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"Analysis of UNECE/EMEP Emission Data MSC-W Status Report 2000".

By Vigdis Vestreng and Egil Støren

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ANALYSIS OF UNECE/EMEP EMISSION DATA
MSC-W Status Report 2000

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Preface & Acknowledgements

This note was prepared to be presented at the twenty fourth 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/EMEP emission data held at and managed by the Meteorological Synthesizing Centre-West (MSC-W) of EMEP. The note also includes an analysis of trends and a comparison of reported emissions with the ceilings of the Protocol to the 1979 Convention on Long-Range Transboundary Air Pollution to Abate Acidification, Eutrophication and Ground- level Ozone (The Gothenburg Protocol).

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 scientific and technical teams at MSC-W are also grateful to Eija Lumme, secretary to the Steering Body of EMEP, for invaluable support and co-operation during her engagement at UNECE (United Nations Economic Commission for Europe).

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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. A description of the database can be found in EMEP/MSC-W Note 1/98 (Støren, 1998). An updated selection of the EMEP emission data are available on the Internet (EMEP web site: http//www.emep.int).

In the following, a summary of the current state of the EMEP emission database is given, with official data outlined first as received by the middle of June 2000 (Chapter 2), followed by the data used in the model calculations (Chapter 3). The section on official submissions includes heavy metals and persistent organic pollutants. In the section on modelling, discussion concentrates on releases of SO_x, NO_x, NH_3, NMVOC and CO 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.

The report also contains an analysis of trends in national total emissions and in sector data submitted to UNECE/CLRTAP (Chapter 4) and a chapter on the progressions made towards implementation of the Gothenburg Protocol (Chapter 5).

To this date the number of Parties to the Convention are 46: 43 European countries, Canada, the United States of America and the European Community. 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 Macedonia refers to the Former Yugoslav Republic of Macedonia.

2. Official Submissions to UNECE/EMEP

This section is divided into three parts. The first part summarises the progress in reporting over the last three years, the second part gives an overview of all major types of data submitted so far, while the third part summarizes the quality assessment.
The official submitted data can also be found in the UNECE report EB.AIR/GE.1/2000/6.

2.1 Emission Reporting Progress

41 of 46 Parties to the Convention have submitted emission data this year. All Parties, except one, submitted some of their data in electronic format. The considerable increase in electronic submissions of data is a positive consequence of the distribution of electronic pre-filled emissions tables.

Regarding the timeliness of submissions, 22% of the Parties submitted some data within deadline, during January this figure increased to 28%, most of the data was received by the end of February, while the latest reports were submitted in the beginning of May. It seems

difficult for many of the Parties to submit their data within the established deadlines. The implication is that late submissions risk exclusion from the work under the Convention for that year.

This year's reporting included 1998 data, updates for previous years and projections for 2005 and 2010. As figures 2.1-2.3 illustrate, there has been an overall marked progress in the reporting for 1998 compared to that of the years before concerning 1996 and 1997. For the traditional pollutants, national total and sector data for 1998 have been reported by approximately 70% of the Parties. The corresponding figures for HMs and POPs are 64% and 26%. The reporting of POPs clearly needs to be strengthened.

There has been a substantial increase in the number of reported emissions for year 2010, in particular for the pollutants included in the Gothenburg Protocol (about 10 Parties more than last year). One reason for this is that almost all the Parties to the Protocol report the protocol emission ceiling as their 2010 projections. With regard to reported gridded totals, there has been only a minor improvement. 42% of the Parties indicated which estimation methodology they have followed, an increase of 7 Parties relative to last year's report. 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. Many of the Parties have recalculated their emissions of the main components, an overview of which is given in Chapter 5, table 5.2.

2.2 Overview

The Convention's current goal is to cover all gaps in the time series of national annual total and sector (SNAP level 1) emissions since 1980 using harmonised emission inventory methodologies as soon as possible, and at the latest during the 2005 inventory. Moreover, EMEP aims at having full sets of gridded data for national total and sector data for every five years starting from 1980 and updates in the years between (EB.AIR/GE.1/1998/3).

To date, not all Parties have reported annual national totals since 1980 or gridded totals every fifth year, however, all Parties, except Malta, have submitted data at least once. The reported national anthropogenic total figures for SO_x, NO_x, NH_3, NMVOC, CO, CH_4, CO_2, POPs and HMs are listed in Tables 1-9 in Annex I.

An overview of reported national total, sector and gridded data available from the EMEP database for each Party is shown in Annex I, Tables 10-16. Reported national totals, sector data and gridded data stored at MSC-W are outlined with crosses. Present lack of data are marked with bars, except for gridded data, where only last emission year reported are marked. The first position indicates data for national totals, second position corresponds to sector data and the third position corresponds to gridded data in the 50x50km^2 EMEP grid. An asterisk over the gridded data indicates that the reported data has been submitted in the 150x150km^2 grid. The tables show superior data coverage for SO_x and NO_x (Tables 10 and 11). For NH_3, NMVOC and CO (Tables 12, 13 and 14), the data gaps are still substantial, especially in the 1980s. HMs and POPs (Tables 15 and 16) with base year 1990, are only available for a few 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 and sector data, reported so far accordingly.

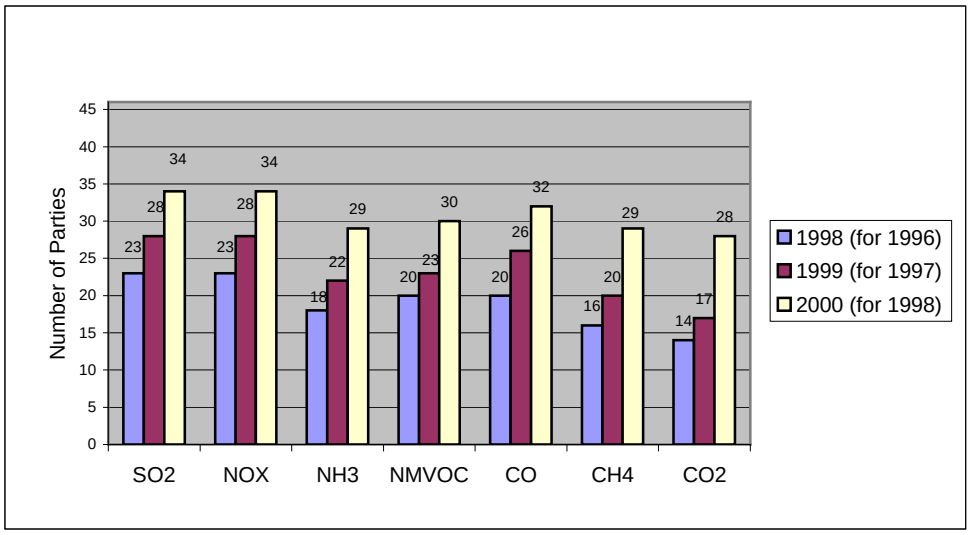

Figure 2. 1 Official submissions of national emission totals.

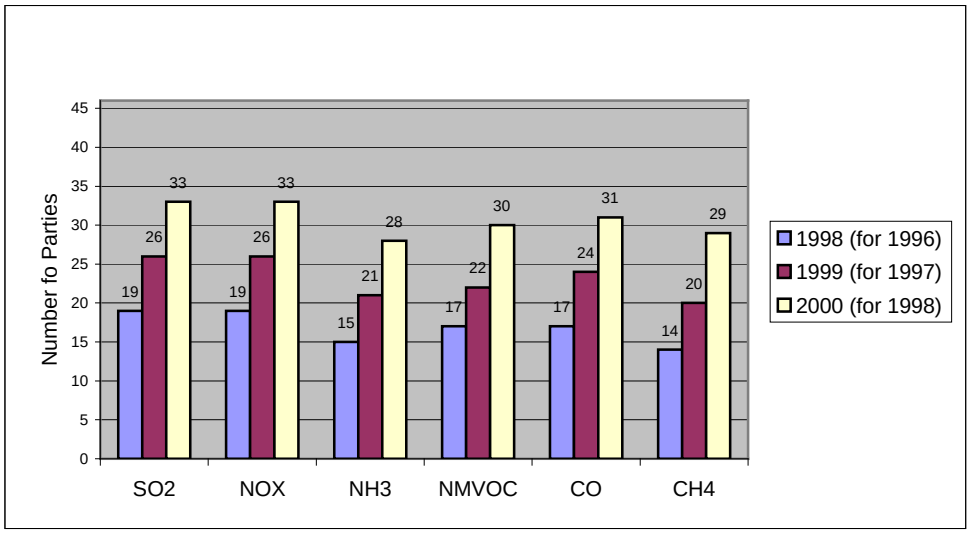

Figure 2.2 Official submissions of national sector totals (SNAP level 1).

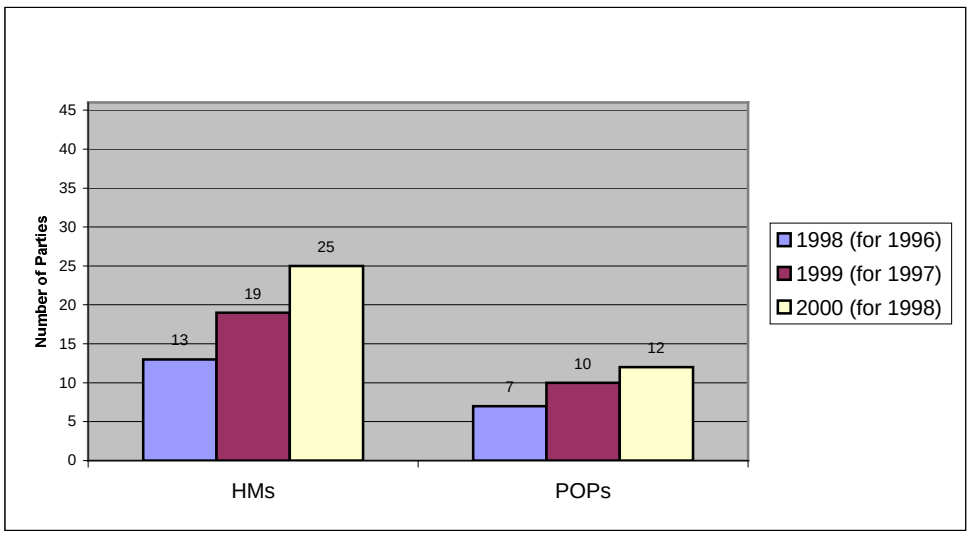

Figure 2.3 Official submissions of national HM and POP emission totals.

The gridded data also plays an important part in the assessment done within EMEP. As can be seen from the overview tables, quite a few Parties have failed to report gridded data for emissions in 1995 or later years. In these cases older data will be used in the assessments, and the spatial distribution of emissions may not reflect the present situation. This will for instance influence trend analysis that takes the spatial distribution into consideration. Gridded data split into sectors, and information on the height distribution are also important elements in the modelling activities of EMEP, but are only available for very few Parties (not shown in the overview tables). Information on the position and characteristics of LPS is extremely useful in shedding light on issues related to emission patterns, monitoring data and model results.

2.3 Quality assessment

All the data submitted to UNECE goes through an initial quality assessment at the MSC-W. This is not to be regarded as a verification process, but the data are checked for internal consistency and efforts are made to compare the reported data under different specifications. The most common problem found, is that the sum of the sector data does not agree with the national totals reported, but also other inconsistencies have been corrected during the quality control period between deadline for submissions and the onset of the model runs. The normal procedure is that MSC-W correct the identified inconsistencies through direct contact with nominated national experts from the reporting Party. Figure 2.4 gives an overview of the communication between MSC-W and the Parties' national experts this year.

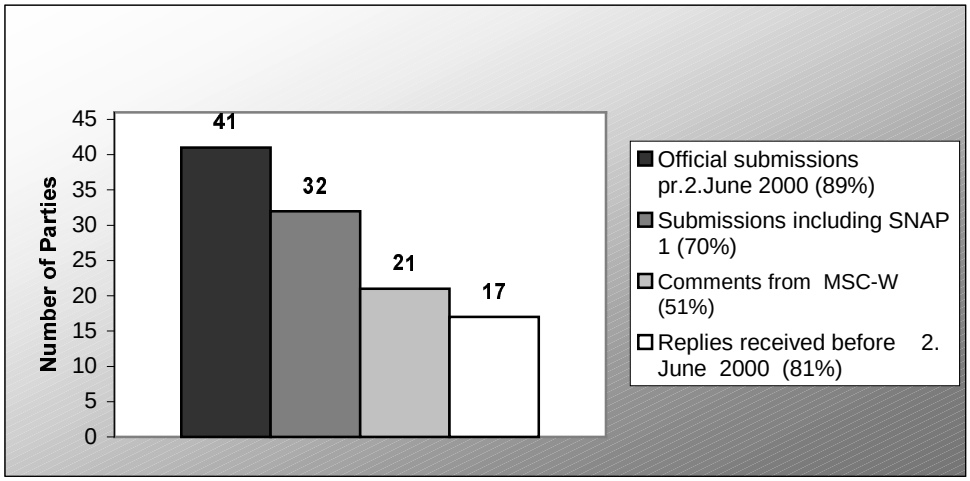

Figure 2.4 Quality assessment statistics

The figure shows that there is indeed a need for an initial quality check of emission data submitted by the Parties before loading them into the database. More than 50% of the Parties received comments from MSC-W. The response of national experts to the MSC-W inquiries for inconsistency are noteworthy. 81% of all inquiries made by MSC-W during spring 2000 received an answer before 2. June 2000. It is most satisfactory to appreciate the quick and positive response from the national experts.

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

There have been major changes this year in emission inventories used for modelling at MSC-W. These are:

(a) Inclusion of the 1990 emissions from International Ship traffic from Lloyd's Register of Shipping for the Mediterranean and the Black Seas
(b) Inclusion of official emission data reported by Turkey for the first time
(c) Inclusion of several large updates reported by the countries (see Chapter 5, Table 5.2).

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 (1980-1998, 2005, 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, those of 1990 replace missing values, since this year constitutes the basis for estimation of national projection figures.

The national totals for SO_2, NO_x, NH_3, NMVOC and CO used in this year's calculations (1985-1998) are those received at the MSC-W by mid-May 2000 and are displayed in Tables 3.1-3.5. Data for 1980, 2005 and 2010 are also given. Official values are highlighted. Data drawn from other sources or interpolated are displayed with no background. 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 and Monaco, as they are not used in the model calculations. On the contrary, emissions from Albania and Kazakhstan (non-Parties to the Convention), along with several Asiatic and North African regions, are included in these tables as they are confined to the EMEP modelling domain.

The split of the German emissions into Germany former East and Germany former West is performed by MSC-W. Because of lack of gridded data for Germany, the split factor used is based on the 1992 emissions for East and West Germany reported officially from Germany in 1995. The German source distribution clearly needs to be updated. 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 latest gridded data received.

In the absence of any official figures, the emission estimates used are those suggested by IIASA (Amann et al., 1997) for SO_2 (Albania), NO_x (Albania, Bosnia and Herzegovina), and NH_3 (Albania, Bosnia and Herzegovina, The FYR of Macedonia, Yugoslavia). Moreover, emission figures for NH_3 reported by Belarus, Estonia, and Ukraine did not include agriculture, and have therefore also been replaced by IIASA estimates (219, 29, and 729 kilo tonnes respectively).

For a few countries official emission estimates for NMVOC and CO are missing for all years and are not available in other databases (e.g. Albania, Bosnia and Herzegovina, the FYR of Macedonia, Yugoslavia). In these cases it is assumed that NMVOC emissions are equal to those of NO_x, and 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, NMVOC 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 50 km x 50 km spatial distribution.

With regard to natural emissions, major contributions are volcanic releases of SO_2 reported by Italy for the period 1980-1997, 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 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_x, 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 1998 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 50km resolution. Grid elements appearing in groups of nine indicate that the 50km x 50km distribution was not available for the corresponding country and that the 150x150 km 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 1985 or 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 50km x 50 km grid for the EMEP modelling activities.

The preliminary CORINAIR 1990 data received this year include a larger area than the CORINAIR 1990 data available in 1998. Since many of the Parties have failed to report gridded data, the preliminary CORINAIR 1990 data has been extensively used in the modelling. The CORINAIR 1985 data also contains information on source and height distribution, and are for example used in combination with the preliminary CORINAIR 1990 data for Denmark and Germany for all components.

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

	1980	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	2005	2010
Africa, north[1]	413	413	413	413	413	413	413	413	413	413	413	413	413	413	413	413	413
Albania	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72
Armenia	141	100	111	111	104	63	72	60	44	6	4	3	2	0.4	3	72	72
Austria	385	190	171	153	115	102	91	82	63	60	57	56	55	49	46	39	39[2]
Belarus	740	690	690	761	720	668	637	652	458	382	324	275	246	209	190	490	480[2]
Belgium	828	400	377	367	354	325	372	334	318	297	253	246	240	220	203	232	106[2]
Bosnia and Herzegovina	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480
Bulgaria	2050	2314	2367	2420	2228	2180	2008	1677	1128	1426	1480	1497	1420	1365	1251	890	856[2]
Croatia	150	165	168	171	174	177	180	108	107	114	89	70	66	80	90	125	70[2]
Cyprus	37	34	37	38	41	42	46	32	38	42	42	42	45	47	49	37	39
Czech Republic	2257	2277	2177	2164	2066	1998	1876	1776	1538	1419	1270	1091	946	701	443	250	283[2]
Denmark	452	343	292	258	254	197	183	241	188	154	156	149	179	110	77	62	50
Estonia	287	254	256	255	254	254	252	246	187	154	149	118	125	119	110	252	252
Finland	584	382	331	328	302	244	260	194	141	123	114	96	105	99	90	116	116[2]
France	3208	1472	1338	1322	1214	1373	1268	1379	1200	1040	985	925	905	764	837	650	400[2]
Georgia	230	273	255	258	255	249	248	194	135	71	47	20	30	33	33	248	248
Germany, former East[3]	4350	5365	5413	5340	4684	4451	3842	2885	2388	2126	1786	1512	1066	981	933	715	565[4]
Germany, former West[3]	3164	2367	2228	2056	1803	1714	1479	1111	919	819	688	582	410	378	359	275	
Greece	400	500	502	504	505	507	502	549	556	551	526	551	540	531	540	580	546[2]
Hungary	1633	1404	1362	1285	1218	1102	1010	913	827	762	741	705	673	659	591	816	550[2]
Iceland	18	18	18	16	18	17	24	23	24	25	24	24	24	25	27	29	29
Ireland	222	140	162	174	152	162	186	180	172	161	175	161	147	166	176	155	42[2]
Italy	3757	1901	1929	2029	1963	1854	1651	1539	1394	1333	1271	1322	1123	1021	1021	847	842
Kazakhstan[1]	140	140	140	140	140	140	140	140	140	140	140	140	140	140	140	140	140
Latvia	119	119	119	119	119	119	119	90	79	73	86	59	59	44	40	114	157
Lithuania	311	304	316	316	300	298	222	234	139	125	117	94	93	77	94	155	145[2]
Luxembourg	24	16	16	16	16	15	15	15	15	15	13	9	8	6	4	4	4[2]
Netherlands	490	258	264	263	250	204	202	173	172	164	146	147	135	118	113	50	50[2]
Norway	137	98	91	73	68	58	53	44	36	35	35	34	33	30	30	22	22[2]
Poland	4100	4300	4200	4200	4180	3910	3210	2995	2820	2725	2605	2376	2368	2181	1897	1397	1397[2]
Portugal	266	198	234	218	204	329	343	333	396	340	321	365	334	334	334	294	294
Republic of Moldova	308	282	297	317	273	238	265	260	168	156	108	64	67	36	32	135	135[2]
Romania	1055	1255	1293	1305	1469	1517	1311	1041	951	928	912	912	912	912	912	1311	1311
Russian Federation[1]	7161	6191	5707	5622	5145	4677	4460	4392	3839	3456	2983	2838	2685	2449	2208	4297	4297
Slovakia	780	613	604	614	589	573	543	445	380	325	239	239	227	202	179	210	210
Slovenia	234	241	247	222	210	211	196	180	186	183	177	125	112	118	123	78	27[2]
Spain[1]	2836	2393	2267	2139	1787	2122	2049	2050	2040	1919	1875	1721	1498	1498	1498	2143	2143
Sweden	491	266	272	228	224	160	119	96	88	87	82	79	83	51	49	67	67[2]
Switzerland	116	76	68	62	56	49	43	41	38	34	31	34	30	26	28	26	26[2]
The FYR Macedonia	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17
Turkey[5]	205	520	674	653	498	792	833	909	896	844	1069	1026	1197	1256	1288	990	995
Ukraine	3849	3463	3393	3264	3211	3073	2782	2538	2376	2194	1715	1639	1293	1132	1132	2310	2310
United Kingdom	4871	3734	3895	3892	3822	3700	3737	3552	3462	3144	2689	2356	2018	1647	1615	1020	850
Yugoslavia	406	478	470	484	502	506	508	446	348	401	424	462	434	522	521	889	1135
Other Asiatic areas[1]	869	869	869	869	869	869	869	869	869	869	869	869	869	869	869	869	869
The Baltic Sea	228	228	228	228	228	228	228	228	228	228	228	228	228	228	228	228	228
The Black Sea	57	57	57	57	57	57	57	57	57	57	57	57	57	57	57	57	57
The Mediterranean Sea	1189	1189	1189	1189	1189	1189	1189	1189	1189	1189	1189	1189	1189	1189	1189	1189	1189
The North Sea	454	454	454	454	454	454	454	454	454	454	454	454	454	454	454	454	454
Rem. N.E. Atlantic[1]	901	901	901	901	901	901	901	901	901	901	901	901	901	901	901	901	901
Natural Oceanic[1]	743	743	743	743	743	743	743	743	743	743	743	743	743	743	743	743	743
Volcanic[6]	2144	2144	2144	2181	2113	2493	2807	1645	2235	2027	1918	2000	2000	2000	2000	2000	2000
Total	60359	53101	52318	51761	49023	48286	45567	41217	38052	35803	33289	31587	29496	27759	26729	29955	28723

(1) The part inside the EMEP domain of calculation. "Other Asiatic areas" refers to Azerbaijan, Syria, Lebanon, Israel and parts of Uzbekistan, Turkmenistan, Iran, Iraq and Jordan. (2) Gothenburg protocol (G.p) emission ceiling. (3) Split estimated by MSC-W. See text. (4) Projection figure for whole Germany. G.p. figure 550 Kt also reported. (5) Sum of sector data. (6) Natural emissions reported by Italy.
Officially submitted data are printed inside grey-shaded boxes. Updates from last year's report from MSC-W are printed in bold. Countries in white boxes have not provided any data to ECE; data are drawn from open sources.

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

	1980	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	2005	2010
Africa, north[1]	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96
Albania	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
Armenia	15	45	53	52	56	51	46	40	22	12	12	15	11	15	11	46	46[2]
Austria	228	217	213	210	202	195	193	197	187	175	182	171	170	171	170	154	107[2]
Belarus	234	238	258	263	262	263	285	281	224	207	203	195	173	189	164	184	180
Belgium	442	325	317	338	345	357	339	335	343	341	342	336	316	306	301	181	181[2]
Bosnia and Herzegovina	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80
Bulgaria	416	416	416	416	415	411	361	266	239	242	230	266	259	225	223	270	266[2]
Croatia	60	74	77	80	82	85	88	65	56	59	66	66	69	73	76	87	87[2]
Cyprus	14	14	16	16	18	19	18	16	19	19	20	19	21	21	22	23	23
Czech Republic	937	831	826	816	858	920	742	725	698	574	435	412	432	423	413	310	286[2]
Denmark	273	298	319	313	303	285	279	322	276	275	266	248	288	248	231	159	133
Estonia	70	70	70	70	70	69	68	63	39	38	41	42	44	45	46	68	68
Finland	295	275	277	288	293	301	300	290	284	282	282	258	268	260	252	224	224
France	2030	1827	1786	1816	1819	1867	1877	1942	1880	1769	1739	1714	1695	1643	1652	1200	860[2]
Georgia	121	140	134	134	135	131	130	113	48	33	21	27	50	55	55	130	130
Germany, former East[3]	717	736	740	672	648	604	547	505	467	444	413	402	388	373	360	430	1166[4]
Germany, former West[3]	2617	2540	2546	2655	2560	2385	2162	1996	1844	1754	1630	1587	1531	1473	1420	1700	
Greece	306	306	310	314	318	322	326	333	334	331	342	341	378	361	382	344	344[2]
Hungary	273	262	264	265	258	246	238	203	183	184	188	190	196	200	217	210	198[2]
Iceland	21	21	22	24	25	25	26	27	28	29	29	28	30	29	28	29	30
Ireland	73	91	100	115	122	127	118	120	130	119	115	115	120	118	122	105	65[2]
Italy	1638	1614	1690	1811	1854	1917	1938	1984	2010	1990	1789	1768	1756	1685	1685	1508	1436
Kazakhstan[1]	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76
Latvia	93	93	93	93	93	93	93	61	53	46	48	42	35	44	42	70	81
Lithuania	152	166	169	171	172	173	158	166	98	78	77	65	65	57	60	110	110[2]
Luxembourg	23	21	21	22	22	23	23	23	23	23	23	21	22	18	17	11	11[2]
Netherlands	583	589	587	599	602	584	580	568	556	535	510	498	501	453	441	249	266[2]
Norway	188	211	227	226	222	221	219	210	208	216	213	213	221	223	224	156	156[2]
Poland	1229	1500	1510	1530	1550	1480	1280	1205	1130	1120	1105	1120	1154	1114	991	806	879[2]
Portugal	166	96	110	116	122	214	306	323	346	344	354	370	374	374	374	306	306
Republic of Moldova	58	66	72	71	74	70	100	97	67	53	46	38	38	36	22	35	90[2]
Romania	523	542	559	580	590	579	546	464	357	318	319	319	319	319	318	546	546
Russian Federation[1]	1734	1903	1871	2653	2358	2553	3600	3325	3093	3054	2685	2570	2467	2379	2488	3600	3600
Slovakia	197	197	197	197	212	227	225	204	190	183	173	181	130	124	130	225	225
Slovenia	51	53	58	57	59	58	63	58	58	63	66	67	70	71	64	61	45[2]
Spain[1]	1019	934	957	1003	1030	1131	1156	1210	1240	1202	1214	1216	1194	1194	1194	892	892
Sweden	404	426	432	437	432	418	338	339	329	324	331	301	302	270	257	194	148[2]
Switzerland	170	179	177	174	172	170	166	160	153	145	139	136	130	125	123	110	79[2]
The FYR Macedonia	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Turkey[5]	372	484	532	589	596	633	670	677	693	772	755	805	855	861	851	1484	2044
Ukraine	1145	1059	1112	1094	1090	1065	1097	989	830	700	568	531	467	455	455	1094	1094
United Kingdom	2586	2545	2627	2738	2793	2834	2788	2674	2587	2405	2302	2132	2054	1868	1754	1295	1161
Yugoslavia	47	58	58	60	63	62	66	57	50	54	52	59	57	66	66	115	147
Other Asiatic areas[1]	212	212	212	212	212	212	212	212	212	212	212	212	212	212	212	212	212
The Baltic Sea	352	352	352	352	352	352	352	352	352	352	352	352	352	352	352	352	352
The Black Sea	86	86	86	86	86	86	86	86	86	86	86	86	86	86	86	86	86
The Mediterranean Sea	1639	1639	1639	1639	1639	1639	1639	1639	1639	1639	1639	1639	1639	1639	1639	1639	1639
The North Sea	648	648	648	648	648	648	648	648	648	648	648	648	648	648	648	648	648
Rem. N.E. Atlantic[1]	1266	1266	1266	1266	1266	1266	1266	1266	1266	1266	1266	1266	1266	1266	1266	1266	1266
Natural Oceanic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Volcanic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	26005	25947	26288	27563	27380	27653	28040	27118	25857	24977	23810	23369	23135	22449	22186	23206	22195

(1) The part inside the EMEP domain of calculation. "Other Asiatic areas" refers to Azerbaijan, Syria, Lebanon, Israel and parts of Uzbekistan, Turkmenistan, Iran, Iraq and Jordan. (2) Gothenburg protocol (G.p) emission ceiling. (3) Split estimated by MSC-W. See text. (4) Projection figure for whole Germany. G. p. figure 1081 Kt also reported. (5) Sum of sector data.

Officially submitted data are printed inside grey-shaded boxes. Updates from last year's report from MSC-W are printed in bold. Countries in white boxes have not provided any data to ECE; data are drawn from open sources.

