

Annual European Union greenhouse gas inventory 1990–2008 and inventory report 2010

Submission to the UNFCCC Secretariat

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The full report and annexes are available at:

www.eea.europa.eu/publications/european-union-greenhouse-gas-inventory-2010/

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Executive summary

ES.1 Background information on greenhouse gas inventories and climate change

The European Union (EU), as a party to the United Nations Framework Convention on Climate Change (UNFCCC), reports annually on greenhouse gas (GHG) inventories for the year t-2 and within the area covered by its Member States (i.e. domestic emissions taking place within its territory).

The present inventory also constitutes the EU-15 submission under the Kyoto Protocol and covers information and data from Member States available until 26 March 2010. Under the Kyoto Protocol, the EU-15 took on a common commitment to reduce emissions by 8 % between 2008 and 2012 compared to emissions in the 'base year' ⁽¹⁾. EU-27 does not have a common target under the Kyoto Protocol in the same way as EU-15.

The legal basis for the compilation of the EU inventory is Council Decision No. 280/2004/EC concerning a mechanism for monitoring Community greenhouse gas emissions and for implementing the Kyoto Protocol ⁽²⁾. The purpose of this decision is:

- 1 to monitor all anthropogenic GHG emissions covered by the Kyoto Protocol in the Member States;
- 2 to evaluate progress towards meeting GHG reduction commitments under the UNFCCC and the Kyoto Protocol;
- 3 to implement UNFCCC and the Kyoto Protocol obligations relating to national programmes, greenhouse gas inventories, national systems and registries of the EU and its Member States, and the relevant procedures under the Kyoto Protocol;

- 4 to ensure the timeliness, completeness, accuracy, consistency, comparability and transparency of reporting by the EU and its Member States to the UNFCCC secretariat.

The EU GHG inventory comprises the direct sum of the national inventories compiled by the EU Member States making up the EU-15 and the EU-27. Energy data from Eurostat are used for the reference approach for CO₂ emissions from fossil fuels developed by the Intergovernmental Panel on Climate Change (IPCC). The main institutions involved in the compilation of the EU GHG inventory are the Member States, the European Commission Directorate-General Climate Action (DG CLIMA), the European Environment Agency (EEA) and its European Topic Centre on Air and Climate Change (ETC/ACC), Eurostat, and the Joint Research Centre (JRC).

The process of compiling the EU GHG inventory is as follows. Member States submit their annual GHG inventories by 15 January each year to the European Commission, DG CLIMA, with a copy to the EEA. The EEA and its ETC/ACC, Eurostat and JRC then perform initial checks on the submitted data. The draft EU GHG inventory and inventory report are circulated to Member States for review and comments by 28 February. Member States check their national data and the information presented in the EU GHG inventory report, send updates if necessary and review the EU inventory report itself by 15 March. The EEA prepares the final EU GHG inventory and inventory report through its ETC/ACC by 15 April for submission by the European Commission to the UNFCCC Secretariat; a resubmission is prepared by 27 May, if needed.

On 23 January 2008 the European Commission adopted the 'Climate Action and Renewable

⁽¹⁾ For the EU-15, the base year for CO₂, CH₄ and N₂O is 1990; for fluorinated gases 12 Member States have selected 1995 as the base year, whereas Austria, France and Italy have chosen 1990. As the EU inventory is the sum of Member State inventories, the EU-15 base-year estimates for fluorinated gas emissions are the sum of 1995 emissions for 12 Member States and 1990 emissions for Austria, France and Italy. The EU-15 base-year emissions also include emissions from deforestation for the Netherlands, Portugal and the United Kingdom.

⁽²⁾ OJ L 49, 19.2.2004, p. 1. Note that Council Decision No. 280/2004/EC entered into force in March 2004. Therefore, the compilation of the 2004 inventory report started under the previous Council Decision 1999/296/EC.

Energy' package. The proposal was part of draft legislation implementing the 'Integrated Energy and Climate Change' package of 10 January 2007, which was endorsed by the European Council in March 2007. In December 2008 the European Parliament and the Council reached agreement on the package. It was adopted by the Council on 6 April 2009. The package underlines the objective of limiting the rise in global average temperature to no more than two degrees Celsius above pre-industrial levels. To achieve this goal the EU committed to a unilateral emission reduction target of 20% ⁽³⁾ by 2020, compared with 1990 levels, and agreed to a reduction of 30% provided that other major emitters agree to take on their fair share of a global reduction effort.

Both trading, i.e. EU Emissions Trading Scheme (ETS), and non-trading sectors will contribute to the 20 % objective. Minimising overall reduction costs implies a 21 % reduction in emissions from EU ETS sectors compared to 2005 by 2020 and a reduction of approximately 10 % compared to 2005 by 2020 for non-EU ETS sectors. The non-trading sectors broadly include direct emissions from households and services, as well as emissions from transport, waste and agriculture. The coverage of the non-trading sectors currently represents about 60 % of total greenhouse gas emissions.

Information on Land Use, Land-Use Change and Forestry (LULUCF) activities is covered in the Kyoto Protocol under Art. 3.3 (afforestation, reforestation and deforestation) and Art. 3.4 (forest land management, cropland management, grazing land management and revegetation). Detailed information on 3.3 and 3.4 LULUCF activities are provided in Chapter 11 of this report, for the first time.

