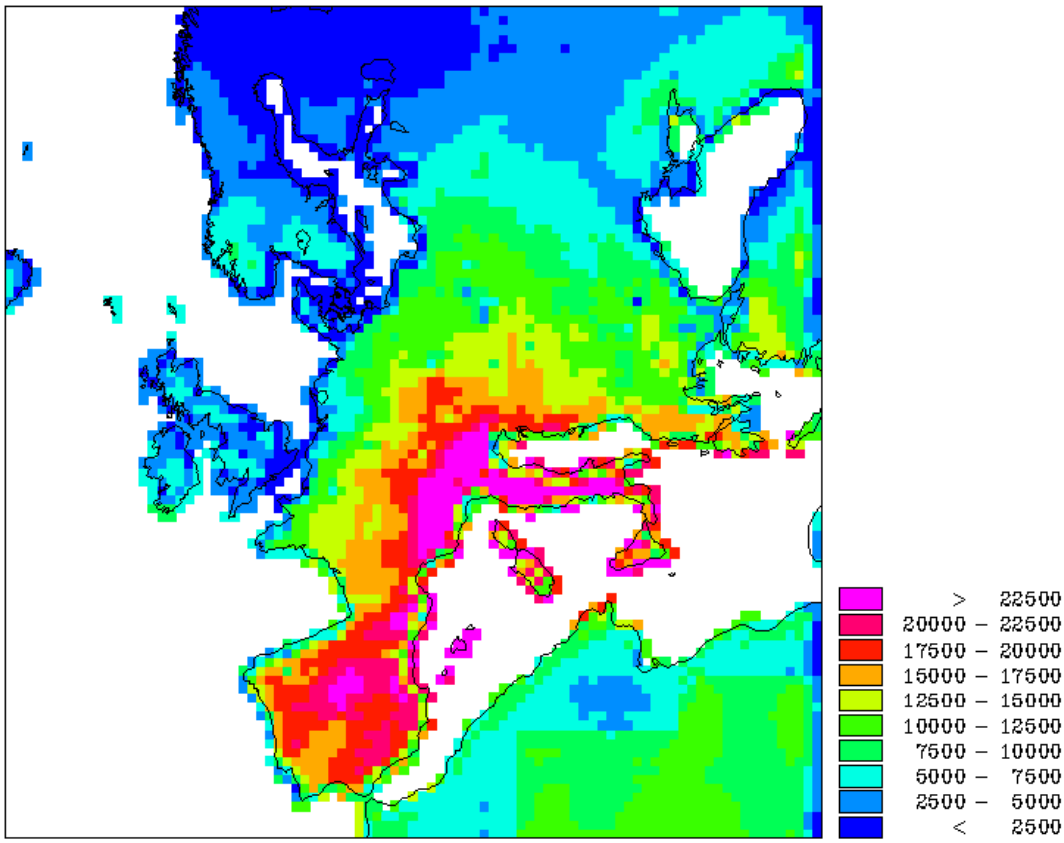


Figure 4.5 AOT40 –forest calculated with 1980s distribution (top) and 1990s distribution (bottom). Emissions are scaled to 1996 in both cases. Unit: ppb.h

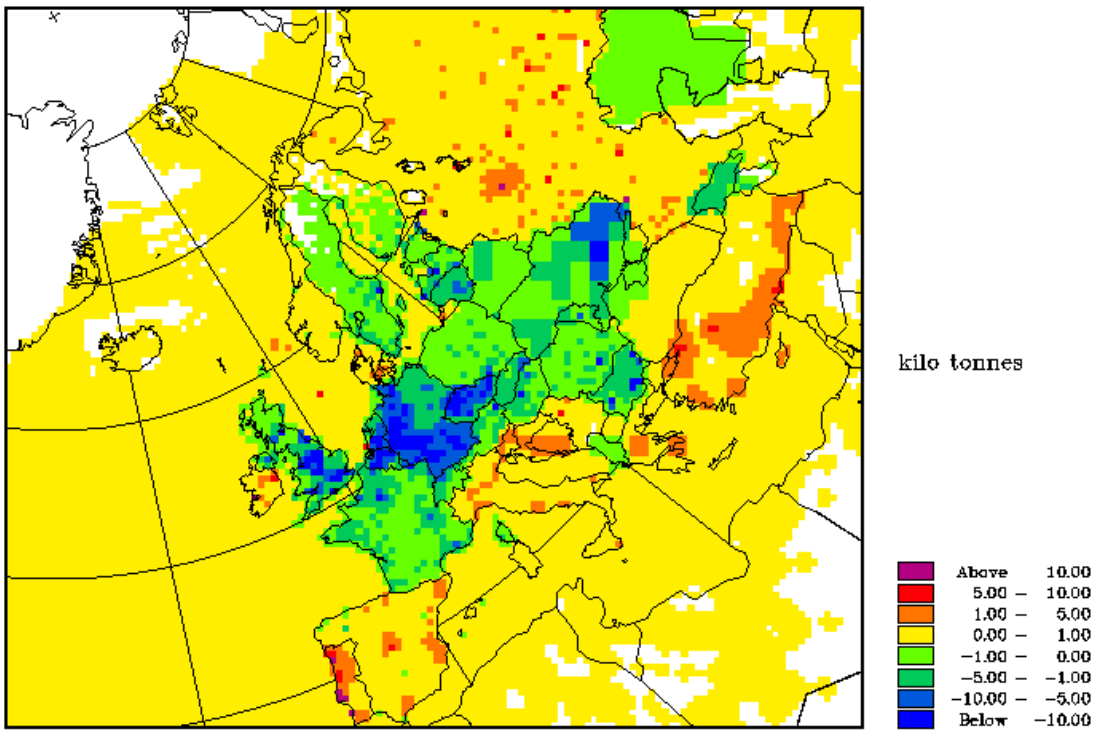
4. 4 Effect of emission differences in calculated ozone concentrations

In order to further evaluate the importance of chances in spatial distribution, a comparison with changes in emission level was performed. A third model run was made using the 1990s emission distribution with 1980 emission levels for all compounds (SO_2, NO_x, NMVOC, NH_3 and CO). These results were compared to the results from the model run with the same distribution and 1996 emission levels, reported above.

Figure 4.7 shows the difference in NO_x emissions caused by changes in emission levels. Reddish colour indicate an increase, while blue/green indicate a decrease. The NO_x emissions in former West Germany, Czech Republic, United Kingdom and Ukraina have decreased most, while increases are seen Portugal, in the Mediterranean countries, Ireland, Turkey and Russia. The level of difference is similar (+/- 10 Ktonnes (NO_2)) to the difference in distribution (Figure 4.2 upper panel), but the changes are more evenly and wide spread. Please note that the colour legend is slightly different in figures 4.2 and 4.7.

The lower panel in figure 4.7 displays the difference in calculated ground level ozone (average for July) between 1996 and 1980. A relatively large increase is associated with the decrease in NO_x emissions in South-western part of Germany and the Czech Republic. The largest ozone decreases is seen along the Mediterranean coast, in Romania and over the Black Sea. Maximum differences in mean ozone concentrations reach approximately +/- 6 ppb.

By comparing the changes in ozone concentrations associated with the difference in spatial distribution, with the ozone concentrations associated with the difference in emission level, this study indicates that the spatial distribution is at least as important as the emission level.



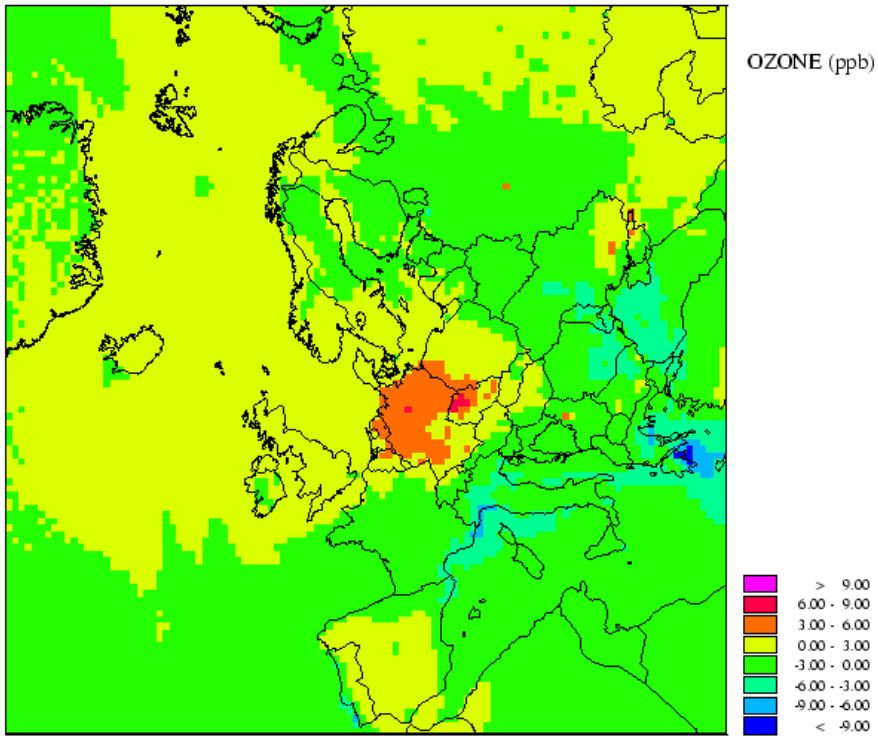


Figure 4.7 Difference in NO_x emission levels (top). Unit: 1000 tonnes/year as NO_2. Difference in calculated O_3 concentrations (average for July) (bottom). Unit: ppb.

4. 5 Comparison of calculated ozone concentration with measurements

The ozone daily maximum concentrations from the two different emission distributions (1980s and 1990s) have been compared with measurements from several EMEP measurement stations in 1996. Figure 4.8 displaying measured ozone concentration (red), calculated ozone concentration with the 1980s distribution (green) and calculated ozone concentration with the 1990s distribution (blue) for two of the selected stations. In addition, the average correlation (April-October) between the two distributions and the measurements, and the correlation between the distributions are shown. The Spanish station, Noia, (upper panel) is located to the west, close to the boarder between Spain and Portugal. The model reproduces in general the pattern in the ozone concentrations, but 1980s distribution is sometimes anti-correlated. The ozone levels are often too low, especially in the autumn. The average correlation from April–October, is not very good (below 0.5), but correlation increases drastically for the 1990s distribution relative to the 1980s distribution (R^2 = 0.42 versus 0.25). Unfortunately, measurements are lacking for the month of July. The average ozone concentration for April-September is 48 ppb for the 1990s distribution and 42 ppb for the 1980s distribution in accordance with the increase in ozone concentrations seen at this location in figure 4.2 lower panel.

Results from the Italian station, Ispra, is shown in the lower panel of figure 4.8. The station is located in the Northern part of Italy close to the border between Italy and Switzerland. The model reproduces in general nicely the ozone concentration pattern for both distributions, but the levels do not always match. The correlation is generally much better than for the Spanish station, and increases slightly (R^2 = 0.66 versus 0.68) for the 1990s distribution.

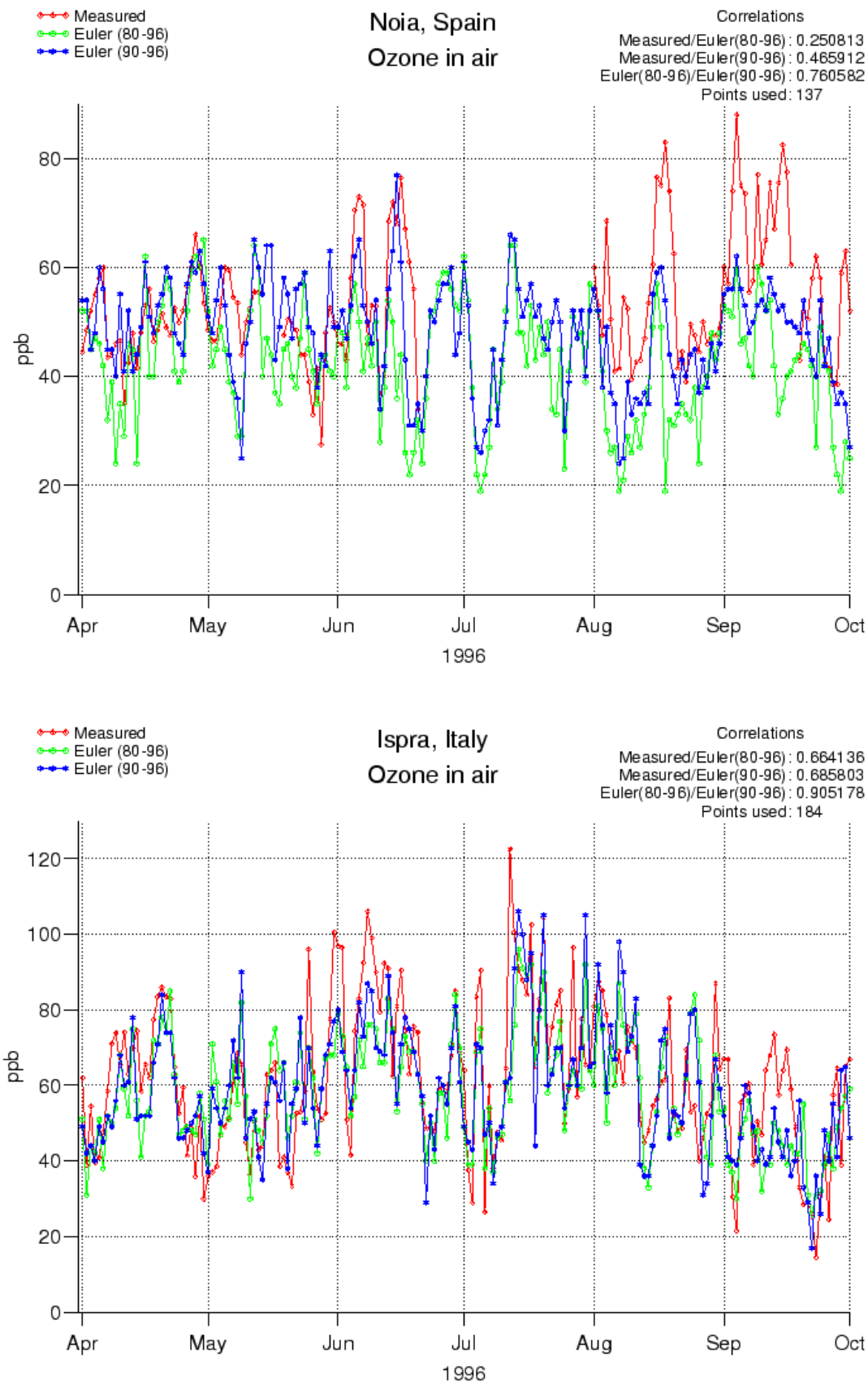


Figure 4.8 Comparisons of measured versus calculated O_3 concentrations for two different spatial distributions. Units: vertical axis: ppb, horizontal axis: months.

5. Emission trends and reductions

5.1 Emission Trends in the EMEP Area

Provided that data gaps are filled in, it is possible to calculate the development of emissions over the EMEP area since 1980. Figures 5.1-5.5 illustrate such emission trends for SO_2, NO_x, NH_3, NMVOC and CO, respectively. The figures are based on the data displayed in tables 3.1-3.5, where all national figures refer to anthropogenic emissions only. It should be noted that for several regions emissions in the tables are only first estimates (shaded values). Moreover, new emission methodologies adopted by the Parties are rarely applied to all preceding years, resulting in temporal inconsistencies. The year 2010 projections are derived as documented in Chapter 3 of this report.

European sulphur dioxide emissions (Figure 5.1) experience a clear downward trend. The total emission reduction of SO_2 between 1980 and 1999 is 59%, while the corresponding reduction between 1990 (base year of the Gothenburg Protocol) and 1999 is 47%. The trend in the emission of NO_2 (Figure 5.2) is characterised by relatively high releases in the late 1980s and an easing-off in the 1990s. The reduction is 18% between 1990 and 1999. European emissions of ammonia (Figure 5.3) appear to have dropped by approximately 17% between 1990 and 1999. The almost constant emission trend before 1990 is primarily a result of assumptions made to fill in the large amount of missing data for most countries. In the NMVOC emissions (Figure 5.4) there is a downward trend in the 1990s, leading to an average emission reduction of 27% between 1999 and 1990. In the case of CO (Figure 5.5), the reduction between 1980 and 1999 is 39% while the reduction between 1990 and 1999 is 33%.

The EMEP 2010 projection for CO would have been much higher, exceeding the 1999 value, if projections reported by Turkey, 10986 ktonnes and Ukraina, 8141 ktonnes in 2000 and 1996 respectively had been taken into account. The latest reported emission value was used instead of the reported projections, since reported projections seemed very high compared to the 1999 sum of sector data (3606 ktonnes) reported by Turkey and 1997 national total (2516 ktonnes) reported by Ukraine.

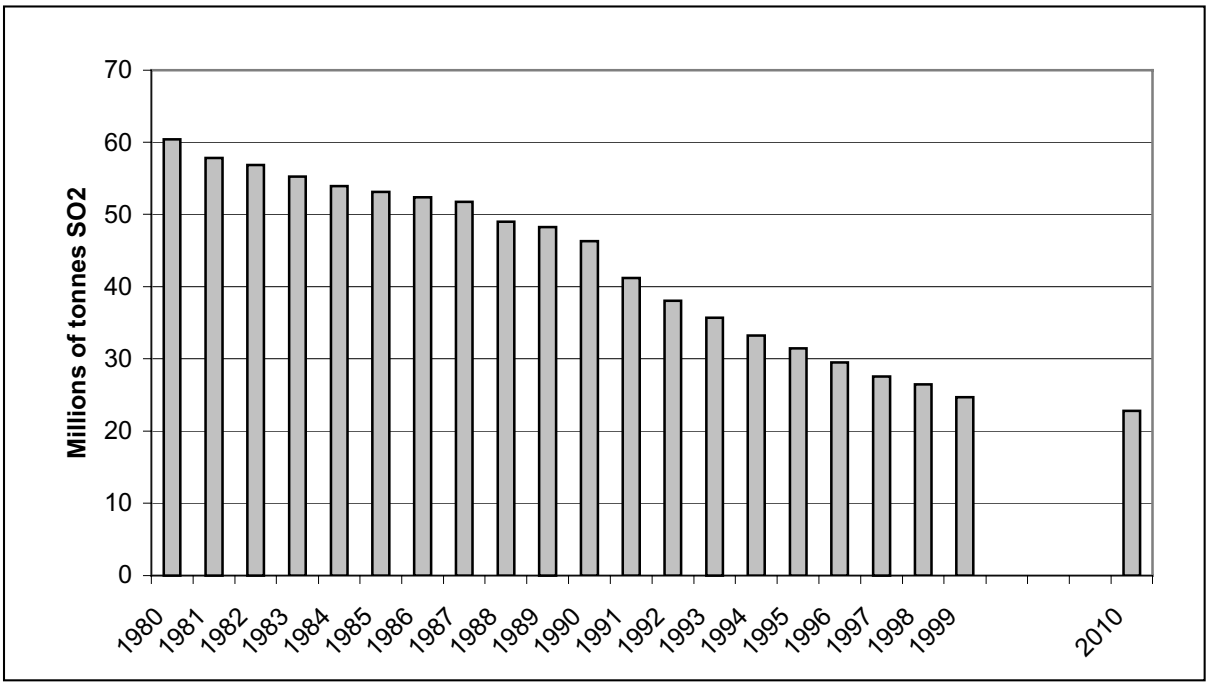


Figure 5.1 Emissions of sulphur in the EMEP area 1980-1999, 2010 (Millions of tonnes as SO_2)