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

	1980	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	2005	2010
Africa, north[1]	235	235	235	235	235	235	235	235	235	235	235	235	235	235	235	235	235
Albania	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31
Armenia[2]	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25[3]
Austria	79	82	82	81	80	80	80	79	77	76	76	74	73	72	72	66	66[3]
Belarus [2]	219	219	219	219	219	219	219	219	219	219	219	219	219	219	219	219	219
Belgium	89	89	92	95	98	101	107	93	92	97	96	97	99	99	99	74	74[3]
Bosnia Herzegovina	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31
Bulgaria	144	144	144	144	144	144	144	124	111	109	101	99	83	77	66	113	108[3]
Croatia	37	37	37	37	37	37	37	32	27	26	24	25	23	23	23	33	30[3]
Cyprus	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Czech Republic	156	156	156	156	156	156	156	134	115	99	91	86	81	81	80	156	156
Denmark	125	115	111	107	105	104	100	100	104	104	100	100	100	102	104	103	103
Estonia[2]	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29
Finland	39	40	41	40	39	39	38	37	37	36	36	35	35	38	38	23	23
France	832	830	832	828	809	810	813	809	797	787	793	801	814	822	827	800	780[3]
Georgia	97	97	97	97	97	97	97	97	97	97	97	97	97	97	97	97	97
Germany, former East[4]	263	269	266	167	165	162	151	133	128	126	126	125	125	123	123	550	550[3,5]
Germany, former West[4]	572	588	580	679	671	661	614	540	521	512	513	509	509	502	502		
Greece	79	79	79	79	79	79	79	78	75	75	73	85	73	71	74	73	73[3]
Hungary	157	150	170	150	160	170	124	93	84	77	76	77	78	76	74	100	90[3]
Iceland	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Ireland	112	112	112	112	112	112	112	115	117	117	119	120	122	123	127	126	116[3]
Italy	479	487	495	497	499	481	466	451	440	449	459	461	461	467	467	446	449
Kazakhstan[1]	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
Latvia	44	44	44	44	44	44	44	42	33	20	17	17	16	15	13	44	44[3]
Lithuania	85	89	89	90	89	86	84	85	81	80	80	38	36	35	35	84	84[3]
Luxembourg	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7[3]
Netherlands	234	248	258	258	237	232	226	228	180	191	166	146	146	188	177	82	128[3]
Norway	23	23	23	23	21	23	23	24	25	25	25	26	27	26	27	23	23[3]
Poland	550	550	550	550	550	550	508	450	447	382	384	380	364	350	371	468	468[3]
Portugal	98	98	98	98	98	98	98	98	96	94	94	97	97	97	97	98	98
Republic of Moldova	53	58	56	54	52	50	49	49	44	37	35	33	31	25	25	42	42[3]
Romania	340	343	350	329	339	341	300	267	255	223	221	221	221	221	221	300	300
Russian Federation[1]	1189	1239	1286	1277	1269	1258	1191	1161	1084	903	772	824	749	730	675	1191	1191
Slovakia	63	63	63	63	63	63	63	59	51	45	43	41	41	38	35	63	63
Slovenia	24	24	24	24	24	24	24	23	23	23	22	22	22	19	19	22	20[3]
Spain[1]	396	420	435	474	475	487	472	468	468	448	470	467	517	517	517	472	472
Sweden	54	54	54	54	54	54	61	51	61	61	61	61	61	59	59	58	57[3]
Switzerland	77	74	74	73	73	72	72	61	62	63	71	71	71	71	71	63	63[3]
The FYR Macedonia	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17
Turkey	321	321	321	321	321	321	321	321	321	321	321	321	321	321	321	321	321
Ukraine[2]	729	729	729	729	729	729	729	729	729	729	729	729	729	729	729	729	729
United Kingdom	366	366	366	366	366	366	366	360	345	345	347	339	335	344	350	366	366
Yugoslavia	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90
Other Asiatic Areas[1]	303	303	303	303	303	303	303	303	303	303	303	303	303	303	303	303	303
The Baltic Sea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
The Black Sea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
The Mediterranean Sea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
The North Sea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rem. N.E. Atlantic[1]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Natural Oceanic[1]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Volcanic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	8918	9030	9126	9108	9067	9043	8761	8403	8139	7789	7650	7636	7569	7573	7527	8198	8196

(1) The part inside the EMEP domain of calculation. "Other Asiatic areas" refers to Azerbaijan, Syria, Lebanon, Israel and parts of Uzbekistan, Turkmenistan, Iran, Iraq and Jordan. (2) Armenia has reported more figures, but they did not include emissions from agriculture. Emissions reported from Belarus were from stationary sources only. Emissions reported from Estonia and Ukraine was calculated from industry only. (3) Gothenburg protocol (G.p) emission ceiling. (4) Split estimated by MSC-W. See text. (5) Projection figure for whole Germany.
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Table 3.4 Emissions of non-methane volatile organic compounds (1000 tonnes as NMVOC per year)

	1980	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	2005	2010
Africa, North[1]	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96
Albania	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32
Armenia	26	93	98	104	93	90	81	70	31	20	17	23	18	35	17	81	81[2]
Austria	352	359	372	375	377	367	344	313	280	268	258	259	250	246	238	159	159[2]
Belarus	549	516	506	509	535	511	533	546	412	372	366	367	328	345	294	323	321
Belgium	688	688	621	554	488	420	354	313	313	311	305	294	274	270	268	144	144[2]
Bosnia and Herzegovina	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80
Bulgaria	309	309	309	309	309	263	217	178	179	208	175	173	147	120	132	194	185[2]
Croatia	105	105	105	105	105	105	105	87	64	69	75	74	82	80	80	90	90[2]
Cyprus	16	16	16	16	18	19	20	17	20	21	21	21	21	23	22	23	23
Czech Republic	275	275	307	339	371	403	435	398	359	338	310	286	284	272	269	230	220[2]
Denmark	203	209	212	212	211	205	178	183	177	169	167	161	136	133	129	89	73
Estonia	81	81	83	83	84	87	88	82	45	42	45	48	50	54	54	88	88
Finland	210	210	210	210	213	211	209	204	200	195	191	185	173	174	174	150	150
France	2666	2666	2666	2666	2666	2628	2535	2518	2442	2336	2232	2161	2101	2033	1964	1800	1100[2]
Georgia[3]	46	49	48	48	48	46	46	8	4	2	2	2	2	3	3	46	46
Germany, former East[4]	702	743	762	524	521	512	516	448	406	372	345	317	298	285	273	1100[5]	1150[5]
Germany, former West[4]	2522	2447	2456	2749	2734	2690	2709	2350	2134	1954	1813	1663	1563	1494	1432		
Greece	614	614	558	502	446	390	334	338	340	348	357	362	376	384	397	261	261[2]
Hungary	215	232	263	228	215	205	205	150	142	149	142	150	150	145	141	150	137[2]
Iceland	8	8	8	12	13	13	13	14	14	14	14	12	12	10	10	7	7
Ireland	110	110	110	110	110	110	110	111	114	108	107	104	110	114	115	55	55[2]
Italy	2179	1992	2019	2088	2124	2215	2213	2293	2338	2344	2349	2368	2113	2091	2091	1543	1440
Kazakhstan[1]	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76
Latvia	152	152	152	152	152	152	152	97	63	98	101	70	41	74	67	118	204
Lithuania	100	108	108	108	109	109	103	106	60	46	46	77	82	81	79	84	84
Luxembourg	15	15	16	16	17	18	19	19	19	18	18	16	16	15	13	9	9[2]
Netherlands	579	502	489	485	538	468	502	462	438	405	389	365	362	317	302	191	191[2]
Norway	175	230	248	255	247	275	300	298	329	343	354	367	368	359	345	195	195[2]
Poland	1036	1011	1029	1014	1026	1016	831	833	805	756	819	769	766	774	730	800	800[2]
Portugal	199	199	223	245	268	291	314	328	343	347	364	367	375	375	375	314	314
Republic of Moldova	105	105	101	102	102	96	157	151	99	75	66	62	64	69	43	70	100[2]
Romania	829	787	830	884	846	812	772	678	627	634	638	604	571	538	505	772	772
Russian Federation[1]	2843	2496	2338	2807	2790	3715	3566	3259	3204	2979	2861	2507	2576	2338	2332	3566	3566
Slovakia	148	148	148	148	148	148	148	138	128	122	108	107	104	101	137[6]	148	148
Slovenia	39	39	39	39	39	41	44	41	40	42	44	44	49	48	42	37	40[2]
Spain[1]	2572	2594	2622	2679	2711	2759	2790	2737	2649	2485	2697	2635	2515	2515	2515	2790	2790
Sweden	600	600	555	555	555	541	526	517	485	483	478	457	458	417	413	315	241[2]
Switzerland	323	324	318	311	305	298	292	274	256	239	226	211	203	195	187	150	144[2]
The FYR Macedonia	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Turkey[7]	359	378	403	467	489	493	524	520	543	596	585	599	627	632	569	1582	1925
Ukraine	1626	1626	1660	1687	1604	1512	1369	1302	1171	972	1024	811	718	665	665	1369	1369
United Kingdom	2224	2302	2348	2394	2456	2496	2445	2387	2284	2179	2135	2023	1959	1853	1780	1336	1344
Yugoslavia	47	58	58	60	63	62	66	57	49	54	52	59	57	66	66	115	147
Other Asiatic Areas[1]	212	212	212	212	212	212	212	212	212	212	212	212	212	212	212	212	212
The Baltic Sea	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
The Black Sea	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
The Mediterranean Sea	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34
The North Sea	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
Rem. N.E. Atlantic[1]	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
Natural Oceanic[1]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Volcanic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	26433	25982	26000	26737	26732	27378	26751	25411	24192	23099	22882	21766	20985	20329	19854	21080	20699

(1) The part inside the EMEP domain of calculation. "Other Asiatic areas" refers to Azerbaijan, Syria, Lebanon, Israel and parts of Uzbekistan, Turkmenistan, Iran, Iraq and Jordan. (2) Gothenburg protocol (G.p) emission ceiling. (3) Figures without all sectors included. (4) Split estimated by MSC-W. See text. (5) Projection figure for whole Germany. G.p. figure 995 Kt also reported for 2010. (6) Sum of gridded data. (7) Sum of sector data.

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

	1980	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	2005	2010
Africa, North[1]	336	336	336	336	336	336	336	336	336	336	336	336	336	336	336	336	336
Albania	84	84	84	84	84	84	84	84	84	84	84	84	84	84	84	84	84
Armenia	405	405	405	417	417	399	304	377	195	145	128	174	125	224	124	304	304
Austria	1711	1549	1643	1603	1552	1486	1307	1287	1206	1177	1151	1050	1048	1043	999	1307	1307
Belarus	1654	1654	1605	1601	1590	1615	1722	1717	1381	1201	1241	1253	1242	1223	1034	1406	1404
Belgium	1112	1112	1112	1112	1112	1112	1112	1120	1138	1104	1054	1032	1009	949	900	1112	1112
Bosnia and Herzegovina	280	280	280	280	280	280	280	280	280	280	280	280	280	280	280	280	280
Bulgaria	997	997	997	997	995	985	891	608	768	830	858	846	613	515	650	800	750
Croatia	655	655	655	655	655	655	655	565	416	375	369	346	389	366	345	660	660
Cyprus	56	56	56	56	63	67	70	60	70	74	74	74	74	81	77	81	81
Czech Republic	894	899	740	738	737	884	1055	1102	1045	967	1026	874	886	877	767	1055	1055
Denmark	956	903	881	924	891	979	659	665	640	606	604	585	597	557	588	383	331
Estonia	400	400	417	423	419	448	434	399	208	210	241	242	268	283	280	434	434
Finland	660	608	598	587	577	566	559	522	478	457	444	436	461	474	452	559	559
France	15863	13601	13291	12937	12725	12144	10955	10848	10320	9802	9365	9257	8657	8208	7975	10955	10955
Georgia	648	637	643	639	648	597	526	441	130	143	149	250	390	429	429	526	526
Germany, former East [2]	3040	3159	3214	2649	2573	2435	2389	2026	1779	1641	1502	1425	1339	1251	1156	5400[3]	5400[3]
Germany, former West[2]	11006	8975	8921	9789	9507	8995	8829	7487	6572	6062	5551	5267	4946	4621	4270		
Greece	1328	1328	1328	1328	1328	1328	1328	1369	1318	1317	1309	1340	1385	1405	1500	1328	1328
Hungary	1019	931	944	957	970	983	997	914	846	796	774	761	727	733	755	800	800
Iceland	44	46	48	54	57	57	58	59	61	60	60	49	50	39	40	21	19
Ireland	429	429	429	429	429	429	401	394	395	350	329	304	307	312	318	322	322
Italy	7588	7692	7607	7674	7581	7735	7824	8003	7961	7755	7549	7755	7334	7186	7186	4851	4213
Kazakhstan[1]	266	266	266	266	266	266	266	266	266	266	266	266	266	266	266	266	266
Latvia	388	388	388	388	388	388	388	733	453	528	307	454	176	354	326	294	330
Lithuania	541	547	554	564	578	568	521	599	501	292	303	286	312	358	358	410	400
Luxembourg	193	193	189	185	182	178	175	168	160	153	145	107	103	80	51	33	33
Netherlands	1530	1381	1252	1192	1179	1131	1143	1025	983	960	907	892	903	749	724	1143	1143
Norway	822	844	872	832	869	823	820	759	750	745	737	699	669	634	611	820	820
Poland	7406	7406	7406	7406	7406	7406	7406	7245	7083	8655	5115	4547	4837	4700	4301	7406	7406
Portugal	1041	1041	1041	1041	1041	1041	1041	1107	1216	1259	1295	1323	1386	1386	1386	1041	1041
Republic of Moldova	55	483	478	474	496	476	453	468	279	218	171	192	170	210	153	150	150
Romania	3245	3307	3378	3196	3317	3314	3186	2695	2506	2434	2325	2325	2325	2325	2326	3186	3186
Russian Federation[1]	13520	14122	13142	13119	12988	12054	13174	12869	11574	11193	10495	9846	9312	10262	10284	13174	13174
Slovakia	491	491	491	491	491	491	487	437	382	408	412	401	346	336	313	487	487
Slovenia	68	68	78	79	75	75	81	78	78	87	93	91	95	93	77	62	53
Spain[1]	3670	3475	3526	3633	3824	4000	3898	3992	4078	3885	3859	3448	3662	3662	3662	3898	3898
Sweden	1210	1210	1210	1210	1210	1210	1210	1212	1176	1148	1142	1088	1082	962	1004	600	450
Switzerland	1280	990	933	877	820	764	707	665	621	578	549	510	485	458	432	369	370
The FYR Macedonia	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23
Turkey [4]	2564	2718	2862	3067	3197	3216	3318	3283	3415	3677	3590	3599	3713	3729	3632	9105	10986
Ukraine	9832	9832	9722	9269	9085	8794	8141	7406	5496	4218	3375	2906	2567	2516	2516	8141	8141
United Kingdom	7525	7068	7067	7106	7162	7340	6938	6774	6399	5943	5665	5320	5299	4982	4758	1837	1378
Yugoslavia	165	203	203	210	221	217	231	200	172	189	182	207	200	231	231	403	515
Other Asiatic Areas[1]	741	741	741	741	741	741	741	741	741	741	741	741	741	741	741	741	741
The Baltic Sea	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29
The Black Sea	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
The Mediterranean Sea	139	139	139	139	139	139	139	139	139	139	139	139	139	139	139	139	139
The North Sea	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59
Rem. N.E. Atlantic[1]	111	111	111	111	111	111	111	111	111	111	111	111	111	111	111	111	111
Natural Oceanic[1]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Volcanic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	108087	103879	102402	101984	101431	99461	97469	93754	86325	83718	76521	73637	71565	70879	69066	86939	87597

(1) The part inside the EMEP domain of calculation. "Other Asiatic areas" refers to Azerbaijan, Syria, Lebanon, Israel and parts of Uzbekistan, Turkmenistan, Iran, Iraq and Jordan. (2) Split estimated by MSC-W. See text. (3) Projection figure for whole Germany. (4) Sum of sector data. Officially submitted data are printed inside grey-shaded boxes. Updates from last year's report from MSC-W are printed in bold. Countries in white boxes have not provided any data to ECE; data are drawn from open sources.

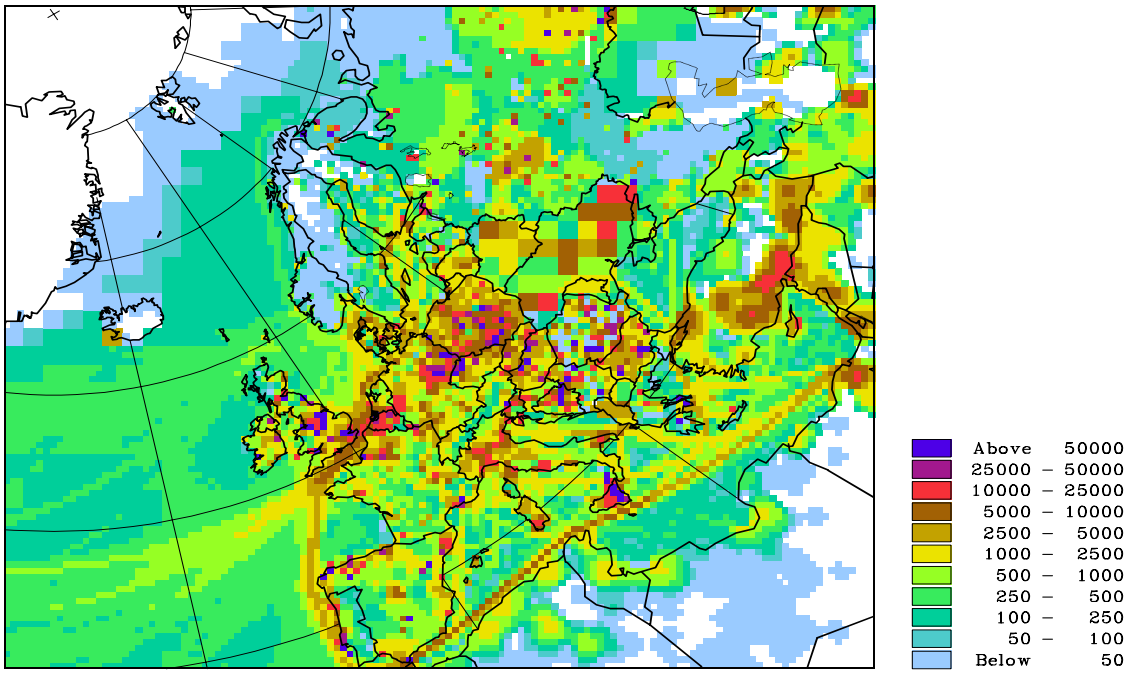

Figure 3.1 Emissions of sulphur in 1998 at 50km resolution (tonnes as SO_2)

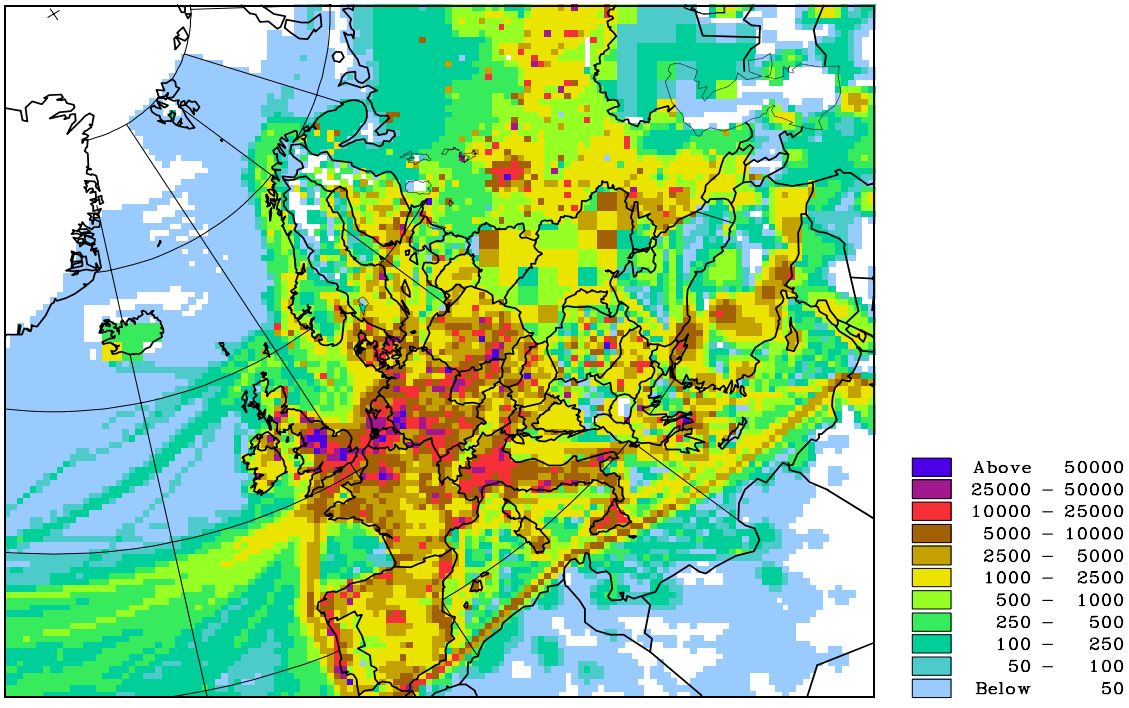

Figure 3.2 Emissions of nitrogen oxides in 1998 at 50km resolution (tonnes as NO_2)

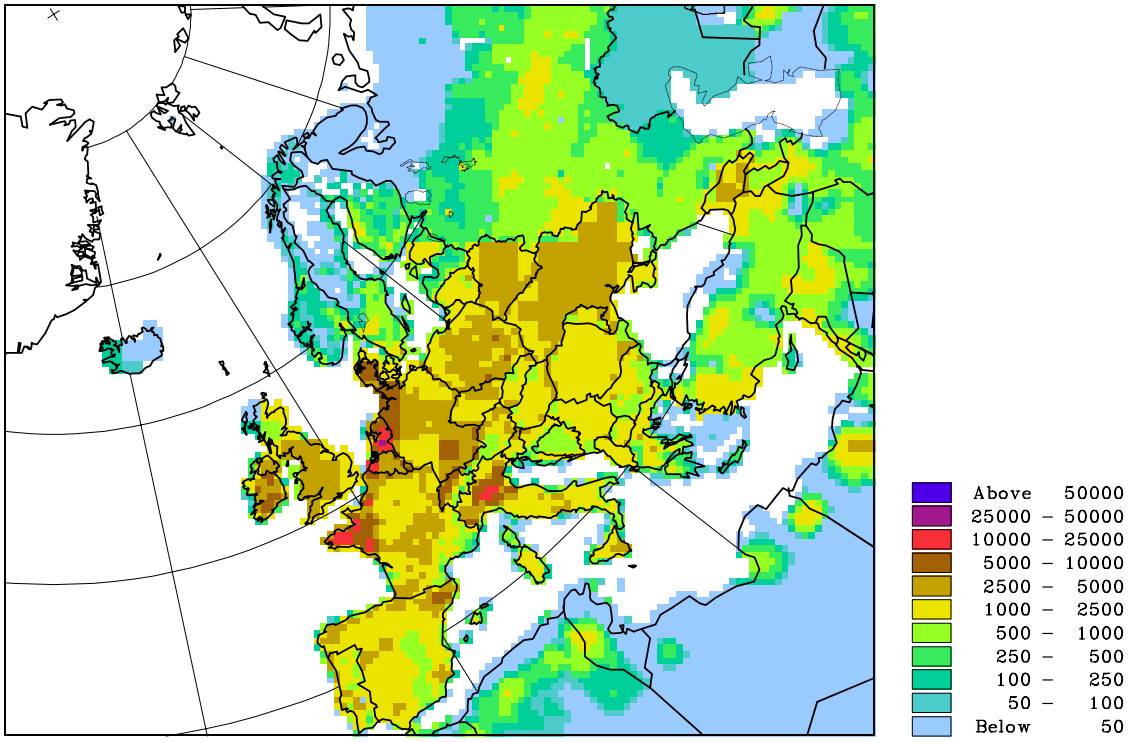

Figure 3.3 Emissions of ammonia in 1998 at 50km resolution (tonnes as NH_3)

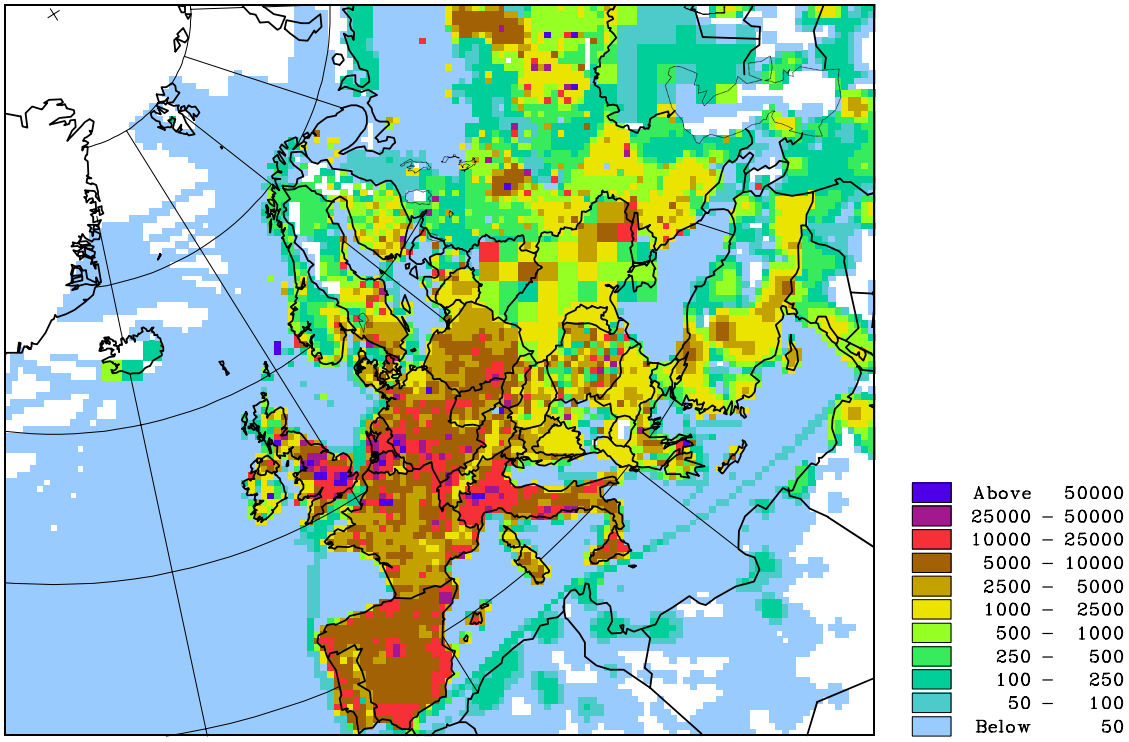

Figure 3.4 Emissions of non-methane volatile organic compounds in 1998 at 50km resolution (tonnes as NMVOC)

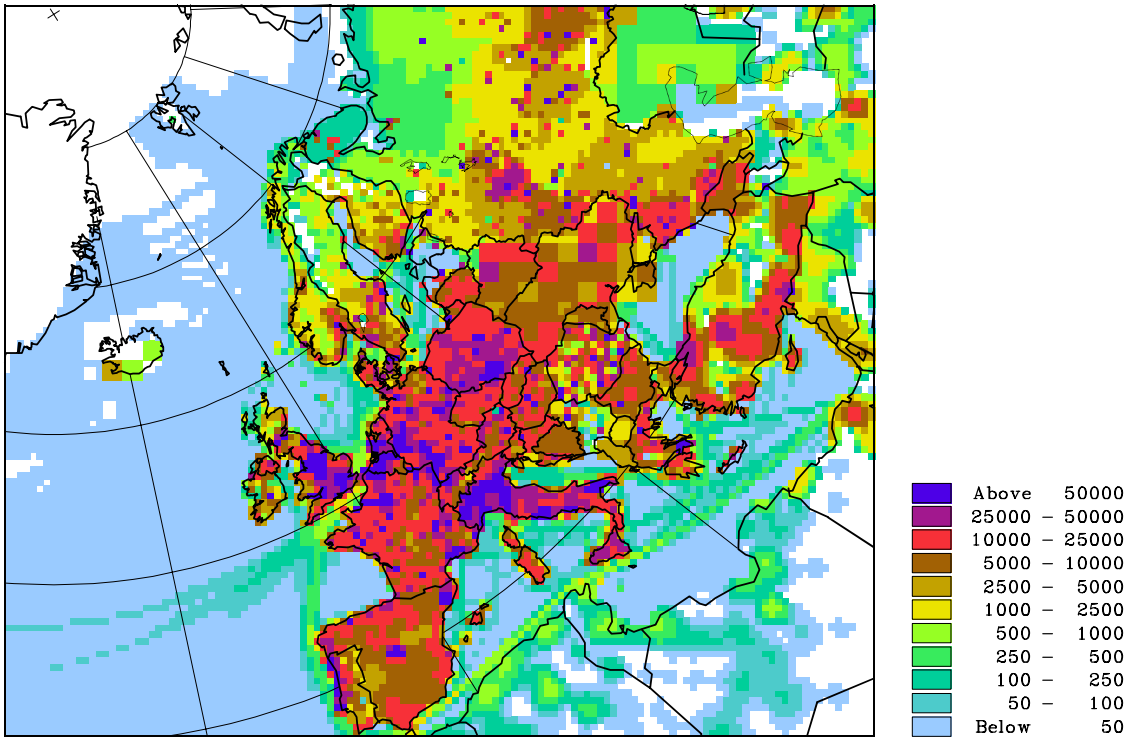

Figure 3. 5 Emissions of carbon monoxide in 1998 at 50km resolution (tonnes as CO)

3.3 Source Sector Emissions in the EMEP Area

The gridded sector data prepared at the MSC-W for modelling for 1998 are based on the latest official sector submissions. In the absence of official data, information is either drawn from available documented sources or a standard sector split is assumed derived from averaging sector data reported by all Parties. For the total EMEP area, 1998 emission totals split into eleven source sectors for SO_2, NO_x, NH_3, NMVOC and CO are displayed in figure 3.6.