In addition, all parties to the Kyoto Protocol must provide information on how they are striving to implement their greenhouse gas commitments in such a way as to minimize potential adverse social, environmental and economic impacts on developing countries. This information is required under Article 3, paragraph 14 of the Protocol and is included in Chapter 15.

ES.2 Summary of greenhouse gas emission trends in the EU

EU-27

Total GHG emissions, without LULUCF, in the EU-27 decreased by 11.3 % between 1990 and 2008 (627 million tonnes CO₂-equivalents). Emissions decreased by 2.0 % (– 99 million tonnes CO₂-equivalents) between 2007 and 2008 (Figure ES.1).

EU-15

In 2008 total GHG emissions in the EU-15, without LULUCF, were 6.5 % (274 million tonnes CO₂-equivalents) below 1990. Emissions decreased by 1.9 % (76 million tonnes CO₂-equivalents) between 2007 and 2008.

Under the Kyoto Protocol, the EU agreed to reduce its GHG emissions by 8 % by 2008–2012 compared to 'base year' ⁽⁴⁾. This can be achieved by a combination of existing and planned domestic policies and measures, the use of carbon sinks and the use of Kyoto mechanisms. Emissions (i.e. domestic) in 2008 were 6.9 % or 295 million tonnes CO₂-equivalents lower than emissions in the base year (Figure ES.2).

Main trends by source category, 1990–2008

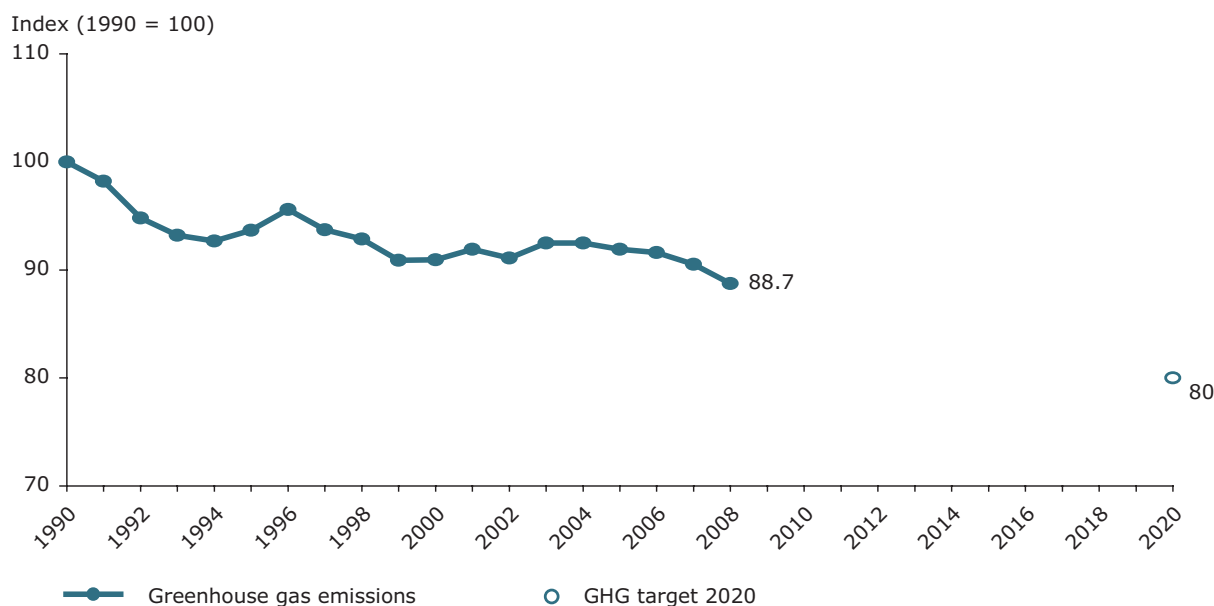
Between 1990 and 2008, EU-15 emissions decreased by 6.5 %, while in the EU-27 emissions decreased by 11.3 %. In the EU-27, significantly higher decreases are reported for public electricity and heat production, energy use in manufacturing industries and households, and agriculture (see Table ES.1).