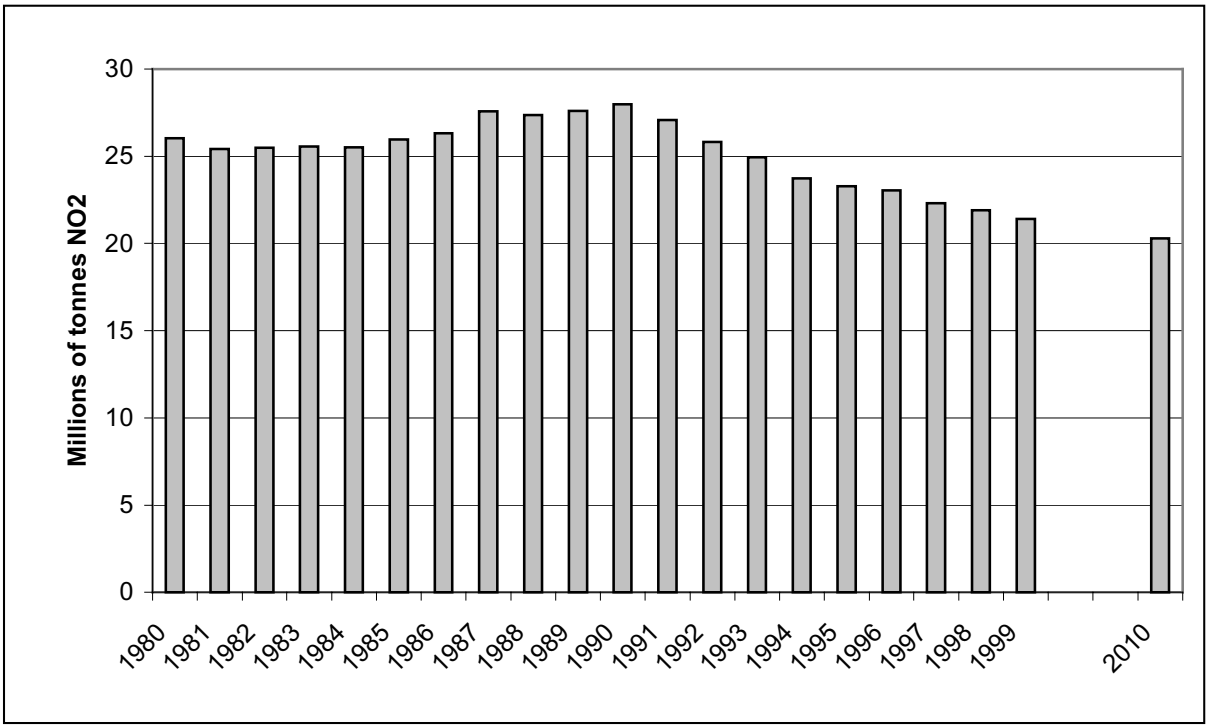


Figure 5.2 Emissions of nitrogen oxides in the EMEP area 1980-1999, 2010 (Millions of tonnes as NO_2)

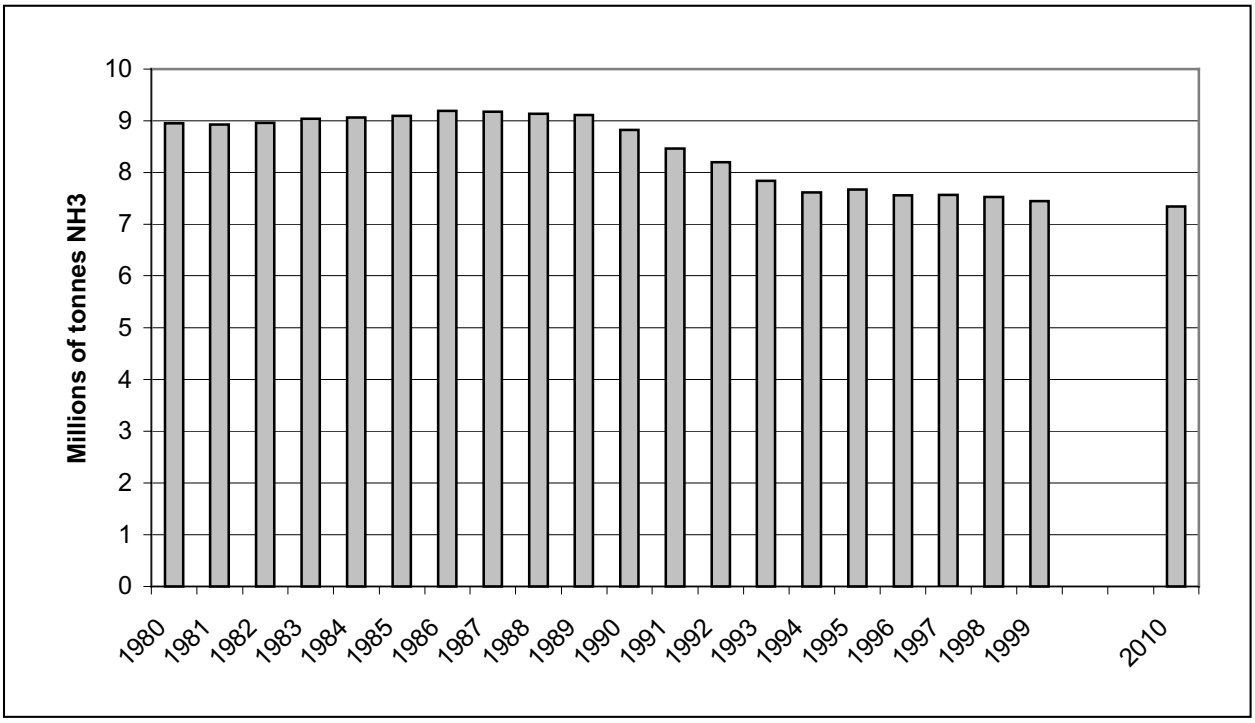


Figure 5.3 Emissions of ammonia in the EMEP area 1980-1999, 2010 (Millions of tonnes as NH_3)

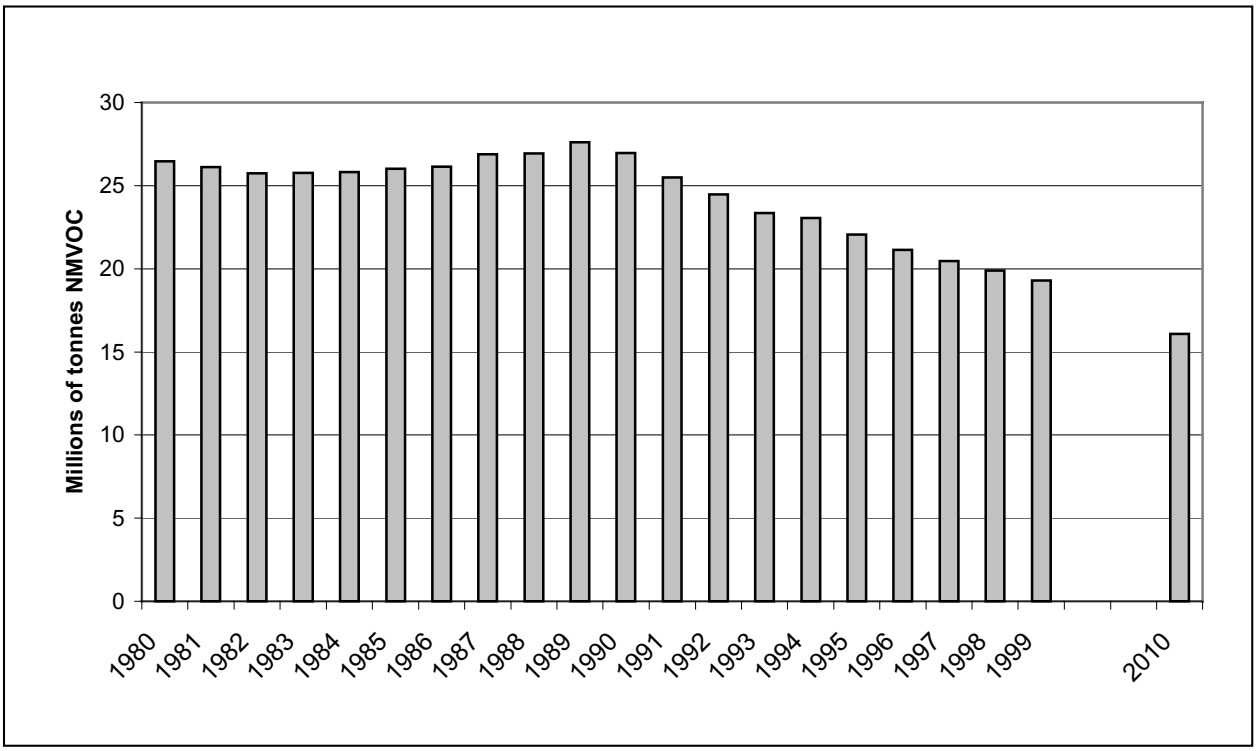


Figure 5.4 Emissions of non-methane volatile organic compounds in the EMEP area 1980-1999, 2010 (Millions of tonnes as NMVOC)

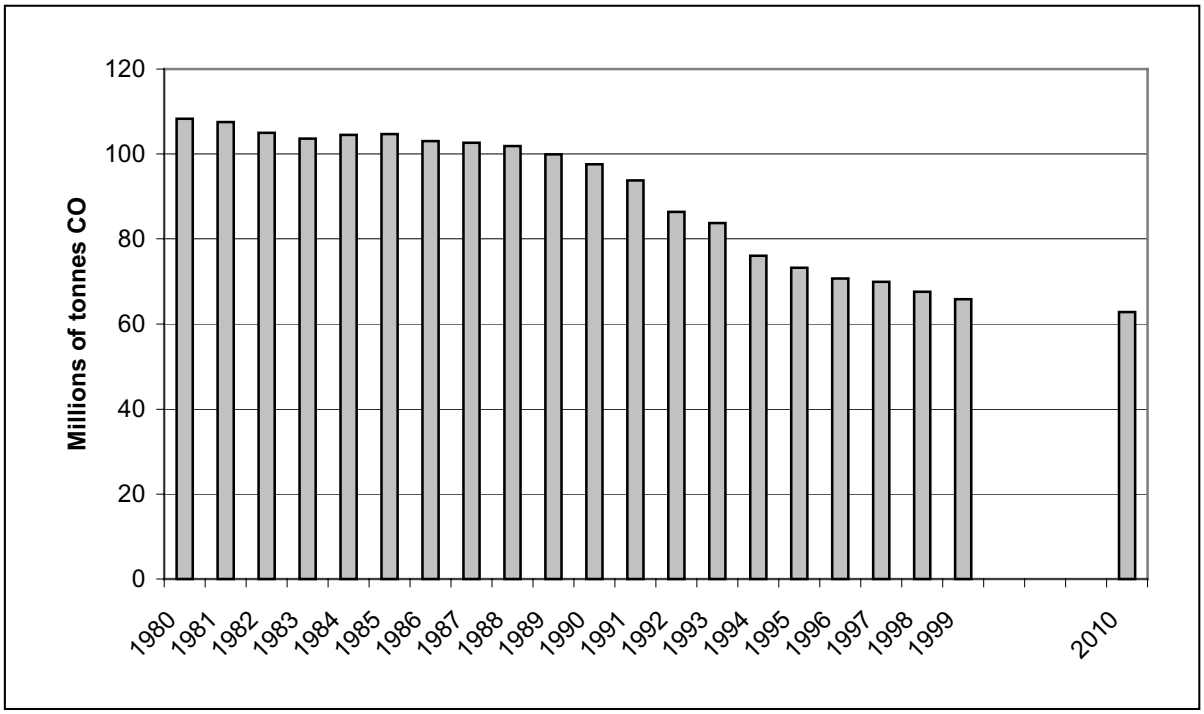


Figure 5.5 Emissions of carbon monoxide in the EMEP area 1980- 1999, 2010 (Millions of tonnes as CO)

5.2 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 5.6-5.9 present the percentage emission reduction (100* (E_{year1} – E_{year2})/ E_{year1}) between 1990 (the Gothenburg Protocol base year) and 1999. The calculated reductions are based on the most updated emissions reported by each Party (Annex I, Table 19). Non-Signatories to the Gothenburg Protocol are listed to the right in the figures.The Protocol had 31 Signatories as of 11 March 2001.

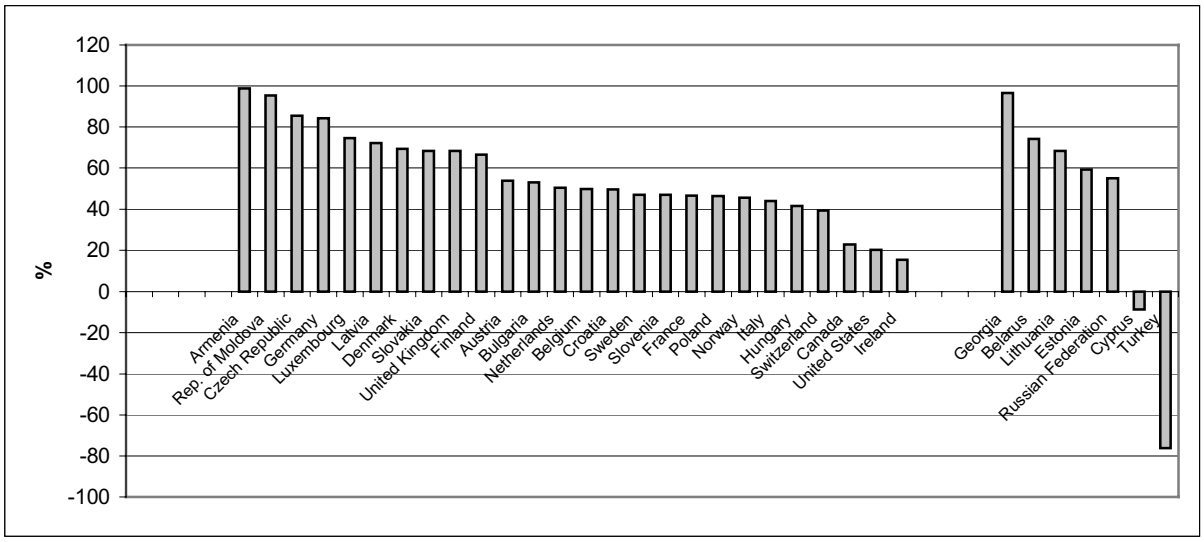


Figure 5.6 Emissions reductions of sulphur in the ECE region 1990-1999 (based on the latest data available, see table 19). Signatories to the 1999 Gothenburg Protocol are on the left. Only countries that have reported emission data for both 1990 and 1999 are listed here.

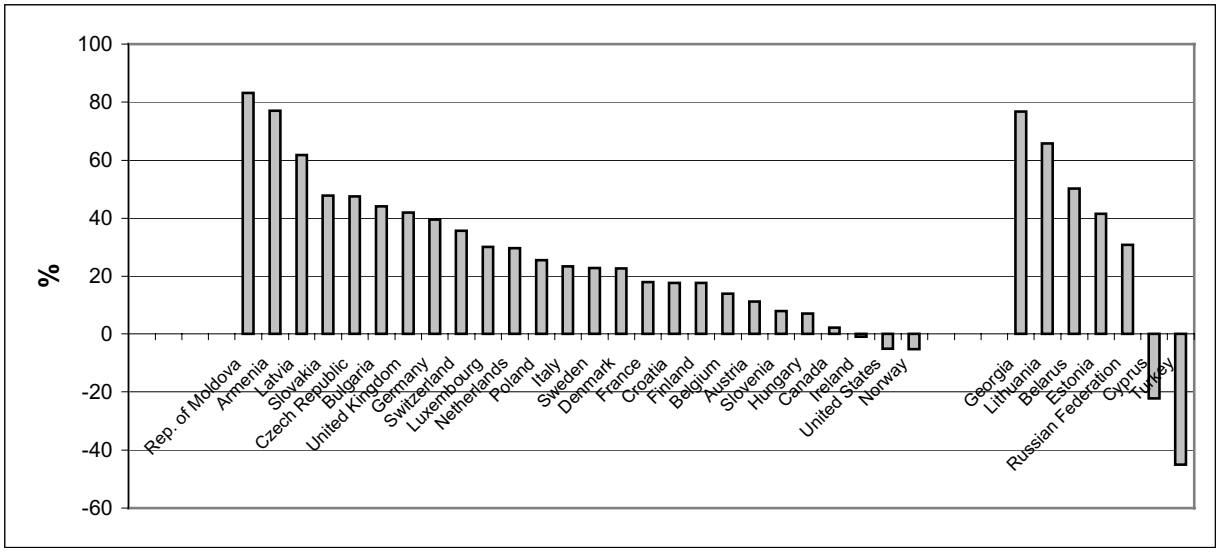


Figure 5.7 Emission reductions of nitrogen oxides in the ECE region 1990-1999 (based on the latest data available, see table 19). Signatories to the 1999 Gothenburg Protocol are on the left. Only countries that have reported emission data for both 1990 and 1999 are listed here.

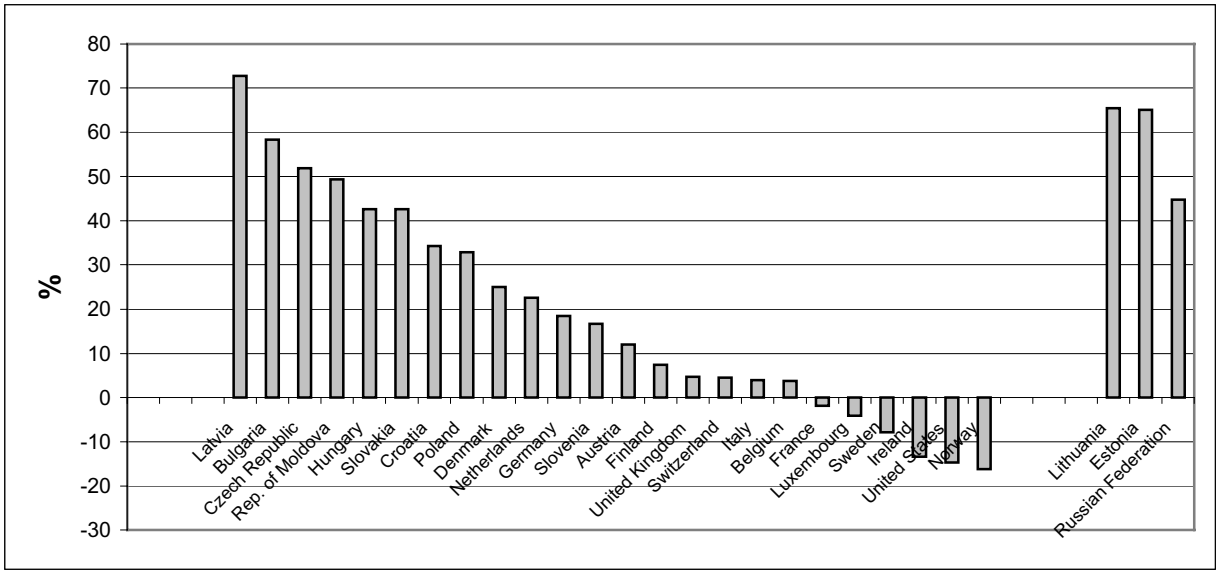


Figure 5.8 Emission reduction of ammonia in the ECE region 1990-1999 (based on the latest data available, see table 19). Signatories to the 1999 Gothenburg Protocol are on the left. Only countries that have reported emission data for both 1990 and 1999 are listed here.

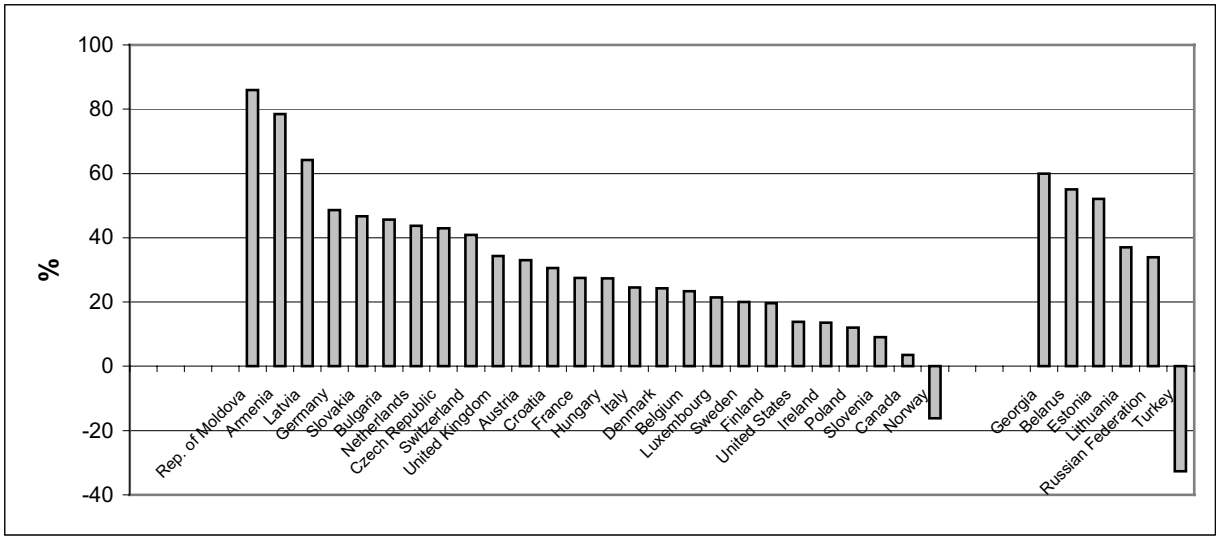


Figure 5.9 Emission reductions of non-methane volatile organic compounds in the ECE region 1990-1999 (based on the latest data available, see table 19). Signatories to the 1999 Gothenburg Protocol are on the left. Only countries that have reported emission data for both 1990 and 1999 are listed here.