It should be noted here that a difficulty in the preparation of emission inventories concerns the determination of marine exhaust emissions. In principle, national shipping and other marine sources such as coastal traffic and off-shore installations should be included in national totals and in particular reported under sector 8 (other mobile sources and machinery). Unfortunately, disaggregation of national emissions at SNAP level 1 does not enable specification of the exact type of sub-sources included. Therefore, as it is not clear whether Parties do report their marine emissions under sector 8, the use of Lloyd's estimates (based on both national and international shipping) may often result in double counting of emissions from domestic coastal shipping.

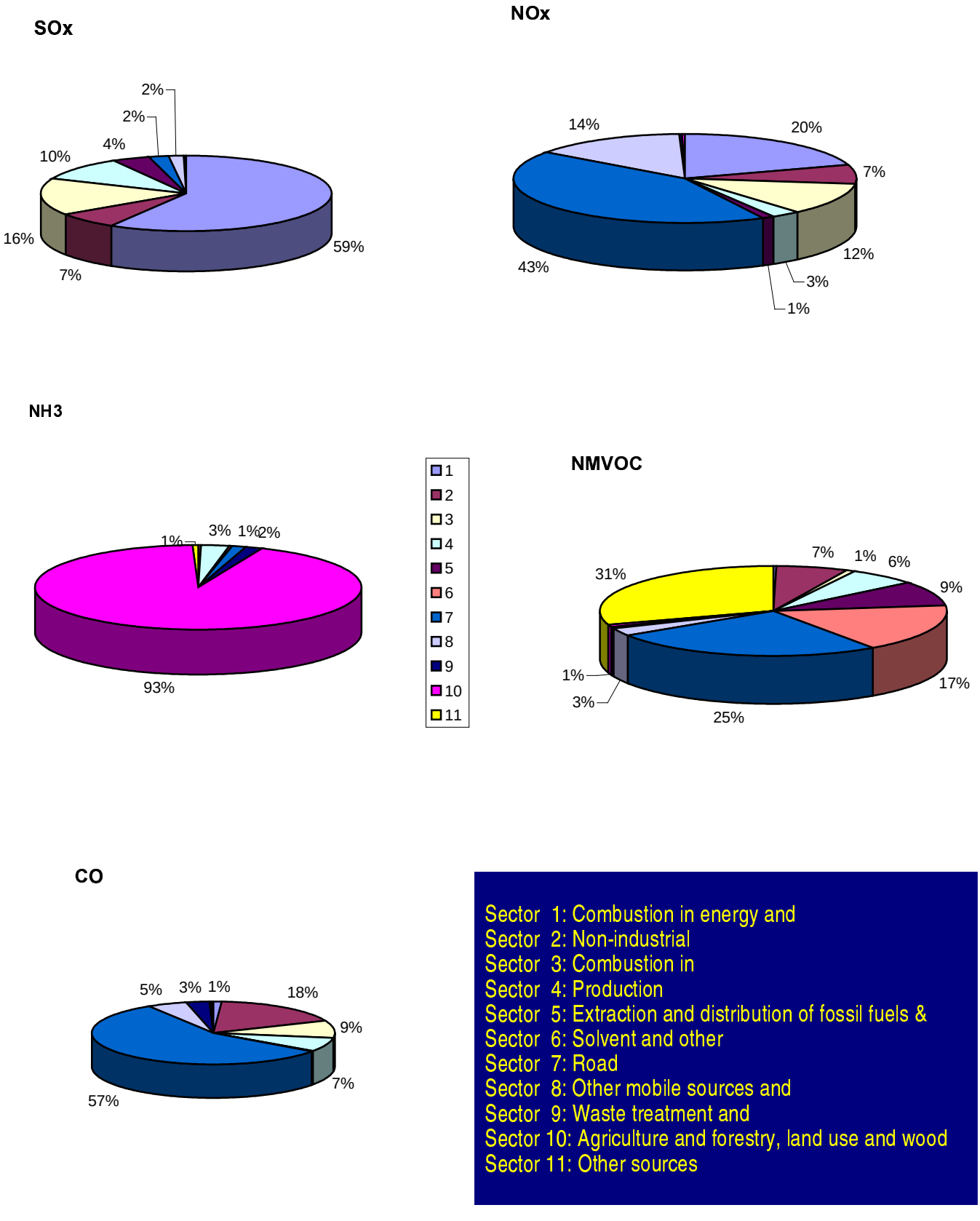

Figure 3.6 Emissions in the EMEP area in 1998 split into SNAP level 1 source sectors

4. Analysis of trends

4.1 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 4.1-4.5 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 these totals are crude, as emissions over several regions are only first estimates. Moreover, new emission methodologies adopted by the Parties are rarely applied to all preceding years, resulting in temporal inconsistencies.

European sulphur dioxide emissions (Figure 4.1) experience a clear downward trend. The total emission reduction of SO_x between 1980 and 1998 is 56%. The trend in the emission of NO_x (Figure 4.2) is characterised by relatively high releases in the late 1980s and an easing-off in the 1990s. The 15% reduction in 1998 compared to the 1980 level reaches 21% when 1990 (base year of the Gothenburg Protocol) is used as a reference instead. European emissions of ammonia (Figure 4.3) appear to have dropped by approximately 14% between 1990 and 1998. 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 4.4) there is a downward trend in the 1990s, leading to an average emission reduction of 26% between 1998 compared to 1990 (base year of the Gothenburg Protocol). In the case of CO (Figure 4.5), a reduction of 29% between 1990 and 1998 is detected. ***Emissions in 2005 and 2010 appear higher than those in late 1990s due to substitution of not reported values with those reported for 1990.***

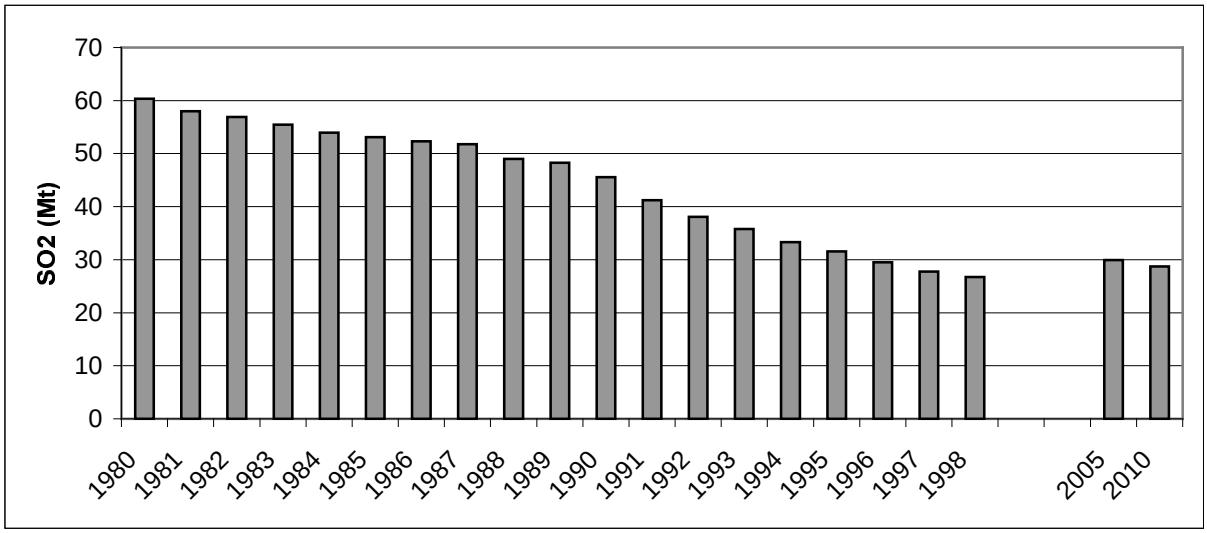

Figure 4.1 Emissions of sulphur in the EMEP area 1980-2010 (Millions of tonnes as SO_2).

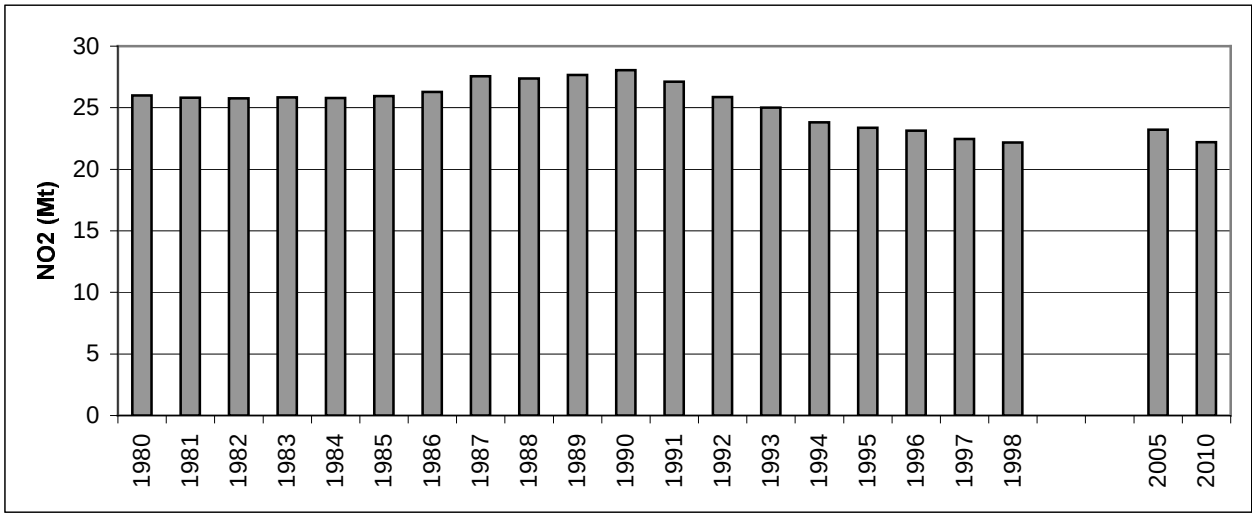

Figure 4.2 Emissions of nitrogen oxides in the EMEP area 1980-2010 (Millions of tonnes as NO_2).

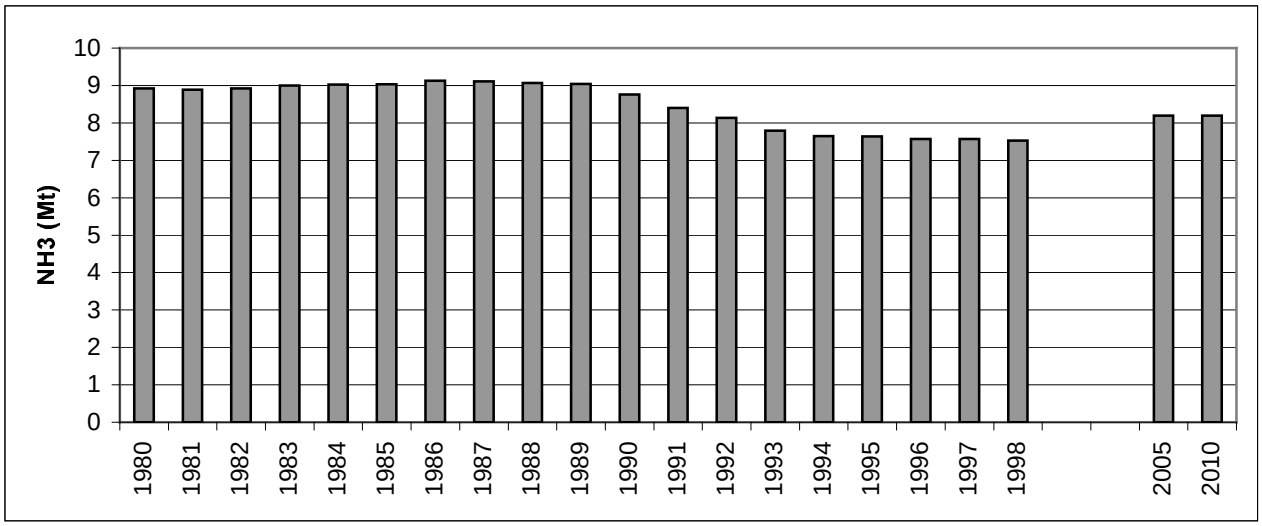

Figure 4.3 Emissions of ammonia in the EMEP area 1980-2010 (Millions of tonnes as NH_3)

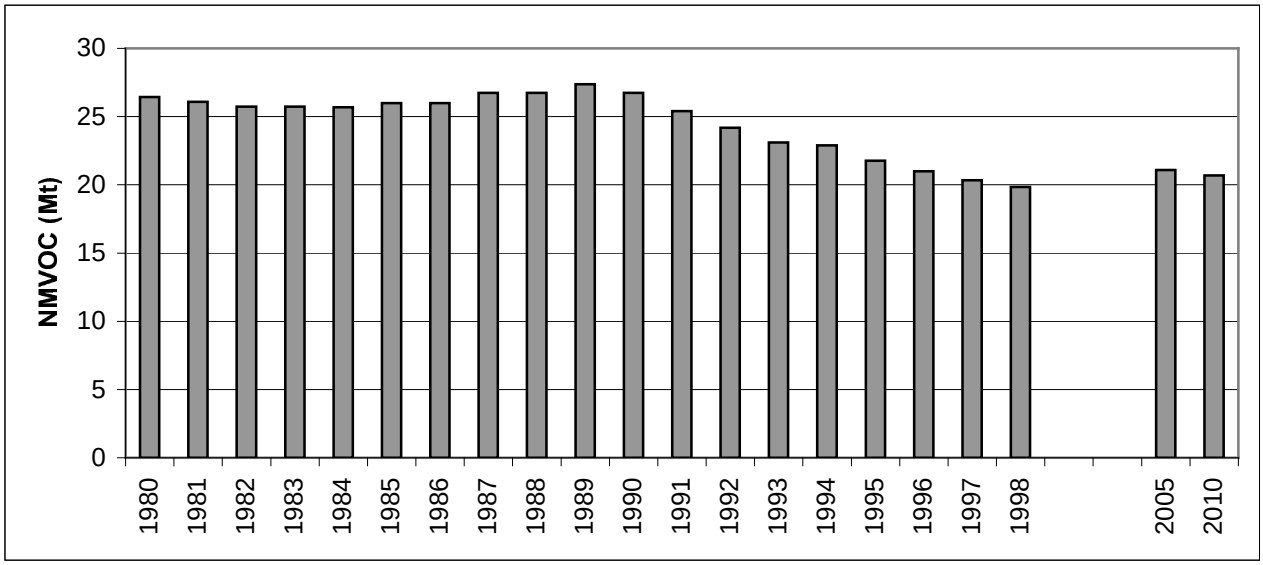

Figure 4.4 Emissions of non-methane volatile organic compounds in the EMEP area 1980-2010 (Millions of tonnes as NMVOC)

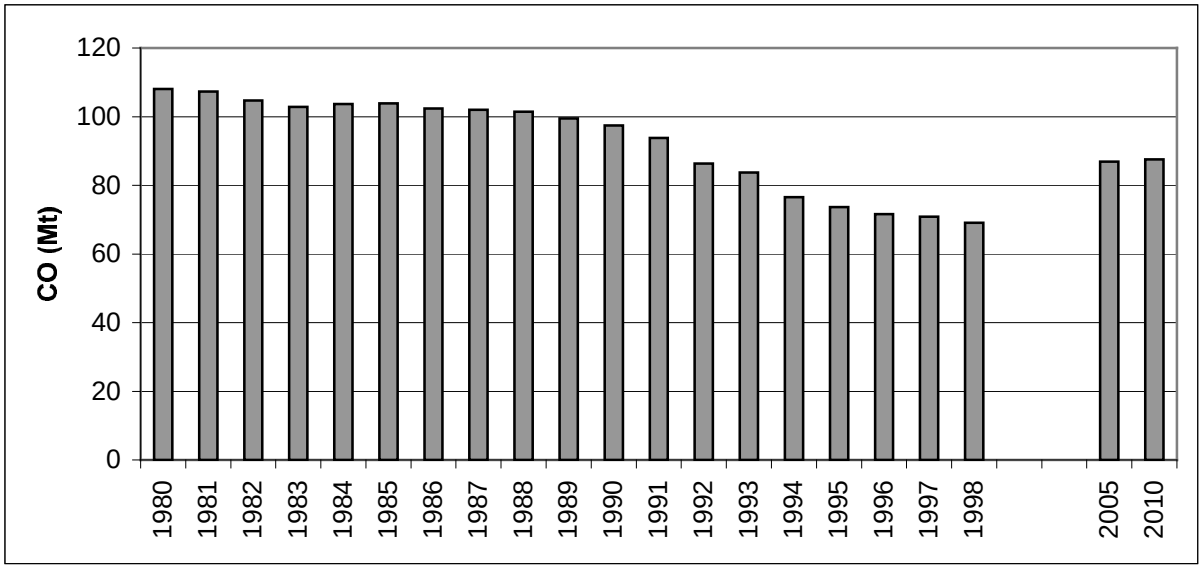

Figure 4.5 Emissions of carbon monoxide in the EMEP area 1980, 1985-2010 (Millions of tonnes as CO)

4.2 Trend analysis of selected data

Efforts have been made to look at trends in the emission data reported to CLRTAP. In particular the trends in the sector data have been highlighted. Table 4.1 shows the CORINAIR/UNECE source category split of emissions, and all further references to different sectors/source categories are related to this split.

The sector distribution of emissions of SO_x, NO_x, NH_3, NMVOC and CO for all the Parties to the Convention does not vary much over the years. The years 1980, 1985, 1990 and 1998 have been studied, and the split between the sectors is approximately as shown in Section 3.3, figure 3. 6.

In the following, all the emission reduction percentages quoted are calculated the following way: $100^* (E_{year1} - E_{year2})/ E_{year1}$ (1)

Table 4.1 The CORINAIR/UN-ECE source category split of emissions

SOURCE CATEGORY	SO_x	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 and forestry, land use and wood stock change			■		
11. Other sources and sinks				■	
TOTAL					

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

4.2.1 Data selection

It is a challenge to select a reasonable dataset in order to perform trend studies. For this study it was decided to use anthropogenic emissions data for SO_x, NO_x, NH_3, NMVOC and CO from Parties within the EMEP area that provided both national totals and sector data for all the years 1990 to 1998 in their year 2000 reporting. These data has been quality checked in terms of internal consistency and extensive communication with Parties has taken place (See Section 2.3, figure 2.4). It should be noted that this does not necessarily assure comparability between the different countries, although it is expected that the comparability is satisfied by the common use of the methodologies described in the EMEP/CORINAIR Guidebook. The selection of Parties contains about 50% of all Parties to the CLRTAP.

4.2.2 Sulphur trends

The 22 countries selected for analysing the sulphur trends are shown if figure 4.6. The trend from 1990 to 1998 given in figure 4.7 seems almost linear, although a less steep declination from 1992 onwards can be observed. The best fit to the emission totals found with simple regression methods was an exponential curve. The goodness of the fit, R^2 , was found to be 0.99. The next best fit was for a logarithmic function, for which the goodness of the fit, R^2 , was found to be 0.98. The average percentage emission reduction between 1990 and 1998 for the selected countries is 52%, while the reduction seen in the whole EMEP area is 41% (Table 4.2).

From figure 4.6 it is seen that Bulgaria, Czech Republic, France, Germany, the Russian Federation, Turkey and United Kingdom are the countries contributing most to the sulphur trend and emission magnitude These countries have reported more than 1000 kilo tons SO_2 emissions. Large contributors to the total sulphur load like Italy, Poland, Spain and Ukraine are not amongst the selected countries because of lack of reported data for this study. All countries except Turkey, Cyprus, Monaco and Yugoslavia, have reported less SO_2 emissions in 1998 compared to 1990, but it is also evident that for some of the countries, like Germany and United Kingdom, the reductions in kilo tons per year decreases towards 1998 (Figure 4.6).

When looking at the sector data shown in figure 4.8, it is seen that sector 1, "*Combustion in energy and transformation industries*", is the main contributor to the total followed by sector 3, "*Combustion in manufacturing industry*" and 2, "*Non-industrial combustion plants*". All these sectors show a decrease in emission over the years, but the reductions are much smaller the last years. Table 4.2 shows that the largest average percentage reductions between 1990 and 1998 are not in the main sector 1, but in sector 2. Sectors 3-5 have also experienced large reductions in this 8-years period. The increase seen in sector 10, "*Agriculture and forestry, land use and wood stock change*", is due to an increase in the reported data from Cyprus, that is the only country reporting emissions of sulphur in this sector. The study of emission distribution between the 11 sectors for the years 1980, 1985, 1990 and 1998 for all the countries within EMEP reporting sector data, shows that the percentage split has remained relatively constant. In addition, the reductions seen in sectors 2 and 3 are already high (60-70%). Hence, this study indicates that in order to obtain continued reductions of some magnitude in the sulphur totals, the reduction in sector 1, "*Combustion in energy and transformation industries*", will have to continue.

4.2.3. Nitrogen oxides trends

The same 22 countries as for sulphur were selected. (Figure 4.9). There are almost no NO_x emissions reductions seen between 1997 and 1998 (Figure 4.10). With simple regression methods it was found that the totals best followed a logarithmic function. The goodness of the fit, R^2 , was found to be 0.98. The next best fit was for an exponential function, for which the goodness of the fit, R^2 , was found to be 0.97. The average percentage emission reduction between 1990 and 1998 for the selected countries is 27%, while the reduction seen in the whole EMEP area is 21% (Table 4.2). The percentage NO_x reductions is about half of the sulphur reductions between 1990 and 1998.

The countries contributing most to the nitrogen dioxide trend and emission magnitude are Czech Republic, France, Germany, the Russian Federation, Turkey and United Kingdom (Figure 4. 9). All the other countries have emitted less than 500 kilo tons NO_2 per year. Large contributors to the total NO_2 load like Italy, Netherlands, Poland, Spain and Ukraine are not amongst the selected countries because of lack of reported data for this trend study. All countries except Turkey, Cyprus, Greece, Ireland, Monaco, Norway and Slovenia have reported less emission in 1998 compared to 1990. Several of the countries have reported an increase or close to zero reduction in their NO_x emission over the last years. The large increase in the Russian Federation emissions between 1997 and 1998 is worth noting.

The largest contribution to the total NO_2 comes from 7, "*Road transport*", followed by sector 1, "*Combustion in energy and transformation industries*", sector 8, "*Other mobile sources and machinery*" and sector 3, "*Combustion in manufacturing industry*" (Figure 4.11). The emission in sector 7 is continuously decreasing, emissions in sector 8 have started to increase, while the emissions reported in sector 1 for 1998 is higher than the 1997 emissions. Sector 7 has experienced almost the smallest percentage reductions of all sectors. (Table 4.2). The NO_x reductions in the main sectors are by far as large as the associated SO_x reductions (Table 4.2). In order to reduce the NO_x emissions by a larger amount in the future, this study indicates that continued decreases in emissions from sector 7 combined with efforts to turn the trend in sector 8 and a close follow up of the development in sector 1 are favourable.

4.2.4 Ammonia trends

The 18 countries selected for studying the trends in ammonia are displayed in figure 4.12.The trend is seen to flattening out the last years (Figure 4.13). The best fit was found for a logarithmic regression (goodness of the fit, R^2 , equaled 0.98), but a geometric regression also gave a good match (goodness of the fit, R^2 , equaled 0.97). The average percentage emission reduction between 1990 and 1998 for the selected countries is 23%, while the reduction seen in the whole EMEP area is 14% (Table 4.2).

The countries contributing most to the total emission are France, Germany, the Russian Federation and United Kingdom (Figure 4.12). The ammonia emissions in France and United Kingdom have increased, German emissions are stagnant and the Russian Federation emissions have decreased over the last years. France, Ireland and Norway have higher emissions in 1998 than in 1990. Large contributors like Belarus, Belgium, Denmark, Italy, Netherlands, Poland, Romania, Spain and Ukraine are not amongst the selected countries because of lack of reported data for this trend study. The only country that shows emissions reduction of some magnitude in terms of kilotons is the Russian Federation. The Russian Federation reductions seems to have a large influence on the ammonia trend. The Russian Federation increase in ammonia emission in 1995 is visible in the total trend (Figure 4.13).

Sector 10, "*Agriculture and forestry, land use and wood stock change*" is the main sector, and rules the total ammonia load and trend completely (Figure 4.14). Table 4.2 shows the reductions per sector in percent. The increase in sector 3, "*Combustion in manufacturing industry*", is due an increase in the Austrian emissions, in sector 6, "*Solvent and other product use*", the increase is due to increase in emissions from Germany, and in sector 7, "*Road transport*", the increase is due to increase in emissions from several countries, notably France, Germany and United Kingdom. These increases are of less importance since the sectors are negligible compared to sector 10. However, if the emissions in sector 10 flatten out, the steady increase in sector 7 is expected to be visible in the total trend.

4.2.5. NMVOC trends

The 21 countries selected for studying the trends in NMVOC are displayed in figure 4.15. The trend from 1990 to 1998 (figure 4.16) is best approximated by an exponential regression (goodness of the fit, R^2, equaled 0.983) followed by a logarithmic one (goodness of the fit, R^2, equaled 0.980). The average percentage emission reduction is 30%, while the reduction seen in the whole EMEP area is 26% (Table 4.2).

The largest contributors to the total NMVOC load and trend are France, Germany, the Russian Federation and United Kingdom. These countries have NMVOC emissions above 1500 kilo tons/year. Greece, Norway, Turkey and Ireland have increased their NMVOC emissions between 1990 and 1998. The Russian Federation emissions were almost stagnant between 1997 and 1998. Large contributors not within this study are Italy, Poland and Ukraine.

The main sector are sector 11, "*Other sources and sinks*", (not shown in the totals), sector 7, "*Road transport*", and sector 6, "*Solvent and other product use*" (Figure 4.17). Sector 11 is seen to have relatively constant high emissions in the 8-year period studied. All the sectors have lower emissions in 1998 than in 1990. Emissions in sector 8, "*Other mobile sources and machinery*", and sector 10 "*Agriculture and forestry*", have increased slightly in later years. The average emission reduction in sector 11 is 1% (Table 4.2). Concentrating on the anthropogenic emissions, it is seen that emissions reductions are between 20-40% in important (in terms of NMVOC emitted) sectors. It seems like efforts are being made in order to increase the reductions in sector 6 and 7 after a period of stagnation between 1996 and 1997.

4.2.6. Carbon monoxide trends

The 20 countries selected for the study of CO trends, are displayed with total emissions in figure 4.18. The trend in the total anthropogenic emissions emitted from 1990 to 1998 is best described by a logarithmic function (goodness of the fit, R^2, equaled 0.98), followed by a geometric one (goodness of the fit, R^2, equaled 0.97) (Figure 4.19). The average emission reduction between 1990 and 1998 is 29% both for the selected countries and for the whole EMEP area.

The countries contributing most to the total trend and load are France, Germany, the Russian Federation, Turkey and United Kingdom. These countries have emissions of more than 3000 kilo tons per year. All countries except Greece and Turkey have lower emissions in 1998 than

in 1990. The Russian Federation emissions increased by a large amount from 1996 to 1997. Important countries in terms of CO load not within the study are Italy, Poland and Spain.

Sector 7, "*Road transport*", is the main sector, followed by sector 2, "*Non-industrial combustion plants*" (Figure 4.20). A general decrease is observed in all sectors, except in sector 8, "*Other mobile sources and machinery*", which seems to experience an increase onwards from 1993.The decreases in sector 7 and 2 seems to flatten out. The average emission reduction in these sectors is approximately 30% (Table 4.2).

The average percentage reduction for the whole EMEP area is seen to be smaller than the corresponding percentage for the selected countries for all the studied components except CO (Table 4.2). The most obvious reason is that the 1990 emissions are much larger for the whole EMEP area because of the inclusion of the emissions from volcanoes and ship traffic (assumed constant) (See Equation 1 on Page 23). Other reasons might be that the emission figure for a Party not reporting 1998 emissions have been substituted with the latest emission reported (See tables 3.1-3.5) and that the selected Parties for this study presumably have been recalculating their emissions more recently than some of the Parties not within the study. It is not evident that the latter should lead to larger average reductions (Chapter 5, Table 5.2), but if so, future reductions in the emissions might be observed solely based on recalculations. Yet another possibility is that the study excludes countries that have a low decline in emissions reduction.