Main trends by source category, 2007–2008

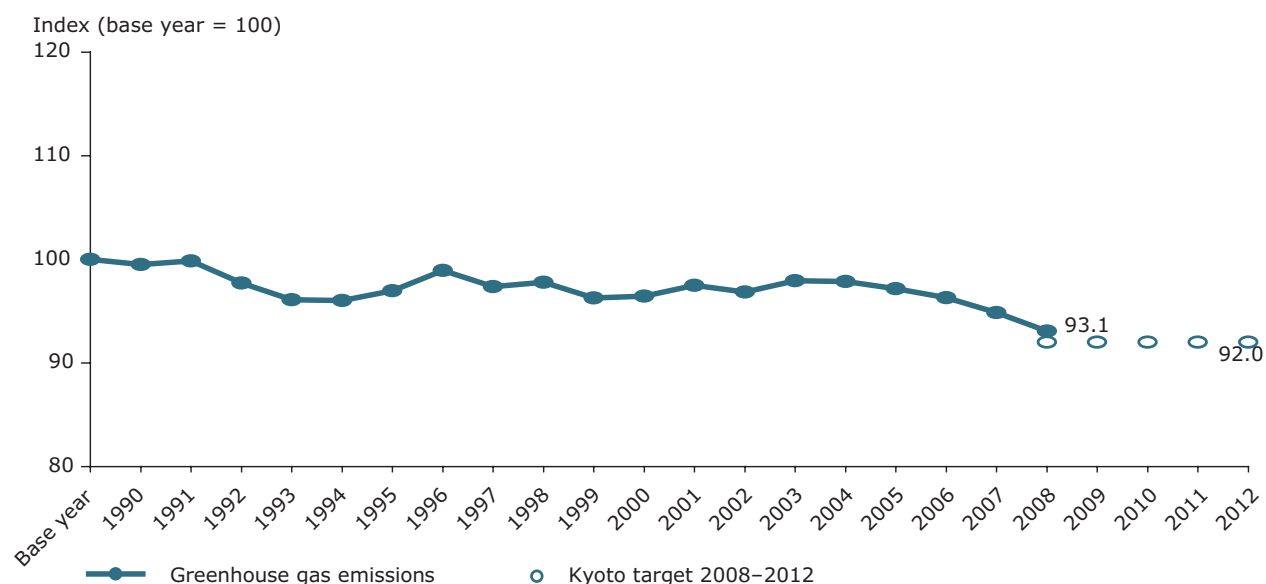
Between 2007 and 2008, EU-15 emissions decreased by 1.9 %, which was just a little less than in the EU-27 (– 2.0 %). One main difference is that emissions from road transport decreased in the EU-15, while emissions increased in the new Member States (Table ES.2).

⁽³⁾ All emission information for EU-27 in this report uses 1990 as the starting point when addressing emission reductions. EU-27 does not have a common target under the Kyoto Protocol in the same way as EU-15.

⁽⁴⁾ Following the UNFCCC reviews of Member States' 'initial reports' during 2007 and 2008 and pursuant to Article 3, Paragraphs 7 and 8 of the Kyoto Protocol, the base-year emissions for the EU-15 have been fixed to 4 265.5 Mt CO₂-equivalent.

Figure ES.1 EU-27 GHG emissions 1990–2008 (excluding LULUCF)

Note: GHG emission data for the EU-27 as a whole, refer to domestic emissions (i.e. within its territory) and do not include emissions and removals from LULUCF; nor do they include emissions from international aviation and international maritime transport. CO₂ emissions from biomass with energy recovery are reported as a Memorandum item according to UNFCCC Guidelines and not included in national totals. In addition, no adjustments for temperature variations or electricity trade are considered. The global warming potentials are those from the 1996 revised IPCC Guidelines for National Greenhouse Gas Inventories.

Figure ES.2 EU-15 GHG emissions 'base year'-2008 compared with target for 2008–2012 (excluding LULUCF)

Note: GHG emission data for the EU-15 as a whole refer to domestic emissions (i.e. within its territory) and do not include emissions and removals from LULUCF; nor do they include emissions from international aviation and international maritime transport. CO₂ emissions from biomass with energy recovery are reported as a Memorandum item according to UNFCCC Guidelines and not included in national totals. In addition, no adjustments for temperature variations or electricity trade are considered. The global warming potentials are those from the 1996 revised IPCC Guidelines for National Greenhouse Gas Inventories.

Following the UNFCCC reviews of Member States' 'initial reports' during 2007 and 2008 and pursuant to Article 3, Paragraphs 7 and 8 of the Kyoto Protocol, the base-year emissions for the EU-15 have been fixed to 4 265.5 Mt CO₂-equivalent. The EU-15 would need to reduce greenhouse gas emissions by about 341 million tonnes, on average for each of the years between 2008 and 2012, in order to meet its 8 % Kyoto target. This can be achieved by a combination of existing and planned domestic policies and measures, the use of carbon sinks and the use of Kyoto mechanisms.

Table ES.1 Overview of EU-27 and EU-15 source categories whose emissions increased or decreased by more than 20 million tonnes CO₂-equivalents in the period 1990–2008

Source category	EU-15	EU-27
	Million tonnes (CO ₂ -equivalent)	
Manufacturing industries (excl. iron and steel) (Energy-related CO ₂ from 1A2 excl. 1A2a)	- 77.5	- 161.1
Solid waste disposal (CH ₄ from 6A)	- 68.1	- 65.7
Adipic acid production (N ₂ O from 2B3)	- 50.3	- 51.3
Fugitive emissions (CH ₄ from 1B)	- 46.2	- 66.9
Manufacture of solid fuels (CO ₂ from 1A1c)	- 42.6	- 42.9
Households and services (CO ₂ from 1A4)	- 39.0	- 94.6
Agricultural soils (N ₂ O from 4D)	- 33.5	- 64.7
Iron and steel production (CO ₂ from 1A2a+2C1)	- 32.2	- 55.2
Nitric acid production (N ₂ O from 2B2)	- 22.4	- 25.8
Production of halocarbons (HFC from 2E)	- 21.7	- 21.7
Enteric fermentation (CH ₄ from 4A)	- 15.9	- 38.3
Public electricity and heat production (CO ₂ from 1A1a)	9.1	- 135.7
Consumption of halocarbons (HFC from 2F)	60.2	66.6
Road transport (CO ₂ from 1A3b)	134.9	185.0
Total	- 274.2	- 627.3

Note: As the table only presents sectors whose emissions increased or decreased by 20 million tonnes CO₂-equivalents, the sum for each country grouping EU-15/EU-27 does not necessarily match the total change listed at the bottom of the table.