Overall, the greatest reductions are detected in sulphur emissions (Figure 5.6). Cyprus and Turkey are the only Parties to the Convention that report an increase in emissions of sulphur. Figure 5.7 shows that for nitrogen oxides, also Ireland, Norway and United States have reported increased emissions. Increases in emissions of ammonia (Figure 5.8) are reported by France, Ireland, Luxembourg, Norway, Sweden and United States, while all other Signatories to the Gothenburg Protocol and the non-Signatories: Estonia, Lithuania and the Russian Federation have reported reduced ammonia emissions. In the case of NMVOC (Figure 5.9), all the Parties except Norway and Turkey have reported reduced emissions.

6. Summary

Emission reporting has remained relatively constant with respect to last year. The need for completeness in reporting and checking data consistency remain focal issues. For pollutants other than SO_2 and NO_x, data gaps are still substantial. Complete information on sector split emission data, gridded data and height distribution for each grid square are essential requirements in the EMEP assessment. Reporting on the emission estimation methodology is necessary to aid work on quality control and possible validation of the reported figures. The latter tasks are highly prioritised in the EMEP work, and is reflected in the new draft Guidelines for Estimating and Reporting Emission data. Moreover, changes in estimation methodologies should be reported and official figures for previous years should be revised accordingly. Parties are kindly requested to address these issues very carefully in future submissions.

The evaluation of the spatial distribution of emissions indicated that:

- The emission distribution is at least as important as the emission level with regards to ozone levels. Peak values of ozone can be affected by these.
- With the present levels of NO_x emissions in Southern Europe, increases in NO_x emissions caused by distribution differences can be associated with relatively large decreases in ozone concentrations, while NO_x decreases are accompanied by ozone increases.
- Reallocation of emission sources due to increased grid resolution can give rise to significant changes in the derived ozone concentrations
- In order to enhance the quality of dispersion modelling results, it is of vital importance that the spatial distributions reported to UNECE are as accurate as possible in locating the emissions sources, and that the emissions are reported in the 50x50km^2 and not in the 150x150 km^2 grid.

Emission tables and maps for the major pollutants are available on the EMEP web site (*http//www.emep.int*).

References

Amann, M., Bertok I., Cofala J., Gyarfas F., Heyes C., Klimont Z. and Schoepp W. (2000) Cost-effective Control of Acidification and Ground-Level Ozone: Further Analysis. Eighth Interim Report to the European Commission, DG Environment..

Benkovitz, C.M., Scholtz, M.T., Pacyna, J., Tarrasón, L., Dignon, J., Voldner, E.C., Spiro, P.A., Logan, J.A., and Graedel, T.E. (1996) Global Gridded Inventories of Anthropogenic Emissions of Sulphur and Nitrogen, J.Geophys. Res., 101, 29239-19253, 1996.

Bouwman, A.F., Lee, D.S., Asman, W.A.H., Dentener, F.J., van der Hoek, K.W. and Olivier, J.G.J.(1997) A global high-resolution emission inventory for ammonia. Submitted to Global Biogeochemical Cycles.

EEA (1995) CORINAIR 90 summary - European Emission Inventory for Air Pollutants. EEA/053/95.

EMEP/CORINAIR (1999) Atmospheric Emission Inventory Guidebook -Second Edition (ed. By S. Richardson). European Environment Agency, Copenhagen. *http://reports.eea.eu.int/EMEPCORINAIR/en*

EMEP/MSC-W (1999) Transboundary Photo-oxidants in Europe , Report 2/99, ISSN 0332-9879

Lloyd's Register of Shipping (1995) Marine Exhaust Emissions Research Programme. Lloyd's Register of Shipping, London.

Lloyd's Register of Shipping (1998) Marine Exhaust Emissions Quantification Study - Baltic Sea. Final Report 98/EE/7036 Lloyd's Register of Shipping, London.

Lloyd's Register of Shipping (1999) Marine Exhaust Emissions Quantification Study for the Mediterranean Sea.

Radunsky and Ritter, (1996) CORINAIR 1990 Summary Report 3, Large Point Sources, Topic report 20, EEA.

Tarrasón, L., Turner, S.M. and Fløisand, I. (1995) An estimation of seasonal DMS fluxes over the North Atlantic ocean and their contribution to European pollution levels. J.Geophys. Res., 100 D6, 11623-11639.

UNECE, 1999, Protocol to the 1979 Convention on Long-Range Transboundary Air Pollution to abate acidification, Eutrophication and ground level ozone. EB.AIR/1999/1, Gothenburg, 15. oktober 1999

UNECE, 2001, Draft Guidelines for Estimating and Reporting Emission data. EB.AIR/GE.1/2001/6 and EB.AIR/GE.1/2001/6 Add.1

UNECE, 2001, Present state of emission data. EB.AIR/GE.1/2001/7

ANNEX I

Official National Anthropogenic Emission Totals

Overviews: Content of officially reported data available in the EMEP database

&

Emission reductions

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 received by June 2000.

Tables 1-9 present national annual emissions along with the associated major comments.

Tables 10-18 Give overviews of data available in the EMEP database for each country

Table 19 lists emissions reductions of sulphur, nitrogen oxides, ammonia and non-methane volatile organic compounds in the ECE region as a percentage of 1990 level (Base year for the Gothenburg Protocol).

It is important to note here that Parties to the Convention are not necessarily Signatories to the Gothenburg Protocol.

The tables of national anthropogenic emissions are to appear on the Internet in autumn 2001 (EMEP web site: *http://www.emep.int*).

Table 1. Anthropogenic emissions of sulphur (1980-2010) in the ECE region (thousands of tonnes SO_2 per year)

Party/Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2010
Armenia	141.0	110.7	101.3	110.3	96.9	100.2	111.2	110.6	104.1	62.7	72.00	59.5	44.1	5.5	4.2	2.5	1.5	.400	3.310	.84[a]	
Austria	384.5	334.2	316.3	237.5	211.8	190.0	171.4	152.9	115.1	102.1	91.0	82.2	63.4	60.3	57.0	56.4	52.9	50.6	46.6	42.0	39.0
Belarus	740	730.0	710.0	710.0	690.0	690	690	761	720	668	637	652	458	382	324	275	246.3	208.5	190	163.7	480
Belgium	828	712	694	560	500	400	377	367	354	325	372	334	318	297	253	246	240	220	212[b]	186[b]	106
Bosnia and Herzegovina											480.0										
Bulgaria	2050							2420	2228	2180	2008	1665	1115	1426	1480	1476	1420	1365	1251	943	856
Canada	4643	4291	3612	3625	3955	3692	3627	3762	3838	3695	3236	3245	3117	3008	2651	2681	2722	2749	2766	2499	2914
Croatia[cde]	150.0										180.0	108.0	106.7	113.7	89.3	70.4	66.2	80.4	89.5	90.7	70
Cyprus	28	28	33	30	33	35	38	39	42	42	46	33	39	43	42	41	45	47	49	50	39
Czech Republic	2257	2341	2387	2338	2305	2277	2177	2164	2066	1998	1876	1776	1538	1419	1270	1091	946	701	443	269	283
Denmark[f]	452.1	370.4	378.7	322.9	305.5	343.5	292.2	258.8	254.9	197.7	182.6	241.1	188.3	154.0	156.4	148.5	179.6	110.0	76.92	55.91	50
Estonia [g]	287					254	256	255	254	254	252.1	245.6	187.4	153.8	149.1	118.5	125.2	119.0	110.0	102.5	57.4
Finland	584	534	484	372	368	382	331	328	302	244	260	194	141	123	114	96	105	99	90	87[b]	110
France[fh]	3211	2523	2414	1984	1770	1479	1343	1329	1220	1379	1278	1389	1211	1052	990	934	913	767	808	682[b]	400
Georgia[i]	230.2	242.1	250.1	267.3	266.6	273.2	255.3	258.3	255.3	249.1	248.3	194.0	135.2	71.4	46.9	20.3	30.1	33.1	20.18	8.61	
Germany[jk]	7514	7441	7440	7346	7633	7732	7641	7396	6487	6165	5321	3996	3307	2945	2473	1994	1405	1127	899	831	550
Greece[l]	400					500					506	549	556	551	526	551	540	531	540		546
Hungary	1633	1580	1545	1480	1440	1404	1362	1285	1218	1102	1010	913.0	827.3	757.3	741.0	705.0	673.2	658.5	591.8	590.2[b]	550
Iceland[mn]	17.8	17.8	17.8	18.2	18.8	18.1	18.4	16.2	17.5	17.3	24.0	23.1	23.9	24.5	23.8	23.9	24.1	24.5	26.8		29.4
Ireland	222	192	158	142	142	140	162	174	152	162	186	180	172	161	175	161	147	166	176	157	42
Italy	3757	3330	2850	2463	2114	1901	1929	2029	1963	1854	1651	1539	1394	1333	1271	1322	1205[o]	1075[o]	1039[o]	923[o]	842
Kazakhstan																					
Kyrgyzstan												52.1	40.8	31.6	21.0	15.7	14.0	9.9	10.8	8.72	
Latvia											119	90	79	73	86	59	59	44	40	33	157
Liechtenstein	.389	.365	.341	.317	.293	.269	.245	.221	.197	.173	.149	.145	.142	.138	.134						.110
Lithuania[p]	311	312	304	310	303	304	316	316	300	298	222	234	139	125	117	94	93	77	94	70	145
Luxembourg	24			14		16					15			15.00	13	9	8	6	4	3.822	4
Malta																					
Monaco											.073	.101	.104	.108	.096	.091	.082	.077	.074		
Netherlands	490	464	404	323	299	258	264	263	250	204	202	173	172	164	146	147	135	118	107	100	50
Norway	137.3	128.0	110.7	103.8	95.8	98.2	91.4	73.0	67.6	58.3	52.7	44.3	36.5	35.2	34.8	33.8	33.0	30.2	29.8	28.7	22
Poland	4100					4300	4200	4200	4180	3910	3210	2995	2820	2725	2605	2376	2368	2181	1897	1719	1397
Portugal[q]	266			306.0		198	234.0	218.0	204.0		359.4	345.6	409.0	360.0	338.9	365.6	323.4	341.3	374.9		
Republic of Moldova [rst]	308	305	287	284	270	282	297	317	273	238	265	259.8	168.2	156.4	108.5	64.06	67.03	36.13	32.08	12.05	135
Romania	1055	1095	1104	1229	1223	1255	1293	1305	1469	1517	1311	1041	951.0	928.0	912.0						
Russian Federation[fu]	7161	6949	7090	6934	6503	6191	5707	5622	5145	4677	4460	4392	3839	3456	2983	2838	2685	2449	2208	2003	4297
Slovakia	780					613	604	614	589	573	543	445	380	325	239	239	227	202	179	171	210
Slovenia	234	254	256	274	250	241	247	222	210	211	196	180	186	183	177	125	112	118	123	104	27
Spain[f]	2836	2773	2749	2764	2523	2393	2267	2139	1787	2122	2049	2050	2040	1919	1875	1721	1498				
Sweden[vw]	491	431	371	305	296	266	272	228	224	160	119	96	88	87	82	79	83	51	49	63	67
Switzerland	116	108	100	92	84	76	68	62	56	49	42	41	38	34	31	34	30	26	27.6	25.5	26.0
The former Yugoslav Republic of Macedonia																		17.00	105.0[x]		
Turkey[y]	204.5	218.0	235.7	299.1	360.8	519.8	674.4	606.4	443.1	740.7	764.7	840.6	821.3	767.8	991.5	1016	1172	1234	1361	1347	995.0
Ukraine	3849	3492	3427	3498	3470	3463	3393	3264	3211	3073	3782	2538	2376	2194	1715	1639	1293	1132			2310
United Kingdom	4880	4426	4214	3874	3711	3750	3910	3908	3839	3720	3754	3568	3447	3105	2665	2348	2010	1637	1567	1187	612.2
United States	23501	22251	20993	20449	21292	21463	20795	20580	21005	21132	21481	20906	20696	20389	19845	17408	17109	17566	17682	17116	15174
Yugoslavia	406	408	409	440	456	478	470	484	502	506	508	446	348	401	424	462	434	522	521		1135
European Community											19127				13072	12278	10181				

[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] Preliminary data
[c] 1990-1998: Distributed according to SNAP90
[d] 1999: Distributed according to SNAP97
[e] Values for the periode 1980-1989 are missing because air emission inventories were not prepared for that period
[f] Data include those located within the EMEP area only
[g] SO2 emissions were calculated from stationary and mobile sources
[h] Emission figures do not include air traffic above 1000 m and international sea traffic
[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] Emissions from 1980-1986 are not updated
[k] Emissions from international air traffic, marine bunkers and managed forests are not included
[l] Emissions reported for 1980-1985 are to be regarded as indicators only, and are not comparable to the emissions reported after 1985
[m] 2/3 of the SO2 emissions are emitted as H2S
[n] Emissions in 1980 and 1981 are assumed to be similar to 1982 due to lack of data
[o] Emissions for 1996-1999 estimated according to SNAP97
[p] Emissions from 1990 onwards are recalculated
[q] Emissions from 1990 onwards are calculated using the categories of SNAP97
[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
[s] For 1990-1999 emissions have been calculated according to EMEP/CORINAIR Emission Inventory Guidebook and the Greenhouse Gas inventory Reporting Instructions
[t] SOx emissions 1980-1989 and NOx emissions 1980-1984 do not include mobile sources
[u] SO2 figures refer to stationary sources only except from those in 1996-1999 which include mobile sources.
[v] International transport (ie aviation and navigation) is not included in national totals except for the CO2 figure for 1980
[w] Emissions ot SO2 and NOx from domestic navigation/coatal shipping, for the years 1980-1993, are assumed to account for 30% of the total emissions from shipping in Sweden
[x] Data are for sectors 1-6 only. Data for sectors 7-11 are not yet ready.
[y] Sum of reported sector data

Table 2. Anthropogenic emissions of nitrogen oxides (1980-1999, 2010) in the ECE region (thousands of tonnes NO2 per year)

Party/Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2010
Armenia		15.4	17.2	16.6	15.7	44.8	53.0	51.5	55.5	51.2	46.20	40.0	21.8	12.1	11.9	14.9	11.4	15.10	10.95	10.61	
Austria	227.8	220.2	218.2	215.4	214.5	216.7	212.7	209.1	201.9	194.4	192.6	196.2	186.7	174.7	181.7	170.4	165.6	172.3	170.8	170.8	107.0
Belarus	234	235.0	235.0	237.0	240.0	238	258	263	262	263	285	281	224	207	203	195	172.7	188.5	164	142	180
Belgium	442					325	317	338	345	357	339	335	343	341	342	336	316	306	312[a]	292[a]	181
Bosnia and Herzegovina																					
Bulgaria								416	415	411	361	256	230	242	230	266	259	225	223	202	266
Canada	1959	1907	1897	1884	1871	2038	2043	2131	2204	2188	2104	2003	1997	2006	2026	2032	2011	2068	2051	2056	2085
Croatia[bcd]	60.00										87.6	65.0	56.2	59.3	65.5	65.7	68.6	73.3	76.0	72.1	87
Cyprus	13	13	14	14	14	14	15	16	17	17	18	16	19	20	20	19	21	21	22	22	23
Czech Republic	937	819	818	830	844	831	826	816	858	920	742	725	698	574	435	412	432	423	413	390	286
Denmark[e]	273.2	243.2	264.1	257.0	270.3	292.0	321.8	304.7	295.1	276.7	271.7	314.5	268.4	267.0	270.7	251.4	291.7	250.2	231.9	210.2	133
Estonia								70	70	69	67.7	63.33	39.35	38.05	41.08	42.06	44.36	44.75	46.01	39.62	
Finland	295	276	271	261	257	275	277	288	293	301	300	290	284	282	282	258	268	260	252	247	170
France[ef]	2014	1910	1869	1846	1841	1817	1776	1807	1808	1858	1865	1930	1886	1772	1731	1700	1684	1633	1592	1530[a]	860
Georgia[g]	121.0	125.6	130.0	137.6	137.3	140.4	133.8	134.1	134.6	130.6	129.5	112.5	47.8	32.5	20.8	26.6	49.6	54.5	42.35	30.14	
Germany[hi]	3334	3259	3219	3258	3305	3276	3286	3327	3208	2989	2706	2493	2303	2189	2038	1967	1877	1781	1709	1637	1081
Greece[j]						306		320.0			326	333	334	331	342	341	378	361	382		344
Hungary	272.9	270	268	266	264	262.5	264.2	264.9	257.8	246.8	238.0	203.1	183.3	184.0	187.4	190.1	195.8	199.5	202.6	221.0[a]	198
Iceland	21.2	21.2	21.2	21.8	21.7	20.5	22.3	24.0	24.9	25.3	26.3	26.7	28.4	29.3	29.2	28.4	29.6	28.6	27.7		30.0
Ireland	73	86	86	85	84	91	100	115	122	127	118	120	130	119	115	115	120	118	122	119	65
Italy	1638	1604	1605	1583	1596	1614	1690	1811	1854	1917	1938	1984	2010	1990	1789	1768	1744[k]	1662[k]	1594[k]	1485[k]	1436
Kazakhstan																					
Kyrgyzstan												20.0	8.9	6.5	3.3	3.4	3.5	3.5	3.6	2.38	
Latvia											102	74	63	56	48	42	35	44	42	39	81
Liechtenstein	.173	.705	.696	.688	.679	.671	.662	.654	.645	.637	.628	.606	.583	.561	.539						.370
Lithuania[l]	152	154	156	158	162	166	169	171	172	173	158	166	98	78	77	65	65	57	60	54	110
Luxembourg	23			21		21					23			25.00	23	21	22	18	17	16.09	11
Malta																					
Monaco											.523	.629	.677	.635	.633	.595	.581	.582	.551		
Netherlands	583	575	562	555	573	589	587	599	602	584	580	568	556	535	510	498	501	453	423	408	260
Norway	189.6	177.7	182.0	186.7	201.0	212.8	227.9	228.6	224.0	222.7	219.2	210.0	208.2	216.7	213.8	214.2	223.1	223.9	225.0	230.6	156
Poland	1229					1500	1510	1530	1550	1480	1280	1205	1130	1120	1105	1120	1154	1114	991	953	879
Portugal[m]	166.0			192.0		96	110.0	116.0	122.0		317.0	332.7	354.4	341.8	344.9	357.8	354.4	360.9	369.3		
Republic of Moldova [nop]	58	57	50	42	44	66	72	71	74	70	100	97	67.3	53	46.2	38.2	38	36.5	21.7	16.91	90
Romania	523.0	528.0	516.0	542.0	546.0	542.0	559.0	580.0	590.0	579.0	546.0	464.0	357.0	318.0	319.0						
Russian Federation[eq]	1734	1915	2002	1976	1879	1903	1871	2653	2358	2553	3600	3325	3093	3054	2685	2570	2467	2379	2488	2494	
Slovakia								197		227	226	205	191	184	174	182	130	125	130	118	
Slovenia	51	52	52	51	52	53	58	57	59	58	63	58	58	63	66	67	70	71	64	58	45
Spain[e]	1019	947	945	959	956	934	957	1003	1030	1131	1156	1210	1240	1202	1214	1216	1194				
Sweden[rs]	404	417	412	401	411	426	432	437	432	418	338	339	329	324	331	301	302	270	257	261	148
Switzerland	170	172	174	175	177	179	176	174	172	169	154	146	138	129	124	120	113	107	104	99	79.0
The former Yugoslav Republic of Macedonia																		6.000	15.22[t]		
Turkey[u]	355.6	368.4	398.5	424.7	449.4	474.1	518.3	559.7	556.5	597.4	628.0	633.0	651.2	730.5	715.0	776.5	847.4	852.4	833.8	911.0	2044
Ukraine	1145	1145	1153	1153	1102	1059	1112	1094	1090	1065	1097	989.0	830.0	700.0	568.0	531.0	467.0	455.2			1094
United Kingdom	2580	2496	2486	2498	2456	2539	2620	2729	2783	2786	2756	2631	2552	2358	2260	2088	2013	1844	1732	1603	1167
United States[v]	22121	22397	21819	21704	22581	21045	20480	20654	21517	21676	21927	22079	22437	22785	23110	22726	23635	23907	23605	23037	17687
Yugoslavia	47	50	50	53	58	58	58	60	63	62	66	57	50	54	52	59	57	66	66		147
European Community											13289				11828	11470	11350				

[a] Preliminary data
[b] 1990-1998: Distributed according to SNAP90
[c] 1999: Distributed according to SNAP97
[d] Values for the periode 1980-1989 are missing because air emission inventories were not prepared for that period
[e] Data include those located within the EMEP area only
[f] Emission figures do not include air traffic above 1000 m and international sea traffic
[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 from 1980-1986 are not updated
[i] Emissions from international air traffic, marine bunkers and managed forests are not included
[j] Emissions reported for 1980-1985 are to be regarded as indicators only, and are not comparable to the emissions reported after 1985
[k] Emissions for 1996-1999 estimated according to SNAP97
[l] Emissions from 1990 onwards are recalculated
[m] Emissions from 1990 onwards are calculated using the categories of SNAP97
[n] 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
[o] For 1990-1999 emissions have been calculated according to EMEP/CORINAIR Emission Inventory Guidebook and the Greenhouse Gas inventory Reporting Instructions
[p] SOx emissions 1980-1989 and NOx emissions 1980-1984 do not include mobile sources
[q] NO2 figures for 1980-1989 refer to stationary and road vehicles only
[r] International transport (ie aviation and navigation) is not included in national totals except for the CO2 figure for 1980
[s] Emissions ot SO2 and NOx from domestic navigation/coatal shipping, for the years 1980-1993, are assumed to account for 30% of the total emissions from shipping in Sweden
[t] Data are for sectors 1-6 only. Data for sectors 7-11 are not yet ready.
[u] Sum of reported sector data
[v] The NO2 emissions for the base year (1978) is 21830 kilo tonnes