Table 4.2 Average reductions (%) per sector 1990-1998 for selected countries[1]

SO_x	1	2	3	4	5	6	7	8	9	10	11	Total	Total EMEP
%	45	71	61	64	69	0	32	11	12	-8	59	52	41
NO_x													
%	33	23	31	44	43	0	22	39	5	23	16	27	21
NH_3													
%	13	24	-3	34	0	-33	-420	0	21	24	20	23	14
NMVOC													
%	31	17	47	33	35	21	36	12	24	13	1	30	26
CO													
%	30	27	27	27	68	0	30	2	16	61	20	29	29

(1) A negative number indicates an increase. Shaded boxes indicates the main sectors

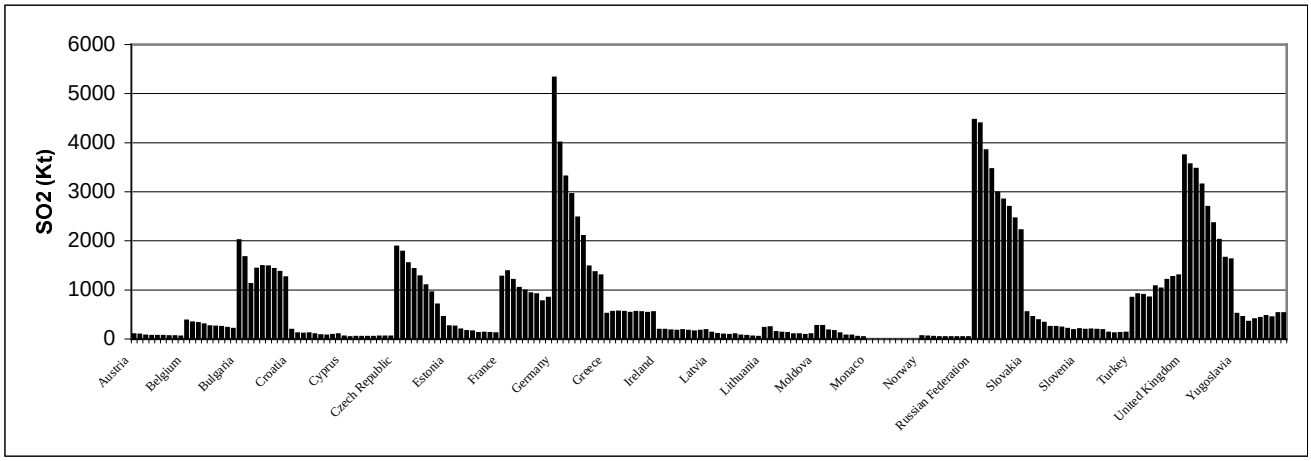

Figure 4.6 Total anthropogenic SO_2 emissions per country 1990-1998

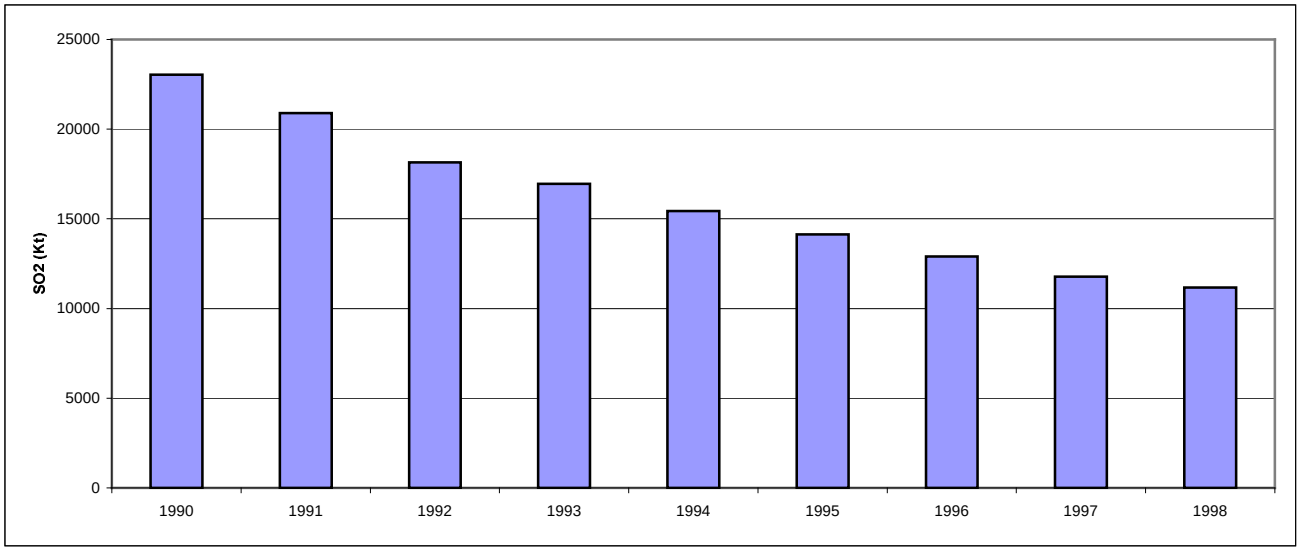

Figure 4.7. Total anthropogenic SO_2 emissions 1990-1998 for selected Parties

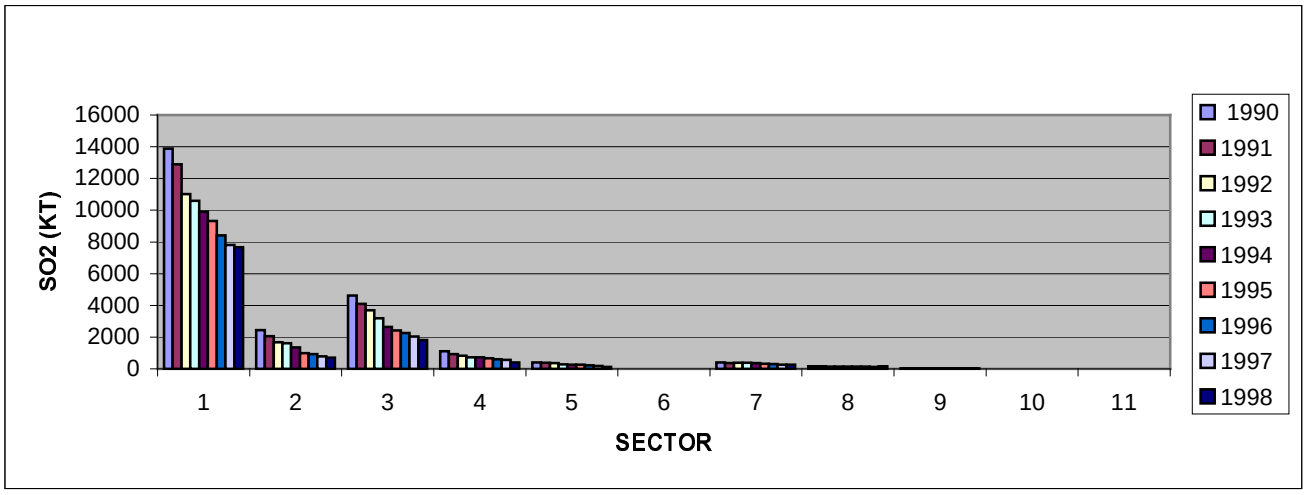

Figure 4.8. SO_2 trends per sector 1990-1998 for selected Parties

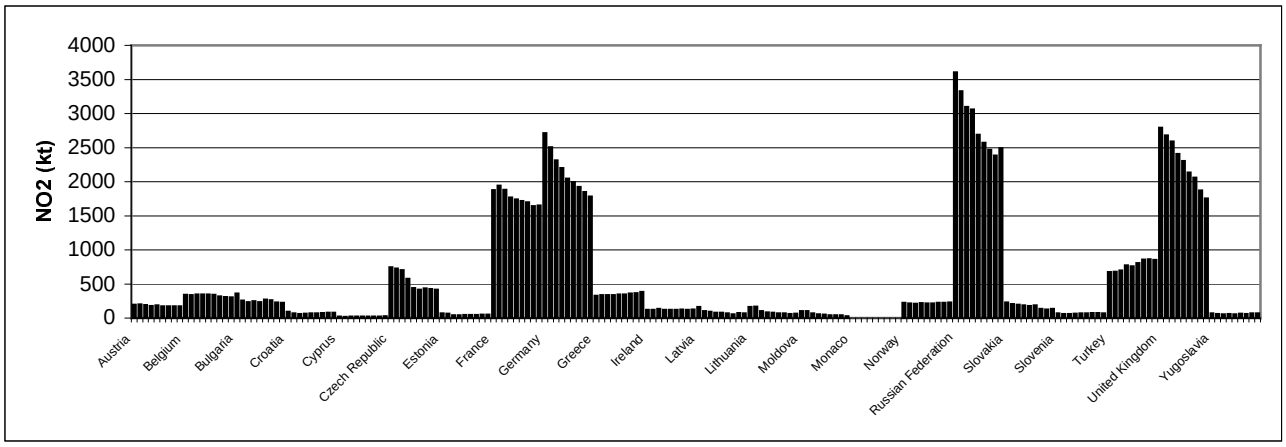

Figure 4.9. Total anthropogenic NO_2 emissions per country 1990-1998

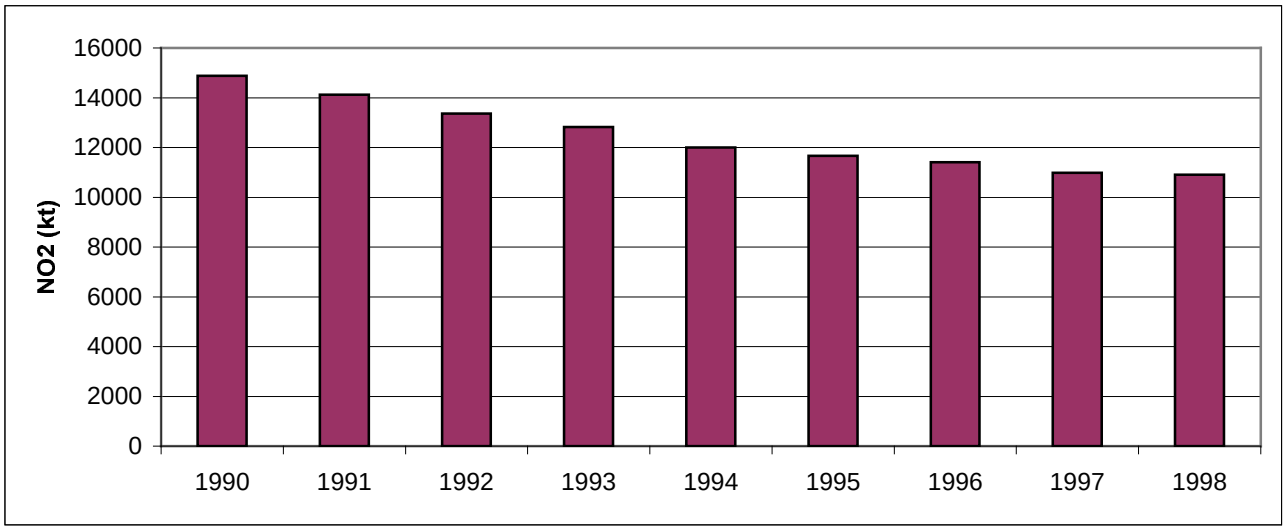

Figure 4.10. Total anthropogenic NO_2 emissions 1990-1998 for selected Parties

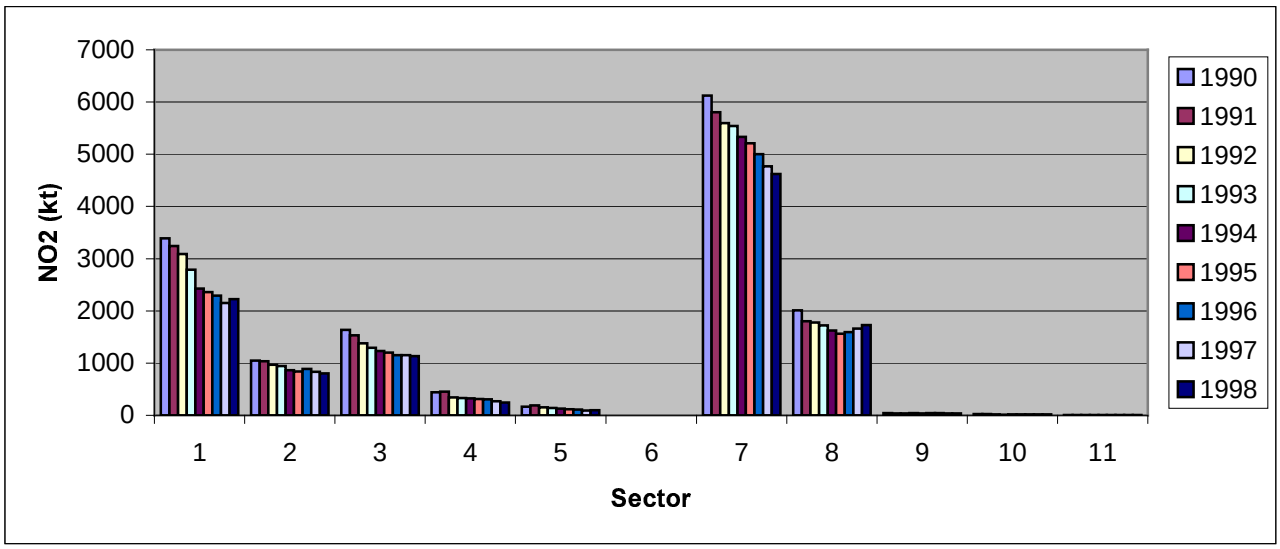

Figure 4.11. NO_2 trends per sector 1990-1998 for selected Parties

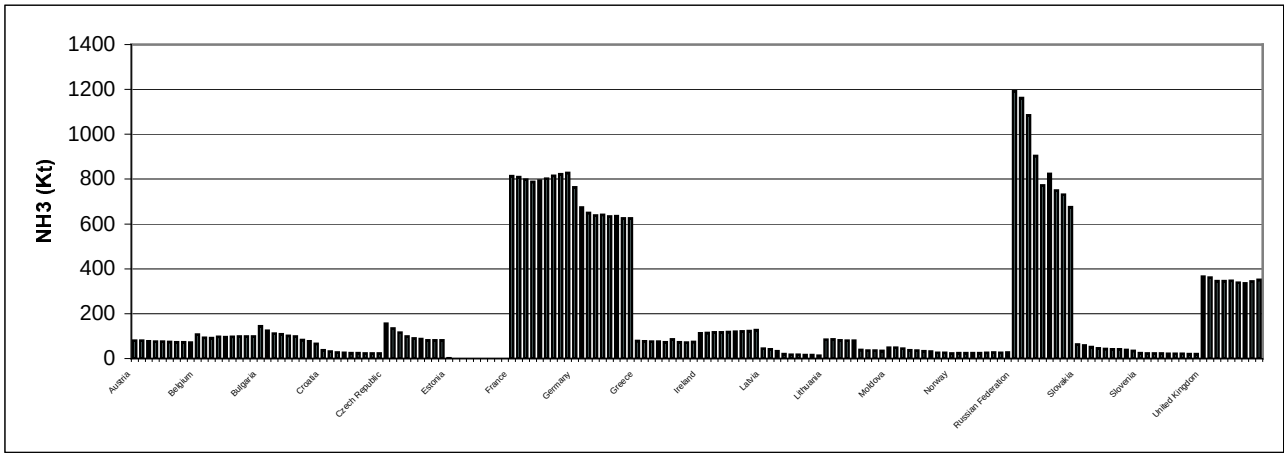

Figure 4.12. Total anthropogenic NH_3 emissions per country 1990-1998

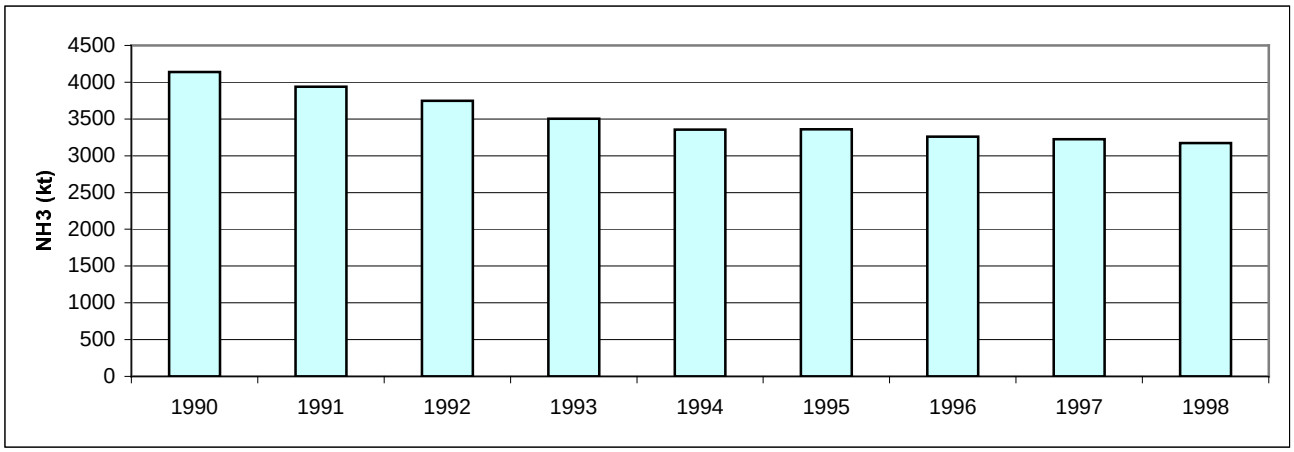

Figure 4.13 Total anthropogenic NH_3 emissions 1990-1998 for selected Parties

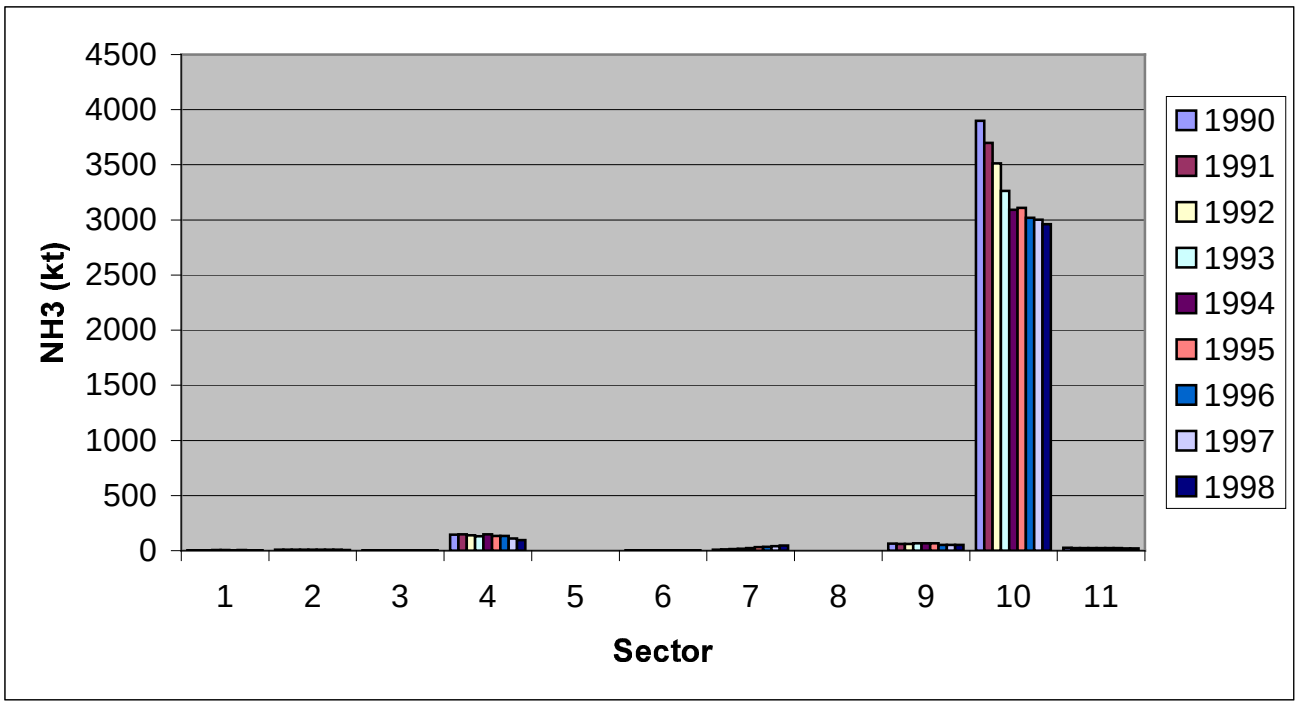

Figure 4.14. NH_3 trend per sector 1990-1998 for selected Parties

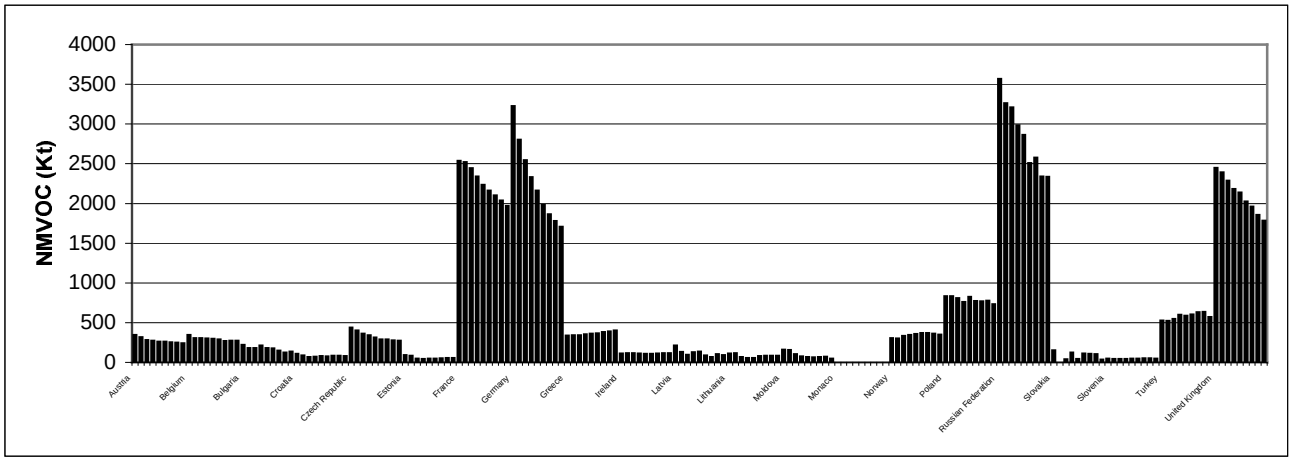

Figure 4.15. Total anthropogenic NMVOC emissions per country 1990-1998

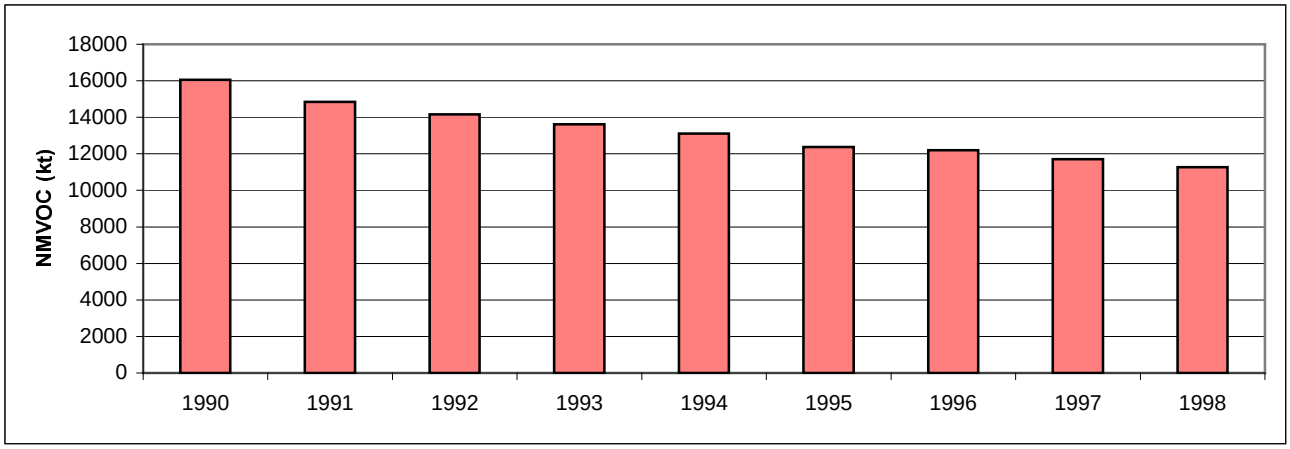

Figure 4.16 Total anthropogenic NMVOC emissions 1990-1998 for selected Parties

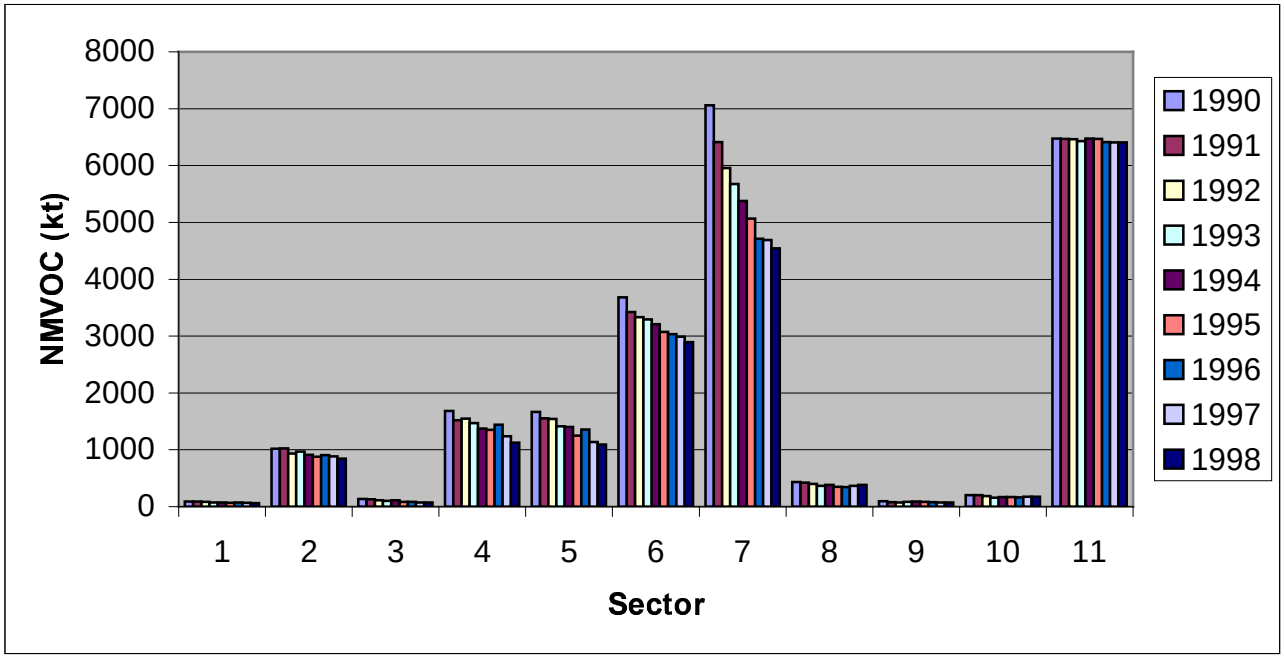

Figure 4.17. NMVOC trends per sector 1990-1998 for selected Parties

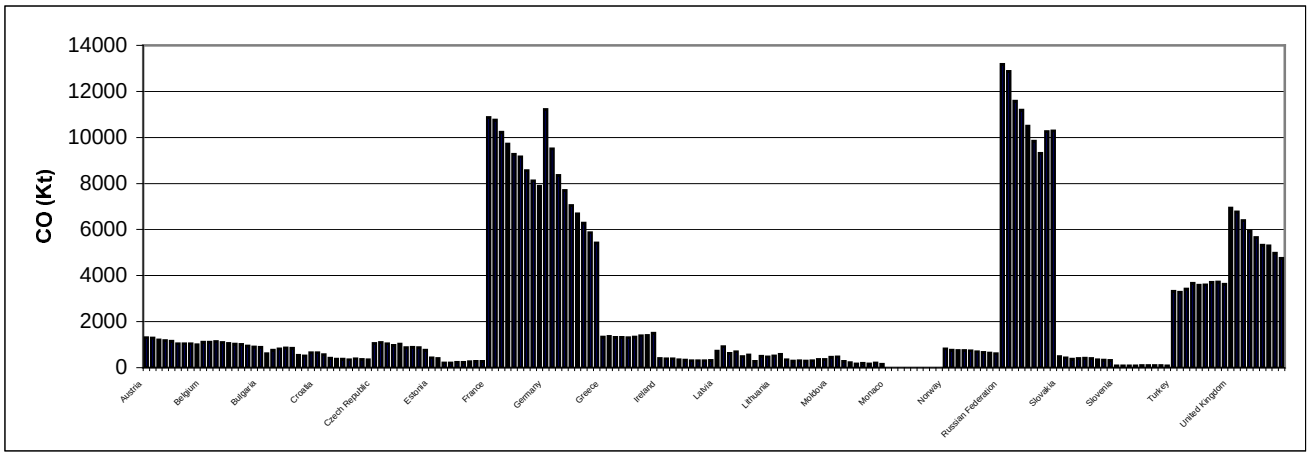

Figure 4.18. Total anthropogenic CO emissions per country 1990-1998

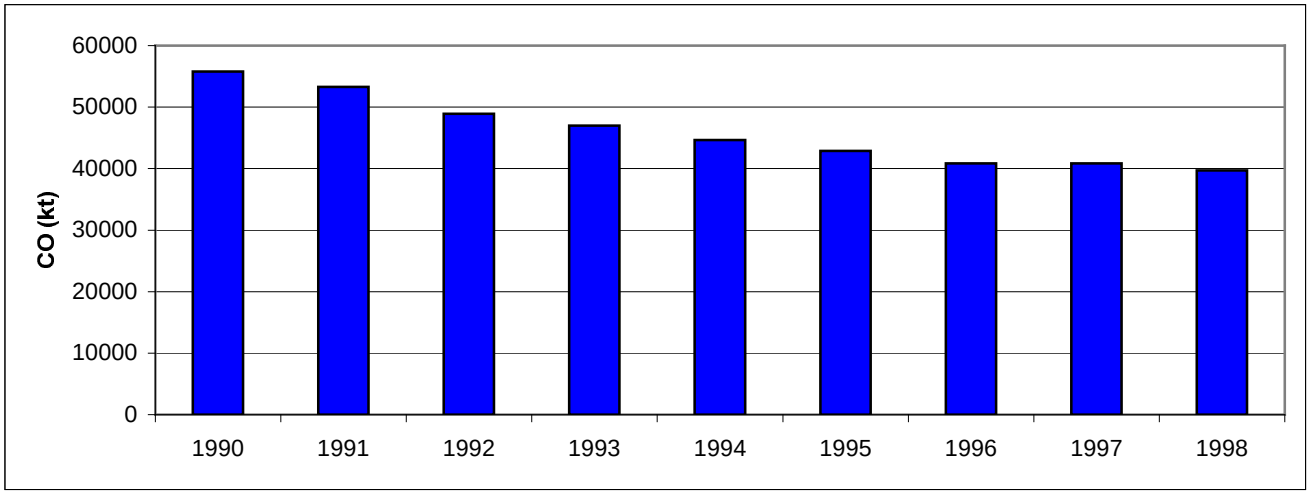

Figure 4.19 Total anthropogenic CO emissions 1990-1998 for selected Parties

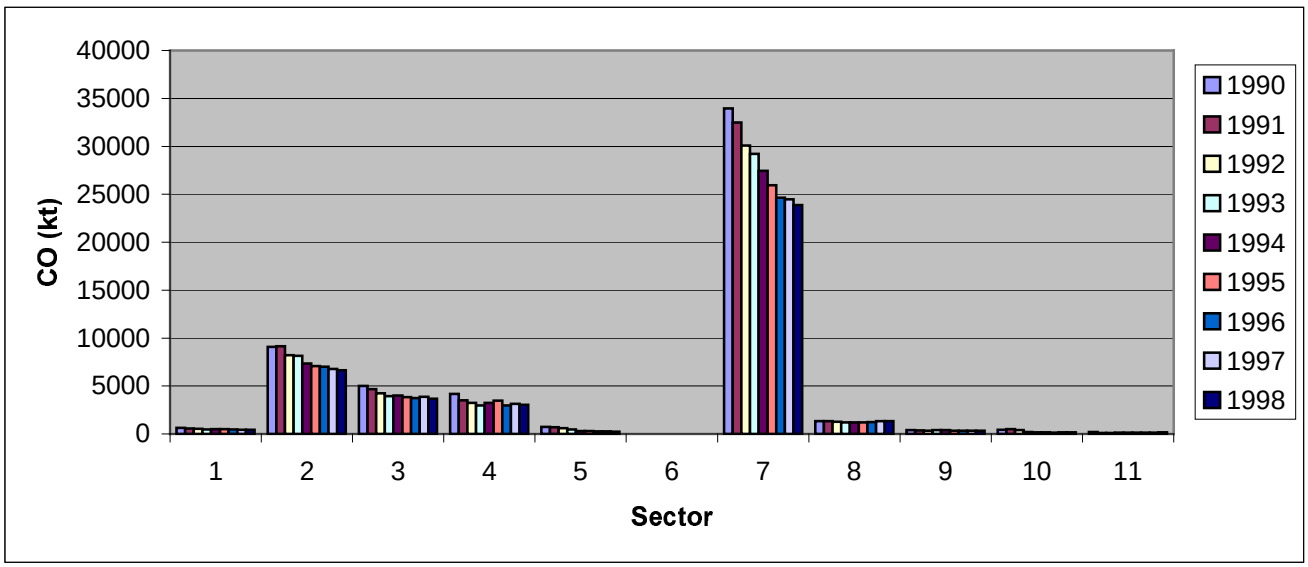

Figure 4.20. CO trends per sector 1990-1998 for selected Parties

5. Progress towards the implementation of the Gothenburg Protocol

5.1 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 5.1-5.4 present the percentage emission reduction between 1990 (the Gothenburg Protocol base year) and 1998. The calculated reductions are based on the most updated emissions reported by each Party (Annex I, Table 17). Parties not included in the Gothenburg Protocol are listed to the right in the figures for comparison. 28 of the 33 Parties within the EMEP area included in the Protocol had signed the Protocol by the 15. March 2000.