Table ES.2 Overview of EU-27 and EU-15 source categories whose emissions increased or decreased by more than 3 million tonnes CO₂-equivalents in the period 2007–2008

Source category	EU-15	EU-27
	Million tonnes (CO ₂ -equivalent)	
Households and services (CO ₂ from 1A4)	45.6	46.6
Consumption of Halocarbons (HFC from 2F)	3.1	3.2
Manufacture of Solid Fuels (CO ₂ from 1A1c)	- 1.4	- 4.8
Solid waste disposal (CH ₄ from 6A)	- 2.4	- 2.9
Iron and steel production (CO ₂ from 1A2a+2C1)	- 3.3	- 9.3
Nitric acid production (N ₂ O from 2B2)	- 5.6	- 8.0
Cement production (CO ₂ from 2A1)	- 7.4	- 7.8
Manufacturing industries (excl. iron and steel) (Energy-related CO ₂ from 1A2 excl. 1A2a)	- 13.1	- 17.3
Road transport (CO ₂ from 1A3b)	- 22.8	- 16.4
Public electricity and heat production (CO ₂ from 1A1a)	- 60.5	- 73.4
Total	- 75.7	- 99.0

Note: As the table only presents sectors whose emissions have increased or decreased by at least 3 million tonnes of CO₂-equivalents, the sum for each country grouping does not necessarily match the total change listed at the bottom of the table.

Main reasons for changes in EU-15 emissions, 2007–2008

The 75.7 million tonnes (CO₂-equivalents) decrease in GHG emissions in EU-15 between 2007–2008 was mainly due to:

- A sharp decrease in CO₂ emission (– 60.5 million tonnes or – 6 %) from public electricity and heat production occurred between 2007 and 2008. Spain (– 17 million tonnes CO₂) and Germany (– 19 million tonnes CO₂) contributed most to this decrease. In Spain the main reason was the strong decline in coal use for power generation; while, in Germany electricity generation by conventional thermal power plants decreased and nuclear electricity generation increased.
- Remarkably also the emissions from road transport decreased to a significant extent (– 22.8 million tonnes or – 2.9 %). All EU-15 Member States except Belgium, Luxembourg and the Netherlands, reported emission decreases. The highest reduction were reported by France (– 6.3 million tonnes), Spain (– 6.2 million tonnes), Italy (– 4.8 million tonnes) where the use of biofuels increased strongly, and the United Kingdom (– 4.3 million tonnes).
- Lower emissions (– 13.1 million tonnes or – 3.1 %) in the category manufacturing industries excluding iron and steel industry are mainly caused by United Kingdom, Spain, Italy and Germany.
- Less N₂O emissions from nitric acid production (– 5.6 million tonnes or – 30 %) are mainly caused by technical emission reduction measures at Dutch plants.
- Less emissions (– 3.3 million tonnes or – 2.1 %) in iron and steel production due to reduced energy use mainly in Germany, France and Italy.

Substantial increases in GHG emissions between 2007–2008 took place in the following source categories:

- CO₂ emissions from Households and Services ⁽⁵⁾ (+ 45.6 million tonnes or +8.2 %)
- Between 2006 and 2007 emissions decreased considerably mainly due to fuel price considerations, but in the last year emissions were on the rise again, mainly due to Germany and France. One underlying reason is that fuel stocks needed to be filled up again in 2008, as in 2007 fuel purchases were avoided because of high prices.
- Increases in hydro-fluorocarbon (HFC) from the consumption of halocarbons (+ 3.1 million tonnes or + 5.4 %) stem from Refrigeration and Air Conditioning. France, Italy, Germany and Greece report the highest increases.

ES.3 Summary of emissions and removals by main greenhouse gas

EU-27

Table ES.4 gives an overview of the main trends in EU-27 GHG emissions and removals for 1990–2008. The most important GHG by far is CO₂, accounting for 82.8 % of total EU-27 emissions in 2008 excluding LULUCF. In 2008, EU-27 CO₂ emissions without LULUCF were 4 089 Tg, which was 7.1 % below 1990 levels. Compared to 2007, CO₂ emissions decreased by 2.1 %.

EU-15

Table ES.5 gives an overview of the main trends in EU-15 GHG emissions and removals for 1990–2008. Also in the EU-15 the most important GHG is CO₂, accounting for 83.6 % of total EU-15 emissions in 2008. In 2008, EU-15 CO₂ emissions without LULUCF were 3 318 Tg, which was 1.3 % below 1990 levels. Compared to 2007, CO₂ emissions decreased by 2.0 %.

⁽⁵⁾ This includes emissions from fuel combustion in commercial and institutional buildings, and all emissions from fuel combustion in households. It also includes a smaller source category covering fuel combustion emissions from agriculture, forestry and fishing. It should be noted that greenhouse gas emissions from households and services do not include indirect emissions. That is, greenhouse gas emissions resulting from the production of heat and electricity supplied to households and services are included under public electricity and heat production. Direct combustion emissions from households are outside the EU ETS.