Table 3. Anthropogenic emissions of ammonia (1980-1999, 2010) in the ECE region (thousands of tonnes NH3 per year)

Party/Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2010
Armenia		3.1	3.1	3.0	2.8	2.0	1.7	1.7	2.0	.2	25.00	.11	.05	.01	.006	.006	.004	.004	.002	.003[a]	
Austria	78.4	79.3	79.4	81.2	82.0	81.4	81.0	80.2	79.0	79.9	79.9	79.2	76.4	76.2	75.9	74.2	72.6	72.1	71.8	70.3	66.0
Belarus											4				4	4.6	4.4	4.05	4.4	4.16	4.0
Belgium						89					107	93	92	97	96	97	99	99	102[b]	103[b]	74
Bosnia and Herzegovina																					
Bulgaria											144	124	111	109	101	99	83	77	66	60	108
Canada																					
Croatia[cde]											37.1	31.7	26.8	25.5	24.2	24.9	23.4	23.0	23.3	24.4	30
Cyprus																					
Czech Republic											156	134	115	99	91	86	81	81	80	75	101
Denmark[f]	125	123	120	119	115	134.9	135.0	131.4	127.8	128.3	127.9	123.6	120.7	116.9	112.2	105.2	100.6	100.0	100.9	95.99	
Estonia [g]											24.25	22.24	18.47	13.36	12.59	10.97	9.55	9.74	9.76	8.47	
Finland	39					43.00	41	45.00			38		41.00			35.2	35.00	38	37.8	35.2	31
France[fh]	805	814	817	822	807	807	812	807	788	788	790	787	776	768	774	781	795	803	807	805[b]	780
Georgia																					
Germany[ij]	835	821	817	841	853	857	846	845	835	823	765	673	649	638	639	635	635	625	632	624	550
Greece											79	78	75	75	73	85	73	71	74		73
Hungary	157.0					150.0	170.0	150.0		170.0	124.0	93.00	84.00	77.00	76.00	77.00	78.00	76.00	73.53	71.09[b]	90
Iceland																					
Ireland											112	115	117	117	119	120	122	123	127	127	116
Italy	479	475	464	504	481	487	495	497	499	481	466	451	440	449	459	461	430[k]	443[k]	438[k]	448[k]	449
Kazakhstan																					
Kyrgyzstan																				59.11	
Latvia											44	42	33	20	17	17	16	15	13	12	
Liechtenstein	.144				.145						.146										.150
Lithuania[l]	85	86	86	87	88	89	89	90	89	86	84	85	81	80	80	38	36	35	35	29	84
Luxembourg											7			7.000	7	7	7	7	7	7.288	7
Malta																					
Monaco																					
Netherlands	234	240	244	244	246	248	258	258	237	232	226	228	180	191	166	146	146	188	170	175	128
Norway	22.5	23.00	23.00	23.00	23.00	23.00	23.00	23.0	21.3	22.8	22.9	23.9	25.0	24.8	24.9	25.9	26.5	26.3	27.1	26.6	23
Poland	550					550	550	550	550	550	508	450	447	382	384	380	364	350	371	341	468.0
Portugal[m]											104.6	100.1	106.6	99.3	92.7	101.7	99.1	100.5	103.0		
Republic of Moldova [no]	52.7					57.9					49	49	44	37	35	33	31	25	25	24.8	42
Romania	340.0	332.0	327.0	311.0	359.0	343.0	350.0	329.0	339.0	341.0	300.0	267.0	255.0	223.0	221.0						
Russian Federation[fp]	1189	1192	1214	1245	1247	1239	1286	1277	1269	1258	1191	1161	1084	903	772	824	749	730	675	657	
Slovakia											62.9	59.2	51.0	45.2	42.6	41.2	41.4	38.4	34.7	36.1	
Slovenia											24	23	23	23	22	22	22	19	20	20	20
Spain[f]	396	383	409	411	417	420	435	474	475	487	472	468	468	448	470	467	517				
Sweden[q]									54		51	51	61	61	61	61	61	59	59	55	57
Switzerland	77				60.00	73.7					71.5	61.00	62.00	63.00		69.2	71	71	68.3	68.3	63.0
The former Yugoslav Republic of Macedonia																					
Turkey																					
Ukraine											23.00					9.100	7.7	7.000			23.00
United Kingdom											365.3	360.0	343.8	343.3	345.4	337.1	334.8	341.1	349.4	348.3	
United States						1685					3926	3977	4028	4093	4157	4226	4258	4343	4432	4503	4505
Yugoslavia																					
European Community											3789					3530					

[a] Agriculture not included
[b] Preliminary data
[c] 1990-1998: Distributed according to SNAP90
[d] 1999: Distributed according to SNAP97
[e] Values for the periode 1980-1989 are missing because air emission inventories were not prepared for that period
[f] Data include those located within the EMEP area only
[g] NH3 emissions were calculated from industry and agriculture
[h] Emission figures do not include air traffic above 1000 m and international sea traffic
[i] Emissions from 1980-1986 are not updated
[j] Emissions from international air traffic, marine bunkers and managed forests are not included
[k] Emissions for 1996-1999 estimated according to SNAP97
[l] Emissions from 1990 onwards are recalculated
[m] Emissions from 1990 onwards are calculated using the categories of SNAP97
[n] 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
[o] For 1990-1999 emissions have been calculated according to EMEP/CORINAIR Emission Inventory Guidebook and the Greenhouse Gas inventory Reporting Instructions
[p] NH3 figures for 1980-1985 refer to agricultural sector only
[q] International transport (ie aviation and navigation) is not included in national totals except for the CO2 figure for 1980

Table 4. Anthropogenic emissions of non-methane volatile organic compounds (1980-1999, 2010) in the ECE region (thousands of tonnes NMVOC per year)

Party/Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2010
Armenia		25.7	24.3	23.8	21.7	92.7	98.1	104.3	92.5	90.2	81.00	69.9	30.9	19.9	17.1	23.4	17.8	35.10	16.94	17.47	
Austria	353.2	352.0	350.4	354.1	361.4	359.8	373.3	376.1	378.3	367.8	344.7	314.2	280.4	269.0	259.2	260.2	249.4	245.6	236.3	230.7	159.0
Belarus	549	546.0	543.0	543.0	540.0	516	506	509	535	511	533	546	412	372	366	367	327.7	344.7	294.0	239.9	321
Belgium						688[a]					354	313	313	311	305	294	274	270	277[b]	271[b]	144
Bosnia and Herzegovina																					
Bulgaria									309		217	178	179	208	175	173	147	120	132	118	185
Canada	2099					2851	2859	2897	2964	2906	2880	2792	2730	2763	2752	2742	2760	2768	2736	2777	2927
Croatia[cde]											105.0	86.5	63.7	69.3	74.7	74.1	81.5	79.5	78.5	72.9	90
Cyprus																					
Czech Republic						275					435	398	359	338	310	286	284	272	269	248	220
Denmark[f]	203	199	199	202	206	196.7	198.5	199.4	195.5	194.3	169.3	167.2	161.7	158.6	150.9	146.9	146.5	136.8	133.9	128.0	73
Estonia						81	83	83	84	87	88.4	81.9	45.4	41.6	44.65	47.5	50.2	53.92	53.7	42.33	44.2
Finland[g]								210	213		209	206	203	195	188	185	173	173	172	168	130
France[fh]									2707	2671	2459	2438	2389	2266	2133	2055	1991	1914	1860	1784[b]	1100
Georgia[i]	45.5	46.8	47.8	49.8	49.3	48.5	47.6	48.2	47.8	46.0	46.4	8.2	3.9	2.2	1.7	1.5	2.4	2.8	10.84	18.63	
Germany[jk]	3224	3152	3134	3152	3191	3190	3218	3273	3255	3202	3221	2796	2539	2326	2158	2024	1896	1805	1723	1653	995
Greece						614[a]					334	338	340	348	357	362	376	384	397		261
Hungary	215					232	263	228	215.0	205	205.0	149.6	141.8	149.0	142.4	150.3	150.1	145.4	140.6	149.0[b]	137
Iceland	7.7	7.7	7.7	7.6	7.7	8.0	8.4	11.9	12.6	12.6	12.8	14.3	14.1	13.6	14.2	12.0	12.0	9.8	10.0		6.6
Ireland											110	111	114	108	107	104	110	114	115	95	55
Italy	2179	2119	2074	2045	2007	1992	2019	2088	2124	2215	2213	2293	2338	2344	2349	2368	1934[l]	1861[l]	1764[l]	1671[l]	1440
Kazakhstan																					
Kyrgyzstan												8.0	6.9	4.0	2.5	2.8	2.4	2.4	2.4	2.32	
Latvia											179	116	84	113	101	64	48	74	67	64	204
Liechtenstein	1.478	1.486	1.494	1.501	1.509	1.517	1.525	1.533	1.540	1.548	1.556	1.492	1.428	1.364	1.300						.860
Lithuania[m]	100	102	104	105	106	112	108	108	109	109	108	111	66	52	52	77	82	81	79	68	84
Luxembourg						15					19			18.00	18	16	16	15	13	14.92	9
Malta																					
Monaco											.700	.805	.926	.829	.825	.755	.702	.643	.586		
Netherlands	579.0	555.0	543.0	526.0	513.0	502	489.0	485.0	538.0	468.0	502	462	438	405	389	365	362	317	298	282	185
Norway	176.0	181.7	188.6	201.3	212.3	231.4	249.4	256.0	249.0	275.8	301.7	294.9	323.5	339.6	354.2	368.8	373.2	368.5	350.3	350.6	195
Poland	1036	912	889	954	985	1011	1029	1014	1026	1016	831	833	805	756	819	769	766	774	730	731	804.0
Portugal[n]						199					379.9	408.7	436.3	444.0	442.7	461.6	437.3	498.8	483.7		
Republic of Moldova [op]						105	101	102	102	96	157	151.2	99	74.5	65.6	61.7	64.4	68.8	42.9	22.14	100
Romania	829.0	810.0	772.0	796.0	812.0	787.0	830.0	884.0	846.0	812.0	772.0	678.0	627.0	634.0	638.0						
Russian Federation[f]	2843	2843	2582	2444	2390	2496	2338	2807	2790	3715	3566	3259	3204	2979	2861	2507	2576	2338	2332	2355	
Slovakia											148		124.0	122	108.0	107	104	90	87	79	
Slovenia									39.00		44	41	40	42	44	44	49	48	42	40	40
Spain[f]	2572	2547	2507	2545	2551	2594	2622	2679	2711	2759	2790	2737	2649	2485	2697	2635	2515				
Sweden[q]						600.0			555		526	517	485	483	478	457	458	417	413	421	245
Switzerland	323				324	324	318	311	305	298	279	261	242	226	213	200	191	182	173	165	144
The former Yugoslav Republic of Macedonia																					
Turkey[r]	359.0	361.0	379.3	387.5	383.9	379.0	403.0	430.3	449.8	453.0	462.2	457.2	478.6	527.1	515.5	581.3	613.1	619.7	614.6	613.0	1925
Ukraine						1626	1660	1687	1604	1512	1369	1302	1171	972.0	1024	811.0	718.0	665.0			1369
United Kingdom	2373	2350	2386	2407	2462	2475	2531	2594	2662	2693	2657	2592	2491	2387	2340	2215	2152	2050	1917	1744	1430
United States	23892	22485	21460	22565	23466	22161	21188	21053	21798	20424	19099	19277	18926	19141	19671	18977	17658	17901	16887	16461	12890
Yugoslavia																					
European Community											16888						14026				

[a] The NMVOC figure for 1985 includes CH4 emissions
[b] Preliminary data
[c] 1990-1998: Distributed according to SNAP90
[d] 1999: Distributed according to SNAP97
[e] Values for the periode 1980-1989 are missing because air emission inventories were not prepared for that period
[f] Data include those located within the EMEP area only
[g] Time series will be updated.
[h] Emission figures do not include air traffic above 1000 m and international sea traffic
[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] Emissions from 1980-1986 are not updated
[k] Emissions from international air traffic, marine bunkers and managed forests are not included
[l] Emissions for 1996-1999 estimated according to SNAP97
[m] Emissions from 1990 onwards are recalculated
[n] Emissions from 1990 onwards are calculated using the categories of SNAP97
[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
[p] For 1990-1999 emissions have been calculated according to EMEP/CORINAIR Emission Inventory Guidebook and the Greenhouse Gas inventory Reporting Instructions
[q] International transport (ie aviation and navigation) is not included in national totals except for the CO2 figure for 1980
[r] Sum of reported sector data

Table 5. Anthropogenic emissions of carbon monoxide (1980-1999, 2010) in the ECE region (thousands of tonnes CO per year)

Party/Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2010
Armenia		26.6	30.0	30.4	30.9	404.9	405.1	416.5	417.1	398.9	304.3	377.2	195.1	145.1	128.0	173.6	125.5	223.6	124.4	123.7	
Austria	1711	1644	1582	1548	1602	1548	1643	1602	1552	1486	1307	1287	1206	1177	1151	1049	1024	1024	970.3	864.9	
Belarus						1654	1605	1601	1590	1615	1722	1717	1381	1201	1241	1253	1242	1223	1034	786.4	1404
Belgium											1112	1120	1138	1104	1054	1032	1009	949	966[a]	944[a]	
Bosnia and Herzegovina																					
Bulgaria								997	995	985	891	608	768	820	855	846	613	515	650	617	750
Canada	10273					9685					10596	10153	9855	9851	9747	9653	9595	9476	9302	9425	10550
Croatia[bcd]											655.2	565.3	416.5	375.4	369.4	345.8	388.8	365.6	344.9	334.3	660
Cyprus																					
Czech Republic	894	0	906	0	895	899	740	738	737	884	1055	1102	1045	967	1026	874	886	877	767	686	
Denmark[e]	956.3	1075	1123	950.6	1060	993.1	998.1	1019	937.8	1000	704.0	718.3	687.3	662.1	621.7	604.9	623.9	567.1	601.1	541.3	331
Estonia						400	417	423	419	448	434.1	399.2	207.8	210.2	241.1	242.3	267.7	282.8	280.7	215.3	
Finland	660										559	552	478	457	444	436	461	474	452	547	
France[ef]	15737	14968	14510	14070	14133	13935	13522	13267	12843	12288	10774	10645	10221	9657	8981	8862	8277	7854	7614	7178[a]	
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	249.5	390.2	429.2	353.3	222.5	
Germany[hi]	14046	13027	12438	11980	12176	12134	12135	12438	12080	11430	11213	9515	8351	7704	7065	6667	6234	5832	5341	4952	
Greece											1328	1369	1318	1317	1309	1340	1385	1405	1500		
Hungary	1019					931.1			963.1		997.0	913.4	835.8	796.1	774.3	761.3	726.9	733.4	736.9	755.1[a]	800
Iceland	44.2	44.2	44.2	43.2	44.1	45.5	48.2	53.6	57.1	57.0	58.2	59.2	60.7	59.9	60.3	49.4	49.9	38.9	39.8		19.41
Ireland											401	394	395	350	329	304	307	312	318	285	322.0
Italy	7588	7478	7527	7432	7590	7692	7607	7674	7581	7735	7824	8003	7961	7755	7549	7755	6971[j]	6681[j]	6318[j]	6051[j]	4213
Kazakhstan																					
Kyrgyzstan												26.2	21.3	13.2	9.5	7.5	5.5	4.6	5.0	3.68	
Latvia											499	823	555	612	307	454	176	354	326	296	330
Liechtenstein	4.187	3.996	3.804	3.613	3.422	3.230	3.039	2.848	2.657	2.465	2.274	2.156	2.038	1.920	1.802						
Lithuania[k]	541	548	543	550	550	545	554	564	578	568	519	577	350	292	303	286	312	358	358	320	400
Luxembourg						193					175			219.0	145	107	103	80	51	49.80	33
Malta																					
Monaco											3.018	3.470	3.935	3.469	3.416	3.088	2.776	2.689	2.297		
Netherlands	1530	1418	1374	1354	1357	1381	1252	1192	1179	1131	1143	1025	983	960	907	892	903	749	722	679	
Norway	822.1	815.1	823.7	815.8	842.0	844.2	872.3	832.0	868.9	823.2	820.8	760.1	751.2	746.1	737.7	700.6	670.2	635.2	600.6	565.4	
Poland											7406		7083	8655	5115	4547	4837	4700	4301	4365	
Portugal[l]											1114	1189	1284	1269	1234	1201	1178	1143	1095		
Republic of Moldova [mn]	55	53	56	49	48	483	478	474	496	476	453.2	468.4	279.2	218.4	170.9	192	170.3	210.2	153.4	100.2	150
Romania	3245	3217	3152	3030	3463	3307	3378	3196	3317	3314	3186	2695	2506	2434	2325						
Russian Federation[e]	13520	15005	13617	13696	13672	14122	13142	13119	12988	12054	13174	12869	11574	11193	10495	9846	9312	10262	10284	10701	
Slovakia										491	535	485	430	456	446	435	360	352	318	310	
Slovenia	68	66	63	61	64	68	78	79	75	75	81	78	78	87	93	91	95	93	77	70	53
Spain[e]	3670	3542	3509	3539	3513	3475	3526	3633	3824	4000	3898	3992	4078	3885	3859	3448	3662				
Sweden[o]											1210	1212	1176	1148	1142	1088	1082	962	1004	924	426
Switzerland	1280	1222	1164	1106	1048	990	933	877	820	764	673	629	581	544	516	491	467	443	422	399	370
The former Yugoslav Republic of Macedonia																		23.00	25.80[p]		
Turkey[q]	2563	2575	2709	2772	2744	2725	2867	3041	3143	3155	3130	3110	3225	3460	3363	3552	3684	3722	3644	3607	10986
Ukraine						9832	9722	9269	9085	8794	8141	7406	5496	4218	3375	2906	2567	2516			8141
United Kingdom	7647	7608	7621	7406	7416	7192	7193	7233	7289	7517	7155	6956	6633	6140	5847	5492	5468	5184	4960	4760	2838
United States	106536	102968	100691	105583	104712	106155	99243	98298	105308	96561	89921	92350	89819	90530	94089	85329	91894	92044	87882	88398	86998
Yugoslavia																					
European Community											50008				41861	40574	39353				

[a] Preliminary data
[b] 1990-1998: Distributed according to SNAP90
[c] 1999: Distributed according to SNAP97
[d] Values for the periode 1980-1989 are missing because air emission inventories were not prepared for that period
[e] Data include those located within the EMEP area only
[f] Emission figures do not include air traffic above 1000 m and international sea traffic
[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 from 1980-1986 are not updated
[i] Emissions from international air traffic, marine bunkers and managed forests are not included
[j] Emissions for 1996-1999 estimated according to SNAP97
[k] Emissions from 1990 onwards are recalculated
[l] Emissions from 1990 onwards are calculated using the categories of SNAP97
[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
[n] For 1990-1999 emissions have been calculated according to EMEP/CORINAIR Emission Inventory Guidebook and the Greenhouse Gas inventory Reporting Instructions
[o] International transport (ie aviation and navigation) is not included in national totals except for the CO2 figure for 1980
[p] Data are for sectors 1-6 only. Data for sectors 7-11 are not yet ready.
[q] Sum of reported sector data

Table 6. Anthropogenic emissions of methane (1980-1999, 2010) in the ECE region (thousands of tonnes CH4 per year)