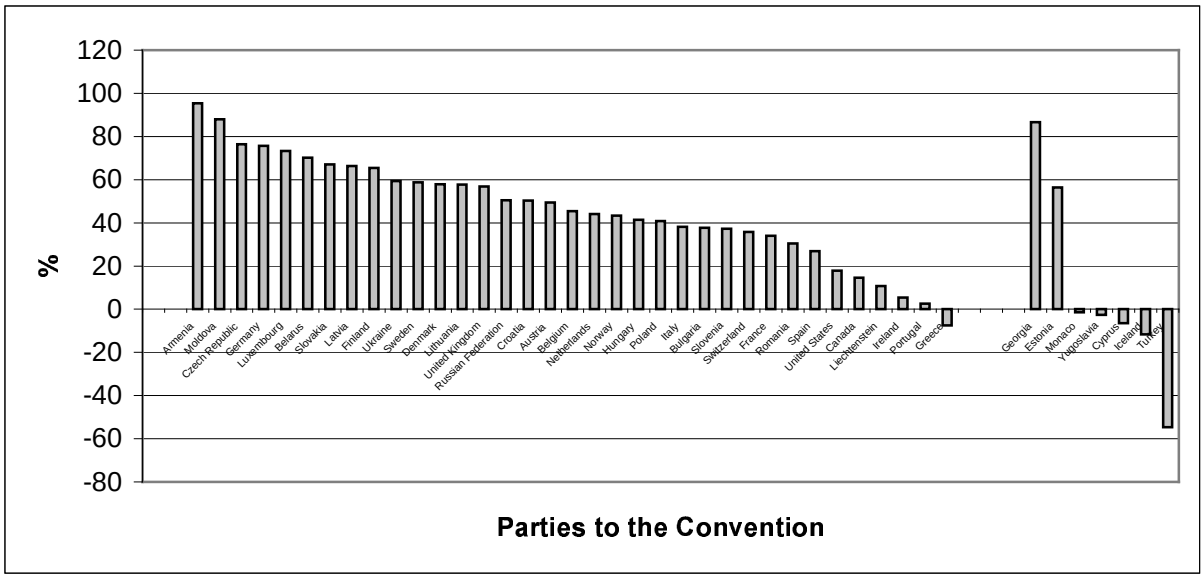

Figure 5.1 Emissions reductions of sulphur in the ECE region 1990-1998 (based on the latest data available, see table 1 in Annex I). Parties included in the 1999 Gothenburg Protocol are on the left. Only countries that have reported emission data for both 1990 and 1998 are listed here.

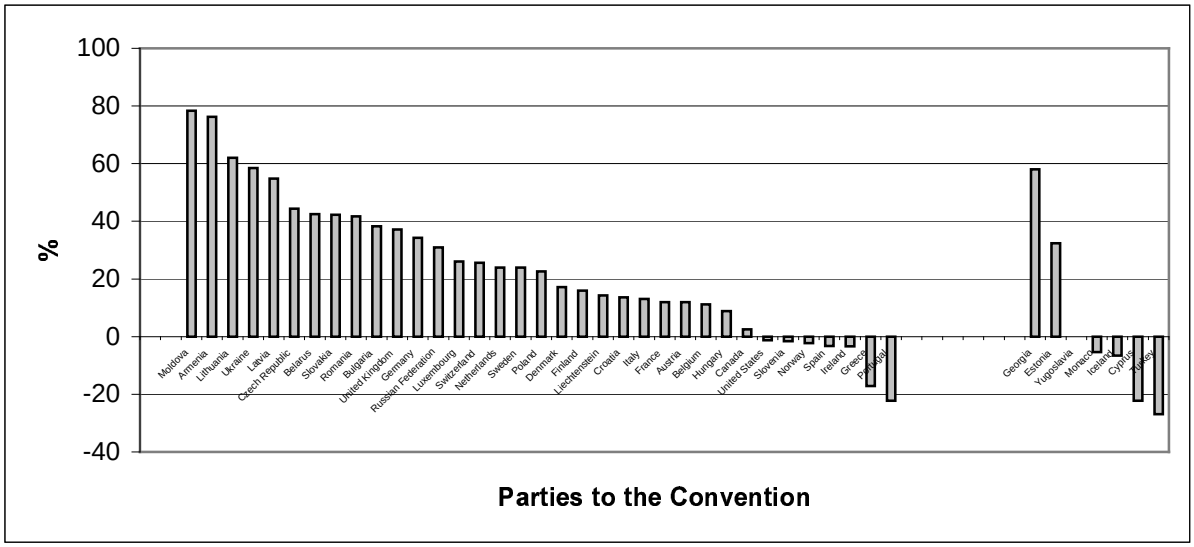

Figure 5.2 Emission reductions of nitrogen oxides in the ECE region 1990-1998 (based on the latest data available, see table 2 in Annex I). Parties included in the 1999 Gothenburg Protocol are on the left. Only countries that have reported emission data for both 1990 and 1998 are listed here.

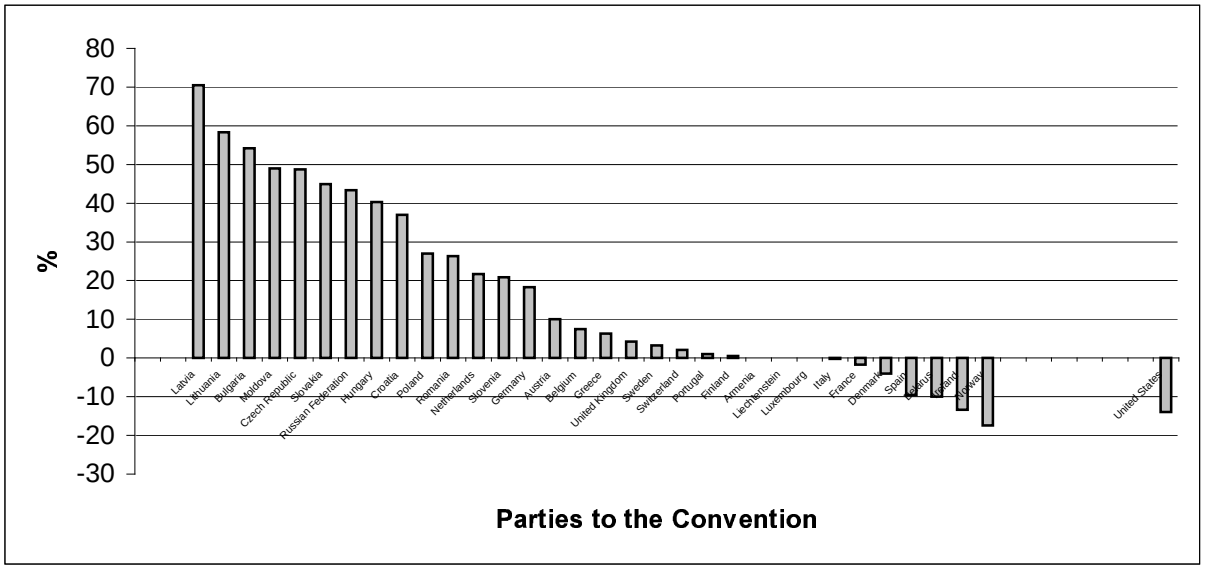

Figure 5.3 Emission reduction of ammonia in the ECE region 1990-1998 (based on the latest data available, see table 3 in Annex I). Parties included in the 1999 Gothenburg Protocol are on the left. Only countries that have reported emission data for both 1990 and 1998 are listed here.

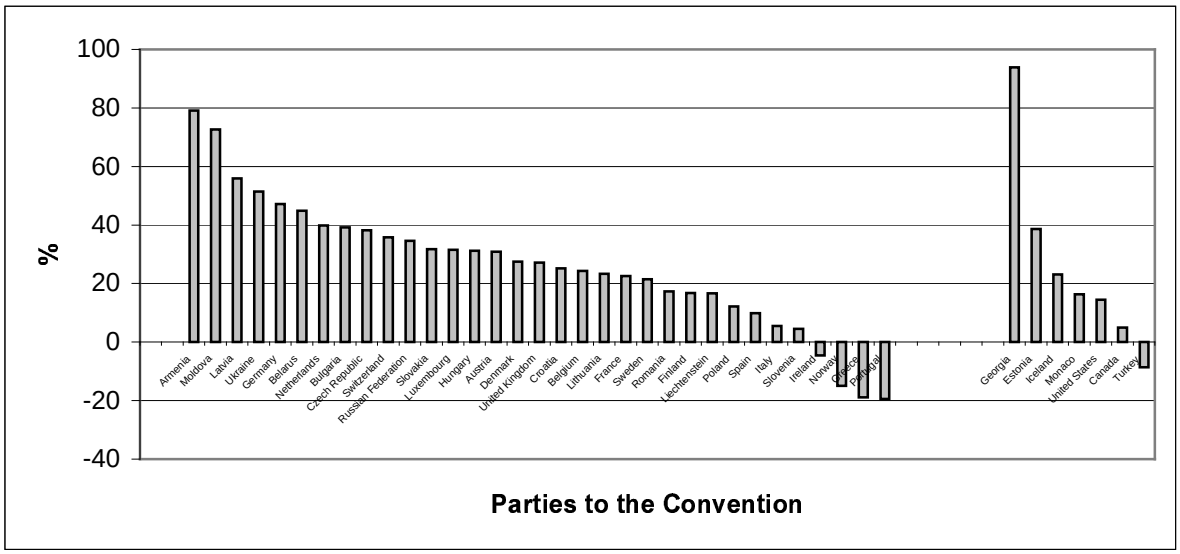

Figure 5.4 Emission reductions of non-methane volatile organic compounds in the ECE region 1990-1998 (based on the latest data available, see table 4 in Annex I). Parties included in the 1999 Gothenburg Protocol are on the left. Only countries that have reported emission data for both 1990 and 1998 are listed here.

Overall, the greatest reductions are detected in sulphur emissions. Some of the Parties to the Convention that are not included in the Protocol have nevertheless reduced their emissions. For SO_x and $NO_{x,}$ this applies for Estonia and Georgia. In the case of NMVOC, all the Parties not included in the Protocol except Turkey have reduced their emissions. On the contrary, several of the countries that are included in the Protocol appear to have increased their emissions; Greece for $SO_{x,}$ Portugal, Greece, Ireland, Spain, Norway, Slovenia and United States for $NO_{x,}$ Norway, Ireland, Belarus, Spain, Denmark, France and Italy for NH_3 and Portugal, Greece, Norway and Ireland in the case of NMVOC. It should be noted here that Belarus and Greece have not signed the Gothenburg Protocol.

Figure 5.6 shows a comparison of the sum of the reported 1998 emissions for Parties included both in the EMEP area and the Protocol, and the sum of corresponding Protocol ceilings. Only 26 of the Parties included in the Gothenburg Protocol are included in this overview, while the total number of Parties within the EMEP area included in the Gothenburg Protocol is 33. The Russian Federation, non-signatory to the Protocol, was not included in this overview, because their emission ceiling only concerns their PEMA (Pollutant Emission Management Area).

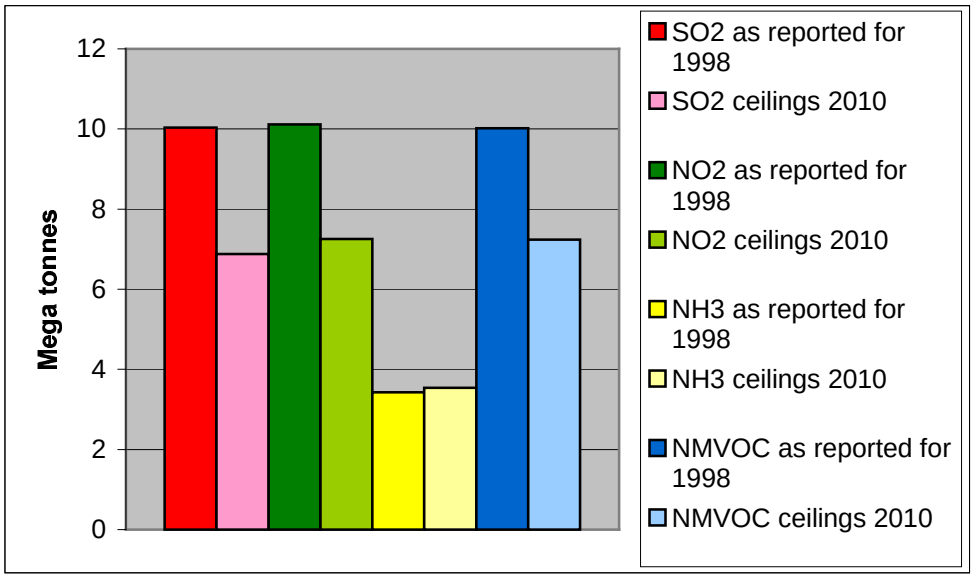

Figure 5.6 Reported 1998 emissions and corresponding 2010 emission ceilings according to the Gothenburg Protocol

Figure 5.6 shows that for sulphur, nitrogen oxides and non-methane volatile organic compounds measures needs to be implemented in order to reach the ceilings. The emission ceiling for this selection of countries is already obtained for ammonia. The average emission reduction of sulphur per year in order to reach the emission ceiling is 2.6%. The corresponding figures for NOx, and NMVOC are 2.4% and 2.3% respectively.

5.2 Future emissions reductions

The regressions that best seemed to fit the emission data studied in Section 4.2 have been extrapolated to year 2010 in order to look at percentage emission reductions required for the emissions to follow these trends also in the 12-year period 1998 to 2010.

The exponential trend found for sulphur indicates an average emission reduction between 1998 and 2010 of 69%, or 5.7% per year. The logarithmic trend found, indicates a reduction of 37%, or approximately 3% per year. Linear regressions for sulphur also fitted the emissions seen between 1990 and 1998 well, but they will lead to negative emissions in year 2010.

The logarithmic trend found for nitrogen oxides indicates an average emission reduction between 1998 and 2010 of 15%, or 1.2% per year. The corresponding figures for the exponential trend found is 39% or approximately 3.3%.

The logarithmic NH_3 trend indicates average emission reductions between 1998 and 2010 of 1%, while the geometric trend indicated a 0.85% yearly reduction. The corresponding figures

for the exponential NMVOC trend is 3.4%, and the yearly average emission reduction for the logarithmic NMVOC trend is 1.1%.

Taken into account the yearly average emission reductions between 1990 and 1998 (Table 5.1), the logarithmic trends were seen as the most likely for all the components included in the Gothenburg Protocol. One may argue that the numbers of years studied (9) are too few to have great confidence in the trends found. Likewise, that the selection of the countries may have influenced the results, that the countries contributing to figure 5.6 are not identical to the countries included in the trend analysis and that average yearly reductions may not be the best tool to compare trends and emission ceilings. In spite of the crudeness of the study performed, it is felt that there are relatively strong indications for claiming that it seems very difficult to reach the protocol ceilings for NO_x and NMVOC. This might reflect difficulties in reducing emissions from road transport, the main sector with anthropogenic emissions for both components.

Table 5.1 Average yearly percentage reductions for historical and future emissions[1]

	Selected Countries 1990-1998	Whole EMEP area 1990-1998	Logarithmic trends 1998-2010	Gothenburg Protocol (Fig. 5.1) 1998-2010
SO_x %/year	4.3	3.4	3.0	2.6
NO_x %/year	2.3	1.2	1.2	2.4
NH_3 %/year	1.9	1.2	1.0	-0.3
NMVOC %/year	2.5	2.2	1.1	2.3

(1) A negative number indicates an increase

5.3 Recalculations

At the Task Force meeting on Emissions Inventories and Projections this year, the incentives for the countries to perform and report recalculations in the case where this would lead to an increase in 1990 emissions, hence possibly larger difficulties in reaching the agreed emission ceilings were discussed (Rypdal, 2000).

As previously mentioned, several of the Parties submitted recalculations this year. A summary of all recalculations relative to previous year's reporting can be found in table 5.2. This table shows that recalculations imply a decrease of 1990 emissions for SO_x by 46%, NO_x by 57%, NH3 by 25% and NMVOC by 67% of the countries that have provided recalculations. It is noteworthy that countries do not necessarily report recalculations to decrease with respect to reference year emissions, and thus facilitate the implementations of the goals set by the Gothenburg Protocol. However, the percentage of the recalculations implying a decrease of the 1990 emissions are largest for NO_x and NMVOC, the two components for which it seems most difficult to reach the Protocol ceilings. Not all the Parties report the reasons for recalculation. Recalculation in accordance with CORINAIR SNAP97 is the dominating reason amongst Parties reporting methodology. ***As pointed out in Chapter 4 and demonstrated here, recalculations influence the trends and the compliance with protocol ceilings. It is therefore seen as very important that the Parties document the reason for their recalculations.***

Table 5.2 Recalculations of national total emissions relative to 1999 reporting (1000 tonnes)[1]

SO_x	1980	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Austria	-15	-5	-5	-7				-1			1	4	3	-8
Belgium							50	8	8	8	2	-1		
Bulgaria							-12							
Cyprus		-3		-3	-2	-5	-9	-9	-7	-1	-4	-4	-1	
Denmark	2	4	10	8	12	6	1	-2	-2	-2	1	-1	-7	1
France	-130	2	-4	32	-12	39	-30	3	-38	-81	-28	-64	-126	
Germany				49	9	-31	8		8	7	8	-8	-67	-109
Greece							-7	-3	2	1	-12	-2	-3	
Ireland							8	1	11	4	-2			1
Portugal			3	-46	-92		-19	-19	-24	-16	-15	-8		
Moldova							34	76	42	120	85	37	48	19
Slovenia						-1	2	-1	-4			6	2	-2
Spain	-483	203	306	236	200	172	-217	-173	-155	-152				
United Kingdom	9	5	-5	5	6	7	6	4	6	5	10	13	1	-9

NO_x	1980	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Austria	-3	-3	-4	-3	-1	-1	-1	-1	-1	-1	-2	1	7	-1
Belgium							-4	-9	-11	-3	-4	-3	-18	
Bulgaria							-15							
Cyprus		-2					-2	-1	-1	-2	-1	-2		-2
Denmark	-9	-3	-1	1	1	3	-3	1		1	-6	-2		
France	207	212	168	186	204	95	292	310	283	225	57	48	54	2
Germany				150	159	97	16	-20	3	47	23	43	32	43
Greece							-17	-20	-18	-18	-16	-17	4	
Ireland							3	1	5	-3	-2		-1	-6
Portugal							-42	-44	-45	-38	-37	-37	-33	
Moldova		-1					37	30	28	38	28			
Slovenia							1	4	3	2				
Spain	69	95	103	111	138	139	-21	-17	-11	-21				
United Kingdom	75	112	115	120	118	114	102	90	77	60	50	28	25	20

NH_3	1980	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Austria	-1				-1	2	4	6	3	1	-2	-4	-3	-3
Belgium							3						2	2
Denmark	-16	-11	-11	-10	-10	-9	-22	-10	-10	-15	-13	-14	1	
Finland							3							4
France							113	119	121	121	125	133	146	154
Germany				9	6	5	1	-3	-6	-8	-11	-12	-15	-23
Greece											-34			
Hungary	-39	-39					-40	-41	-39	-38	-38	-39		
Ireland							-14	-11	-9	-9	-4	-4	-6	-9
Slovakia							1		-10		3	-4	-9	-12
Spain							119	114	116	103				
Sweden							10							-5
United Kingdom							33						16	21

NMVOC	1980	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Austria	-3	-2	-2	-2	-2	-2	-7	-10	-16	-16	-16	-11	-11	-7
Belgium		28	21	15	9	2	-4	-42	-41	-34	-31	-30	-50	-54
France							131	178	113	139	-473	-459	-469	-537
Germany				53	67	56	30	17	5	20	-11	-1	-16	-28
Greece		459					-39	-40	-39	-33	-32	-35	-33	
Ireland							-87	-89	-85	-94	-68	-72	7	9
Lithuania	-8						-8				-8	2	3	3
Luxembourg		-2	-2	-2	-2	-1	-1	-1	-1	-1	-1	-2	-2	
Norway	-5	-4	-5	-4	-1	-9	-10	-11	-2	-4	-4	-3		
Portugal							-326	-324	-325	-325	-326	-324		
Moldova							18	75	59	50	42	19	46	29
Slovakia							-1			5		-12	-1	
Slovenia							2	-1	-2	0	2	2		
Spain		1329	1740	1757	1756		1656	1550	1442	1289				
United Kingdom	-85	-97	-93	-87	-101	-113	-107	-110	-114	-114	-102	-98	-87	-101

(1) Figures reported to UNECE in year 2000 relative to last year's reporting. A negative number indicates that the figure is adjusted downwards in the year 2000 reporting. Blank indicates no change or lack of reported data.

6. Summary

Emission reporting has improved markedly since last year. The need for completeness in reporting and checking data consistency remain focal issues. For pollutants other than SO_x and NO_x, data gaps are still substantial. Complete information on sector split emission data, gridded data and clear distinction between low and high sources 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 require strong interaction with other relevant actors. 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 trend study and the analysis of progress towards the implementation of the Gothenburg Protocol indicated that:

- The average emission reduction between 1990 and 1998 for the countries within the trend study versus the whole EMEP area are: 52% versus 41% for SO_x, 27% versus 21% for NO_x, 23% versus 14% for NH_3 and 30% versus 26% for NMVOC. For CO the percentage reduction was 29%.
- Total emissions of SO_x, NO_x, NH_3 and NMVOC fit better to logarithmic trends between 1990 and 1998. By extrapolating the logarithmic trends to 2010, it is seen that it will be a great challenge to reach the emission ceilings in the Gothenburg Protocol for NO_x and NMVOC. On the other hand, the commitments for SO_x and in particular NH_3 appear to be achievable.
- The recalculations reported this year implied decrease of 1990 emissions for SO_x in 46% of the Parties that have provided recalculations. The corresponding figure for NO_x are 57%, NH_3 25% and NMVOC 67% The countries did not necessarily report recalculations to decrease with respect to reference year emissions, and thus facilitate the implementations of the goals set by the Gothenburg Protocol. However, the percentage of the recalculations implying a decrease of the 1990 emissions are largest for NO_x and NMVOC, the two components for which it seems most difficult to reach the Protocol ceilings.

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. (1997) Cost-effective Control of Acidification and Ground-Level Ozone. Second Interim Report to the European Commission, DG-XI.

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.

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 ( ) Marine Exhaust Emissions Quantification Study for the Mediterranean Sea.

Rypdal, K., (2000) Methodological choice and LRTAP gases (DRAFT), Statistics Norway

Støren, E. (1998) The EMEP/MSC-W Emission Database System. EMEP/MSC-W Note 1/98. Norwegian Meteorological Institute, Oslo.

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, 1998 Visions for the EMEP work by 2005/2010, Seventh-phase programme (1999-2001). EB.AIR/GE.1/1998/3

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, 2000, Present state of emission data. EB.AIR/GE.1/2000/6

ANNEX I

Official National Anthropogenic Emission Totals

Overviews

&

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 10-16 Give overviews of data available in the EMEP database for each country

Table 17 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 included in the Gothenburg Protocol.