Table ES.3 Greenhouse gas emissions in CO₂-equivalents (excl. LULUCF) and Kyoto Protocol targets for 2008–2012

Member State	1990	Kyoto Protocol base year ^{a)}	2008	Change 2007–2008	Change 2007–2008	Change 1990–2008	Change base year 2008	Targets 2008–2012 under Kyoto Protocol and 'EU burden sharing'
	(million tonnes)	(million tonnes)	(million tonnes)	(million tonnes)	(%)	(%)	(%)	(%)
Austria	78.2	79.0	86.6	- 0.3	- 0.4 %	10.8 %	9.6 %	- 13.0 %
Belgium	143.4	145.7	133.3	3.0	2.3 %	- 7.1 %	- 8.6 %	- 7.5 %
Denmark	68.9	69.3	63.8	- 3.0	- 4.5 %	- 7.4 %	- 7.9 %	- 21.0 %
Finland	70.4	71.0	70.1	- 7.9	- 10.2 %	- 0.3 %	- 1.2 %	0.0 %
France	563.2	563.9	527.0	- 3.2	- 0.6 %	- 6.4 %	- 6.5 %	0.0 %
Germany	1231.8	1232.4	958.1	0.7	0.1 %	- 22.2 %	- 22.3 %	- 21.0 %
Greece	103.3	107.0	126.9	- 5.0	- 3.8 %	22.8 %	18.6 %	25.0 %
Ireland	54.8	55.6	67.4	- 0.2	- 0.3 %	23.0 %	21.3 %	13.0 %
Italy	517.0	516.9	541.5	- 11.1	- 2.0 %	4.7 %	4.8 %	- 6.5 %
Luxembourg	13.1	13.2	12.5	- 0.30	- 2.3 %	- 4.8 %	- 5.1 %	- 28.0 %
Netherlands	212.0	213.0	206.9	0.0	0.0 %	- 2.4 %	- 2.9 %	- 6.0 %
Portugal	59.3	60.1	78.4	- 1.5	- 1.9 %	32.2 %	30.3 %	27.0 %
Spain	285.1	289.8	405.7	- 32.9	- 7.5 %	42.3 %	40.0 %	15.0 %
Sweden	72.4	72.2	64.0	- 2.2	- 3.3 %	- 11.7 %	- 11.3 %	4.0 %
United Kingdom	771.7	776.3	628.2	- 11.8	- 1.8 %	- 18.6 %	- 19.1 %	- 12.5 %
EU-15	4 244.7	4 265.5	3 970.5	- 75.7	- 1.9 %	- 6.5 %	- 6.9 %	- 8.0 %
Bulgaria	117.4	132.6	73.5	- 2.4	- 3.2 %	- 37.4 %	- 44.6 %	- 8.0 %
Cyprus	5.3	Not applicable	10.2	0.4	3.7 %	93.9 %	Not applicable	Not applicable
Czech Republic	195.2	194.2	141.4	- 6.1	- 4.1 %	- 27.5 %	- 27.2 %	- 8.0 %
Estonia	40.8	42.6	20.3	- 1.8	- 8.2 %	- 50.4 %	- 52.5 %	- 8.0 %
Hungary	97.4	115.4	73.1	- 2.6	- 3.4 %	- 24.9 %	- 36.6 %	- 6.0 %
Latvia	26.8	25.9	11.9	- 0.4	- 3.1 %	- 55.6 %	- 54.1 %	- 8.0 %
Lithuania	49.7	49.4	24.3	- 1.1	- 4.5 %	- 51.1 %	- 50.8 %	- 8.0 %
Malta	2.0	Not applicable	3.0	- 0.05	- 1.8 %	44.2 %	Not applicable	Not applicable
Poland	453.3	563.4	395.6	- 4.3	- 1.1 %	- 12.7 %	- 29.8 %	- 6.0 %
Romania	242.1	278.2	145.9	- 6.7	- 4.4 %	- 39.7 %	- 47.6 %	- 8.0 %
Slovakia	73.9	72.1	48.8	1.1	2.3 %	- 33.9 %	- 32.2 %	- 8.0 %
Slovenia	18.5	20.4	21.3	0.7	3.5 %	15.2 %	4.6 %	- 8.0 %
EU-27	5 567.0	Not applicable	4 939.7	- 99.0	- 2.0 %	- 11.3 %	Not applicable	Not applicable

Note: ^{a)} As Cyprus, Malta and EU-27 do not have targets under the Kyoto Protocol, they do not have applicable Kyoto Protocol base years.

Table ES.4 Overview of EU-27 GHG emissions and removals from 1990 to 2008 in CO₂-equivalents (Tg)

Greenhouse gas emissions	1990	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Net CO ₂ emissions/removals	4 048	3 760	3 838	3 752	3 734	3 662	3 704	3 762	3 765	3 865	3 852	3 829	3 823	3 812	3 671
CO ₂ emissions (without LULUCF)	4 401	4 154	4 255	4 166	4 156	4 090	4 112	4 189	4 161	4 251	4 259	4 239	4 236	4 178	4 089
CH ₄	598	542	537	520	506	495	481	467	458	448	434	428	423	418	413
N ₂ O	518	458	464	461	438	415	412	405	394	390	393	384	373	372	364
HFCs	28	41	47	53	54	47	46	45	48	53	55	60	62	66	70
PFCs	20	13	13	12	11	11	9	8	10	8	6	5	5	4	4
SF ₆	11	16	15	14	13	11	11	10	9	9	9	9	10	9	9
Total (with net CO ₂ emissions/removals)	5 223	4 830	4 914	4 812	4 756	4 641	4 663	4 699	4 684	4 772	4 750	4 716	4 696	4 681	4 530
Total (without CO ₂ from LULUCF)	5 576	5 224	5 331	5 226	5 178	5 068	5 071	5 126	5 081	5 158	5 157	5 126	5 108	5 047	4 948
Total (without LULUCF)	5 567	5 215	5 321	5 217	5 169	5 060	5 062	5 117	5 072	5 149	5 148	5 117	5 100	5 039	4 940