Party/Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2010
Armenia											152.8				77.56	79.24	77.52				
Austria	528.7	531.1	531.3	535.4	540.6	538.9	539.9	535.7	535.8	537.1	537.6	527.1	514.5	508.3	500.1	489.5	481.3	469.6	459.0	454.4	
Belarus											955.4					429.6					1000
Belgium											590	594	592	599	598	597	597	590	593[a]	585[a]	
Bosnia and Herzegovina																					
Bulgaria								646	660	638	757	582	623	664	523	506	495	533	553	478	420
Canada	2072	2682	2739	2759	2785	2847	2691	2801	2934	2987	3500	3700	3800	3900	4000	4200	4300	4300	4300	4300	
Croatia[bcd]											169.6	159.7	144.8	147.2	138.0	134.4	134.0	127.8	123.4	126.1	150
Cyprus																					
Czech Republic											779	710	668	633	614	599	573	562	529	517	
Denmark[e]	328.3	332.8	333.2	329.5	327.7	318.8	314.3	303.5	299.9	301.8	278.8	281.0	280.9	285.4	281.7	280.6	278.9	271.8	286.5	268.8	248
Estonia											105.2	101.1	91.3	79.7	79.5	67.7	63.2	103.1	101	120.5	
Finland	660								520.0		298	279	252	229	222	223	216	208	197	189	
France[ef]											2945	2996	3008	3045	3054	3096	3052	2809	2783	2688[a]	
Georgia[g]	379.8	374.5	382.2	387.4	396.1	411.2	416.3	411.9	394.6	383.3	356.4	309.1	242.5	189.6	163.3	151.9	155.5	167.4	114.3	62.93	
Germany[hi]	6117	6020	5914	5839	5803	5918	5875	5607	5533	5516	5571	5013	4654	4267	4022	3894	3570	3477	3353	3271	2628
Greece											438	440	440	441	446	456	453	457	465		
Hungary	1115					1173					1215	1134	1243	1165	1122	1210	1176	1131	1010	977.1[a]	900
Iceland	15.1	15.1	15.1	14.6	14.9	15.0	14.6	14.1	13.9	13.9	14.0	13.9	13.7	13.7	13.8	13.6	13.9	13.9	13.7		3.9
Ireland											602	608	610	613	616	623	634	643	637	637	580
Italy	2176	2172	2151	2234	2206	2231	2276	2313	2344	2330	2341	2390	2362	2461	2559	2555	1923[j]	1960[j]	1960[j]	1962[j]	
Kazakhstan																					
Kyrgyzstan																					
Latvia											194	190	157	112	98	101	93	102	97	99	119
Liechtenstein	.742				.713						.704										
Lithuania[k]	256	272	250	276	295	358	309	313	310	298	339	353	333	323	321	260	247	263	274	262	332
Luxembourg											24			25.00	22	23	24	24	23	23.77	26
Malta																					
Monaco											.052	.056	.059	.060	.061	.059	.060	.062	.060		
Netherlands	971	875	876	1009	1039	1177	1049	1047	1024	1039	1293	1300	1253	1223	1203	1173	1233	1110	1060	1030	
Norway	257.2	271.0	276.0	281.0	285.0	290.0	295.0	291.1	292.6	304.8	311.8	315.6	321.8	327.6	334.6	337.1	340.5	343.0	337.9	337.2	23.00
Poland									3141		2801	2589	2474	2432	2467	2457	2252	2279	2335		
Portugal[l]											637.1	639.9	635.1	623.1	634.7	633.5	632.5	636.5	633.9		
Republic of Moldova [mn]											193.2	183.8	164.2	144.2	147.3	134.3	128.2	117.9	106.8	116.3	
Romania	2393	2363	2218	2272	2345	2306	2475	2732	2535	2357	1955	1725	1532	1532	1512						
Russian Federation[eo]	5462	5414	5396	5423	5441	5427	5400	5428	5358	5312	5174	4923	4649	3680	3542	3400	3136	2902	2474	2775	
Slovakia											322	294	268	250	244	248	254	241	222	222	
Slovenia									90.00		169	171	162	164	162	166	166	164	165	163	116
Spain[e]	1109	1146	1243	1269	1290	1311	1422	1507	1520	1613	1624	1650	1686	1710	1754	1796	1890				
Sweden[p]											324	325	321	321	303	297	297	260	256	301	262
Switzerland	312				239	287					242	243	240	238	234	233	230	227	222	217	192
The former Yugoslav Republic of Macedonia																					
Turkey[q]	142.4	144.1	155.2	161.8	163.2	175.7	183.0	194.4	190.3	195.7	164.2	188.7	193.7	233.5	194.5	332.0	386.3	441.7	133.3	125.0	174.0
Ukraine																					
United Kingdom	3911	3907	3930	3948	3228	3760	3940	3884	3819	3752	3677	3628	3534	3179	2944	2918	2855	2764	2637		2852
United States											30689	30606	30883	30389	30784	30978	30379	30096	29754	29504	
Yugoslavia																					
European Community											20878	20380	19701	18908	18399		17766	17572	17489		

[a] Preliminary data
[b] 1990-1998: Distributed according to SNAP90
[c] 1999: Distributed according to SNAP97
[d] Values for the periode 1980-1989 are missing because air emission inventories were not prepared for that period
[e] Data include those located within the EMEP area only
[f] Emission figures do not include air traffic above 1000 m and international sea traffic
[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 from 1980-1986 are not updated
[i] Emissions from international air traffic, marine bunkers and managed forests are not included
[j] Emissions for 1996-1999 estimated according to SNAP97
[k] Emissions from 1990 onwards are recalculated
[l] Emissions from 1990 onwards are calculated using the categories of SNAP97
[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
[n] For 1990-1999 emissions have been calculated according to EMEP/CORINAIR Emission Inventory Guidebook and the Greenhouse Gas inventory Reporting Instructions
[o] Since 1995 CH4 emissions from wetlands, livestock and poultry are refined by application of coefficient in the Guidebook (1996 edition)
[p] International transport (ie aviation and navigation) is not included in national totals except for the CO2 figure for 1980
[q] Sum of reported sector data

Table 7. Anthropogenic emissions of carbon dioxide (1980-1999, 2010) in the ECE region (millions of tonnes CO2 per year)

Party/Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2010
Armenia											21.40				3.000	4.400	3.300				
Austria	63.8	59.8	57.4	56.5	58.4	59.2	58.5	59.8	57.2	58.0	62.1	66.0	60.2	59.9	61.8	63.8	64.9	66.8	65.5	65.8	54.0
Belarus											101.6				67.0	61.1			64.0		96.2
Belgium											116	120	118	109	113	126	129	126	122[a]	122[a]	
Bosnia and Herzegovina																					
Bulgaria								100	97	98	85	67	61	63	60	63		59			101
Canada	440	442	401	387	404	421	416	434	466	490	466	456	470	468	482	494	507	518	529	529	
Croatia[bcd]											23.5	18.6	17.0	17.7	18.2	17.6	18.2	19.8	20.4	20.0	30
Cyprus	3	3	3	3	3	3	3	4	4	4	5	5	5	5	6	6	6	6	6	7	9
Czech Republic	196					180	179	178	173	170	163	148	134	129	124	123	129	130	125	118	161.0
Denmark[e]	64.51	55.68	58.52	54.95	57.41	63.91	65.32	63.45	59.28	54.29	53.16	63.54	58.04	59.54	63.33	60.20	73.61	64.18	59.90	57.02	60
Estonia											36.25	35.19	25.13	19.6	21.53	17.36	18.58	16.87	15.85	8.880[f]	
Finland	54	45	43	42	43	50	48	52	52	52	59	59	57	57	63	61	67	65	64	64	59
France[eghi]	441	385	368	347	335	329	313	310	310	322	323	349	336	309	303	311	323	316	337	330[a]	
Georgia[j]	34.59	36.05	37.17	39.23	39.26	39.62	36.63	36.93	36.32	34.88	36.42	28.67	17.77	10.51	7.343	5.344	8.343	9.176	7.52	4.73	
Germany[kl]	1105	1083	1045	1042	1070	1076	1084	1074	1059	1039	1015	976	928	918	904	903	924	893	887	858	
Greece	48					59	58	63	67	72	85	85	86	87	88	90	92	96	100		
Hungary	92.00	92	92	91	90	88.80	87.00	87.40	84.50	80.90	74.20	72.40	65.90	65.66	63.94	63.45	67.06	64.78	62.35	60.70[a]	77
Iceland	1.8	1.8	1.8	1.8	1.9	1.9	2.0	2.0	2.1	2.1	2.1	2.1	2.2	2.3	2.3	2.3	2.4	2.5	2.5		2.9
Ireland											31.57	32.25	32.89	32.42	33.98	34.50	35.70	38.07	40.02	41.89	51.37
Italy	364	352	345	339	342	345	363	377	391	403	412	404	415	403	391	416	437[m]	440[m]	454[m]	457[m]	
Kazakhstan																					
Kyrgyzstan																					
Latvia											24	19	15	13	12	10	9.6	8.7	8.3	7.3	18
Liechtenstein	.153	.145	.130	.128	.153	.177	.172	.177	.178	.202	.207	.214	.221	.218	.220						
Lithuania[n]	46	46	45	45	44	45	46	47	47	46	42	45	29	25	25	18	19	19	19	17.9	35
Luxembourg						11					10			11.00	9	7	7	6	5	5.143	6
Malta																					
Monaco											.108	.125	.133	.135	.138	.135	.141	.143	.138		
Netherlands[o]	167					150					165	171	169	172	174	182	190	183	181	174	
Norway	32.3	31.7	30.8	31.8	33.7	32.1	34.6	33.3	35.4	34.3	35.1	33.5	34.3	35.8	37.7	37.8	40.9	41.2	41.4	41.6	48.60
Poland									478	488	381	368	372	364	372	349	373	362	338		
Portugal[p]											56.9	58.8	62.7	60.8	61.2	63.8	62.2	63.2	66.4		
Republic of Moldova [qr]											26.50	23.63	17.67	12.84	10.37	8.73	8.40	7.30	6.40	4.30	
Romania	184.0	184.0	180.0	184.0	193.0	189.0	195.0	196.0	201.0	198.0	171.0	141.0	126.0	123.0	121.0						
Russian Federation[e]	1400	1425	1450	1475	1500	1560	1600	1700	1650	1725	1670	1630	1630	1450	1580	1500	1500	1500	1500	1500	1900
Slovakia									63		60	52	49	46	43	45	45	45	44	45	
Slovenia	14	15	15	15	15	14	16	14	14	14	15	13	13	14	14	15	16	16	16	15	14
Spain[e]	191	193	192	194	184	183	184	187	183	212	216	224	233	221	233	243	230				
Sweden[s]	82	74	69	64	63	67	68	67	63	64	55	55	56	56	58	58	63	56	57	57	64
Switzerland											40.07	41.88	41.46	37.85	37.17	38.08	38.29	37.38	38.73	40.6	
The former Yugoslav Republic of Macedonia																					
Turkey[f]	112.4	112.6	118.9	123.7	129.9	137.9	146.5	156.1	152.2	166.3	171.0	177.0	183.7	190.6	188.9	218.0	237.0	263.4	203.8	213.5	487.0
Ukraine																					
United Kingdom	603.0	579.0	570.0	564.0	548.0	567.0	581.0	586.0	586.0	577.0	592.3[u]	596.1[u]	581.1[u]	565.3[u]	561.1[u]	551.9[u]	571.4[u]	546.5[u]	568.7[u]	536.3[u]	620.0
United States											4913	4861	4961	5073	5169	5220	5403	5479	5490	5558	
Yugoslavia																					
European Community											3309		3263	3199	3214	3253	3329	3269	3315		

[a] Preliminary data
[b] Values for the periode 1980-1989 are missing because air emission inventories were not prepared for that period
[c] Projection for 2010 according to Business as usual scenario determined in the First national communication to the UNFCCC.
[d] Sink of CO2 is not added to total emission of CO2
[e] Data include those located within the EMEP area only
[f] New IPCC methodology. Removal of CO2 has increased approximately by a factor of two
[g] Emission figures do not include air traffic above 1000 m and international sea traffic
[h] Emission figures do not include international air traffic and international sea traffic
[i] Net emissions including sinks
[j] 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
[k] Emissions from 1980-1986 are not updated
[l] Emissions from international air traffic, marine bunkers and managed forests are not included
[m] Emissions for 1996-1999 estimated according to SNAP97
[n] Emissions from 1990 onwards are recalculated
[o] CO2 figures are reported under the United Nations Framework Convention on Climate Change. Current Reduction Plans according to EU-council agreement on the EU-NEC directive
[p] Emissions from 1990 onwards are calculated using the categories of SNAP97
[q] 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
[r] For 1990-1999 emissions have been calculated according to EMEP/CORINAIR Emission Inventory Guidebook and the Greenhouse Gas inventory Reporting Instructions
[s] International transport (ie aviation and navigation) is not included in national totals except for the CO2 figure for 1980
[t] Sum of reported sector data
[u] As reported to IPPC.

Table 8. Anthropogenic emissions of persistent organic pollutants in the ECE region
(Kg per year, except for dioxins and furans which are g Teq per year; PAHs are tonnes per year)

		ANNEX I									ANNEX II			ANNEX III			OTHER			
Party	**Year**	**Aldrin**	**Chlor-dane**	**Chlor-decone**	**Dieldrin**	**Endrin**	**Hepta-chlor**	**Hexa-bromo-biphenyl**	**Mirex**	**Toxa-phene**	**HCH**	**DDT**	**PCBs**	**Dioxins and furans**	**PAHs**	**HCB**	**PCP**	**SCCP**	**PER**	**TRI**
Austria	1990													92.06	547.1					
	1991													85.35	504.9					
	1992													70.86	483.0					
	1993													64.28	496.4					
	1994	0	0	0	0	0	0		0	0	12000	0		58.38	477.4		0			
	1995	0	0	0	0	0	0		0	0	8056	0		61.00	520.8		0			
	1996	0	0	0	0	0	0		0	0	8640	0		60.21	514.6		0			
	1997	0	0	0	0	0	0		0	0	2324	0		56.67	481.2		0			
	1998	0	0	0	0	0	0		0	0	0	0		53.83	467.6		0			
	1999	0	0	0	0	0	0		0	0	0	0		50.62	459.5		0			
Belarus	1997													16.4						
	1998													15.68						
	1999													15.19						
Belgium	1990													448.0[a]	354.3[a]	487.6	5768			
	1993[a]														294.1					
	1994													147.6[b]	235.2	30.00[c]				
	1995										9[c]			437.5	274.5	236.8	16.00[d]			
	1996										9[c]			108.1	184.2	21.00[c]	6.000[c]			
	1997										9600[c]			122.6	187.4	25.00[c]	7.000[c]			
	1998[e]										9600[c]			116.3	187.2	25.00[c]	7.000[c]			
	1999[e]													135.9	189.8					
Bulgaria	1990												258.4	554.2	677.3	544	49.30			
	1995												382.2	456.0	443.4	79	10.72			
	1996												261.7	340.9	409.5	87	10.61			
	1997												227.0	309.6	364.3	47	7.54			
	1998												252.8	288.4	384.0	75.6	9.07			
	1999												247.4	245.3	286.0	46	6.36			
Croatia	1990										9400[fg]			178.6[fg]	11[fg]	0[fg]	8500	1458967		
	1996										12800[fg]			97.35[fg]	9.30[fg]	0[fg]	0	1636000		
	1997										3100[fg]			95.04[fg]	9.17[fg]	0[fg]			142700	1242000
	1998[fg]										5000			110.8	8.59	0				
	1999[fg]										5000			97.96	7.93	0				
Cyprus	1990													772			.7			
Czech Republic	1990												772.9	1252	751.6					
	1991												772.0	1220	747.0					
	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					
Denmark[h]	1994										61.00			15	9.974			842555		
	1995	.000	.000	.000	.000	.000	.000		.000	.000		.000		14	10.45					
	1996													21	11.46					
	1997	.000	.000	.000	.000	.000	.000	.000	.000	.000		.000		20	11.15					
	1998	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000		20	10.49					
	1999													95	11.18					
Estonia	1990														.308					
	1991														.290					
	1992														.172					
	1993														.182					

		ANNEX I									ANNEX II			ANNEX III			OTHER			
Party	**Year**	**Aldrin**	**Chlor-dane**	**Chlor-decone**	**Dieldrin**	**Endrin**	**Hepta-chlor**	**Hexa-bromo-biphenyl**	**Mirex**	**Toxa-phene**	**HCH**	**DDT**	**PCBs**	**Dioxins and furans**	**PAHs**	**HCB**	**PCP**	**SCCP**	**PER**	**TRI**
	1994														.183					
	1995														.188					
	1996														.191					
	1997														.197					
	1998														.213					
Finland	1990													35.4[i]	16.11[j]					
	1991													34.8[i]	12.74[j]					
	1992													33.1[i]	12.85[j]					
	1993												5300	34.7[i]	13.04[j]					
	1994												1100	41.5[i]	17.39[j]					
	1995												15800	40.7	17.35[j]					
	1996													39.8	16.80[j]					
	1997													39.1	16.11[j]					
	1998													39.5	16.25[j]					
	1999													41.1	16.73[j]					
France[hk]	1990												59	2206	2054			78200000[l]	18800000	28400000
	1991												66	2268	2467			69100000[l]	16900000	25500000
	1992												67	2312	2308			59900000[l]	13400000	23200000
	1993												67	2392	2282			50900000[l]	12000000	20200000
	1994												64	2363	1943			48700000[l]	12600000	18800000
	1995												60	2107	1971			42900000[l]	11300000	18300000
	1996												61	1865	2109			40000000[l]	10200000	19800000
	1997												50	1253	1886			35700000[l]	9200000	19100000
	1998												50	836	1927			34200000[l]	9400000	19900000
	1999[e]												47	558	1896			31900000[l]	9600000	19900000
Germany	1990												43579[m]	1196	420[mn]	86[m]				
	1994										15000		30894[m]		396[mn]		752	2100300		
	1995													309						
Hungary	1985												169	215.0	158	.486	.0365			
	1990										9281		135	180.6	132.3	.304	.0228			
	1991										60		120	159.7	121.6	.506	.038			
	1992										12		108	121.8	86.87	.678	.0509			
	1993										462		106	121.0	80.71	.632	.0474			
	1994										798		105	114.9	72.34	.476	.0357			
	1995										1650		101	113.5	67.62	.660	.0495			
	1996										2400		97.7	105.2	63.25	.660	.0495			
	1997										31		97.6	103.3	60.48	.678	.0509			
	1998										22		92.2	93.64	53.50	.712	.0534			
Iceland	1990	.000																		
Kyrgyzstan	1992										.04				1.824					
	1993										.038				4.363					
	1994										4.898				.27					
	1995														.129					
	1996														.544					
	1997										.003				.20					
	1998										.003				.202					
	1999														.089					
Lithuania	1997												12.45	5.620	71.21					
	1998												14.20	5.970	53.14					
	1999												12.69	5.030	44.49					
Luxembourg	1990													40						
	1994													23	1.1					
	1995													24	.6					
	1996													16	.7					
	1997													16	.4					
	1998													8	.3					

		ANNEX I									ANNEX II			ANNEX III			OTHER			
Party	**Year**	**Aldrin**	**Chlor-dane**	**Chlor-decone**	**Dieldrin**	**Endrin**	**Hepta-chlor**	**Hexa-bromo-biphenyl**	**Mirex**	**Toxa-phene**	**HCH**	**DDT**	**PCBs**	**Dioxins and furans**	**PAHs**	**HCB**	**PCP**	**SCCP**	**PER**	**TRI**
	1999														.000					
Netherlands	1990	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	618.0	172.0	.000	.000	8858000		
	1992	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.251	505.0	142.0		30000			
	1994	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.283	143.0	139.0	.0	.0	5631000		
	1995	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.015	74.2	128.0	.0	.0	4755000		
	1996										.000			60.7	109.0	.0	.0	4036600		
	1997										.000			55.3	107.0	2.1	.0	3533200		
	1998													43.8	73.1	.0	26000	3470000		
	1999													34.8	73.2	.0	25000	2850000		
Norway	1990	0	0	0	0	0	0	0	0	0		0			14.9[o]					
	1991	0	0	0	0	0	0	0	0	0		0			14.5[o]					
	1992	0	0	0	0	0	0	0	0	0	0	0			13.9[o]	120[p]				
	1993	0	0	0	0	0	0	0	0	0	0	0			14.6[o]	135[p]				
	1994	0	0	0	0	0	0	0	0	0	0	0			14.6[o]	125[p]				
	1995	0	0	0	0	0	0	0	0	0	0	0		125	14.7[o]	80[p]	63		379335	
	1996	0	0	0	0	0	0	0	0	0	0	0		105	15.2[o]	50[p]	100	766800	304000	
	1997	0	0	0	0	0	0	0	0	0	0	0		105	15.3[o]	60[p]	100			
	1998	0	0	0	0	0	0	0	0	0	0	0			14.9[o]	50[p]				
	1999	0	0	0	0	0	0	0	0	0	0	0			13.7[o]	40[p]				
Poland	1990	.000	.000	.000	.000	.000	.000		.000	.000		.000	2373	368.3	163.4	.000				
	1991													349.2	178.4					
	1992													338.1	175.6					
	1993													396.6	170.0					
	1994													360.9	235.9					
	1995	.000	.000	.000	.000	.000	.000		.000	.000		.000	2338	387.7	242.3	.000				
	1996	.000	.000	.000	.000	.000	.000		.000	.000		.000	2342	366.2	229.6	.000				
	1997	.000	.000	.000	.000	.000	.000		.000	.000		.000	2386	347.7	201.2	.000				
	1998	.000	.000	.000	.000	.000	.000		.000	.000		.000	2312	290.4	181.0	.000				
	1999	.000	.000	.000	.000	.000	.000		.000	.000		.000	2304	287.4	180.5	.000				
Republic of Moldova	1990														6.171					
	1991														4.879					
	1992														3.993					
	1993														3.282					
	1994														3.120					
	1995														4.261					
	1996														3.595					
	1997														5.058					
	1998														4.760					
	1999														4.350					
Russian Federation[h]	1990										923.0			991	18.26	1.637				
	1991													947	17.30	1.637				
	1992													901	15.60	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	14.99	.979				
	1998													606	14.71	.95				
	1999													625	15.32	.98				
Slovakia	1990												164.8	224.5	42.0					
	1995												141.1	372.7	19.4					
	1997												138.7	194.2	18.5					
	1998												136.4	187.6	16.0					
	1999												133.9	161.0	16.6					
Slovenia	1990												357	8.60	23.61					
	1994												265	5.67	17.99					