The tables of national anthropogenic emissions are to appear on the Internet in autumn 2000 (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	2005	2010
Armenia [4]	141	110	101	110	96	100	111	110	104	62	72	59	44	5	4	2	1	0.4	3		
Austria	384	334	316	237	211	190	171	152	115	102	91	82	63	60	56	56	54	48	46		39
Belarus	740	730	710	710	690	690	690	761	720	668	637	652	458	382	324	275	246	208	190	490	480
Belgium [5]	828	712	694	560	500	400	377	367	354	325	372	334	318	297	253	246	240	220	203	232	106
Bosnia and Herzegovina											480										
Bulgaria	2050							2420	2228	2180	2008	1677	1128	1426	1480	1497	1420	1365	1251	890	856
Canada	4643	4291	3612	3625	3955	3692	3627	3762	3838	3695	3236	3245	3117	3008	2651	2681	2722	2749	2766	2914	2914
Croatia [6]	150										180	108	106	113	89	70	66	80	89	125	70
Cyprus						34	37	38	41	42	46	32	38	42	42	42	45	47	49	37	39
Czech Republic [7]	2257	2341	2387	2338	2305	2277	2177	2164	2066	1998	1876	1776	1538	1419	1270	1091	946	701	443	250	283
Denmark	452	370	379	323	305	343	292	258	254	197	183	241	188	154	156	149	179	110	77	62	50
Estonia [8]	287					254	256	255	254	254	252	246	187	154	149	118	125	119	110		
Finland [5]	584	534	484	372	368	382	331	328	302	244	260	194	141	123	114	96	105	99	90		
France [2) 5) 7)]	3208	2519	2409	1979	1764	1472	1338	1322	1214	1373	1268	1379	1200	1040	985	925	905	764	837	650	400
FYR Macedonia [1]																		17 [a]			
Georgia	230	242	250	267	266	273	255	258	255	249	248	194	135	71	46	20	30	33			
Germany [9) 10)]	7514	7441	7440	7346	7633	7732	7641	7396	6487	6165	5321	3996	3307	2945	2473	2094	1476	1359	1292	990	550 [b]
Greece [3]	400					500					506	549	556	551	526	551	540	531	540	580	546
Hungary [5]	1633	1580	1545	1480	1440	1404	1362	1285	1218	1102	1010	913	827	762	741	705	673	659	591	816	550
Iceland [11) 12)]	17	17	17	18	18	18	18	16	17	17	24	23	23	24	23	23	24	24	26	29	29
Ireland [13) 14)]	222	192	158	142	142	140	162	174	152	162	186	180	172	161	175	161	147	166	176	155	42
Italy	3757	3330	2850	2463	2114	1901	1929	2029	1963	1854	1651	1539	1394	1333	1271	1322	1123	1021		847	842
Latvia											119	90	79	73	86	59	59	44	40	114	157
Liechtenstein	0.39	0.37	0.34	0.32	0.29	0.27	0.25	0.22	0.20	0.17	0.15	0.15	0.14	0.14	0.13					0.11	0.11
Lithuania [14]	311	312	304	310	303	304	316	316	300	298	222	234	139	125	117	94	93	77	94	155	145
Luxembourg	24			14		16					15			15	13	9	8	6	4		4
Malta																					
Moldova [13) 15) 16)]	308	305	287	284	270	282	297	317	273	238	265	260	168	156	108	64	67	36	32		135
Monaco											0.07	0.10	0.10	0.11	0.10	0.09	0.08	0.08	0.07		
Netherlands [17)]	490	464	404	323	299	258	264	263	250	204	202	173	172	164	146	147	135	118	113		50
Norway	137	128	111	104	96	98	91	73	68	58	53	44	36	35	35	34	33	30	30		22
Poland	4100					4300	4200	4200	4180	3910	3210	2995	2820	2725	2605	2376	2368	2181	1897		1397
Portugal [18]	266			306		198	234	218	204		343	333	396	340	321	365	334			294	
Romania	1055	1095	1104	1229	1223	1255	1293	1305	1469	1517	1311	1041	951	928	912						
Russian Federation [2) 21)]	7161	6949	7090	6934	6503	6191	5707	5622	5145	4677	4460	4392	3839	3456	2983	2838	2685	2449	2208	4297	4297
Slovakia [5]	780					613	604	614	589	573	543	445	380	325	239	239	227	202	179	210	210
Slovenia	234	254	256	274	250	241	247	222	210	211	196	180	186	183	177	125	112	118	123	78	27
Spain [2]	2836	2773	2749	2764	2523	2393	2267	2139	1787	2122	2049	2050	2040	1919	1875	1721	1498				
Sweden [19]	491	431	371	305	296	266	272	228	224	160	119	96	88	87	82	79	83	51	49	67	67
Switzerland [13]	116				84	76	68	62	56	49	43	41	38	34	31	34	30	26	27	26	26
Turkey [1]	205	218	237	299	361	520	674	653	498	792	833	909	896	844	1069	1026	1197	1256	1288	990	995
Ukraine	3849	3492	3427	3498	3470	3463	3393	3264	3211	3073	3782	2538	2376	2194	1715	1639	1293	1132		2310	2310
United Kingdom	4871	4414	4198	3856	3692	3733	3895	3892	3821	3700	3736	3551	3461	3144	2688	2356	2017	1647	1615	1020	850
United States	2351	22251	2093	20229	21292	21974	20452	20238	20654	20781	21463	20901	20688	20380	19838	17400	17141	17596	17622	16651	16258
Yugoslavia [20]	406	408	409	440	456	478	470	484	502	506	508	446	348	401	424	462	434	522	521	889	1135
European Community																					

1) Sum of sector data
2) Figures apply to the European part within EMEP
3) Emissions reported for 1981-1985 are to be regarded as indications only, and are not comparable to the emissions reported after 1985
4) Reduction in emission of SO2 from 1993 onwards is explained by the blockade of communications in Armenia followed by drop in energy production
5) Data for 1998 are provisional
6) Emissions from 1990 and onwards are distributed according to SNAP90 nomenclature
7) Figures for 2005 are preliminary/based on assessments and figures for 2010 are national emission ceilings from the Gothenburg Protocol
8) Emissions are calculated from stationary and mobile sources
9) Emissions for 1980-1986 are not updated
10) Emissions from international air traffic, marine bunkers and managed forests are not included
11) 2/3 of the SO2 emissions are emitted as H2S
12) Emissions in 1980 and 1981 are assumed to be similar to 1982 due to lack of data
13) Projections for 2010 as negotiated in the Gothenburg Protocol
14) Emissions for 1998 are recalculated
15) Since 1993 emissions located on the left side of Dniester 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.
16) Emissions 1985-1989 and 1991-1994 do not include mobile sources
17) Recalculations based on new methodology from 1996 onwards
18) The 1991-1996 emissions were updated using the categories of SNAP 97
19) Emissions from industrial processes for 1980-1986 are not comparable to emissions for 1997 and 1998 due to change of methodology
Emission from stationary sources only
Emissions from stationary sources only except for 1996-1998 which includes mobile sources

a) The figure refers to Skopje only
b) Projections 2010: 565 kt includes measures taken or already started. 550 Kt includes additional measures to be taken to meet the targets of the Gothenburg protocol

Table 2. Anthropogenic emissions of nitrogen oxides (1980-2010) in the ECE region (thousands of tonnes NO_2 per year)

Party/Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	2005	2010
Armenia		15	17	16	15	44	53	51	55	51	46	40	21	12	11	14	11	15	10		
Austria	228	220	218	215	215	217	213	209	202	194	193	196	187	175	182	170	170	171	169	154	107
Belarus	234	235	235	237	240	238	258	263	262	263	285	281	224	207	203	195	172	188	164	184	180
Belgium [4]	442					325	317	338	345	357	339	335	343	341	342	336	316	306	301		181
Bosnia and Herzegovina																					
Bulgaria								416	415	411	361	266	239	242	230	266	259	225	223	270	266
Canada [5]	1959	1907	1897	1884	1871	2038	2043	2131	2204	2188	2104	2003	1997	2006	2026	2032	2011	2068	2051	2057	2085
Croatia [6]	60										87	65	56	59	65	65	68	73	76	83	87
Cyprus						14	16	16	18	19	18	16	19	19	20	19	21	21	22	23	23
Czech Republic [7]	937	819	818	830	844	831	826	816	858	920	742	725	698	574	435	412	432	423	413	310	286
Denmark	273	243	264	257	270	298	319	313	303	285	279	322	276	275	266	248	288	248	231	159	133
Estonia								70	70	69	68	63	39	38	41	42	44	45	46		
Finland [4]	295	276	271	261	257	275	277	288	293	301	300	290	284	282	282	258	268	260	252	224	224
France [2)4)7)]	2030	1927	1885	1860	1853	1827	1786	1816	1819	1867	1877	1942	1880	1769	1739	1714	1695	1643	1652	1200	860
FYR Macedonia [1]																		6 [a]			
Georgia	121	125	130	137	137	140	133	134	134	130	129	112	47	32	20	26	49	54			
Germany [8)9)]	3334	3259	3219	3258	3305	3276	3286	3327	3208	2989	2709	2501	2311	2198	2042	1989	1919	1846	1780	2130	1081 [b]
Greece [3]						306					326	333	334	331	342	341	378	361	382		344
Hungary [4]	273	270	268	266	264	262	264	265	258	246	238	203	183	184	188	190	196	200	217	210	198
Iceland [10]	21	21	21	21	21	20	22	24	24	25	26	26	28	29	29	28	29	28	27	28	30
Ireland [11) 12)]	73	86	86	85	84	91	100	115	122	127	118	120	130	119	115	115	120	118	122	105	65
Italy	1638	1604	1605	1583	1596	1614	1690	1811	1854	1917	1938	1984	2010	1990	1789	1768	1756	1685		1508	1436
Latvia											93	61	53	46	48	42	35	44	42	70	81
Liechtenstein	0.71	0.71	0.7	0.69	0.68	0.67	0.66	0.65	0.65	0.64	0.63	0.61	0.58	0.56	0.54					0.37	0.37
Lithuania [12]	152	154	156	158	162	166	169	171	172	173	158	166	98	78	77	65	65	57	60	110	110
Luxembourg	23			21		21					23				23	21	22	18	17		11
Malta																					
Moldova [11)13)14)]	58	57	50	42	44	66	72	71	74	70	100	97	67	53	46	38	38	36	21	35	90
Monaco											0.53	0.63	0.68	0.64	0.63	0.6	0.58	0.58	0.55		
Netherlands [15)]	583	575	562	555	573	589	587	599	602	584	580	568	556	535	510	498	501	453	441	249	266
Norway	188	178	182	186	201	211	227	226	222	221	219	210	208	216	213	213	221	223	224		156
Poland	1229					1500	1510	1530	1550	1480	1280	1205	1130	1120	1105	1120	1154	1114	991		879
Portugal [16]	166			192		96	110	116	122		306	323	346	344	354	370	374				
Romania	523	528	516	542	546	542	559	580	590	579	546	464	357	318	319						
Russian Federation [2)19)]	1734	1915	2002	1976	1879	1903	1871	2653	2358	2553	3600	3325	3093	3054	2685	2570	2467	2379	2488		
Slovakia [4]								197		227	225	204	190	183	173	181	130	124	130		
Slovenia	51	52	52	51	52	53	58	57	59	58	63	58	58	63	66	67	70	71	64	61	45
Spain [2]	1019	947	945	959	956	934	957	1003	1030	1131	1156	1210	1240	1202	1214	1216	1194				
Sweden [17]	404	417	412	401	411	426	432	437	432	418	338	339	329	324	331	301	302	270	257	194	148
Switzerland [11]	170				177	179	177	174	172	170	166	160	153	145	139	136	130	125	123	110	79
Turkey [1]	372	374	405	431	460	484	532	589	596	633	670	677	693	772	755	805	855	861	851	1484	2044
Ukraine	1145	1145	1153	1153	1102	1059	1112	1094	1090	1065	1097	989	830	700	568	531	467	455		1094	1094
United Kingdom	2585	2501	2489	2501	2460	2545	2627	2738	2792	2834	2788	2673	2586	2405	2301	2132	2054	1868	1753	1295	1161
United States	22501	22397	21819	21704	22581	21308	21169	20689	22250	21825	21815	21997	22311	22643	23016	22606	22283	22417	22083	18160	17192
Yugoslavia [18]	47	50	50	53	58	58	58	60	63	62	66	57	50	54	52	59	57	66	66	115	147
European Community																					

1) Sum of sector data
2) Figures apply to the European part within EMEP
3) Emissions reported for 1980-1985 are to be regarded as indications only, and are not comparable to the emissions reported after 1985
4) Data for 1998 are provisional
5) Emission levels include estimated impacts of planned reduction initiatives
6) Emissions from 1990 and onwards are distributed according to SNAP90 nomenclature
7) Figures for 2005 are preliminary/based on assessments and figures for 2010 are national emission ceilings from the Gothenburg Protocol
8) Emissions for 1986 are not updated
9) Emissions from international air traffic, marine bunkers and managed forests are not included
10) Emissions in 1980 and 1981 are assumed to be similar to 1982 due to lack of data
11) Projections for 2010 as negotiated in the Gothenburg Protocol
12) Emissions for 1998 are recalculated
13) Since 1993 emissions located on the left side of Dniester 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.
14) Emissions for 1980-1984 do not include mobile sources
15) Recalculations based on new methodology from 1996 onwards
16) The 1994-1996 emissions were updated using the categories of SNAP 97
17) Emissions from industrial processes for 1996 are not comparable to emissions for 1997 and 1998 due to change of methodology
18) Emission from stationary sources only
19) Emissions 1980-1989 refer to stationary and road vehicles only

a) The figure refers to Skopje only
b) Projections 2010: 1166 Kt includes measures taken or already started. 1081 Kt includes additional measures to be taken to meet the targets of the Gothenburg protocol

Table 3. Anthropogenic emissions of ammonia (1980-2010) in the ECE region (thousands of tonnes NH_3 per year)

Party/Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	2005	2010
Armenia [3]		3	3	3	2	2	1	1	2		25	0.11	0.05	0.001	0.006	0.006	0.004	0.004	0.002		
Austria	79	80	80	81	82	82	81	80	79	79	79	79	76	76	75	74	72	72	71		66
Belarus [4]											4				4	4	4	4	4	4	4
Belgium [5]						89					107	93	92	97	96	97	99	99	99		74
Bosnia and Herzegovina																					
Bulgaria											144	124	111	109	101	99	83	77	66	113	108
Canada																					
Croatia [6]											37	31	26	25	24	24	23	23	23	33	30
Cyprus																					
Czech Republic											156	134	115	99	91	86	81	81	80		
Denmark	125	123	120	119	115	115	111	107	105	104	100	100	104	104	100	100	100	102	104		
Estonia [7]											0.9	0.7	0.6	0.2	0.3	0.3	0.2	0.2	0.15		
Finland [5]	39						41				38					35		38	37	23	23
France [1)5)8)]	832	840	843	847	830	830	832	828	809	810	813	809	797	787	793	801	814	822	827	800	780
FYR Macedonia																					
Georgia																					
Germany [9)10)]	835	821	817	841	853	857	846	845	835	823	765	673	649	638	639	634	634	625	625		550
Greece											79	78	75	75	73	85	73	71	74		73
Hungary [5]	157					150	170	150		170	124	93	84	77	76	77	78	76	74	100	90
Iceland																					
Ireland [11)12)]											112	115	117	117	119	120	122	123	127	126	116
Italy	479	475	464	504	481	487	495	497	499	481	466	451	440	449	459	461	461	467		446	449
Latvia											44	42	33	20	17	17	16	15	13		
Liechtenstein	0.14				0.15						0.15									0.15	0.15
Lithuania [12]	85	86	86	87	88	89	89	90	89	86	84	85	81	80	80	38	36	35	35	84	84
Luxembourg											7				7	7	7	7	7		7
Malta																					
Moldova [11) 13)]	52					57					49	49	44	37	35	33	31	25	25		42
Monaco																					
Netherlands [14]	234	240	244	244	246	248	258	258	237	232	226	228	180	191	166	146	146	188	177	82	128
Norway	23	23	23	23	23	23	23	23	21	23	23	24	25	25	25	26	27	26	27		23
Poland	550					550	550	550	550	550	508	450	447	382	384	380	364	350	371		468
Portugal [15]											98	98	96	94	94	97	97				
Romania	340	332	327	311	359	343	350	329	339	341	300	267	255	223	221						
Russian Federation [1)16)]	1189	1192	1214	1245	1247	1239	1286	1277	1269	1258	1191	1161	1084	903	772	824	749	730	675		
Slovakia											62	59	51	45	42	41	41	38	34		
Slovenia											24	23	23	23	22	22	22	19	19	22	20
Spain [1]	396	383	409	411	417	420	435	474	475	487	472	468	468	448	470	467	517				
Sweden									54		61	51	61	61	61	61	61	59	59	58	57
Switzerland [11]	77				60	74					72	61	62	63		71	71	71	70	69	63
Turkey [2]																					
Ukraine [3]											23					9	7				
United Kingdom											366	360	344	345	347	338	335	343	350		
United States						1685					3929	3983	4036	4101	4163	4232	4329	4388	4477	4097	4227
Yugoslavia																					
European Community																					

1) *Figures apply to the European part within EMEP*
2) *Sum of sector data*
3) *The emission reported for 1990 includes emissions from agriculture. All other years do not include agriculture.*
4) *Figures refer to stationary sources only*
5) *Data for 1998 are provisional*
6) *Emissions from 1990 and onwards are distributed according to SNAP90 nomenclature*
7) *Emissions are calculated from industry only*
8) *Figures for 2005 are preliminary/based on assessments and figures for 2010 are national emission ceilings from the Gothenburg Protocol*
9) *Emissions for 1990-96 are not updated*
10) *Emissions from international air traffic, marine bunkers and managed forests are not included*
11) *Projections for 2010 as negotiated in the Gothenburg Protocol*
12) *Emissions for 1990-98 are recalculated*
13) *Since 1993 emissions located on the left side of Dniester 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.Recalculations based on new methodology from 1996 onwards*
14) *The 1990-1996 emissions were updated using the categories of SNAP 97* *15) The 1990-1996 emissions were updated uding the categoties of SNAP 97* *16) 1980-85 figures refer to agriculture only*

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

Party/Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	2005	2010
Armenia		25	24	23	21	92	98	104	92	90	81	69	30	19	17	23	17	35	16		
Austria	352	351	349	353	360	358	372	375	377	366	343	313	279	268	258	259	250	246	237	266	159
Belarus	549	546	543	543	540	516	506	509	535	511	533	546	412	372	366	367	327	344	294	323	321
Belgium [3]						688 [a)]					354	313	313	311	305	294	274	270	268		144
Bosnia and Herzegovina																					
Bulgaria									309		217	178	179	208	175	173	147	120	132	194	185
Canada [4]	2099					2851	2859	2897	2964	2906	2880	2792	2730	2763	2752	2742	2760	2768	2736	2790	2927
Croatia [5]											105	86	63	69	74	74	81	79	78	100	90
Cyprus																					
Czech Republic [6]						275					435	398	359	338	310	286	284	272	269	230	220
Denmark [7]	203	199	199	202	206	209	212	212	211	205	178	183	177	169	167	161	136	133	129	89	73
Estonia [8]						81	83	83	84	87	88	82	45	42	45	48	50	54	54		
Finland								210	213		209			195		185	173	174			
France [1)3)6)]									2666	2628	2535	2518	2442	2336	2232	2161	2101	2033	1964	1800	1100
FYR Macedonia																					
Georgia	45	46	47	49	49	48	47	48	47	46	46	8	3	2	1	1	2	2			
Germany [8)9)]	3224	3152	3134	3152	3191	3190	3218	3273	3255	3202	3225	2798	2540	2327	2158	1980	1861	1779	1705	1100	995 [b]
Greece						614 [a]					334	338	340	348	357	362	376	384	397		261
Hungary [3]	215					232	263	228	215	205	205	150	142	149	142	150	150	145	141	150	137
Iceland [10]	7	7	7	7	7	8	8	11	12	12	12	14	14	13	14	12	12	9	10	6	6
Ireland [11)12)]											110	111	114	108	107	104	110	114	115	138	55
Italy	2179	2119	2074	2045	2007	1992	2019	2088	2124	2215	2213	2293	2338	2344	2349	2368	2113	2091		1543	1440
Latvia											152	97	63	98	101	70	41	74	67	118	204
Liechtenstein	1.48	1.49	1.49	1.50	1.51	1.52	1.53	1.53	1.54	1.55	1.56	1.49	1.43	1.35	1.30					0.86	0.86
Lithuania [12]	100	102	104	105	106	108	108	108	109	109	103	106	60	46	46	77	82	81	79	84	84
Luxembourg						15					19				18	16	16	15	13		9
Malta																					
Moldova [11)13)]						105	101	102	102	96	157	151	99	74	65	61	64	68	42	70	100
Monaco											0.7	0.81	0.93	0.83	0.83	0.76	0.70	0.64	0.59		
Netherlands [14]	579	555	543	526	513	502	489	485	538	468	502	462	438	405	389	365	362	317	302		191
Norway	175	182	189	201	212	230	248	255	247	275	300	298	329	343	354	367	368	359	345		195
Poland	1036	912	889	954	985	1011	1029	1014	1026	1016	831	833	805	756	819	769	766	774	730		800
Portugal [15]						199					314	328	343	347	364	367	375				
Romania	829	810	772	796	812	787	830	884	846	812	772	678	627	634							
Russian Federation [1]	2843	2843	2582	2444	2390	2496	2338	2807	2790	3715	3566	3259	3204	2979	2861	2507	2576	2338	2332		
Slovakia [3]											148			122		107	104	101			
Slovenia									39		44	41	40	42	44	44	49	48	42	37	40
Spain [1]	2572	2547	2507	2545	2551	2594	2622	2679	2711	2759	2790	2737	2649	2485	2697	2635	2515				
Sweden						600			555		526	517	485	483	478	457	458	417	413	315	241
Switzerland [11]	323				324	324			305		292	274	256	239	226	211	203	195	187	150	144
Turkey [2]	359	361	379	387	384	378	403	467	489	493	524	520	543	596	585	599	627	632	569	1582	1925
Ukraine						1626	1660	1687	1604	1512	1369	1302	1171	972	1024	811	718	665		1369	1369
United Kingdom	2224	2200	2240	2249	2294	2301	2348	2393	2455	2496	2445	2387	2284	2179	2134	2022	1958	1852	1780	1336	1344
United States											18992	19142	18740	18930	19535	18884	16995	17122	16252	14630	14176
Yugoslavia																					
European Community																					

1) Figures apply to the European part within EMEP
2) Sum of sector data
3) Data for 1998 are provisional
4) Emission levels include estimated impacts of planned reduction initiatives
5) Emissions from 1990 and onwards are distributed according to SNAP90 nomenclature
6) Figures for 2005 are preliminary7based on assessments and figures for 2010 are national emission ceilings from the Gothenburg protocol
7) NMVOC figures for 1980-1997 as previously reported, but they will later be revised
8) Emissions for 1980-86 are not updated
9) Emissions from international air traffic, marine bunkers and managed forests are not included
10) Emissions in 1980 and 1981 are assumed to be similar to 1982 due to lack of data
11) Projections for 2010 as negotiated in the Gothenburg Protocol
12) Emissions for 1990-98 are recalculated
13) Since 1993 emissions located on the left side of Dniester 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.
14) Recalculations based on new methodology from 1996 onwards
15) The 1990-1996 emissions were updated using the categories of SNAP 97
a. The NMVOC figure for 1985 includes CH4 emissions
b.) Projections 2010: 1150 Kt includes measures taken or already started. 995 Kt includes additional measures to be taken to meet the targets of the Gothenburg protocol

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

Party/Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	2005	2010
Armenia		27	30	30	31	404	405	416	417	398	304	377	195	145	128	173	125	223	124		
Austria	1711	1643	1582	1547	1601	1548	1643	1602	1552	1485	1306	1287	1206	1177	1151	1049	1047	1043	998		
Belarus						1654	1605	1601	1590	1615	1722	1717	1381	1201	1241	1253	1241	1223	1034	1406	1404
Belgium [3]											1112	1120	1138	1104	1054	1032	1009	949	900		
Bosnia and Herzegovina																					
Bulgaria								997	995	985	891	608	768	830	858	846	613	515	650	800	750
Canada [4]	10273					9685					10596	10153	9855	9851	9747	9653	9595	9475	9302	9809	10550
Croatia [5]											655	565	416	375	369	345	388	365	344	660	660
Cyprus																					
Czech Republic	894		906		895	899	740	738	737	884	1055	1102	1045	967	1026	874	886	877	767		
Denmark	956	1075	1123	951	1060	903	881	924	891	979	659	665	640	606	604	585	597	557	588	383	331
Estonia						400	417	423	419	448	434	399	208	210	241	242	268	283	280		
Finland [3]	660										559	522	478	457	444	436	461	474	452		
France [3]	15863	15160	14650	13983	14063	13601	13291	12937	12725	12144	10955	10848	10320	9802	9365	9257	8657	8208	7975		
FYR Macedonia [1]																		23 [a]			
Georgia	648	617	632	647	651	636	642	638	647	597	526	441	129	142	148	249	390	429			
Germany [6)7)]	14046	13027	12438	11980	12176	12134	12135	12438	12080	11430	11218	9513	8350	7702	7053	6692	6284	5872	5425	5400	
Greece											1328	1369	1318	1317	1309	1340	1385	1405	1500		
Hungary [3]	1019					931					997	914	846	796	774	761	727	733	755	800	800
Iceland [8]	44	44	44	43	44	45	48	53	57	57	58	59	60	59	60	49	49	38	39	21	19
Ireland [9)10)]											401	394	395	350	329	304	307	312	318	322	322
Italy	7588	7478	7527	7432	7590	7692	7607	7674	7581	7735	7824	8003	7961	7755	7549	7755	7334	7186		4851	4213
Latvia											388	733	453	528	307	454	176	354	326	294	330
Liechtenstein	4.19	4.00	3.80	3.61	3.42	3.23	3.04	2.85	2.66	2.47	2.27	2.16	2.04	1.92	1.80					1.05	
Lithuania [10]	541	548	543	550	550	547	554	564	578	568	521	599	501	292	303	286	312	358	358	410	400
Luxembourg						193					175				145	107	103	80	51		33
Malta																					
Moldova [11)12)]	55	53	56	49	48	483	478	474	496	476	453	468	279	218	170	192	170	210	153	150	150
Monaco											3	3	3	3	3	3	2	2	2		
Netherlands [13]	1530	1418	1374	1354	1357	1381	1252	1192	1179	1131	1143	1025	983	960	907	892	903	749	724		
Norway	822	815	824	816	842	844	872	832	869	823	820	759	750	745	737	699	669	634	611		
Poland											7406		7083	8655	5115	4547	4837	4700	4301		
Portugal [14]											1041	1107	1216	1259	1295	1323	1386				
Romania	3245	3217	3152	3030	3463	3307	3378	3196	3317	3314	3186	2695	2506	2434	2325						
Russian Federation [2]	13520	15005	13617	13696	13672	14122	13142	13119	12988	12054	13174	12869	11574	11193	10495	9846	9312	10262	10284		
Slovakia [3]										491	487	437	382	408	412	401	346	336	313		
Slovenia	68	66	63	61	64	68	78	79	75	75	81	78	78	87	93	91	95	93	77	62	53
Spain [2]	3670	3542	3509	3539	3513	3475	3526	3633	3824	4000	3898	3992	4078	3885	3859	3448	3662				
Sweden											1210	1212	1176	1148	1142	1088	1082	962	1004	600	450
Switzerland	1280				621	990					707	665	621	578	549	510	485	458	432	369	370
Turkey [1]	2564	2575	2710	2769	2740	2718	2862	3067	3197	3216	3318	3283	3415	3677	3590	3599	3713	3729	3632	9105	10986
Ukraine						9832	9722	9269	9085	8794	8141	7406	5496	4218	3375	2906	2567	2516		8141	8141
United Kingdom	7524	7493	7501	7285	7297	7068	7067	7105	7161	7340	6938	6773	6399	5942	5665	5319	5299	4981	4757	1837	1378
United States	105872	102968	100690	105582	104711	104912	100157	98774	106295	94754	89372	91503	88562	89043	93110	84682	86604	85635	81139	86304	88068
Yugoslavia																					
European Community																					

1) *Sum of sector data*
2) *Figures apply to the European part within EMEP*
3) *Data for 1998 are provisional*
4) *Emission levels include estimated impacts of planned reduction initiatives*
5) *Emissions for 1980-1986 are not updated*
6) *Emissions from international air traffic, marine bunkers and managed forests are not included*
7) *Emissions from 1990 and onwards are distributed according to SNAP90 nomenclature*
8) *Emissions in 1980 and 1981 are assumed to be similar to 1982 due to lack of data*
9) *Projections for 2010 as negotiated in the Gothenburg Protocol*
10) *Emissions for 1990-1998 are recalculated*
11) *Since 1993 emissions located on the left side of Dniester 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.*
12) *Emissions for 1980-1984 do not include mobile sources*
13) *Recalculations based on new methodology from 1996 onwards*
14) *The 1991-1996 emissions were updated using the categories of SNAP 97*

a) *The figure refers to Skopje only*

Table 6. Anthropogenic emissions of methane (1980-2010) in the ECE region (thousands of tonnes of CH_4 per year)

Party/Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	2005	2010	
Armenia												152										
Austria	528	531	531	535	540	539	540	535	535	537	537	527	514	508	500	489	481	469	459			
Belarus												955					429				930	1000
Belgium [2]												590	594	592	599	598	597	597	590	587		
Bosnia and Herzegovina																						
Bulgaria									646	660	638	757	582	624	664	528	511	495	533	553	420	420
Canada	2072	2682	2739	2759	2785	2847	2691	2801	2934	2987	3500	3600	3800	3900	4000	4100	4300	4300				
Croatia [3]												169	159	144	147	138	134	134	127	123	150	150
Cyprus																						
Czech Republic												779	710	668	633	614	599	573	562	529		
Denmark	328	333	333	330	328	318	313	302	299	301	279	281	281	285	282	281	279	272	287	256	248	
Estonia												105	101	91	80	80	68	63	103	101		
Finland [2]												298	279	252	229	222	223	216	208	197		
France [2]												2870	2869	2829	2821	2761	2699	2569	2470	2457		
FYR Macedonia																						
Georgia	379	374	382	387	396	411	416	411	394	383	356	309	242	189	163	151	155	167				
Germany [5)6)]	6117	6020	5914	5839	5803	5918	5875	5607	5533	5516	5571	5013	4654	4267	4022	3893	3555	3517	3484	3004	2628	
Greece												438	440	440	441	446	456	453	457	465		
Hungary [2]	1115					1172						1215	1134	1243	1165	1122	1210	1176	1131	1010	1000	900
Iceland [6]	15	15	15	14	14	15	14	14	13	13	14	13	13	13	13	13	13	13	13	13	3	
Ireland [7)8)]												602	608	610	613	616	623	634	643	637		
Italy	2176	2172	2151	2234	2206	2231	2276	2313	2344	2330	2341	2390	2362	2461	2559	2555	2316	2351				
Latvia												186	183	150	105	98	101	93	102	97	110	119
Liechtenstein	0.74				0.71						0.70									0.5		
Lithuania [8]	256	272	250	276	295	301	309	313	310	298	281	296	275	265	263	260	247	263	274	332	332	
Luxembourg												24				22	23	24	24	23		26
Malta																						
Moldova [9]												187	171	150	130	122	118	114	114	100		
Monaco												0.05	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06		
Netherlands [10]	971	875	876	1009	1039	1177	1049	1047	1024	1039	1293	1300	1253	1223	1203	1173	1233	1110	1070			
Norway	261							296	296	309	315	320	327	332	340	343	346	351	346			23
Poland											5715		3647	2990	1841	1792	2154	2145	2043			
Portugal [11]												903	909	905	895	913	917	921				
Romania	2302	2272	2127	2181	2254	2217	2384	2641	2444	2265	1864	1634	1462	1462	1442							
Russian Federation [1)13)]	5462	5414	5396	5423	5441	5427	5400	5428	5358	5312	5174	4923	4649	3680	3542	3400	3136	2902	2474			
Slovakia [2]												363	333	303	287	280	288	297	284	268		
Slovenia									90			169	171	162	164	162	166	166	164	164	168	116
Spain 1	1109	1146	1243	1269	1290	1311	1422	1507	1520	1613	1624	1650	1686	1710	1754	1796	1890					
Sweden												324	325	321	321	303	297	297	260	256	271	262
Switzerland	312				239	287						244	233	231	229		235	235	232	231	211	192
Turkey [12]	143	144	155	161	163	175	182	194	190	195	173	196	203	244	206	331	383	435	130	169	174	
Ukraine																						
United Kingdom	3910	3906	3930	3947	3227	3760	3939	3883	3819	3752	3677	3627	3533	3179	2944	2917	2854	2763	2636	3227	2852	
United States											31055	31022	31329	31203	31711	32147	31972	32082	31594			
Yugoslavia																						
European Community																						