Table ES.5 Overview of EU-15 GHG emissions and removals from 1990 to 2008 in CO₂-equivalents (Tg)

Greenhouse gas emissions	1990	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Net CO ₂ emissions/removals	3 142	3 036	3 089	3 034	3 078	3 039	3 083	3 140	3 161	3 236	3 230	3 213	3 195	3 178	3 062
CO ₂ emissions (without LULUCF)	3 362	3 290	3 367	3 312	3 361	3 333	3 359	3 426	3 414	3 477	3 484	3 466	3 446	3 386	3 318
CH ₄	438	413	407	395	385	376	365	353	343	331	320	314	308	305	302
N ₂ O	394	374	380	378	358	337	334	326	317	312	312	303	291	289	282
HFCs	28	41	46	52	53	46	45	43	46	49	51	54	56	60	63
PFCs	17	11	10	10	9	9	7	6	8	7	5	4	4	3	3
SF ₆	11	15	15	13	13	11	10	10	9	9	9	9	9	9	9
Total (with net CO ₂ emissions/removals)	4 031	3 890	3 948	3 882	3 895	3 818	3 844	3 879	3 884	3 944	3 926	3 897	3 863	3 844	3 720
Total (without CO ₂ from LULUCF)	4 251	4 144	4 227	4 160	4 178	4 112	4 120	4 165	4 137	4 185	4 179	4 151	4 114	4 052	3 976
Total (without LULUCF)	4 245	4 137	4 220	4 154	4 171	4 106	4 114	4 159	4 131	4 178	4 174	4 145	4 108	4 046	3 970

ES.4 Summary of emissions and removals by main source and sink categories

EU-27

Table ES.6 gives an overview of EU-27 GHG emissions in the main source categories for 1990–2008. The most important sector by far is energy (i.e. combustion and fugitive emissions) accounting for 79.1 % of total

EU-27 emissions in 2008. The second largest sector is Agriculture (9.6 %), followed by Industrial Processes (8.3 %).

EU-15

Table ES.7 gives an overview of EU-15 GHG emissions in the main source categories for 1990–2008. More detailed trend descriptions are included in Chapters 3 to 9.

Table ES.6 Overview of EU-27 GHG emissions in the main source and sink categories 1990 to 2008 in CO₂-equivalents (Tg)

GHG source and sink	1990	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
1. Energy	4 267	4 024	4 136	4 030	4 018	3 957	3 962	4 046	4 013	4 096	4 088	4 062	4 050	3 978	3 907
2. Industrial processes	484	463	458	467	439	401	413	400	397	405	416	420	421	434	410
3. Solvent and other product use	17	14	14	14	14	14	14	13	13	13	13	12 910	13	13	12
4. Agriculture	592	513	515	515	513	509	501	492	487	481	481	475	472	472	472
5. Land use, land-use change and forestry	- 344	- 385	- 407	- 405	- 413	- 419	- 399	- 418	- 388	- 377	- 399	- 401	- 404	- 357	- 410
6. Waste	207	201	198	190	185	179	173	165	161	155	150	146	145	142	139
7. Other	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total (with net CO ₂ emissions/removals)	5 223	4 830	4 914	4 812	4 756	4 641	4 663	4 699	4 684	4 772	4 750	4 716	4 696	4 681	4 530
Total (without LULUCF)	5 567	5 215	5 321	5 217	5 169	5 060	5 062	5 117	5 072	5 149	5 148	5 117	5 100	5 039	4 940

Table ES.7 Overview of EU-15 GHG emissions in the main source and sink categories 1990 to 2008 in CO₂-equivalents (Tg)

GHG source and sink	1990	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
1. Energy	3 254	3 176	3 261	3 194	3 238	3 212	3 226	3 297	3 281	3 338	3 335	3 316	3 291	3 223	3 168
2. Industrial processes	375	374	371	379	359	327	331	322	320	323	329	327	322	330	313
3. Solvent and other product use	14	12	12	12	12	12	12	11	11	11	11	10 736	11	10	10
4. Agriculture	431	410	415	415	415	414	410	401	395	390	389	383	378	379	378
5. Land use, land-use change and forestry	- 214	- 246	- 272	- 272	- 277	- 289	- 270	- 280	- 247	- 234	- 248	- 248	- 246	- 202	- 251
6. Waste	171	165	161	153	148	141	136	129	123	116	111	108	106	104	102
7. Other	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total (with net CO ₂ emissions/removals)	4 031	3 890	3 948	3 882	3 895	3 818	3 844	3 879	3 884	3 944	3 926	3 897	3 863	3 844	3 720
Total (without LULUCF)	4 245	4 137	4 220	4 154	4 171	4 106	4 114	4 159	4 131	4 178	4 174	4 145	4 108	4 046	3 970

ES.5 Summary of EU Member State emission trends

Table ES.8 gives an overview of Member State contributions to the EU GHG emissions for 1990–2008. Member States show large variations in GHG emission trends.