		ANNEX I									ANNEX II			ANNEX III			OTHER			
Party	**Year**	**Aldrin**	**Chlor-dane**	**Chlor-decone**	**Dieldrin**	**Endrin**	**Hepta-chlor**	**Hexa-bromo-biphenyl**	**Mirex**	**Toxa-phene**	**HCH**	**DDT**	**PCBs**	**Dioxins and furans**	**PAHs**	**HCB**	**PCP**	**SCCP**	**PER**	**TRI**
	1995												235	4.94	17.00					
	1996												214	4.91	17.28					
	1997												194	3.82	18.89					
	1998												180	3.53	18.20					
	1999												100	3.51	18.33					
Spain[h]	1990													181	301.1	9227	69			
	1991													190	307.1	8641	70			
	1992													200	284.3	14703	73			
	1993													196	288.0	7065	74			
	1994													185	281.2	7733	74			
	1995													157	232.7	6088	76			
	1996													155	252.1	6065	72			
Sweden	1990													127[q]	182					
	1992														153					
	1993[q]													46						
	1995														153					
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														.770					
United Kingdom	1990	0	0	0	0	0	0	0	0	0	100013	0	6976	1142	243.4	1267	538010	62.00		
	1991	0	0	0	0	0	0	0	0	0	86189	0	6397	1123	229.8	1259	537991	62.00		
	1992	0	0	0	0	0	0	0	0	0	74756	0	5901	1098	208.6	1280	537989	62.00		
	1993	0	0	0	0	0	0	0	0	0	65250	0	5407	1049	159.3	1255	529774	62.00		
	1994	0	0	0	0	0	0	0	0	0	57300	0	4846	953.2	149.0	1240	518780	62.00		
	1995	0	0	0	0	0	0	0	0	0	50616	0	4292	819.5	122.0	1248	511033	62.00		
	1996	0	0	0	0	0	0	0	0	0	44963	0	3750	588.6	66.77	1241	503463	62.00		
	1997	0	0	0	0	0	0	0	0	0	40158	0	3248	384.2	54.55	892.8	496159	62.00		
	1998	0	0	0	0	0	0	0	0	0	36052	0	2747	361.0	49.14	892.8	489217	62.00		
	1999										33586		2071	345.7	43.92	785.9	482498	62.00		
United States	1990												102	234	15642[r]	1450	5639			
	1996		299				82			1	236		195	252	13992[r]	715	5811			

[a] Referring to Flanders only
[b] Referring to Brussels and Wallonia only
[c] Referring to Wallonia only
[d] Referring to Flanders and Wallonia only
[e] Preliminary data
[f] 1990-1998: Emission of POPs is distributed according to SNAP94. 1999: According to SNAP97
[g] Values for the periode 1991-1995 are missing because air emission inventories were not prepared for that period
[h] Data include those located within the EMEP area only
[i] Emissions prior to 1994 is underestimated and will be updated
[j] Time series will be updated.
[k] Emission figures do not include air traffic above 1000 m and international sea traffic
[l] Sum of TRI, PER AND TCE
[m] Figures for 1990 and 1994 are not comparable because they are based on different reports
[n] Figures include only Benzo(ghi)perylene and Flouranthene (Borneff 6)
[o] ECE-4 is used for the new PAH-data given this year
[p] Only data for sector 4:Production processes, no data for other sectors
[q] Sweden officially reported the 1990 emission range to be 58-127 gTeq, and the 1993 emission range to be 19-46 gTeq
[r] PAHs are defined as the sum of 16-PAH, which includes: Benz(a)anthracene, Benzo(a)pyrene, Benzo(b)fluouranthene, Benzo(k)fluouranthene, Chrysene, Dibenz(a, h)anthracene, Indeno(1,2,3-cd)pyrene, Acenaphthene, Acenaphtylene, Antracene, Benzo(ghi)perylene, Fluoranthene, Fluorene, Naphthalene, Phenanthrene, Pyrene

Table 9. Anthropogenic emissions of heavy metals in the ECE region (tonnes per year)

		PRIORITY METALS			OTHER METALS					
Party	**Year**	**Lead**	**Cadmium**	**Mercury**	**Arsenic**	**Chromium**	**Copper**	**Nickel**	**Selenium**	**Zinc**
Armenia	1983	91.00		.01	30.00					
	1984	61.00		.01	95.00					
	1985	44.00		.01	62.00		5.00			
	1986	87.00					5.00			
	1987	46.00			62.00	.20	5.00	.30		
	1988	57.00			66.00		5.00	.003		.10
	1989	22.00		.03	22.00	5.00	2.00	.10		
	1990	11.00		.01		4.00	2.50	.10		
	1991	.82		.01		5.97	1.60	.24		
	1992	.61		.008		1.8	.068	.239		
	1993	.79		.009		1.04	.036	.074		
	1994	.34		.001		.34	.002	.003		
	1995	.334		.001		.101	.001	.009		
	1996	.009		.0008	.0003	.466	.009	.02		.016
	1997	.009				.019	.650	.003		
	1998	.010				.008	.005	.007		.001
	1999	.0053[a]				.073	.008	.004		.021
Austria	1985	320.2	4.81	4.29						
	1990	201.9	3.09	2.64						
	1991	170.3	2.72	2.53						
	1992	116.1	2.29	2.03						
	1993	81.97	2.14	1.78						
	1994	57.06	1.84	1.55	3.300	6.600	9.200	35.50	4.700	208.4
	1995	38.61	1.64	1.44						
	1996	35.88	1.59	1.39						
	1997	35.35	1.63	1.42						
	1998	35.37	1.61	1.28						
	1999	33.64	1.50	1.19						
Belarus	1990	797.6	7.59	.480	13.15	29.24	34.98	601.9		210.5
	1995	148.4	3.48	.265	4.48	14.10	19.11	246.4		121.7
	1996	46.34	1.20	.297	3.66	8.68	13.89	202.7		122.3
	1997	42.20	1.25	.310	3.07	8.27	15.10	167.1		159.3
	1998	41.24	1.45	.392	2.96	7.91	13.64	154.3		177.9
	1999	37.52	1.42	.38	2.64	7.19	13.19	128.9		180.1
Belgium	1990[b]	601.3	9.515	8.794	10.45	53.98	52.26	106.5	21.35	370.5
	1991[c]	218.0	3.00	2.00	1.00	12.00	6.00	10.00	.00	135.0
	1992[c]	230.0	4.00	3.00	3.00	11.00	20.00	9.00	.10	97.00
	1993[c]	230.0	1.00	1.00	2.00	22.00	22.00	11.00	3.00	86.00
	1994	325.4	4.397	5.824	4.625	26.82	45.69	52.64	23.46	241.6
	1995	336.1	6.379	4.544	6.393	48.32	55.70	46.73	18.80	286.5
	1996	302.0	4.618	5.546	5.220	32.09	33.19	57.68	7.657	219.9
	1997	290.8	4.599	3.520	5.212	28.12	29.17	48.66	10.19	177.4
	1998[d]	203.1	3.260	3.495	4.858	22.47	29.52	67.72	9.985	186.4
	1999[d]	212.2	3.310	3.020	4.318	22.63	30.46	65.22	9.987	181.5
Bulgaria	1990	435.9	28.25	13.20						
	1995	297.5	12.82	6.88						
	1996	278.8	14.33	4.70						
	1997	231.2	14.23	4.31						
	1998	250.8	14.87	4.69						
	1999	223.5	13.57	4.06						
Croatia[efg]	1990	466	1.61	1.15	2.28	13.00	14.64	45.76	.91	84.21
	1995	264	.95	.29						
	1996	268	1.04	.30						
	1997	190	1.03	.32	1.25	5.19	10.21	30.39	.41	64.67
	1998	183	1.06	.32	1.33	5.63	10.31	31.42	.42	68.29
	1999	178	1.05	.31	1.32	5.65	10.72	31.83	.38	68.40
Cyprus	1990	81.00	.20	.30	.60	1.60	1.20	1.70		1.80
	1991	63.00								
	1992	66.00								
	1993	69.00								
	1994	68.00								
	1995	67.00								
	1996	67.00								
	1997	72.00								
	1998	69.00								
	1999	75.00								
Czech Republic	1990	269.4	4.34	7.52						
	1991	240.0	3.92	7.42						
	1992	247.0	3.61	7.28						
	1993	232.0	3.48	7.46						
	1994	202.5	3.52	7.17						
	1995	179.7	3.55	7.40						
	1996	165.4	2.94	5.86						
	1997	179.7	3.00	5.54						
	1998	169.2	2.65	5.16						
	1999	157.0	2.72	3.66						
Denmark	1990[h]	126.8	1.125	3.171	1.447	6.2	10.04	26.49	4.236	34.56
	1994	45.63	1.156	8.196	1.333	4.724	14.97	27.46	2.928	56.32
	1995	43.03	1.120	8.485						
	1996	20.12	1.085	2.677	1.270	3.399	10.45	25.40	3.386	36.10
	1997[h]	8.507	.779	2.117	.865	3.102	9.375	20.49	3.196	25.50
	1998[h]	7.553	.776	1.948	.846	2.700	9.522	18.92	2.83	23.04
	1999[h]	7.337	.713	1.976	.846	2.65	9.609	15.2	3.514	22.89
Estonia	1990	232.5	1.612	1.292	8.1	8.2	1.7	4.4	.2	29.3
	1991	208.4	1.493	1.183	7.7	7.9	1.7	4.2	.2	27.5
	1992	120.9	1.118	.980	7.2	7.795	1.648	3.9	.2	26.77
	1993	100.4	.885	.750	5.6	6.195	1.241	3.1	.1	21.47
	1994	106.7	.937	.798	4.8	5.078	1.033	2.651	.1	17.64
	1995	87.56	.899	.751	4.0	3.982	.841	2.167	.1	16.76

		PRIORITY METALS			OTHER METALS					
Party	**Year**	**Lead**	**Cadmium**	**Mercury**	**Arsenic**	**Chromium**	**Copper**	**Nickel**	**Selenium**	**Zinc**
	1996	80.16	.941	.778	4.3	4.236	2.344	2.352	.1	16.34
	1997	73.08	.978	.773	3.8	3.874	2.255	2.068	.1	14.33
	1998	54.66	.829	.664	3.5	3.368	2.158	1.929	.1	13.23
	1999	45.04	.776	.611						
Finland	1990	326.1	6.3	1.1	33.2	31.6	94.4	67.0		570.5
	1991	247.4	3.4	.9	22.1	41.4	90.7	45.1		381.4
	1992	174.7	2.9	.8	17.5	31.2	65.5	37.1		283.7
	1993	99.7	2.9	.6	14.3	20.5	54.1	25.9		259.6
	1994	60.1	2.4	.7	10.7	19.6	48.9	33.6		315.7
	1995	56.6	1.7	.7	3.5	21.7	26.7	33.8		321.7
	1996	35.0	1.5	.8	7.2	21.2	54.5	25.1		191.4
	1997	18.5	1.1	.6	12.3	20.5	72.3	27.8		70.3
	1998	20.3	1.3	.5	12.4	18.2	27.4	20.8		71.2
	1999	14	.6	.4	3.6	18.5	4.1	16.9		57.7
France[hi]	1990	4335	16	44	24	376	93	280	11	1944
	1991	2908	16	46	24	319	94	329	11	1783
	1992	2120	16	47	23	267	93	273	11	1627
	1993	1846	15	42	20	210	90	232	10	1429
	1994	1647	14	37	21	184	91	220	11	1355
	1995	1494	14	31	21	195	91	229	11	1305
	1996	1325	14	28	20	199	90	232	11	1324
	1997	1208	13	21	20	228	89	223	12	1418
	1998	1102	13	19	22	234	89	244	12	1411
	1999[d]	868	12	17	21	225	88	227	12	1310
Germany	1985	5028	45.00	154.0	221.0	344.0	459.0	440.0		1900
	1990	2323	31	113	122	253	361	278	27	1323
	1995	632	11	31	32	115	79	158	25	451
	2010	294.0	11.00	24.00						
Greece	1996	470.0	3.00	13.00	4.00	10.00	14.00	101.0	.20	52.00
Hungary	1980	574.4	7.49	8.71	21.68	22.25	38.72	66.94	4.93	97.64
	1985	528.9	6.78	8.34	22.45	22.41	36.71	74.13	4.78	99.96
	1990	680.5	5.52	6.28	15.94	16.42	28.07	42.48	3.39	96.59
	1991	487.6	4.70	5.83	14.52	14.83	23.80	48.96	3.19	70.83
	1992	207.7	4.03	4.99	10.22	11.79	18.34	48.72	2.81	62.02
	1993	187.1	4.14	5.00	10.10	12.21	18.18	57.24	2.89	67.64
	1994	155.5	4.08	4.72	9.66	11.83	16.70	54.08	2.78	46.14
	1995	126.6	3.78	4.83	8.79	10.88	15.76	50.07	2.47	48.26
	1996	99.82	3.41	4.67	8.34	10.04	14.50	42.87	2.25	45.69
	1997	89.73	3.26	4.47	7.25	9.19	14.69	46.60	2.11	44.95
	1998	82.20	3.08	4.28	6.12	7.40	14.61	45.92	1.90	39.37
	1999[d]	38.55	2.99	4.26	6.13	7.26	14.86	43.05	1.84	39.86
Iceland	1990	12.2								
	1991	8.9								
	1992	6.8								
	1993	5.3								
	1994	4.6								
	1995	3.9								
	1996	1.7								
	1997	.4								
	1998	.4								
Italy	1990	4300	53.79	19.98						
	1994	2174	29.90	13.23						
Kyrgyzstan	1999	.005				.169				
Latvia	1990	20.3	2.46	.37	18.80	11.50	9.900	58.80		22.70
	1991	10.1	1.79	.32	7.570	4.810	6.140	46.00		21.70
	1992	7.94	1.71	.27	5.470	3.930	5.570	41.70		11.00
	1993	6.18	1.68	.22	2.340	3.690	3.430	40.60		9.550
	1994	10.3	2.2	.37	2.680	4.710	4.860	56.80		13.30
	1995	4.69	1.44	.17	4.450	3.490	2.760	36.70		6.540
	1996	4.12	.36	.1						
	1997	2.74	.44	.14						
	1998	3.5	.77	.23						
	1999	12.26	.32	.18						
Lithuania	1990	46.70	3.800	.018	3.400	7.400	11.70	95.60		59.10
	1991	48.80	2.800	.016	2.100	4.600	10.50	57.40		55.20
	1992	32.40	2.500	.011	2.100	4.600	6.800	59.90		30.00
	1993	28.20	2.300	.014	2.000	4.400	5.700	57.00		13.20
	1994	33.00	2.100	.013	1.900	4.300	3.700	57.80		8.900
	1995	30.20	2.10	.153	1.70	4.20	6.80	51.60		50.10
	1996	17.80	2.20	.159	1.70	4.50	7.50	54.40		56.90
	1997	19.50	2.20	.232	1.50	4.10	8.30	49.40		71.00
	1998	21.78	2.59	.245	1.85	5.07	9.18	62.40		78.71
	1999	19.25	2.008	.253	1.366	3.813	7.872	46.10		72.84
Luxembourg	1990	77.4	.6	.3						
	1994	52.5	.5	.2						
	1995	29.8	.4	.1						
	1996	26.1	.4	.1						
	1997	17.7	.3	.1						
	1998	6.8	.2	.1						
	1999	2.340	.054	.286	.082	.373	1.205	.790	.015	35.47
Netherlands	1990	272.0	2.38	3.00	1.63	12.10	44.90	84.80	.396	331.0
	1991	251.0	2.33	2.74		11.50	46.90	85.70		325.0
	1992	233.0	2.33	2.75	1.50	11.30	48.70	96.50	.40	317.0
	1993	213.0	1.84	2.57		13.80	49.90	90.30		270.0
	1994	164.0	1.68	1.54	1.81	10.40	50.70	95.60	.30	277.0
	1995	152.0	1.51	1.04	1.38	9.23	50.40	96.90	.30	270.1
	1996	106.0	1.83	1.04	1.29	7.51	43.40	95.60	.541	267.0
	1997	72.1	1.88	.759	1.37	6.32	47	85.1	.332	251
	1998	47.2	1.14	.557	1.16	4.91	41.8	51.4	.108	90.3
	1999	35.4	1.01	.529	1.18	5.32	44.6	51.5	.109	91.4
Norway	1980	624								
	1981	577								

		PRIORITY METALS			OTHER METALS					
Party	**Year**	**Lead**	**Cadmium**	**Mercury**	**Arsenic**	**Chromium**	**Copper**	**Nickel**	**Selenium**	**Zinc**
	1982	651								
	1983	559								
	1984	401								
	1985	406	1.1							
	1986	341	.0							
	1987	294	.0							
	1988	293	.0							
	1989	276	1.2							
	1990	184.7	1.7	1.8						
	1991	141.5	1.7	1.6						
	1992	124.5	1.7	1.5						
	1993	84.7	1.7	1.2						
	1994	21.4	1.3	1.2						108.1
	1995	19.7	1.1	1.2						109.2
	1996	7.8	1.2	1.2						103.7
	1997	7.3	1.2	1.2			9.100			
	1998	7.4	1.2	1.2						
	1999	6.3	1.1	1.2						
Poland	1990	1372	91.60	33.30	82.10	154.6	599.4	370.0		3092
	1991	1336	85.00	32.70	79.80	133.5	530.4	354.8		2781
	1992	986.0	84.10	31.90	78.90	121.6	497.3	349.8		2678
	1993	996.9	91.90	32.50	82.40	127.8	511.0	352.9		2830
	1994	966.1	85.80	32.40	76.20	120.0	478.3	322.5		2624
	1995	936.6	82.60	32.30	73.40	118.3	464.9	312.3		2580
	1996	959.7	91.20	33.60	75.60	117.0	494.8	328.3		2749
	1997	895.8	85.80	33.00	71.00	116.0	475.1	364.9		2580
	1998	736	55.4	29.5	54.3	89.8	388.7	251.3		2191
	1999	693.7	55.1	25.1	54.5	84.0	393.2	250.1		2167
Republic of Moldova	1990	253.2	3.078	4.253	5.136	9.088	10.01	100.7	.518	12.51
	1991	220.3	3.493	3.810	3.199	7.300	7.467	83.49	.239	8.381
	1992	102.6	1.693	3.290	2.869	4.911	4.465	59.63	.072	5.384
	1993	71.20	1.415	1.849	1.671	4.189	3.633	48.33	.113	4.589
	1994	23.16	.819	1.287	1.487	2.681	2.848	27.33	.072	3.781
	1995	33.90	.594	.894	1.536	2.015	2.785	17.00	.162	3.100
	1996	27.90	0	.954	1.551	1.631	2.748	19.58	.057	3.007
	1997	22.36	.364	.571	.908	1.397	2.033	12.02	.038	2.052
	1998	7.898	.328	.406	.596	1.037	1.389	9.667	.065	1.371
	1999	11.21	.148	.180	.210	.479	.796	4.374	.007	.628
Russian Federation[h]	1990	3591	79.4	15.6						
	1991	3553	68.2	13.4						
	1992	3095	68.8	11.4						
	1993	3276	59.0	11.8						
	1994	2643	56.6	10.4						
	1995	2426	57.4	10.4						
	1996	2304	51.0	10.1						
	1997	2247	50.4	9.6						
	1998	2262	49.0	9.4						
	1999	2339	50.9	9.9						
Slovakia	1990	166.1	9.70	12.50	150.3	78.90	103.4	78.00	8.90	110.8
	1992	182.0	12.00	5.00	96.30	72.10	84.60	52.80	12.90	96.70
	1994	90.50	7.70	3.00	55.00	13.50	55.60	22.50	9.50	79.80
	1995	91.02	11.50	4.09	41.77	14.80	51.54	38.48	9.34	79.90
	1996	97.00	11.00	3.20	92.00	11.00	95.00	41.00	8.40	94.00
	1997	84.30	11.20	3.40	47.20	9.20	64.40	35.30	10.30	73.30
	1998	69.27	9.02	2.37	39.76	11.02	52.17	35.12	8.95	66.18
	1999	53.27	7.54	1.66	12.64	11.12	22.74	30.63	5.67	54.87
Slovenia	1990	460.2	1.68	.76						
	1991	386.0								
	1992	390.0								
	1993	398.0								
	1994	405.6	1.66	.61						
	1995	195.5	1.71	.65						
	1996	99.00	1.77	.59						
	1997	80.38	1.75	.61						
	1998	60.47	1.67	.63						
	1999	50.20	1.62	.60						
Spain[h]	1990	2755	13	20	33	33	94	223	42	1053
	1991	2025	14	21	36	35	105	238	46	1072
	1992	1267	15	21	41	37	105	269	46	1078
	1993	1164	14	19	39	33	103	235	45	1097
	1994	1148	14	20	42	35	103	254	50	1132
	1995	949	15	20	42	37	95	275	52	1149
	1996	944	14	18	46	33	118	223	53	1164
Sweden	1990	540.0	2.00	1.50	6.00	23.00	27.00	26.00		230.0
	1992	365.0	1.30	1.20	4.00	20.00	30.00	25.00		195.0
	1994	37.00	.70	.90	1.10	13.00	9.00	34.00		94.00
	1995	37.80	.80	.90	1.30	13.80	9.80	32.20		138.0
Switzerland	1980	1760	6.350	7.930						1280
	1985	768.0	4.740	7.840						925.0
	1990	520	4.2	6.8						841
	1991	461.0	3.90	6.10						814.0
	1992	401.0	3.60	5.40						767.0
	1993	341.0	3.10	4.70						719.0
	1994	287.0	2.70	4.00						674.0
	1995	226	2.5	3.3						607
	1996	199.7	2.30	3.10						609.2
	1997	173.9	2.20	2.90						589.6
	1998	148.6	2.18	2.63						547.3
	1999	131.2	2.18	2.63						553.4
The former Yugoslav Republic of Macedonia	1998	3.020	.167	.048						162.7
United Kingdom	1985		31.80	7234						
	1990	2831	21.21	29.83	88.17	145.2	129.2	422.9	130.5	1048