1) *Figures apply to the European part within EMEP*
2) *Data for 1998 are provisional*
3) *Emissions from 1990 and onwards are distributed according to SNAP90 nomenclature*
4) *Emissions for 1980-1997 have been changed compared to those previously reported, mainly due to new knowledge changing emissions from manure management to a IPCC Tier-2 approach based on a cool climate.*
5) *Emissions for 1980-86 are not updated*
5) *Emissions from international air traffic, marine bunkers and managed forests are not included*
6) *Emissions in 1980 and 1981 are assumed to be similar to 1982 due to lack of data*
7) *Projections for 2010 as negotiated in the Gothenburg Protocol*
8) *Emissions for 1990-98 are recalculated*
9) *Since 1993 emissions located on the left side of Dniester 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.*
10) *Recalculations based on new methodology from 1996 onwards*
11) *The 1990-1996 emissions were updated using the categories of SNAP 97*
12) *Sum of sector data*
13) *Since 1995 emissions from wetlands, livestock and poultry are refined by application of the CORINAIR guidebook (edition 1996)*

Table 7. Anthropogenic emissions of carbon dioxide (1980-2010) in the ECE region (millions of tonnes CO_2 per year)

Party/Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	2005	2010	
Armenia												21										
Austria		63	59	57	56	58	59	58	59	57	57	62	66	60	59	61	63	65	66	66		54
Belarus												101				67	61			64	86	96
Belgium [3]												116	120	118	109	113	126	129	126	126		
Bosnia and Herzegovina																						
Bulgaria										92		76		62		63					88	101
Canada [4]		440	442	401	387	404	421	416	434	466	490	461	452	466	467	480	495	508	520			
Croatia												23	18	17	17	18	17	18	19	20	30	23
Cyprus						3	3	3	4	4	4	5	5	5	5	6	6	6	6	6	8	9
Czech Republic [5]		196					180	179	178	173	170	163	148	134	129	124	123	129	130	125	148	161
Denmark		65	56	59	55	57	64	65	63	59	54	53	63	58	59	63	60	73	64	60	57	60
Estonia [6]												38	37	28	22	23	21	21	21	19		
Finland [3]		54	45	43	42	43	50	48	52	52	52	59	59	57	57	63	61	67	65	63		
France [3]		443	387	370	349	337	331	315	312	312	325	328	354	339	313	310	317	328	320	341		
FYR Macedonia																						
Georgia		34	36	37	39	39	39	36	36	36	34	36	28	17	10	7	5	8	9			
Germany [7][8]		1105	1083	1045	1042	1070	1076	1084	1074	1059	1039	1015	976	928	918	904	903	924	892	886		
Greece [2]		48					59	58	63	67	72	85	85	86	87	88	90	92	96	100		
Hungary [3]		92	92	92	91	90	89	87	87	84	81	74	67	61	61	59	60	67	64	61	73	77
Iceland [9]		1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Ireland [10][11]												26	27	27	26	28	28	29	30	33		
Italy		364	352	345	339	342	345	363	377	391	403	412	404	415	403	391	416	437	438			
Latvia [12]												25	20	16	15	12	12	11	13	8	15	18
Liechtenstein		0.15	0.15	0.13	0.13	0.15	0.18	0.17	0.18	0.18	0.20	0.21	0.21	0.22	0.22	0.22					0.26	
Lithuania [11]		46	46	45	45	44	45	46	47	47	46	42	45	29	25	25	18	19	19	19	38	35
Luxembourg							11					10				9	7	7	6	5		6
Moldova [13]												29	28	19	17	10	8	8	8	9		
Monaco												0.11	0.13	0.13	0.14	0.14	0.14	0.14	0.14	0.14		
Netherlands [14]		167					150					165	171	169	172	174	182	190	183	181		
Norway		32	31	30	31	33	31	34	33	35	34	35	33	34	35	37	38	41	41	41		49
Poland										477	488	407	397	393	348	348	338	373	362	338		
Portugal [15]												55	58	62	60	61	64	65				
Romania		184	184	180	184	193	189	195	196	201	198	171	141	126	123	121						
Russian Federation [1]		1400	1425	1450	1475	1500	1560	1600	1700	1650	1725	1670	1630	1630	1450	1580	1500	1500	1500	1500		
Slovakia [3]										63		62	55	50	48	45	47	47	46	45		
Slovenia		14	15	15	15	15	14	16	14	14	14	15	13	13	14	14	15	16	16	16	17	14
Spain [1]		191	193	192	194	184	183	184	187	183	212	216	224	233	221	233	243	230				
Sweden		82	74	69	64	63	67	68	67	63	64	55	55	56	56	58	58	63	56	57	62	64
Switzerland [16]												45										
Turkey [17]		116	41	41	41	41	143	153	194	197	208	222	227	233	244	244	257	277	291	199	348	487
Ukraine																						
United Kingdom												616	620	605	589	586	577	569	570	574	619	620
United States												3753	3703	3793	4291	4372	4416	4601	4676	4704		
Yugoslavia																						
European Community		2850	2715	2620	2575	2605	2660	2700	2600		2765											

1) Figures apply to the European part within EMEP
2) Emissions reported for 1980-1985 are to be regarded as indications only, and are not comparable to the emissions reported after 1988
3) Data for 1998 are provisional
4) Includes emissions from marine air bunkers
5) According to IPCC methodology (including removals from Land Use Change and Forestry)
6) Man –made emissions, excluded removal emissions from Land-Use Change and Forestry (10 SNAP activity)
7) Emissions for 1986 are not updated
8) Emissions from international air traffic, marine bunkers and managed forests are not included
9) Emissions in 1980 and 1981 are assumed to be similar to 1982 due to lack of data
10) Projections for 2010 as negotiated in the Gothenburg Protocol
11) Emissions for 1990-98 are recalculated
12) Do not include sink
13) Since 1993 emissions located on the left side of Dniester 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.
14) Recalculations based on new methodology from 1996 onwards
15) The 1991-1996 emissions were updated using the categories of SNAP 97
16) Figure for 1990 is without climatic correction
17) Sum of sector data

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			
	Year(s)	Aldrin	Chlor-dane	Clor-decone	Dieldrin	Endrin	Hepta-chlor	Hexabro mo-biphenyl	Mirex	Toxa-phene	HCH	DDT	PCBs	Dioxins & Furans	PAHs	HCB	PCP	SCCP	PER	TRI
Austria	1994	0 a)b)	0 a)b)	0 a)b)	0 a)b)	0 a)b)	0 a)b)		0 a)b)	0 a)b)	12000 a)b)	0 a)b)		28.6	477.4	0 c)	0 b)			
	1995	0 a)b)	0 a)b)	0 a)b)	0 a)b)	0 a)b)	0 a)b)		0 a)b)	0 a)b)	8056 a)b)	0 a)b)		31.0	520.8	0 c)	0 b)			
	1996	0 a)b)	0 a)b)	0 a)b)	0 a)b)	0 a)b)	0 a)b)		0 a)b)	0 a)b)	8640 a)b)	0 a)b)		30.5	534.0	0 c)	0 b)			
	1997	0 a)b)	0 a)b)	0 a)b)	0 a)b)	0 a)b)	0 a)b)		0 a)b)	0 a)b)	2324 a)b)	0 a)b)		29.5	493.3	0 c)	0 b)			
	1998	0 a)b)	0 a)b)	0 a)b)	0 a)b)	0 a)b)	0 a)b)		0 a)b)	0 a)b)	0 a)b)	0 a)b)		28.7	479.5	0 c)	0 b)			
Belgium d	1990													448 1)	354.2 1)	487.6	5768.0			
	1993														294.1 1)					
	1994													147.56 4)	235.174	30.0 2)				
	1995										9765 2)			437.5	274.543	236.8	16 3)			
	1996										9765 2)			108.07	184.243	21.3 2)	6.0 2)			
	1997										9600 2)			122.627	187.377	25.0 2)	7.0 2)			
	1998 6)										9600 2)			123.187	185.789	25.0 2)	7.0 2)			
Bulgaria	1990										0		258.4	554.196	677.32	544	49.30			
	1995										0		382.1	456.000	521.43	79	10.72			
	1996										0		261.7	340.935	487.509	87	10.61			
	1997												226.9	309.576	420.520	47	7.54			
	1998										0		252.8	288.43	433.940	75.6	9.07			
Croatia j	1990										9400			178.64	15.11					
	1996										12800			97.35	9.30	0	0			
	1997										3100			95.04	9.17					
	1998										5000			110.77	8.59					
Cyprus	1990													772			0.7			
Czech Republic	1990												772.9	1251.65	751.63					
	1991												772.0	1219.94	747.02					
	1992												741.3	1219.78	1131.13					
	1993												643.6	1140.42	1114.73					
	1994												629.8	1135.27	951.39					
	1995												622.8	1135.04	1357.23					
	1996												554.5	921.53	971.4					
	1997												447.8	830.22	657.38					
	1998												457.6	766.73	656.74					
Denmark	1994										61.0			15	9848					
	1995	0	0	0	0	0	0		0	0		0		14	10360					
	1996													21	11375					
	1997	0	0	0	0	0	0	0	0	0		0		20	11151	0				
	1998	0	0	0	0	0	0	0	0	0	0	0	0	20	10490	0	0	0		
Estonia	1990														0.308 k)					
	1991														0.290					
	1992														0.172					
	1993														0.182					
	1994														0.183					
	1995														0.188					
	1996														0.191					
	1997														0.197					
	1998														0.213					
Finland e																				
France m	1990	0	0	0	0	0	0	0	0	0	0	0	56	2028	1835	0	0	80.0	19.	29.
	1991	0	0	0	0	0	0	0	0	0	0	0	63	2024	2221	0	0	70.6	17.	26.
	1992	0	0	0	0	0	0	0	0	0	0	0	63	2007	2062	0	0	60.9	13.	23.
	1993	0	0	0	0	0	0	0	0	0	0	0	64	1921	2061	0	0	52.3	12.	20.
	1994	0	0	0	0	0	0	0	0	0	0	0	62	1911	1830	0	0	50.9	13.	19.
	1995	0	0	0	0	0	0	0	0	0	0	0	58	1728	1889	0	0	47.9	12.	21.
	1996	0	0	0	0	0	0	0	0	0	0	0	58	1599	2074	0	0	43.1	11.	21.

		ANNEX I									ANNEX II			ANNEX III			OTHER			
	Year(s)	Aldrin	Chlor-dane	Clor-decone	Dieldrin	Endrin	Hepta-chlor	Hexabro mo-biphenyl	Mirex	Toxa-phene	HCH	DDT	PCBs	Dioxins & Furans	PAHs	HCB	PCP	SCCP	PER	TRI
France [m]	1997	0	0	0	0	0	0	0	0	0	0	0	56	1648	1876	0	0	40.4	11.	21.
	1998 [t]	0	0	0	0	0	0	0	0	0	0	0	58	1660	1877	0	0	40.4	11.	21.
Germany[n]	1990																			
	1995																			
Greece[1]																				
Hungary	1985												169	215	158	0.486	0.036			
	1990										9281		135	180.58	132.33	0.304	0.022			
	1991										60		120	159.67	121.62	0.506	0.038			
	1992										12		108	121.77	86.87	0.678	0.050			
	1993										462		106	120.98	80.71	0.632	0.047			
	1994										798		105	114.9	72.34	0.476	0.035			
	1995										1650		101	113.51	67.62	0.660	0.049			
	1996										2400		97.7	105.22	63.25	0.660	0.049			
	1997										31		976	103.32	60.48	0.678	0.050			
	1998										22		92.2	93.641	53.504	0.712	0.053			
Iceland	1990-97	0	0	0	0	0	0	?	0	0		0	?	?	0		?			
Lithuania	1997												12.45	5.620	71.205					
	1998												14.19	5.970	53.136					
Luxembourgh	1994													23	1093 [f]					
	1995													16	638 [f]					
	1996													16	732 [f]					
Moldova	1990														0.531					
	1991														0.459					
	1992														0.298					
	1993														0.201					
	1994														0.171					
	1995														0.171					
	1996														0.151					
	1997														0.152					
	1998														0.135					
Netherlands [n]	1990	0	0	0	0	0	0	0	0	0	0	0	0	618.000	172.000	0	0	8858000 [g]		
	1992	0	0	0	0	0	0	0	0	0	0	0	0	505.000						
	1994	0	0	0	0	0	0	0	0	0	0	0	.283	143.000	139.000	0	0	5631000 [g]		
	1995	0	0	0	0	0	0	0	0	0	0	0	.015	74.200	128.000	0	0	4755000[g]		
	1996										0			60.700	109.000	0	0	4036600 [g]		
	1997										0			55.300	107.000	2.10	0	3533200 [g]		
	1998													43.600	106.000	2.10		3257000 [g]		
Norway [t]	1995		0											125	172	172	63			
	1996													0.105	167	0.2	0.1	766800 [g]		
	1997													105.00	167.000	200	100			
Poland	1990	0	0	0	0	0	0		0	0		0	2373	368.300	163.36	0				
	1991													349.2	178.38					
	1992													338.1	175.59					
	1993													396.6	169.96					
	1994													360.9	235.90					
	1995	0	0	0	0	0	0		0	0		0	2338	387.7	242.3	0				
	1996	0	0	0	0	0	0		0	0		0	2342	366.2	229.605	0				
	1997	0	0	0	0	0	0		0	0		0	2386	347.742	201.159	0				
	1998	0	0	0	0	0	0		0	0		0	2312	290.353	181.044	0				
Russian Federation[h]	1990										923.0			991	18.26	1.6				
	1991													947	17.30	1.6				
	1992													901	15.60	1.6				
	1993													878	15.29	1.7				
	1994													825	15.45	1.6				
	1995													769	15.28	1.3				
	1996													637	15.02	1.1				
	1997													614	14.99	0.98				
	1998													606	14.71	0.95				

		ANNEX I									ANNEX II			ANNEX III			OTHER			
	Year(s)	Aldrin	Chlor-dane	Clor-decone	Dieldrin	Endrin	Hepta-chlor	Hexabro mo-biphenyl	Mirex	Toxa-phene	HCH	DDT	PCBs	Dioxins & Furans	PAHs	HCB	PCP	SCCP	PER	TRI
Slovakia	1990												161.4	495.9	77.8					
	1995												138.9	653.4	30.1					
	1997												136.7	464.5	29.4					
Spain	1990													181	301052	9227	69			
	1991													190	307113	8641	70			
	1992													200	284282	14703	73			
	1993													196	288017	7065	74			
	1994													185	281235	7733	74			
	1995													157	232746	6088	76			
	1996													155	252123	6065	72			
Sweden	1990																			
	1992																			
	1993																			
	1995																			
Switzerland	1990																			
	1991																			
	1992																			
	1993																			
	1994																			
	1995																			
	1996																			
	1997																			
Ukraine °	1997														2.948					
	1998														0.770					
United Kingdom	1990	0	0	0	0	0	0	0	0	0	99023.	0	6975.	1029.7	235.0	1266.9	538010			
	1991	0	0	0	0	0	0	0	0	0	8533.5	0	6400.	1015.4	221.6	1258.6	537813			
	1992	0	0	0	0	0	0	0	0	0	74016.	0	5901.	993.02	199.9	1280.1	537812			
	1993	0	0	0	0	0	0	0	0	0	64603.	0	5406	951.49	150.6	1255.2	529774			
	1994	0	0	0	0	0	0	0	0	0	56733.	0	4845.	853.18	140.1	1240.3	518779			
	1995	0	0	0	0	0	0	0	0	0	50114.	0	4290.	723.57	113.6	1247.7	511032			
	1996	0	0	0	0	0	0	0	0	0	44518.	0	3749.	490.31	58.0	1240.9	503462			
	1997	0	0	0	0	0	0	0	0	0	39760.	0	3247.	278.97	50.06	892.76	496162			
	1998	0	0	0	0	0	0	0	0	0	35695.	0	2747	276.50	46.68	892.76	489219			
United States	1990												45.4	234	15642	1434	5639			
	1996		300				82			1	235		209.	252	14238	908	5811			

a) Figures related to use as pesticide in agriculture
b) Possible indirect emissions (from soil, imported cotton, …) not taken into account
c) Not used as pesticide in agriculture
d) Referring to: [1] Flanders only; [2] Wallonia only; [3] Figures for Flanders and Wallonia only. [4] Brussels and Wallonia only. [5] Brussels and Flanders only. [6] Data for 1998 are provisional.
e) Finland has started a new major analysis of POPs. Figures will be reported during the next reporting round
f) Including source categories: SNAP 1, 2, 3, 4.
g) Including TCM, TRI, PER, TCE.
h) Figures are calculated by TNO.
i) POP emissions are not available. The use of pesticides listed in the table has been forbidden since 1972.
j) Emissions are distributed according to SNAP94 nomenclature
k) Emissions from mobile sources
l) Provisional figures
m) Emissions within the EMEP area
n) PAH according to Borneff 6
o) Aldrin, Dieldrin, DDT, Endrin, Chlordan, Hexachlorobenzene, Heptachlor, HCH are pesticides prohibited for use in agriculture since 1997Mirex and Toxaphene are not used, imported or exported

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

		PRIORITY METALS			OTHER METALS					
	Year(s)	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	0.				0.	0.	0.		
	1998	.010				.008	.005	.007		.001
Austria	1985	320.16	4.81	4.29						
	1990	201.42	3.09	2.63						
	1994				3.3	6.6	9.2	35.5	4.7	208.4
	1995	38.45	1.63	1.41						
	1998	35.65	1.58	1.49						
Belarus	1990	797.63	7.59	.480	13.15	29.24	34.98	601.89		210.48
	1995	148.35	3.48	.265	4.48	14.10	19.11	246.36		121.66
	1996	46.34	1.20	.297	3.66	8.68	13.89	202.74		122.26
	1997	42.20	1.25	.310	3.07	8.27	15.10	167.05		159.28
	1998	41.24	1.45	.392	2.96	7.91	13.64	154.28		177.87
Belgium [a]	1990	601.294	9.515	8.794	10.45	53.98	52.262	106.492	21.354	370.465
	1991	218.00	3.00	2.00	1.00	12.00	6.00	10.00	.00	135.00
	1992	230.00	4.00	3.00	3.00	11.00	20.00	9.00	.10	97.00
	1993	230.00	1.00	1.00	2.00	22.00	22.00	11.00	3.00	86.00
	1994	325.435	4.397	5.824	4.625	26.82	45.691	52.643	23.455	241.593
	1995	336.075	6.379	4.544	6.393	48.32	55.704	46.734	18.802	286.529
	1996	301.962	4.618	5.546	5.220	32.09	33.191	57.679	7.657	219.948
	1997	290.754	4.599	3.520	5.212	28.12	29.167	48.659	10.193	177.366
	1998	210.489	3.599	3.520	5.212	23.13	28.167	36.659	10.193	175.368
Bulgaria	1990	435.85	28.25	13.20						
	1995	297.49	12.82	6.88						
	1996	278.81	14.33	4.70						
	1997	231.24	14.23	4.31						
	1998	250.78	14.87	4.69						
Croatia [j]	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
Cyprus [b]	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								
Czech Republic [k]	1990	269.44	4.34	7.52						
	1991	240.02	3.92	7.42						
	1992	247.02	3.61	7.28						
	1993	232.01	3.48	7.46						
	1994	202.49	3.52	7.17						
	1995	179.74	3.55	7.40						
	1996	165.43	2.94	5.86						
	1997	179.67	3.00	5.54						
	1998	169.24	2.65	5.16						
Denmark [c]	1990	124.23	1.12	3.17	1.45	6.20	9.67	26.48	4.23	34.35
	1994	45.63	1.16	8.20	1.33	4.72	14.97	27.46	2.93	56.32
	1996	20.121	1.085	2.677	1.270	3.399	10.447	25.396	3.586	36.103.
	1997	8.55	.78	2.12	.87	3.10	9.24	20.48	3.20	25.42
	1998	7.83	.78	1.95	.85	2.70	9.38	18.91	2.83	22.95
Estonia	1990	172.3	.2	.02	8.1	8.2	1.7	4.4	.2	29.3
	1991	153.8	.1	.01	7.7	7.9	1.7	4.2	.2	27.5
	1992	78.444	.1	.01	7.2	7.79	1.648	3.9	.2	26.773
	1993	68.739	.1	.01	5.6	6.19	1.241	3.1	.1	21.469
	1994	69.517	.1	.01	4.8	5.08	1.033	2.651	.1	17.635
	1995	51.528	.1	.01	4.0	3.98	.841	2.167	.1	16.763
	1996	42.838	.1	.008	4.3	4.24	2.344	2.352	.1	16.343
	1997	33.030	.1	.007	3.8	3.87	2.255	2.068	.1	14.329
	1998	20.921	.1	.01	3.5	3.37	2.158	1.929	.1	13.230
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	16.0	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	9.4	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
France [l]	1990	4576.	16.	43.	24.	376.	92.	280.	11.	1938.
	1991	3080.	16.	46.	24.	319.	93.	329.	11.	1778.
	1992	2210.	15.	46.	23.	269.	92.	273.	11.	1622.
	1993	1946.	15.	44.	20.	209.	90.	232.	10.	1421.
	1994	1768.	14.	42.	21.	184.	90.	220.	11.	1349.
	1995	1605.	13.	38.	21.	194.	90.	229.	11.	1297.
	1996	1413.	14.	36.	20.	199.	90.	232.	11.	1314.

		PRIORITY METALS			OTHER METALS					
	Year(s)	Lead	Cadmium	Mercury	Arsenic	Chromium	Copper	Nickel	Selenium	Zinc
France [1]	1997	1296.	14.	34.	20.	229.	90.	223.	12.	1455.
	1998[A]	1190.	14.	36.	22.	240.	91.	225.	12.	1505.
Germany [d]	1985	5028.0	45.0	154.0	221.0	344.0	459.0	440.0	115.0	1900.0
	1990	2323.	31.	113.	122.	253.	361.	278.	27.	1323.
	1995	632.	11.	31.	32.	115.	79.	158.	25.	451.
	2010	294.0	11.0	24.0						
Greece	1996[A]	470.00	3.00	13.00	4.00	10.00	14.00	101.00	.20	52.00
Hungary	1985	573.4	6.8	8.6	22.5	22.5	36.8	74.1	4.8	101.1
	1990	695.3	5.6	6.8	16.0	16.5	28.2	42.5	3.4	99.2
	1991	522.8	4.7	6.0	14.5	14.9	23.9	49.0	3.2	71.8
	1992	241.6	4.0	4.9	10.2	11.8	18.3	48.7	2.8	61.5
	1993	217.7	4.1	5.0	10.1	12.2	18.2	57.2	2.9	67.5
	1994	189.6	4.1	4.9	9.7	11.9	16.8	54.1	2.8	47.4
	1995	153.7	3.8	4.8	8.8	10.9	15.7	50.1	2.5	47.9
	1996	126.4	3.4	4.6	8.3	10.0	14.5	42.9	2.3	45.4
	1997	118.7	3.3	4.5	7.3	9.2	14.7	46.6	2.1	45.0
	1998	82.2	3.1	4.5	6.1	7.4	14.6	45.9	1.9	39.4
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	4299.80	53.786	19.975						
	1994	2173.80	29.898	13.228						
Latvia	1990	20.30 [e]	2.46	.37						
	1991	10.10 [e]	1.79	.32						
	1992	7.94 [e]	1.71	.27						
	1993	6.18 [e]	1.68	.22						
	1994	10.30 [e]	2.2	.37						
	1995	4.69 [e]	1.44	.17						
	1996	4.12 [e]	.36	.1						
	1997	2.74 [e]	.44	.14						
	1998	3.5 [e]	.77	.23						
Lithuania [f]	1990	46.7	3.8	0.018	3.4	7.4	11.7	95.6		59.1
	1991	48.8	2.8	0.016	2.1	4.6	10.5	57.4		55.2
	1992	32.4	2.5	0.011	2.1	4.6	6.8	59.9		30.0
	1993	28.2	2.3	0.014	2.0	4.4	5.7	57.0		13.2
	1994	33.0	2.1	0.013	1.9	4.3	3.7	57.8		8.9
	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[A]	21.78	2.59	.245	1.85	5.07	9.18	62.40		78.71
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						
Moldova	1990	286.6	1.082	.253	.393	1.177	4.787	3.635	.144	42.093
	1991	219.9	.851	.227	.325	.952	3.049	1.955	.120	36.525
	1992	119.9	.251	.178	.249	.913	2.501	1.734	.109	34.312
	1993	74.1	.220	.148	.240	.767	1.790	2.050	.101	26.110
	1994	27.1	.049	.114	.189	.172	1.203	1.044	.055	1.185
	1995	26.8	.041	.041	.084	.088	1.110	.634	.039	.920
	1996	29.6	.036	.040	.084	.085	.999	.609	.030	.819
	1997	17.8	.062	.019	.041	.052	.978	.479	.025	.844
	1998	19.4	.040	.013	.032	.032	.800	.289	.022	.636
Netherlands	1990	272.00	2.38	3.00	1.63	12.10	44.90	84.80	.396	331.00
	1991	251.00	2.33	2.74		11.50	46.90	85.70		325.00
	1992	233.00	2.33	2.75	1.50	11.30	48.70	96.50	.40	317.00
	1993	213.00	1.84	2.57		13.80	49.90	90.30		270.00
	1994	164.00	1.68	1.54	1.81	10.40	50.70	95.60	.30	277.00
	1995	152.00	1.51	1.04	1.38	9.23	50.40	96.90	.30	270.10
	1996	106.00	1.83	1.04	1.29	7.51	43.40	95.60	.541	267.00
	1997	72.1	1.88	.759	1.37	6.32	47.	85.1	.332	251.
	1998	54.6	1.67	.718	1.29	6.43	47.9	86.8	.396	254.
Norway [A]	1980	624.								
	1981	577.								
	1982	651.								
	1983	559.								
	1984	401.								
	1985	406.	1.1							
	1986	341.	.0							
	1987	294.	.0							
	1988	293.	.0							
	1989	276.	1.2							
	1990	228.	1.2							
	1991	183.	1.2							
	1992	149.	1.1							
	1993	105.	1.1							
	1994	20.	.6							
	1995	14.	.6							
	1996	7.	.6							
	1997	6.	.6	.700			9.100			
	1998	6.	.7							
Poland	1990	1371.70	91.60	33.30	82.10	154.60	599.40	370.00		3091.5

		PRIORITY METALS			OTHER METALS					
	Year(s)	Lead	Cadmium	Mercury	Arsenic	Chromium	Copper	Nickel	Selenium	Zinc
Poland	1991	1335.60	85.00	32.70	79.80	133.50	530.40	354.80		2780.9
	1992	986.00	84.10	31.90	78.90	121.60	497.30	349.80		2677.5
	1993	996.90	91.90	32.50	82.40	127.80	511.00	352.90		2829.9
	1994	966.10	85.80	32.40	76.20	120.00	478.30	322.50		2623.7
	1995	936.60	82.60	32.30	73.40	118.30	464.90	312.30		2580.2
	1996	959.70	91.20	33.60	75.60	117.00	494.80	328.30		2749.0
	1997	895.80	85.80	33.00	71.00	116.00	475.10	364.90		2579.6
	1998	736.	55.4	29.5	54.3	89.8	388.7	251.3		2191.4
Russian Federation	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						
Slovakia	1990	166.10	9.70	12.50	150.30	74.50	103.40	78.00	8.90	110.80
	1992	182.00	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
Slovenia	1990	460.18	1.68	.76						
	1991	386.00								
	1992	390.00								
	1993	398.00								
	1994	405.62	1.66	.61						
	1995	195.51	1.71	.65						
	1996	99.00	1.77	.59						
	1997	80.38	1.75	.61						
	1998	60.47	1.67	.63						
Spain	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	540.00	2.00	1.50	6.00	23.00	27.00	26.00		230.00
	1992	365.00	1.30	1.20	4.00	20.00	30.00	25.00		195.00
	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		138.00
Switzerland [g]	1980	1760	6.35	7.93						1280
	1985	768	4.74	7.84						925
	1990	520.00	4.20	6.80						861.00
	1991	461.00	3.90	6.10						814.00
	1992	401.00	3.60	5.40						767.00
	1993	341.00	3.10	4.70						719.00
	1994	287.00	2.70	4.00						674.00
	1995	226.00	2.50	3.30						629.00
	1996	199.70	2.30	3.10						609.20
	1997	173.90	2.20	2.90						589.60
	1998	148.60	2.25	2.75						570.60
Ukraine [h]	1995									
United Kingdom [i]	1985	7234	31.8	32.3						
	1990	2964.14	25.72	31.36	93.39	132.79	129.85	460.61	131.27	1544.9
	1991	2678.91	25.11	32.17	96.26	127.82	122.57	483.91	131.24	1426.9
	1992	2464.56	25.81	30.60	94.15	124.23	115.31	486.50	126.00	1441.1
	1993	2245.01	25.72	24.48	90.33	114.91	108.76	475.13	115.67	1419.8
	1994	1982.79	24.36	23.62	80.44	107.29	101.12	441.63	108.26	1368.8
	1995	1647.71	15.68	18.18	67.17	90.27	83.63	366.99	95.38	1207.1
	1996	1433.56	15.05	14.62	63.22	81.43	75.03	333.28	94.89	1157.5
	1997	1311.17	14.46	12.87	56.33	68.09	60.63	258.13	83.96	1134.1
	1998	1032.58	12.96	12.37	50.60	62.12	58.76	234.46	85.81	1046.8
	2010	340	12.3	12.3						
United States	1990[m]	2979.	179.		259.	807.		1197.	319.	
	1991	3781.489								
	1992	3455.047								
	1993	3548.322								
	1994	3667.831								
	1995	3577.29		146.						
	1996[n]	2115.	176.			1044.		1098.	782.	