The overall EU GHG emission trend is dominated by the two largest emitters Germany and the United Kingdom, accounting for about one third of total EU-27 GHG emissions. These two Member States have achieved total GHG emission reductions of

417 million tonnes CO₂-equivalents compared to 1990.

The main reasons for the favourable trend in Germany were increasing efficiency in power and heating plants and the economic restructuring of the five new Länder after German reunification. The reduction of GHG emissions in the United Kingdom was primarily the result of liberalising energy markets and the subsequent fuel switches from oil and coal to gas in electricity production and N₂O emission reduction measures in the production of adipic acid.

Table ES.8 Overview of Member States' contributions to EU GHG emissions excluding LULUCF from 1990 to 2008 in CO₂-equivalents (Tg)

Member State	1990	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Austria	78	80	83	82	82	80	80	85	86	92	91	93	90	87	87
Belgium	143	150	154	145	151	144	145	144	143	145	145	141	136	130	133
Denmark	69	76	90	80	76	73	68	70	69	74	68	64	72	67	64
Finland	70	71	77	75	72	71	69	74	76	84	80	68	80	78	70
France	563	557	572	565	578	562	557	559	550	554	553	556	540	530	527
Germany	1 232	1 101	1 122	1 084	1 060	1 027	1 025	1 041	1 020	1 014	1 000	978	983	957	958
Greece	103	108	111	116	121	121	125	126	126	130	130	133	129	132	127
Ireland	55	58	60	62	65	66	68	70	68	68	67	69	68	68	67
Italy	517	529	522	528	539	546	550	555	556	571	574	573	562	553	541
Luxembourg	13	10	10	10	9	9	10	10	11	12	13	13	13	13	12
Netherlands	212	225	233	226	227	215	215	216	216	217	218	212	209	207	207
Portugal	59	70	68	71	76	83	81	83	87	82	85	87	82	80	78
Spain	285	315	308	328	339	367	381	381	397	405	420	435	427	439	406
Sweden	72	74	78	73	74	70	69	69	70	71	70	68	67	66	64
United Kingdom	772	712	733	708	703	671	673	676	655	661	659	655	650	640	628
EU-15	4 245	4 137	4 220	4 154	4 171	4 106	4 114	4 159	4 131	4 178	4 174	4 145	4 108	4 046	3 970
Bulgaria	117	89	87	84	75	70	69	70	67	72	71	71	72	76	73
Cyprus	5	7	7	7	8	9	9	9	9	9	9	10	10	10	10
Czech Republic	195	154	160	153	145	141	148	150	145	145	146	145	147	147	141
Estonia	41	21	22	21	20	18	18	19	18	20	20	19	19	22	20
Hungary	97	79	81	79	79	79	77	79	77	80	79	80	78	76	73
Latvia	27	13	13	12	12	11	10	11	11	11	11	11	12	12	12
Lithuania	50	22	23	23	24	21	19	21	21	21	22	23	24	25	24
Malta	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3
Poland	453	440	449	444	414	402	390	387	374	386	387	390	403	400	396
Romania	242	180	187	168	150	133	136	141	147	154	155	150	154	153	146
Slovakia	74	53	52	51	51	50	49	51	50	51	51	50	50	48	49
Slovenia	18	18	19	19	19	19	19	20	20	20	20	20	20	21	21
EU-27	5 567	5 215	5 321	5 217	5 169	5 060	5 062	5 117	5 072	5 149	5 148	5 117	5 100	5 039	4 940

Italy and France are the third and fourth largest emitters both with a share of 11 %. Italy's GHG emissions are about 5 % above 1990 levels in 2008. Italian GHG emissions increased since 1990 primarily from road transport, electricity and heat production and petrol refining. France's emissions were 6 % below 1990 levels in 2008. In France, large reductions were achieved in N₂O emissions from the adipic acid production, but CO₂ emissions from road transport and HFC emissions from consumption of halocarbons increased considerably between 1990 and 2008.

Spain and Poland are the fifth and sixth largest emitters in the EU-27, each accounting for about

8 % of total EU-27 GHG emissions. Spain increased emissions by 42 % between 1990 and 2008. This was largely due to emission increases from road transport, electricity and heat production, and manufacturing industries. Poland decreased GHG emissions by 12.7 % between 1990 and 2008 (– 29.8 % since the base year, which is 1988 in the case of Poland). The main factors for decreasing emissions in Poland — as for other new Member States — were the decline of energy inefficient heavy industry and the overall restructuring of the economy in the late 1980s and early 1990s. The notable exception was transport (especially road transport) where emissions increased.

ES.6 International aviation and maritime transport

Emissions of greenhouse gases from international aviation and shipping activities decreased as a whole for the first time since 1992 in the EU-27, which partly reflects the start of the economic recession. Contributions from these sectors, currently not included in the national greenhouse gas totals, stabilised for aviation at about 139 million tonnes in 2008 and decreased by 2.1 % between 2007 and 2008 to 171 million tonnes for international shipping. EU greenhouse gas emissions from international aviation are lower than for international maritime transport but are growing significantly more rapidly. The average annual EU-27 growth rates in emissions since 1990 were 4.2 % and 2.5 %, respectively. Together, the two sectors currently account for about 5.9 % of total greenhouse gas emissions.