		PRIORITY METALS			OTHER METALS					
Party	**Year**	**Lead**	**Cadmium**	**Mercury**	**Arsenic**	**Chromium**	**Copper**	**Nickel**	**Selenium**	**Zinc**
	1991	2581	20.82	30.62	90.86	141.8	123.3	442.4	130.6	981.9
	1992	2356	20.41	28.53	90.02	139.3	117.2	444.9	125.6	991.7
	1993	2121	19.93	22.31	86.43	130.4	110.7	432.6	111.5	988.2
	1994	1869	19.15	21.77	80.03	123.9	105.1	397.2	100.3	986.0
	1995	1555	12.33	17.27	69.54	107.3	89.13	329.3	83.47	911.2
	1996	1321	10.39	13.17	64.45	97.19	80.00	294.7	78.02	800.8
	1997	1170	8.75	11.16	56.79	86.55	65.21	219.0	63.21	731.3
	1998	906.0	7.06	10.69	50.71	82.00	63.14	193.5	61.23	655.5
	1999	552.7	6.47	8.53	46.79	66.73	59.06	147.3	44.22	442.0
	2010	340.0	12.30	12.30						
United States	1990	2996	180	187	394	1003		1205	504	
	1991	3781								
	1992	3455								
	1993	3548								
	1994	3668								
	1995	3577		146						
	1996	2271	139	148	359	1050		1108	784	

[a] Road transport not included
[b] Figures for 1990 refer to Flanders and Wallonia only.
[c] Figures for 1991-1993 totals for Flanders only.
[d] Preliminary data
[e] 1990-1998: Distributed according to SNAP90
[f] 1999: Distributed according to SNAP97
[g] Values for the periode 1991-1994 are missing because air emission inventories were not prepared for that period
[h] Data include those located within the EMEP area only
[i] Emission figures do not include air traffic above 1000 m and international sea traffic

Table 10. Sulphur: Overview of national emission totals, sector data and gridded data reported and stored at the UNECE/EMEP emission database at MSC-W

Totals	Sector data	Gridded 50kmx50km
X	X	X

(*) Gridded 150kmx150km

Party/Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2010
Armenia	X--	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	---
Austria	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	X--
Belarus *	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X-X	X--	X--	X-X	X--	X-X	X--	X--	X--	X--	X--
Belgium	X--	X--	X--	X--	X--	XX-	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	X--
Bosnia and Herzegovina	---	---	---	---	---	---	---	---	---	---	X-X	---	---	---	---	---	---	---	---	---	---
Bulgaria	XX-	---	---	---	---	---	---	X--	X--	X--	XXX	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	XX-	X--
Canada	X--	X--	X--	X--	X--	XX-	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-
Croatia	X--	---	---	---	---	---	---	---	---	---	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XX-	X--
Cyprus	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-
Czech Republic	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	XXX	XX-	XX-	XX-	XX-	XXX	XXX	XX-	XX-	XX-	X--
Denmark	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	X--
Estonia	X--	---	---	---	---	X--	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XXX	XX-	X--
Finland	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	X--
France	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	XX-	X--
Georgia	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	---
Germany	X--	X--	X--	X--	X--	X--	X--	XX-	XX-	XX-	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	X--
Greece *	X--	---	---	---	---	XX-	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	---	X--
Hungary	XX-	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XXX	XXX	XX-	X--
Iceland	X--	X--	X--	X--	X--	X--	X--	XX-	X--	X--	XX-	XX-	XX-	XX-	XX-	XX-	X--	XX-	XX-	---	X--
Ireland	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	XXX	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	XX-	X--
Italy	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	X--
Kazakhstan	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Kyrgyzstan	---	---	---	---	---	---	---	---	---	---	-X-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	---
Latvia	---	---	---	---	---	---	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	XX-	XX-
Liechtenstein	X--	X--	X--	X--	X--	XX-	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	---	---	---	---	---	X--
Lithuania	X--	X--	X--	X--	X--	XX-	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	XX-	X--
Luxembourg	X--	---	---	X--	---	XX-	---	---	---	---	XX-	---	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	X--
Malta	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Monaco	---	---	---	---	---	---	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	---	---
Netherlands	X--	X--	X--	X--	X--	XX-	X--	X--	X--	X--	XXX	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	XX-	X--
Norway	XX-	X--	X--	X--	X--	XX-	X--	XX-	X--	XX-	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XX-	XX-	XX-	X--
Poland	X--	---	---	---	---	XX-	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	XX-	X--
Portugal	X--	---	---	X--	---	X--	X--	X--	X--	---	XXX	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	---	---
Republic of Moldova	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	X--
Romania	X--	X--	X--	X--	X--	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XX-	---	---	---	---	---	---
Russian Federation	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	XXX	XX-	XX-	XX-	XXX	XXX	XXX	XXX	XX-	XX-	X--
Slovakia	X--	---	---	---	---	X--	X--	X--	X--	X--	XXX	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XXX	X--
Slovenia	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	XX-	XX-
Spain	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XXX	XXX	XXX	XXX	XXX	XXX	---	---	---	---
Sweden	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	XX-	XX-	XXX	XX-	X-X	XXX	XX-	XX-	XX-	XX-	X--
Switzerland	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	XXX	XX-	XX-	XX-	XXX	XXX	XX-	XX-	XX-	XX-	XX-
The former Yugoslav Republic of Macedonia	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	XX-	XX-	---	---
Turkey	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-
Ukraine *	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	XXX	XX-	XX-	XX-	XX-	XX-	XX-	XX-	--X	--X	X--
United Kingdom	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	XX-	XX-
United States	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-
Yugoslavia	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	-XX	XX-
European Community	---	---	---	---	---	---	---	---	---	---	XX-	---	---	---	X--	X--	X--	---	---	---	---

Table 11. Nitrogen oxides: Overview of national emission totals, sector data and gridded data reported and stored at the UNECE/EMEP emission database at MSC-W

Totals	Sector data	Gridded 50kmx50km
X	X	X

(*) Gridded 150kmx150km

Party/Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2010
Armenia	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	---
Austria	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	X--
Belarus *	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X-X	X--	X--	X-X	X--	X-X	X--	X--	X--	X--	X--
Belgium	X--	---	---	---	---	XX-	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	X--
Bosnia and Herzegovina	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Bulgaria	---	---	---	---	---	---	---	X--	X--	X--	XXX	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	XX-	X--
Canada	X--	X--	X--	X--	X--	XX-	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-
Croatia	X--	---	---	---	---	---	---	---	---	---	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XX-	X--
Cyprus	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-
Czech Republic	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	XXX	XX-	XX-	XX-	XX-	XXX	XXX	XX-	XX-	XX-	X--
Denmark	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	X--
Estonia	---	---	---	---	---	---	---	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XXX	XX-	---
Finland	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	X--
France	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	XX-	X--
Georgia	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	---
Germany	X--	X--	X--	X--	X--	X--	X--	XX-	XX-	XX-	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	X--
Greece *	---	---	---	---	---	XX-	---	XX-	---	---	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	---	X--
Hungary	XX-	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XXX	XXX	XX-	X--
Iceland	X--	X--	X--	X--	X--	X--	X--	XX-	X--	X--	XX-	XX-	XX-	XX-	XX-	XX-	X--	XX-	XX-	---	X--
Ireland	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	XXX	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	XX-	X--
Italy	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	X--
Kazakhstan	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Kyrgyzstan	---	---	---	---	---	---	---	---	---	---	-X-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	---
Latvia	---	---	---	---	---	---	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	XX-	XX-
Liechtenstein	X--	X--	X--	X--	X--	XX-	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	---	---	---	---	---	X--
Lithuania	X--	X--	X--	X--	X--	XX-	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	XX-	X--
Luxembourg	X--	---	---	X--	---	XX-	---	---	---	---	XX-	---	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	X--
Malta	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Monaco	---	---	---	---	---	---	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	---	---
Netherlands	X--	X--	X--	X--	X--	XX-	X--	X--	X--	X--	XXX	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	XX-	X--
Norway	XX-	X--	X--	X--	X--	XX-	X--	XX-	X--	XX-	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XX-	XX-	XX-	X--
Poland	X--	---	---	---	---	XX-	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	XX-	X--
Portugal	X--	---	---	X--	---	X--	X--	X--	X--	---	XXX	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	---	---
Republic of Moldova	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	X--
Romania	X--	X--	X--	X--	X--	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XX-	---	---	---	---	---	---
Russian Federation	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	XXX	XX-	XX-	XX-	XXX	XXX	XXX	XXX	XX-	XX-	---
Slovakia	---	---	---	---	---	---	---	X--	---	X--	XXX	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XXX	---
Slovenia	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	XX-	XX-
Spain	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XXX	XXX	XXX	XXX	XXX	XXX	---	---	---	---
Sweden	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	XX-	XX-	XXX	XX-	XXX	XXX	XX-	XX-	XX-	XX-	X--
Switzerland	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	XXX	XX-	XX-	XX-	XXX	XXX	XX-	XX-	XX-	XX-	XX-
The former Yugoslav Republic of Macedonia	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	XX-	XX-	---	---
Turkey	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-
Ukraine *	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	XXX	XX-	XX-	XX-	XX-	XX-	XX-	XX-	--X	--X	X--
United Kingdom	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	XX-	XX-
United States	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-
Yugoslavia	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	-XX	X--
European Community	---	---	---	---	---	---	---	---	---	---	XX-	---	---	---	X--	X--	X--	---	---	---	---

Table 12. Ammonia: Overview of national emission totals, sector data and gridded data reported and stored at the UNECE/EMEP emission database at MSC-W

Totals	Sector data	Gridded 50kmx50km
X	X	X

(*) Gridded 150kmx150km

Party/Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2010
Armenia	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	---
Austria	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	X--
Belarus *	---	---	---	---	---	---	---	---	---	---	X-X	---	---	--X	X--	X-X	X--	X--	X--	X--	X--
Belgium	---	---	---	---	---	XX-	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	X--
Bosnia and Herzegovina	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Bulgaria	---	---	---	---	---	---	---	---	---	---	XXX	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	XX-	X--
Canada	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Croatia	---	---	---	---	---	---	---	---	---	---	XX-	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XX-	X--
Cyprus	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Czech Republic	---	---	---	---	---	---	---	---	---	---	XXX	XX-	XX-	XX-	XX-	XXX	XXX	XX-	XX-	XX-	X--
Denmark	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	---
Estonia	---	---	---	---	---	---	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	---
Finland	X--	---	---	---	---	X--	X--	X--	---	---	XX-	-X-	XX-	-X-	-X-	XXX	XX-	XXX	XXX	XXX	X--
France	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	XX-	X--
Georgia	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Germany	X--	X--	X--	X--	X--	X--	X--	XX-	XX-	XX-	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	X--
Greece	---	---	---	---	---	---	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	---	X--
Hungary	XX-	---	---	---	---	XX-	X--	X--	---	X--	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	X--
Iceland	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Ireland	---	---	---	---	---	---	---	---	---	---	XXX	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	XX-	X--
Italy	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	X--
Kazakhstan	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Kyrgyzstan	---	---	---	---	---	---	---	---	---	---	-X-	-X-	-X-	-X-	-X-	-X-	-X-	-X-	---	XX-	---
Latvia	---	---	---	---	---	---	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	XX-	---
Liechtenstein	X--	---	---	---	X--	---	---	---	---	---	X--	---	---	---	---	---	---	---	---	---	X--
Lithuania	X--	X--	X--	X--	X--	XX-	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	XX-	X--
Luxembourg	---	---	---	---	---	---	---	---	---	---	XX-	---	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	X--
Malta	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Monaco	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Netherlands	X--	X--	X--	X--	X--	XX-	X--	X--	X--	X--	XXX	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	XX-	X--
Norway	XX-	X--	X--	X--	X--	X--	X--	XX-	X--	XX-	XXX	XXX	XXX	XX-	XXX	XXX	XXX	XX-	XX-	XX-	X--
Poland	X--	---	---	---	---	X--	X--	X--	X--	X--	XX-	XX-	X--	XX-	XX-	XXX	XX-	XX-	XX-	XX-	X--
Portugal	---	---	---	---	---	---	---	---	---	---	XXX	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	---	---
Republic of Moldova	XX-	---	---	---	---	XX-	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	X--
Romania	X--	X--	X--	X--	X--	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XX-	---	---	---	---	---	---
Russian Federation	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XXX	XXX	XXX	XX-	XX-	---
Slovakia	---	---	---	---	---	---	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	---
Slovenia	---	---	---	---	---	---	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	X--
Spain	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XXX	XXX	XXX	XXX	XXX	XXX	---	---	---	---
Sweden	---	---	---	---	---	---	---	---	X--	---	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	XX-	X--
Switzerland	X--	---	---	---	X--	X--	---	---	---	---	XXX	XX-	XX-	XX-	-XX	XXX	XX-	XX-	XX-	XX-	XX-
The former Yugoslav Republic of Macedonia	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Turkey	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Ukraine *	---	---	---	---	---	---	---	---	---	---	XXX	-X-	-X-	-X-	-X-	XX-	XX-	XX-	--X	--X	X--
United Kingdom	---	---	---	---	---	---	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	---
United States	---	---	---	---	---	X--	---	---	---	-X-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-
Yugoslavia	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
European Community	---	---	---	---	---	---	---	---	---	---	XX-	---	---	---	---	X--	---	---	---	---	---

Table 13. Non-methane volatile organic compounds: Overview of national emission totals, sector data and gridded data reported and stored at the UNECE/EMEP emission database at MSC-W

Totals	Sector data	Gridded 50kmx50km
X	X	X

(*) Gridded 150kmx150km

Party/Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2010
Armenia	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	---
Austria	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	X--
Belarus *	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X-X	X--	X--	X-X	X--	X-X	X--	X--	X--	X--	X--
Belgium	---	---	---	---	---	XX-	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	X--
Bosnia and Herzegovina	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Bulgaria	---	---	---	---	---	---	---	---	XX-	---	XXX	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	XX-	X--
Canada	X--	---	---	---	---	XX-	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-
Croatia	---	---	---	---	---	---	---	---	---	---	XX-	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XX-	X--
Cyprus	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Czech Republic	---	---	---	---	---	X--	---	---	---	---	XXX	XX-	XX-	XX-	XX-	XXX	XXX	XX-	XX-	XX-	X--
Denmark	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	X--
Estonia	---	---	---	---	---	X--	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	X--
Finland	---	---	---	---	---	---	---	X--	X--	---	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	X--
France	---	---	---	---	---	---	---	---	XX-	XX-	XXX	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	XX-	X--
Georgia	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	---
Germany	X--	X--	X--	X--	X--	X--	X--	XX-	XX-	XX-	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	X--
Greece *	---	---	---	---	---	XX-	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	---	X--
Hungary	X--	---	---	---	---	X--	X--	X--	XX-	X--	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	X--
Iceland	X--	X--	X--	X--	X--	X--	X--	XX-	X--	X--	XX-	XX-	XX-	XX-	XX-	XX-	X--	XX-	XX-	---	X--
Ireland	---	---	---	---	---	---	---	---	---	---	XXX	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	XX-	X--
Italy	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	X--
Kazakhstan	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Kyrgyzstan	---	---	---	---	---	---	---	---	---	---	-X-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	---
Latvia	---	---	---	---	---	---	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	XX-	XX-
Liechtenstein	X--	X--	X--	X--	X--	XX-	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	---	---	---	---	---	X--
Lithuania	X--	X--	X--	X--	X--	XX-	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	XX-	X--
Luxembourg	---	---	---	---	---	XX-	---	---	---	---	XX-	---	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	X--
Malta	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Monaco	---	---	---	---	---	---	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	---	---
Netherlands	X--	X--	X--	X--	X--	XX-	X--	X--	XX-	X--	XXX	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	XX-	X--
Norway	XX-	X--	X--	X--	X--	XX-	X--	XX-	X--	XX-	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XX-	XX-	XX-	X--
Poland	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	X--
Portugal	---	---	---	---	---	X--	---	---	---	---	XXX	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	---	---
Republic of Moldova	---	---	---	---	---	X--	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	X--
Romania	X--	X--	X--	X--	X--	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XX-	---	---	---	---	---	---
Russian Federation	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XXX	XXX	XXX	XX-	XX-	XX-	---
Slovakia	---	---	---	---	---	---	---	---	---	---	XX-	-X-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	---
Slovenia	---	---	---	---	---	---	---	---	X--	---	XXX	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-
Spain	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	XX-	XXX	XXX	XXX	XXX	XXX	XXX	XXX	---	---	---	---
Sweden	---	---	---	---	---	X--	---	---	X--	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	X--
Switzerland	X--	---	---	---	X--	X--	X--	X--	X--	X--	XXX	XX-	XX-	XX-	XXX	XXX	XX-	XX-	XX-	XX-	XX-
The former Yugoslav Republic of Macedonia	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Turkey	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-
Ukraine *	---	---	---	---	---	X--	X--	X--	X--	X--	XXX	XX-	XX-	XX-	XX-	XX-	XX-	XX-	--X	--X	X--
United Kingdom	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	XX-	XX-
United States	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-
Yugoslavia	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
European Community	---	---	---	---	---	---	---	---	---	---	XX-	---	---	---	---	---	X--	---	---	---	---

Table 14. Carbon Monoxide: Overview of national emission totals, sector data and gridded data reported and stored at the UNECE/EMEP emission database at MSC-W

Totals	Sector data	Gridded 50kmx50km
X	X	X

(*) Gridded 150kmx150km

Party/Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2010
Armenia	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	---
Austria	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	---
Belarus *	---	---	---	---	---	X--	X--	X--	X--	X--	X-X	X--	X--	X-X	X--	X-X	X--	X--	X--	X--	X--
Belgium	---	---	---	---	---	---	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	---
Bosnia and Herzegovina	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Bulgaria	---	---	---	---	---	---	---	X--	X--	X--	XXX	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	XX-	X--
Canada	X--	---	---	---	---	XX-	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-
Croatia	---	---	---	---	---	---	---	---	---	---	XX-	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XX-	X--
Cyprus	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	-X-	---
Czech Republic	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	XXX	XX-	XX-	XX-	XX-	XXX	XXX	XX-	XX-	XX-	---
Denmark	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	X--
Estonia	---	---	---	---	---	X--	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	---
Finland	X--	---	---	---	---	---	---	---	---	---	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	---
France	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	XX-	---
Georgia	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	---
Germany	X--	X--	X--	X--	X--	X--	X--	XX-	XX-	XX-	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	---
Greece	---	---	---	---	---	---	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	---	---
Hungary	XX-	---	---	---	---	XX-	---	---	XX-	---	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XXX	XXX	XX-	X--
Iceland	X--	X--	X--	X--	X--	X--	X--	XX-	X--	X--	XX-	XX-	XX-	XX-	XX-	XX-	X--	XX-	XX-	---	X--
Ireland	---	---	---	---	---	---	---	---	---	---	XXX	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	XX-	X--
Italy	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-
Kazakhstan	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Kyrgyzstan	---	---	---	---	---	---	---	---	---	---	-X-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	---
Latvia	---	---	---	---	---	---	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-
Liechtenstein	X--	X--	X--	X--	X--	XX-	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	---	---	---	---	---	---
Lithuania	X--	X--	X--	X--	X--	XX-	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	XX-	X--
Luxembourg	---	---	---	---	---	XX-	---	---	---	---	XX-	---	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	X--
Malta	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Monaco	---	---	---	---	---	---	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	---	---
Netherlands	X--	X--	X--	X--	X--	XX-	X--	X--	X--	X--	XXX	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	XX-	---
Norway	XX-	X--	X--	X--	X--	XX-	X--	XX-	X--	XX-	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XX-	XX-	XX-	---
Poland	---	---	---	---	---	---	---	---	---	---	X--	---	X--	XX-	XX-	XX-	XX-	XX-	XX-	XX-	---
Portugal	---	---	---	---	---	---	---	---	---	---	XXX	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	---	---
Republic of Moldova	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	X--
Romania	X--	X--	X--	X--	X--	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XX-	---	---	---	---	---	---
Russian Federation	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XXX	XXX	XXX	XX-	XX-	---
Slovakia	---	---	---	---	---	---	---	---	---	X--	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XXX	---
Slovenia	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-
Spain	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XXX	XXX	XXX	XXX	XXX	XXX	---	---	---	---
Sweden	---	---	---	---	---	---	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	X--
Switzerland	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	XXX	XX-	XX-	XX-	XXX	XXX	XX-	XX-	XX-	XX-	XX-
The former Yugoslav Republic of Macedonia	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	XX-	XX-	---	---
Turkey	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-
Ukraine	---	---	---	---	---	X--	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	---	---	X--
United Kingdom	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	XX-	XX-
United States	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-
Yugoslavia	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
European Community	---	---	---	---	---	---	---	---	---	---	XX-	---	---	---	X--	X--	X--	---	---	---	---