A) The reported figures are preliminary

a) Figures for 1990 refer to Flanders and Wallonie only. Figures for 1991-1993 are totals for Flanders only. Figures for 1998 are preliminary.

b) Figures for 1990 were calculated by TNO

c) Figures for 1990, 1997 and 1998 are based on updated emission factors.

d) 1985 data are totals for both Germany and former GDR

e) Emissions from gasoline are not included.

f) Figures for 1995-1998 are based on updated national emission factors.

g) Data for arsenic, chromium, copper, nickel and selenium will be communicated within the framework of CORINAIR 94.

h) 1995 total for heavy metals is 3225.2 tonnes.

i) Data for 1985 and 2010 are provisional.

j) Emissions is distributed according to SNAP90 nomenclature

k) Totals comprise contributions from: combustion processes, industrial processes and transport

l) Emissions within the EMEP area

m)1990-1993 baseline estimate as national summary- level inventory

n) Facility-level inventory

Table 10. Sulphur Oxides: Overview of national emission totals, sector data and gridded data[1] reported and stored at the UNECE/EMEP emission database at MSC-W

Totals	Sector data	Gridded 50kmx50km[1]
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	2005
Armenia	X--	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XX-	---
Austria	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	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--	X--	X--
Belgium	X--	X--	X--	X--	X--	XX-	X--	X--	X--	X--	XX-	XX-	XX-	XXX	XX-	XX-	XX-	XX-	XX-	X--
Bosnia and Herzegovina	---	---	---	---	---	---	---	---	---	---	X-X	---	---	---	---	---	---	---	---	---
Bulgaria	XX-	---	---	---	---	---	---	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XXX	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-
Croatia	X--	---	---	---	---	---	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	X
Cyprus	---	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-
Czech Republic	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	X--
Denmark	X-X	X--	X--	X--	X--	XX-	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	X--
Estonia	X--	---	---	---	---	X--	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	---
Finland	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	XXX	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XX-	---
France	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	X--
FYR Macedonia	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	-X-	---	---
Georgia	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-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	X--
Greece	X--	---	---	---	---	XX-	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	X--
Hungary	X--	X--	X--	X--	X--	XX-	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XX-	XX-	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--	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	X--
Italy	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	XX-	XX-	XX-	XX-	---	X--
Latvia	---	---	---	---	---	---	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XXX	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-	X--
Luxembourg	X--	---	---	X--	---	XX-	---	---	---	---	XX-	---	---	XX-	XX-	XX-	XX-	XX-	XX-	---
Malta	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Moldova	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	---
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-	---
Norway	XX-	X--	X--	X--	X--	XX-	X--	XX-	X--	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	---
Poland	X--	---	---	---	---	XX-	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	---
Portugal	X--	---	---	X--	---	X--	X--	X--	X--	---	XXX	XX-	XX-	XX-	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--	XX-	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XX-	X--
Slovakia	X--	---	---	---	---	X--	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XX-	X--
Slovenia	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	XX-
Spain	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	---	---	---
Sweden	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	XX-	XX-	XX-	XX-	X--	XXX	XX-	XX-	XX-	X--
Switzerland	X--	---	---	---	X--	X--	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	X--
Turkey	-X-	-X-	-X-	-X-	-X-	-X-	-X-	-X-	-X-	-X-	-X-	-X-	-X-	-X-	-X-	-X-	-X-	-X-	-X-	-X-
Ukraine	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	--X*	X--
United Kingdom	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	X--
United States	X--	X--	X--	X--	X--	XX-	X--	X--	X--	X--	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-
European Community	---	---	---	---	---	---	---	---	---	---	-X-	---	---	---	---	---	---	---	---	---

1) For gridded data only the **last emission year reported** are marked with X.

Table 1. Nitrogen oxides: Overview of national emission totals, sector data and gridded data[1] reported and stored at the UNECE/EMEP emission database at MSC-W

Totals	Sector data	Gridded 50kmx50km[1]
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	2005	2010
Armenia	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XX-	---	---
Austria	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	X--	X--
Belarus	X--	X--	X--	X--	X--	XX-	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XXX*	XX-	XX-	XX-	X--	X--
Belgium	X--	---	---	---	---	XX-	X--	X--	X--	X--	XX-	XX-	XXX	XX-	XX-	XX-	XX-	XX-	XX-	---	X--
Bosnia and Herzegovina	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Bulgaria	---	---	---	---	---	---	---	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	X--	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--	---	---	---	---	---	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	X--	X--
Cyprus	---	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-
Czech Republic	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	X--	X--
Denmark	X-X*	X--	X--	X--	X--	XX-	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	X--	X--
Estonia	---	---	---	---	---	---	---	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XX-	---	---
Finland	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XX-	X--	X--
France	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	X--	X--
FYR Macedonia	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	XX-	---	---	---
Georgia	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-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	X--	X--
Greece	---	---	---	---	---	XX-	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	---	X--
Hungary	X--	X--	X--	X--	X--	XX-	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	X--	X--	X--
Iceland	X--	X--	X--	X--	X--	X--	X--	XX-	X--	X--	XX-	XX-	XX-	XX-	XX-	XX-	X--	XX-	XX-	X--	X--
Ireland	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	X--	X--
Italy	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	XX-	XX-	XX-	XX-	---	X--	X--
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--	X--
Lithuania	X--	X--	X--	X--	X--	XX-	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	X--	X--
Luxembourg	X--	---	---	X--	---	XX-	---	---	---	---	XX-	---	---	-X-	XX-	XX-	XX-	XX-	XX-	---	X--
Malta	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Moldova	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	X--	X--
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-	X--	X--
Norway	XX-	X--	X--	X--	X--	XX-	X--	XX-	X--	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	---	X--
Poland	X--	---	---	---	---	XX-	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	---	X--
Portugal	X--	---	---	X--	---	X--	X--	X--	X--	---	XXX	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-	XXX	XX-	---	---
Slovakia	---	---	---	---	---	---	---	X--	---	X--	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XX-	---	---
Slovenia	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	XX-	XX-
Spain	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	---	---	---	---
Sweden	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	X--	X--
Switzerland	X--	---	---	---	X--	X--	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	X--	X--
Turkey	-X-	-X-	-X-	-X-	-X-	-X-	-X-	-X-	-X-	-X-	-X-	-X-	-X-	-X-	-X-	-X-	-X-	-X-	-X-	-X-	-X-
Ukraine	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	--X*	X--	X--
United Kingdom	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	X--	X--
United States	X--	X--	X--	X--	X--	XX-	X--	X--	X--	X--	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	---	---	---	---	---	---	---	---	---	---	-X-	---	---	---	---	---	---	---	---	---	---

1) For gridded data only the **last emission year reported** are marked with X

Table 12. Ammonia: Overview of national emission totals, sector data and gridded data[1] reported and stored at the UNECE/EMEP emission database at MSC-W

Totals	Sector data	Gridded 50kmx50km[1]
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	2005	2010
Armenia	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XX-	---	---
Austria	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	---	X--
Belarus	---	---	---	---	---	---	---	---	---	---	X--	---	---	---	X--	X-X*	X--	X--	X--	X--	X--
Belgium	---	---	---	---	---	XX-	---	---	---	---	XX-	XX-	XX-	XXX	XX-	XX-	XX-	XX-	XX-	---	X--
Bosnia and Herzegovina	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Bulgaria	---	---	---	---	---	---	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	X--	X--
Canada	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Croatia	---	---	---	---	---	---	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	X--	X--
Cyprus	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Czech Republic	---	---	---	---	---	---	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	---	---
Denmark	X--	X--	X--	X--	X--	XX-	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	---	---
Estonia	---	---	---	---	---	---	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	---	---
Finland	X--	---	---	---	---	---	X--	---	---	---	XX-	---	---	---	---	XXX	---	XX-	XX-	X--	X--
France	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	X--	X--
FYR Macedonia	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Georgia	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Germany	X--	X--	X--	X--	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	---	X--
Greece	---	---	---	---	---	---	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	---	X--
Hungary	X--	---	---	---	---	X--	X--	X--	---	X--	XX-	X--	X--	X--	XX-	XX-	XX-	XX-	X--	X--	X--
Iceland	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Ireland	---	---	---	---	---	---	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	X--	X--	X--
Italy	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	XX-	XX-	XX-	XX-	---	X--	X--
Latvia	---	---	---	---	---	---	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	---	---
Liechtenstein	X--	---	---	---	X--	---	---	---	---	---	X--	---	---	---	---	---	---	---	---	X--	X--
Lithuania	X--	X--	X--	X--	X--	XX-	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	X--	X--
Luxembourg	---	---	---	---	---	---	---	---	---	---	XX-	---	---	-X-	XX-	XX-	XX-	XX-	XX-	---	X--
Malta	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Moldova	XX-	---	---	---	---	XX-	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	---	X--
Monaco	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Netherlands	X--	X--	X--	X--	X--	XX-	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	X--	X--
Norway	XX-	X--	X--	X--	X--	X--	X--	XX-	X--	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	---	X--
Poland	X--	---	---	---	---	X--	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	---	X--
Portugal	---	---	---	---	---	---	---	---	---	---	XXX	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--	XX-	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XX-	---	---
Slovakia	---	---	---	---	---	---	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	---	---
Slovenia	---	---	---	---	---	---	---	---	---	---	XXX	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	X--
Spain	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	---	---	---	---
Sweden	---	---	---	---	---	---	---	---	X--	---	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	X--	X--
Switzerland	X--	---	---	---	X--	X--	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	X--	X--
Turkey	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Ukraine	---	---	---	---	---	---	---	---	---	---	XX-	-X-	-X-	-X-	-X-	XX-	XX-	-X-	--X*	---	---
United Kingdom	---	---	---	---	---	---	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	---	---
United States	---	---	---	---	---	X--	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-
Yugoslavia	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
European Community	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

1) For gridded data only the **last emission year reported** are marked with X

Table 13. Non-methane volatile organic compounds: Overview of national emission totals, sector data and gridded data[1] reported and stored at the UNECE/EMEP emission database at MSC-W

Totals	Sector data	Gridded 50kmx50km[1]
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	2005	2010
Armenia	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XX-		
Austria	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	X--	X--
Belarus	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-	XXX	XX-	XX-	XX-	XX-	XX-	---	X--
Bosnia and Herzegovina	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Bulgaria	---	---	---	---	---	---	---	---	XX-		XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	X--	X--
Canada	X--	---	---	---	---	XX-	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-
Croatia	---	---	---	---	---	---	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	X--	X--
Cyprus	---	---	---	---	---	---	---	---	---	---	--X	---	---	---	---	---	---	---	---	---	---
Czech Republic	---	---	---	---	---	X--	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	X--	X--
Denmark	X--	X--	X--	X--	X--	XX-	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	X--	X--
Estonia	---	---	---	---	---	X--	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	---	---
Finland	---	---	---	---	---	---	---	X--	X--	---	XX-	---	---	XX-	---	XX-	XX-	XXX	---	---	---
France	---	---	---	---	---	---	---	---	X--	X--	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	X--	X--
FYR Macedonia	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Georgia	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-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	X--	X--
Greece	---	---	---	---	---	XX-	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	---	X--
Hungary	X--	---	---	---	---	X--	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	X--	X--	X--
Iceland	X--	X--	X--	X--	X--	X--	X--	XX-	X--	X--	XX-	XX-	XX-	XX-	XX-	XX-	X--	XX-	XX-	X--	X--
Ireland	---	---	---	---	---	---	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	X--	X--
Italy	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	XX-	XX-	XX-	XX-	---	X--	X--
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--	X--
Lithuania	X--	X--	X--	X--	X--	XX-	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	X--	X--
Luxembourg	---	---	---	---	---	XX-	---	---	---	---	XX-	---	---	XX-	XX-	XX-	XX-	XX-	XX-	---	X--
Malta	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Moldova	---	---	---	---	---	X--	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	X--	X--
Monaco	---	---	---	---	---	---	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	---	---
Netherlands	X--	X--	X--	X--	X--	XX-	X--	X--	XX-	X--	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	---	X--
Norway	XX-	X--	X--	X--	X--	XX-	X--	XX-	X--	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	---	X--
Poland	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	---	X--
Portugal	---	---	---	---	---	X--	---	---	---	---	XXX	XX-	XX-	XX-	XX-	XX-	XX-	---	---	---	---
Romania	X--	X--	X--	X--	X--	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	-X-	---	---	---	---	---	---
Russian Federation	X--	X--	X--	X--	X--	XX-	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XX-	---	---
Slovakia	---	---	---	---	---	---	---	---	---	---	XX-	-X-	-X-	XX-	-X-	XX-	XX-	XX-	-X-	---	---
Slovenia	---	---	---	---	---	---	---	---	X--	---	XXX	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-	XXX	---	---	---	---
Sweden	---	---	---	---	---	X--	---	---	X--	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	X--	X--
Switzerland	X--	---	---	---	X--	X--	---	---	X--	---	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	X--	X--
Turkey	-X-	-X-	-X-	-X-	-X-	-X-	-X-	-X-	-X-	-X-	-X-	-X-	-X-	-X-	-X-	-X-	-X-	-X-	-X-	-X-	-X-
Ukraine	---	---	---	---	---	X--	X--	X--	X--	X--	-X-	-X-	-X-	-X-	-X-	-X-	-X-	-X-	--X*	X--	X--
United Kingdom	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	X--	X--
United States	---	---	---	---	---	-X-	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-
Yugoslavia	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
European Community	---	---	---	---	---	---	---	---	---	---	-X-	---	---	---	---	---	---	---	---	---	---

1) For gridded data only the **last emission year reported** are marked with X

Table 14. Carbon monoxide: Overview of national emission totals, sector data and gridded data[1] reported and stored at the UNECE/EMEP emission database at MSC-W

Totals	Sector data	Gridded 50kmx50km[1]
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	2005	2010
Armenia	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XX-	---	---
Austria	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	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--
Belgium	---	---	---	---	---	---	---	---	---	---	XX-	XX-	XX-	XXX	XX-	XX-	XX-	XX-	XX-	---	---
Bosnia and Herzegovina	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Bulgaria	---	---	---	---	---	---	---	X--	X--	X--	XX-	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-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	X--	X--
Cyprus	---	---	---	---	---	---	---	---	---	---	--X	---	---	---	---	---	---	---	---	---	---
Czech Republic	X--	---	X--	---	X--	X--	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	---	---
Denmark	X--	X--	X--	X--	X--	XX-	X--	X--	X--	X--	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-	---	---
Finland	X--	---	---	---	---	---	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	---	---
France	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	---	---
FYR Macedonia	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	-X-	---	---	---
Georgia	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-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	X--	---
Greece	---	---	---	---	---	---	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	---	---
Hungary	X--	---	---	---	---	X--	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XX-	X--	X--
Iceland	X--	X--	X--	X--	X--	X--	X--	XX-	X--	X--	XX-	XX-	XX-	XX-	XX-	XX-	X--	XX-	XX-	XX-	X--
Ireland	---	---	---	---	---	---	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	X--	X--
Italy	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	XX-	XX-	XX-	XX-	---	X--	X--
Latvia	---	---	---	---	---	---	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	X--	XX-
Liechtenstein	X--	X--	X--	X--	X--	XX-	X--	X--	X--	X--	XX-	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-	X--	X--
Luxembourg	---	---	---	---	---	XX-	---	---	---	---	XX-	---	---	-X-	XX-	XX-	XX-	XX-	XX-	-X-	X--
Malta	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Moldova	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	X--	X--
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-	---	---
Norway	XX-	X--	X--	X--	X--	XX-	X--	XX-	X--	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	-X-	---
Poland	---	---	---	---	---	---	---	---	---	---	X--	---	X--	XX-	XX-	XXX	XX-	XX-	XX-	---	---
Portugal	---	---	---	---	---	---	---	---	---	---	XXX	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--	XX-	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XX-	---	---
Slovakia	---	---	---	---	---	---	---	---	---	X--	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XX-	---	---
Slovenia	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	X--	XX-
Spain	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XX-	XXX	---	---	---	---
Sweden	---	---	---	---	---	---	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	X--
Switzerland	X--	---	---	---	X--	X--	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-	XX-	X--
Turkey	-X-	-X-	-X-	-X-	-X-	-X-	-X-	-X-	-X-	-X-	-X-	-X-	-X-	-X-	-X-	-X-	-X-	-X-	-X-	-X-	-X-
Ukraine	---	---	---	---	---	X--	X--	X--	X--	X--	XX-	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-	X--	X--
United States	X--	X--	X--	X--	X--	XX-	X--	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-
Yugoslavia	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
European Community	---	---	---	---	---	---	---	---	---	---	-X-	---	---	---	---	---	---	---	---	---	---

1) For gridded data only the **last emission year reported** are marked with X

Table 15. Heavy Metals: Overview of national emission totals, sector data and gridded data[1] 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
Armenia	---	---	---	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X--	X-X	X--
Austria	---	---	---	---	---	XX-	---	---	---	---	XX-	---	---	---	X--	XX-	---	---	XX-
Belarus	---	---	---	---	---	---	---	---	---	---	XX-	---	---	---	---	XX-	XX-	XX-	XX-
Belgium	---	---	---	---	---	---	---	---	---	---	X--	X--	X--	X--	X--	X--	XX-	XX-	XX-
Bosnia and Herzegovina	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Bulgaria	---	---	---	---	---	---	---	---	---	---	XX-	---	---	---	---	XX-	XX-	XX-	XX-
Canada	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Croatia	---	---	---	---	---	---	---	---	---	---	XX-	---	---	---	---	XX-	XX-	XXX	XXX
Cyprus	---	---	---	---	---	---	---	---	---	---	X--	X--	X--	X--	X--	X--	X--	X--	X--
Czech Republic	---	---	---	---	---	---	---	---	---	---	X--	X--	X--	X--	X--	X--	X--	X--	X--
Denmark	---	---	---	---	---	---	---	---	---	---	X--	---	---	---	X--	---	XX-	X--	XX-
Estonia	---	---	---	---	---	---	---	---	---	---	XX	XX-	XX-	XX-	XX-	XX-	XX-	XX	XX-
Finland	---	---	---	---	---	---	---	---	---	---	X--	X--	X--	X--	X--	X--	X--	X--	XX-
France	---	---	---	---	---	---	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-
FYR Macedonia	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Georgia	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Germany	---	---	---	---	---	---	---	---	---	---	XX-	---	---	---	---	XX-	---	---	---
Greece	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	XX-	---	---
Hungary	---	---	---	---	---	X--	---	---	---	---	X--	X--	X--	X--	XX-	XX-	XX-	XX-	X--
Iceland	---	---	---	---	---	---	---	---	---	---	X--	X--	X--	X--	X--	X--	X--	X--	X--
Ireland	---	---	---	---	---	---	---	---	---	---		---	---	---	---	---	---	---	---
Italy	---	---	---	---	---	---	---	---	---	---	X--	---	---	---	X--	---	---	---	---
Latvia	---	---	---	---	---	---	---	---	---	---	X--	X--	X--	X--	X--	X--	X--	X--	X--
Liechtenstein	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Lithuania	---	---	---	---	---	---	---	---	---	---	X--	X--	X--	X--	X--	XX-	XX-	XX-	XX-
Luxembourg	---	---	---	---	---	---	---	---	---	---	XX-	---	---	---	XX-	XX-	XX-	XX-	XX-
Malta	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Moldova	---	---	---	---	---	---	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX--	XX
Monaco	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Netherlands	---	---	---	---	---	---	---	---	---	---	X--	X--	X--	X--	X--	X--	XX-	XX-	XX-
Norway	XX-	X--	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-
Poland	---	---	---	---	---	---	---	---	---	---	X--	X--	X--	XX-	XX-	XX-	XX-	XX-	XX-
Portugal	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Romania	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Russian Federation	---	---	---	---	---	---	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-
Slovakia	---	---	---	---	---	---	---	---	---	---	X--	X--	X--	X--	X--	XX-	X--	X--	---
Slovenia	---	---	---	---	---	---	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-
Spain	---	---	---	---	---	---	---	---	---	---	XXX	XXX	XXX	XXX	XXX	XXX	XXX	---	---
Sweden	---	---	---	---	---	---	---	---	---	---	X--	---	X--	---	X--	X--	---	-X-	-X-
Switzerland	X--	---	---	---	---	X--	---	---	---	---	X--	X--	X--	X--	X--	X--	X--	X--	XX-
Turkey	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Ukraine	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
United Kingdom	---	---	---	---	---	X--	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-
United States	---	---	---	---	---	---	---	---	---	---	X--	X--	X--	X--	X--	X--	X--	---	---
Yugoslavia	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
European Community	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

1) For gridded data only the **last emission year reported** are marked with X

Table 16. Persistent Organic Pollutants: Overview of national emission totals, sector data and gridded data[1] 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
Armenia	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Austria	---	---	---	---	---	---	---	---	---	---	---	---	---	---	XX-	XX-	XX-	XX-	XX-
Belarus	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Belgium	---	---	---	---	---	---	---	---	---	---	X--	---	---	X--	X--	X--	X--	X--	X--
Bosnia and Herzegovina	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Bulgaria	---	---	---	---	---	---	---	---	---	---	XX-	---	---	---	---	XX-	XX-	XX-	XX-
Canada	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Croatia	---	---	---	---	---	---	---	---	---	---	XX-	---	---	---	---	---	XX-	XX-	XXX
Cyprus	---	---	---	---	---	---	---	---	---	---	X--	---	---	---	---	---	---	---	---
Czech Republic	---	---	---	---	---	---	---	---	---	---	X--	X--	X--	X--	X--	X--	X--	X--	X--
Denmark	---	---	---	---	---	---	---	---	---	---	---	---	---	---	X--	X--	X--	X--	X--
Estonia	---	---	---	---	---	---	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-
Finland	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
France	---	---	---	---	---	---	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XXX	XX-	XX-	XX-
FYR Macedonia	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Georgia	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Germany	---	---	---	---	---	---	---	---	---	---	XX-	---	---	---	-X-	XX-	---	---	---
Greece	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Hungary	---	---	---	---	---	X--	---	---	---	---	X--	X--	X--	X--	XX-	XX-	XX-	XX-	X--
Iceland	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Ireland	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Italy	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Latvia	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Liechtenstein	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Lithuania	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	X--	XX-
Luxembourg	---	---	---	---	---	---	---	---	---	---	-X-	---	---	---	XX-	XX-	XX-	-X-	-X-
Malta	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Moldova	---	---	---	---	---	---	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-
Monaco	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Netherlands	---	---	---	---	---	---	---	---	---	---	X--	---	X--	---	X--	X--	X--	XX-	XX-
Norway	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	X--	X--	XX-	---
Poland	---	---	---	---	---	---	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-
Portugal	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Romania	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Russian Federation	---	---	---	---	---	---	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-
Slovakia	---	---	---	---	---	---	---	---	---	---	XX-	---	---	---	---	XX-	---	XX-	---
Slovenia	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Spain	---	---	---	---	---	---	---	---	---	---	XXX	XXX	XXX	XXX	XXX	XXX	XXX	---	---
Sweden	---	---	---	---	---	---	---	---	---	---	X--	---	X--	X--	---	X--	---	-X-	-X-
Switzerland	---	---	---	---	---	---	---	---	---	---	X--	X--	X--	X--	X--	X--	X--	X--	---
Turkey	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Ukraine	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	X--	X--
United Kingdom	---	---	---	---	---	---	---	---	---	---	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-	XX-
United States	---	---	---	---	---	---	---	---	---	---	X--	---	---	---	---	---	X--	---	---
Yugoslavia	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
European Community	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

1) For gridded data only the **last emission year reported** are marked with

Table 17. Percentage reduction of 1990 level for SO_x, NO_x, NH_3 and NMVOC*

Parties to the Gothenburg Protocol	%	1998	1990	%	1998	1990	%	1998	1990	%	1998	1990
		SO_x			NO_x			NH_3			NMVOC	
Armenia [1]	95.4	3.31	72	76.1	10.95	46	-	-	25	79.0	16.94	81
Austria	49.4	46.01	91	11.9	169.91	193	10.0	71.9	80	30.8	237.93	344
Belarus [1]	70.1	190	637	42.4	164	285	-	-	-	44.8	294	533
Belgium	45.4	203	372	11.2	301	339	7.4	99	107	24.2	268	354
Bulgaria	37.6	1251	2008	38.2	223	361	54.1	66	144	39.1	132	217
Canada [2]	14.5	2766	3236	2.5	2051	2104	-	-	-	5	2736	2880
Croatia	50.2	89.5	180	13.6	76	88	37.0	23.3	37	25.2	78.5	105
Czech Republic	76.3	443	1876	44.3	413	742	48.7	80	156	38.1	269	435
Denmark	57.9	77	183	17.2	231	279	-4	104	100	27.5	129	178
Finland	65.3	90	260	16	252	300	0.52	37.8	38	16.7	174	209
France	33.9	837	1268	11.9	1652	1877	-1.7	827	813	22.5	1964	2535
Germany	75.7	1292	5321	34.2	1780	2709	18.3	625	765	47.1	1705	3225
Greece	-7.5	540	502	-17.1	382	326	6.3	74	79	-18.8	397	334
Hungary	41.4	591	1010	8.8	217	238	40.3	74	124	31.2	141	205
Ireland	5.3	176	186	-3.3	122	118	-13.3	127	112	-4.5	115	110
Italy	38.1	1021	1651	13.0	1685	1938	-0.2	467	466	5.5	2091	2213
Latvia	66.3	40	119	54.8	42	93	70.4	13	44	55.9	67	152
Liechtenstein	10.6	0.134	0.15	14.2	0.54	0.63	0	0.15	0.15	16.6	1.3	1.56
Lithuania	57.6	94	222	62.0	60	158	58.3	35	84	23.3	79	103
Luxembourg	73.3	4	15	26.0	17	23	0	7	7	31.5	13	19
Moldova	87.9	32	265	78.3	21.7	100	48.9	25	49	72.6	42.9	157
Netherlands	44.0	113	202	23.9	441	580	21.6	177	226	39.8	302	502
Norway	43.3	30	53	-2.2	224	219	-17.3	27	23	-15	345	300
Poland	40.9	1897	3210	22.5	991	1280	26.9	371	508	12.1	730	831
Portugal	2.6	334	343	-22.2	374	306	1.0	97	98	-19.4	375	314
Romania	30.4	912	1311	41.	318	546	26.3	221	300	17.3	638	772
Russian Federation	50.4	2208	4460	30.8	2488	3600	43.3	675	1191	34.6	2332	3566
Slovakia	67.0	179	543	42.2	130	225	44.9	34.7	63	31.7	101	148
Slovenia	37.2	123	196	-1.5	64	63	20.8	19	24	4.5	42	44
Spain	26.8	1498	2049	-3.2	1194	1156	-9.5	517	472	9.8	2515	2790
Sweden	58.8	49	119	23.9	257	338	3.2	59	61	21.4	413	526
Switzerland	35.8	27.6	43	25.6	123.4	166	2.0	70.5	72	35.8	187.4	292
Ukraine [1]	59.2	1132.4	2782	58.5	455.2	1097	-	-	-	51.4	665	1369
United Kingdom	56.7	1615.3	3737	37.1	1753.4	2788	4.2	350.41	366	27.1	1780.262	2445
United States of America [2]	17.8	17622	21463	-1.2	22083	21815	-13.9	4477	3929	14.4	16252	18992
European Community	-	-	-	-	-	-	-	-	-	-	-	
Non-Parties to the Gothenburg Protocol												
Bosnia and Herzegovina	-	-	480	-	-	-	-	-	-	-	-	-
Cyprus	-6.5	49	46	-22.2	22	18	-	-	-	-	-	-
Estonia [1]	56.3	110	252	32.3	46	68	-	-	-	38.6	54	88
FYR Macedonia	-	-	-	-	-	-	-	-	-	-	-	-
Georgia	86.6	33.1	248	58.0	54.5	130	-	-	-	93.9	2.8	46
Iceland	-11.6	26.8	24	-6.5	27.7	26	-	-	-	23.0	10	13
Malta	-	-	-	-	-	-	-	-	-	-	-	-
Monaco	-1.3	0.074	0.073	-5.3	0.551	0.523	-	-	-	16.2	0.586	0.7
Turkey	-54.6	1288.2	833	-26.9	850.46	670	-	-	-	-8.6	524	569
Yugoslavia	-2.5	521	508	0	66	66	-	-	-	-	-	-

*) A negative number indicates an increase in emissions between 1990 and 1998

1) Armenia, Belarus, Estonia and Ukraine have report more NH3 emission figures, but they are without emissions from agriculture.

2) Canada and The United States are not Parties to the NH3 and NMVOC parts of the Protocol