Table 15. Methane: Overview of national emission totals, sector data and gridded data reported and stored at the UNECE/EMEP emission database at MSC-W

Totals	Sector data	Gridded 50kmx50km
X	X	X

Party/Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2010
Armenia	---	---	---	---	---	---	---	---	---	---	XX-	---	---	---	X--	X--	X--	---	---	---	---
Austria	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	---
Belarus	---	---	---	---	---	---	---	---	---	---	X--	---	---	---	---	X--	---	---	---	---	X--
Belgium	---	---	---	---	---	---	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	---
Bosnia and Herzegovina	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Bulgaria	---	---	---	---	---	---	---	X--	X--	X--	XXX	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	XX-	X--
Canada	X--	X--	X--	X--	X--	XX-	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	X--	---
Croatia	---	---	---	---	---	---	---	---	---	---	XX-	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XX-	X--
Cyprus	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Czech Republic	---	---	---	---	---	---	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	---
Denmark	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	X--
Estonia	---	---	---	---	---	---	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	---
Finland	X--	---	---	---	---	---	---	---	X--	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	---
France	---	---	---	---	---	---	---	---	---	---	XXX	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	XX-	---
Georgia	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	---
Germany	X--	X--	X--	X--	X--	X--	X--	XX-	XX-	XX-	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	X--
Greece	---	---	---	---	---	---	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	---	---
Hungary	XX-	-X-	-X-	-X-	-X-	XX-	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	X--
Iceland	X--	X--	X--	X--	X--	X--	X--	XX-	X--	X--	XX-	XX-	XX-	XX-	XX-	XX-	X--	XX-	XX-	---	X--
Ireland	---	---	---	---	---	---	---	---	---	---	XXX	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	X--
Italy	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	---
Kazakhstan	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Kyrgyzstan	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Latvia	---	---	---	---	---	---	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-
Liechtenstein	X--	---	---	---	X--	-X-	---	---	---	---	XX-	-X-	-X-	-X-	-X-	---	---	---	---	---	---
Lithuania	X--	X--	X--	X--	X--	XX-	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	XX-	X--
Luxembourg	---	---	---	---	---	---	---	---	---	---	XX-	---	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	X--
Malta	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Monaco	---	---	---	---	---	---	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	---	---
Netherlands	X--	X--	X--	X--	X--	XX-	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	XX-	---
Norway	XX-	X--	X--	X--	X--	X--	X--	XX-	X--	XX-	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XX-	XX-	XX-	X--
Poland	---	---	---	---	---	---	---	---	X--	---	XX-	X--	XX-	XX-	XX-	XX-	XX-	XX-	XX-	---	---
Portugal	---	---	---	---	---	---	---	---	---	---	XXX	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	---	---
Republic of Moldova	---	---	---	---	---	---	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	---
Romania	X--	X--	X--	X--	X--	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XX-	---	---	---	---	---	---
Russian Federation	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	---
Slovakia	---	---	---	---	---	---	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	---
Slovenia	---	---	---	---	---	---	---	---	X--	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-
Spain	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	---	---	---	---
Sweden	---	---	---	---	---	---	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	X--
Switzerland	X--	---	---	---	X--	X--	---	---	---	---	XXX	XX-	XX-	XX-	XXX	XXX	XX-	XX-	XX-	XX-	XX-
The former Yugoslav Republic of Macedonia	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Turkey	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-
Ukraine	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
United Kingdom	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	---	X--
United States	---	---	---	---	---	---	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	---
Yugoslavia	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
European Community	---	---	---	---	---	---	---	---	---	---	XX-	X--	X--	X--	X--	---	X--	X--	X--	---	---

Table 16. Carbon dioxide: Overview of national emission totals, sector data and gridded data reported and stored at the UNECE/EMEP emission database at MSC-W

Totals	Sector data	Gridded 50kmx50km
X	X	X

Party/Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2010
Armenia	---	---	---	---	---	---	---	---	---	---	X--	---	---	---	X--	X--	X--	---	---	---	---
Austria	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	X--
Belarus	---	---	---	---	---	---	---	---	---	---	X--	---	---	---	X--	X--	---	---	X--	---	X--
Belgium	---	---	---	---	---	---	---	---	---	---	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	---
Bosnia and Herzegovina	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Bulgaria	---	---	---	---	---	---	---	X--	X--	X--	X--	X--	X--	X--	X--	X--	---	X--	---	---	X--
Canada	X--	X--	X--	X--	X--	XX-	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	X--	---
Croatia	---	---	---	---	---	---	---	---	---	---	XX-	XXX	XXX	XXX	XXX	XX-	XXX	XXX	XXX	XX-	X--
Cyprus	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	XX-	XX-
Czech Republic	X--	---	---	---	---	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	XX-	X--
Denmark	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	X--
Estonia	---	---	---	---	---	---	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	---
Finland	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	X--
France	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	XX-	---
Georgia	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	---
Germany	X--	X--	X--	X--	X--	X--	X--	XX-	XX-	XX-	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	---
Greece	X--	---	---	---	---	X--	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	---	---
Hungary	XX-	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XXX	XXX	XX-	X--
Iceland	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	---	X--
Ireland	---	---	---	---	---	---	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	X--
Italy	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	---
Kazakhstan	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Kyrgyzstan	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Latvia	---	---	---	---	---	---	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-
Liechtenstein	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	---	---	---	---	---	---
Lithuania	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	XX-	X--
Luxembourg	---	---	---	---	---	XX-	---	---	---	---	XX-	---	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	X--
Malta	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Monaco	---	---	---	---	---	---	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	---	---
Netherlands	X--	---	---	---	---	X--	---	---	---	---	X--	X--	X--	XX-	XX-	XXX	XX-	XX-	XX-	XX-	---
Norway	XX-	X--	X--	X--	X--	X--	X--	XX-	X--	XX-	XX-	XX-	XX-	XXX	XXX	XXX	XXX	XX-	XX-	XX-	X--
Poland	---	---	---	---	---	---	---	---	X--	X--	X--	X--	X--	X--	XX-	X--	X--	X--	X--	---	---
Portugal	---	---	---	---	---	---	---	---	---	---	XXX	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	---	---
Republic of Moldova	---	---	---	---	---	---	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	---
Romania	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	---	---	---	---	---	---
Russian Federation	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--
Slovakia	---	---	---	---	---	---	---	---	X--	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	---
Slovenia	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-
Spain	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	---	---	---	---
Sweden	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	XX-	XX-	XX-	X--
Switzerland	---	---	---	---	---	---	---	---	---	---	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	---
The former Yugoslav Republic of Macedonia	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Turkey	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-
Ukraine	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
United Kingdom	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	X--	X--	X--	X--	X--	X--	X--
United States	---	---	---	---	---	---	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	---
Yugoslavia	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
European Community	---	---	---	---	---	---	---	---	---	---	X--	X--	X--	X--	X--	X--	X--	X--	X--	---	---

Table 17. Persistent organic pollutants: Overview of national emission totals, sector data and gridded data reported and stored at the UNECE/EMEP emission database at MSC-W

Totals	Sector data	Gridded 50kmx50km
X	X	X

Party/Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2010
Armenia	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Austria	---	---	---	---	---	---	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	---
Belarus	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	XX-	XX-	XX-	---
Belgium	---	---	---	---	---	---	---	---	---	---	X--	---	---	X--	X--	X--	X--	X--	X--	X--	---
Bosnia and Herzegovina	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Bulgaria	---	---	---	---	---	---	---	---	---	---	XXX	---	---	---	---	XX-	XX-	XX-	XX-	XX-	---
Canada	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Croatia	---	---	---	---	---	---	---	---	---	---	XX-	---	---	---	---	---	XX-	XX-	XXX	XX-	---
Cyprus	---	---	---	---	---	---	---	---	---	---	X--	---	---	---	---	---	---	---	---	---	---
Czech Republic	---	---	---	---	---	---	---	---	---	---	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	---
Denmark	---	---	---	---	---	---	---	---	---	---	---	---	---	---	X--	X--	X--	X--	X--	X--	---
Estonia	---	---	---	---	---	---	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	---	---
Finland	---	---	---	---	---	---	---	---	---	---	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	---
France	---	---	---	---	---	---	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	XX-	---
Georgia	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Germany	---	---	---	---	---	---	---	---	---	---	XX-	---	---	---	XX-	XX-	---	---	---	---	---
Greece	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Hungary	---	---	---	---	---	X--	---	---	---	---	X--	X--	X--	X--	XX-	XX-	XX-	XX-	X--	---	---
Iceland	---	---	---	---	---	---	---	---	---	---	X--	---	---	---	---	---	---	---	---	---	---
Ireland	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Italy	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Kazakhstan	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Kyrgyzstan	---	---	---	---	---	---	---	---	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	---
Latvia	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Liechtenstein	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Lithuania	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	X--	XX-	XX-	---
Luxembourg	---	---	---	---	---	---	---	---	---	---	XX-	---	---	---	XX-	XX-	XX-	XX-	XX-	XX-	---
Malta	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Monaco	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Netherlands	---	---	---	---	---	---	---	---	---	---	X--	---	X--	---	X--	X--	XX-	XX-	XX-	XX-	---
Norway	---	---	---	---	---	---	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	---
Poland	---	---	---	---	---	---	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	X--	---
Portugal	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Republic of Moldova	---	---	---	---	---	---	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	---
Romania	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Russian Federation	---	---	---	---	---	---	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	---
Slovakia	---	---	---	---	---	---	---	---	---	---	XX-	---	---	---	---	XX-	-X-	XX-	XX-	XX-	---
Slovenia	---	---	---	---	---	---	---	---	---	---	XX-	---	---	---	XX-	XX-	XX-	XX-	XX-	XX-	---
Spain	---	---	---	---	---	---	---	---	---	---	XXX	XXX	XXX	XXX	XXX	XXX	XXX	---	---	---	---
Sweden	---	---	---	---	---	---	---	---	---	---	X--	---	X--	X--	---	X--	---	-X-	-X-	-X-	---
Switzerland	---	---	---	---	---	---	---	---	---	---	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	---
The former Yugoslav Republic of Macedonia	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Turkey	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	-X-	-X-	-X-	-X-	-X-	---
Ukraine	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	X--	X--	---	---
United Kingdom	---	---	---	---	---	---	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	---
United States	---	---	---	---	---	---	---	---	---	---	X--	---	---	---	---	---	XX-	---	---	---	---
Yugoslavia	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
European Community	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Table 18. Heavy Metals: Overview of national emission totals, sector data and gridded data reported and stored at the UNECE/EMEP emission database at MSC-W

Totals	Sector data	Gridded 50kmx50km
X	X	X

(*) Gridded 150kmx150km

Party/Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2010
Armenia	---	---	---	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X-X	X--	X--	---
Austria	---	---	---	---	---	XX-	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	---
Belarus	---	---	---	---	---	---	---	---	---	---	XX-	---	---	---	---	XX-	XX-	XX-	XX-	XX-	---
Belgium	---	---	---	---	---	---	---	---	---	---	X--	X--	X--	X--	X--	X--	XX-	XX-	XX-	XX-	---
Bosnia and Herzegovina	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Bulgaria	---	---	---	---	---	---	---	---	---	---	XXX	---	---	---	---	XX-	XX-	XX-	XX-	XX-	---
Canada	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Croatia	---	---	---	---	---	---	---	---	---	---	XX-	---	---	---	---	XX-	XXX	XXX	XXX	XX-	---
Cyprus	---	---	---	---	---	---	---	---	---	---	X--	X--	X--	X--	X--	X--	X--	X--	X--	XX-	---
Czech Republic	---	---	---	---	---	---	---	---	---	---	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	---
Denmark	---	---	---	---	---	---	---	---	---	---	XX-	-X-	-X-	-X-	XX-	XX-	XX-	XX-	XX-	XX-	---
Estonia	---	---	---	---	---	---	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	---
Finland	---	---	---	---	---	---	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XXX	XXX	---
France	---	---	---	---	---	---	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	XX-	---
Georgia	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Germany	---	---	---	---	---	X--	---	---	---	---	XX-	---	---	---	---	XX-	---	---	---	---	X--
Greece	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	XX-	---	---	---	---
Hungary	X--	---	---	---	---	X--	---	---	---	---	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	X--	---
Iceland	---	---	---	---	---	---	---	---	---	---	X--	X--	X--	X--	X--	X--	X--	X--	X--	---	---
Ireland	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Italy	---	---	---	---	---	---	---	---	---	---	X--	---	---	---	X--	---	---	---	---	---	---
Kazakhstan	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Kyrgyzstan	---	---	---	---	---	---	---	---	---	---	---	---	-X-	-X-	-X-	-X-	-X-	-X-	-X-	XX-	---
Latvia	---	---	---	---	---	---	---	---	---	---	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	---
Liechtenstein	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Lithuania	---	---	---	---	---	---	---	---	---	---	X--	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	---
Luxembourg	---	---	---	---	---	---	---	---	---	---	XX-	---	---	---	XX-	XX-	XX-	XX-	XX-	XX-	---
Malta	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Monaco	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Netherlands	---	---	---	---	---	---	---	---	---	---	X--	X--	X--	X--	X--	X--	XX-	XX-	XX-	XX-	---
Norway	XX-	X--	X--	X--	X--	X--	X--	XX-	X--	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	---
Poland	---	---	---	---	---	---	---	---	---	---	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XX-	XX-	---
Portugal	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Republic of Moldova	---	---	---	---	---	---	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	---
Romania	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Russian Federation	---	---	---	---	---	---	---	---	---	---	XXX	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	XX-	---
Slovakia	---	---	---	---	---	---	---	---	---	---	X--	---	X--	---	X--	XX-	X--	X--	X--	X--	---
Slovenia	---	---	---	---	---	---	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	---
Spain	---	---	---	---	---	---	---	---	---	---	XXX	XXX	XXX	XXX	XXX	XXX	XXX	---	---	---	---
Sweden	---	---	---	---	---	---	---	---	---	---	X--	---	X--	---	X--	X--	---	-X-	-X-	-X-	---
Switzerland	X--	---	---	---	---	X--	---	---	---	---	XXX	X--	X--	X--	X--	XXX	X--	X--	XX-	XX-	---
The former Yugoslav Republic of Macedonia	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	X--	---	---
Turkey	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	-X-	-X-	-X-	-X-	-X-	---
Ukraine *	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	--X	---
United Kingdom	---	---	---	---	---	X--	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	X--
United States	---	---	---	---	---	---	---	---	---	---	X--	X--	X--	X--	X--	X--	XX-	---	---	---	---
Yugoslavia	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
European Community	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Table 19. Percentage reduction (1990-1999) of 1990 level (A negative number indicates an increase)

	SO_2			NO_x			NH_3			NMVOC		
Signatories to the	**1990**	**1999**		**1990**	**1999**		**1990**	**1999**		**1990**	**1999**	
Gothenburg Protocol	1000	tonnes	%	1000	tonnes	%	1000	tonnes	%	1000	tonnes	%
Armenia [1]	72	0,84	98,83	46,2	10,61	77,03	25	.003	-	81	17,47	78,43
Austria	91	42	53,85	192,6	170,8	11,32	79,9	70,3	12,02	344,7	230,7	33,07
Belgium	372	186	50	339	292	13,86	107	103	3,738	354	271	23,45
Bulgaria	2008	943	53,04	361	202	44,04	144	60	58,33	217	118	45,62
Canada [3]	3236	2499	22,78	2104	2056	2,281				2880	2777	3,576
Croatia	180	90,7	49,61	87,6	72,1	17,69	37,1	24,4	34,23	105	72,9	30,57
Czech Republic	1876	269	85,66	742	390	47,44	156	75	51,92	435	248	42,99
Denmark	182,58	55,911	69,38	271,68	210,17	22,64	127,87	95,986	24,93	169,304	128,05	24,37
Finland	260	87	66,54	300	247	17,67	38	35,2	7,368	209	168	19,62
France	1278	682	46,64	1865	1530	17,96	790	805	-1,9	2459	1784	27,45
Germany	5321	831	84,38	2706	1637	39,5	765	624	18,43	3221	1653	48,68
Greece	506			326			79			334		
Hungary	1010	590,15	41,57	238	221,02	7,134	124	71,09	42,67	205	149	27,32
Ireland	186	157	15,59	118	119	-0,85	112	127	-13,4	110	95	13,64
Italy	1651	923	44,09	1938	1485	23,37	466	448	3,863	2213	1671	24,49
Latvia	119	33	72,27	102	39	61,76	44	12	72,73	179	64	64,25
Liechtenstein	0,149			0,628			0,146			1,556		
Luxembourg	15	3,8218	74,52	23	16,092	30,04	7	7,288	-4,11	19	14,92	21,47
Netherlands	202	100	50,5	580	408	29,66	226	175	22,57	502	282	43,82
Norway	52,7	28,7	45,54	219,2	230,6	-5,2	22,9	26,6	-16,2	301,7	350,6	-16,2
Poland	3210	1719	46,45	1280	953	25,55	508	341	32,87	831	731	12,03
Portugal	359,4			317			104,6			379,9		
Rep. of Moldova	265	12,05	95,45	100	16,91	83,09	49	24,8	49,39	157	22,14	85,9
Romania	1311			546			300			772		
Slovakia	543	171	68,51	226	118	47,79	62,9	36,1	42,61	148	79	46,62
Slovenia	196	104	46,94	63	58	7,937	24	20	16,67	44	40	9,091
Spain	2049			1156			472			2790		
Sweden	119	63	47,06	338	261	22,78	51	55	-7,84	526	421	19,96
Switzerland	42	25,5	39,29	154	99	35,71	71,5	68,3	4,476	279	165	40,86
United Kingdom	3754,4	1187	68,38	2755,8	1602,7	41,84	365,33	348,27	4,67	2657,33	1743,8	34,38
United States [3]	21481	17116	20,32	21927	23037	-5,06	3926	4503	-14,7	19099	16461	13,81
Non Signatories to the Gothenburg Protocol												
Belarus [2]	637	163,7	74,3	285	142	50,18	4	4,16	-	533	239,9	54,99
Bosnia and Herzegovina	480											
Cyprus	46	50	-8,7	18	22	-22,2						
Estonia	252,1	102,5	59,34	67,7	39,62	41,48	24,25	8,47	65,1	88,4	42,33	52,12
Georgia	248,3	8,61	96,53	129,5	30,14	76,73				46,4	18,63	59,85
Iceland	24			26,3						12,8		
Kazakhstan												
Kyrgyzstan		8,72			2,38			59,114			2,32	
Lithuania	222	70	68,47	158	54	65,82	84	29	65,48	108	68	37,04
Malta												
Monaco	0,073			0,523						0,7		
Russian Federation	4460	2003	55,09	3600	2494	30,72	1191	657	44,84	3566	2355	33,96
The FYR Macedonia												
Turkey	764,67	1346,7	-76,1	628,04	911,04	-45,1				462,21	613,02	-32,6
Ukraine [2]	3782			1097			23			1369		
Yugoslavia	508			66								
European Community	19127			13289			3789			16888		

1) Emissions of NH_3 from agriculture are not included in 1999 value
2) Emissions of NH_3 from agriculture are not included
3) Special notes for NH_3 and NMVOC are stated in the Gothenburg Protocol

NORDIC ECOLABEL
241 480

www.kursiv.no