For detailed information on emissions from international bunkers see Section 3.7 of this report.

ES.7 Information on recalculations

Base year emissions for the EU-15 are fixed (i.e. 4 265.5 million tonnes CO₂-equivalents) as a result of the UNFCCC reviews during 2007 and 2008. Recalculations are the result of inventory improvements, which Member States are required to undertake for the whole time series to ensure consistency.

In the EU-15, the change in emissions between 2007 and 2008 was – 1.9 %; between 1990 and 2008 it was – 6.5 %, and between the fixed Kyoto base year and 2008 it was – 6.8 %. The effect of the recalculation in 2007, comparing the 2009 and 2010 inventories, was – 0.1 %. This means that of the 6.8 % reduction in emissions between the Kyoto base year and 2008, 0.1% has been due to recalculations. These were mainly due to the revised energy balances in Germany and France.

In the EU-15, recalculations for the year 1990 were + 0.3 % between the 2009 and 2010 inventory submissions. In the EU-27, recalculations affected the years 1990 and 2007 by –0.1 %, respectively.

For detailed information on recalculations see Chapter 10 and the sector specific recalculations.

Table ES.9 Overview of major recalculations in 1990

Source category	Member State	Deviation		Explanation for recalculation
		Gg CO ₂ -equivalent	%	
1.A.2.C-Chemicals, liquid fuels, CO ₂	France	6 194	160.4	Le transfert des émissions de CO ₂ liées à l'utilisation de castine dans la sidérurgie de la catégorie CRF 1A2 dans la catégorie 2A3; La prise en compte des déclarations annuelles des industriels pour estimer les émissions de CO ₂ liées à la production de céramiques.
1.AA.2.F-Other, liquid fuels, CO ₂	France	– 4 534	–23.9	Le transfert des émissions de CO ₂ liées à l'utilisation de castine dans la sidérurgie de la catégorie CRF 1A2 dans la catégorie 2A3; La prise en compte des déclarations annuelles des industriels pour estimer les émissions de CO ₂ liées à la production de céramiques.
4.A-Enteric fermentation, dairy cattle, CH ₄	Germany	3 515	36.6	Improvements on model used for CH ₄ emission estimation; higher CH ₄ conversion factor, improved information on weight.
4.D.1.1-Synthetic fertilisers, N ₂ O	Germany	2 635	25.0	Re-use of the 1996b IPCC EF.
4.D.1.2-Animal manure applied to Soils, N ₂ O	Germany	2 275	45.9	N input from manure management has increased.
4.D.1.4-Crop residue, N ₂ O	Germany	4 388	197.5	Correction of error.
EU-15 Total recalculations	EU-15	11 751	0.3	
EU-27 Total recalculations	EU-27	3 001	0.1	

Note: Explanations for recalculations as provided by the Parties in their national greenhouse gas inventory reports

Table ES.10 Overview of major recalculations in 2007

Source category	Member State	Deviation		Explanation for recalculation
		Gg CO ₂ -equivalent	%	
1.A.1.A-Public electricity and heat production, solid fuels, CO ₂	Czech Republic	4 958	8.7	Recalculation in sectors 1A1, 1A2, 1A3e, 1A4 and 1A5 since 2003; improvement and specification of activity data by using questionnaires elaborated by the Czech Statistical Office (CSO) for IEA and Eurostat, while emissions and oxidation factors remain unchanged. So far, the activity data were taken from annually published 'Energy balances of the Czech Republic' that are less suitable for conversion to UNFCCC/CRF categorisation.
1.AA.1.A-Public electricity and heat production, biomass, CO ₂	Germany	16 626	159.7	Change of data source — from the evaluation tables which were used for the last submission — to the Energy Balance which is now available.
1.AA.1.A-Public electricity and heat production, gaseous fuels, CO ₂	Germany	- 2 127	- 5.2	Change of data source — from the evaluation tables which were used for the last submission — to the Energy Balance which is now available.
1.AA.1.A-Public electricity and heat production, other fuels, CO ₂	Germany	- 2 584	- 25.2	Change of data source — from the evaluation tables which were used for the last submission — to the Energy Balance which is now available.
1.AA.1.A-Public electricity and heat production, solid fuels, CO ₂	Germany	- 4 187	- 1.4	Change of data source — from the evaluation tables which were used for the last submission — to the Energy Balance which is now available.
1.AA.2.F-Other, solid fuels, CO ₂	Czech Republic	- 8 144	- 87.5	Recalculation in sectors 1A1, 1A2, 1A3e, 1A4 and 1A5 since 2003; improvement and specification of activity data by using questionnaires elaborated by the Czech Statistical Office (CSO) for IEA and Eurostat, while emissions and oxidation factors remain unchanged. So far, the activity data were taken from annually published 'Energy balances of the Czech Republic' that are less suitable for conversion to UNFCCC/CRF categorisation.
1.AA.2.F-Other, gaseous fuels, CO ₂	ES	6 393	42.9	Corrección de errores y actualización de información de base en algunas centrales térmicas; actualización de la información de base sobre el balance de combustibles del año 2007. Como consecuencia de estas revisiones se producen variaciones relativas a la baja inferiores, en términos absolutos, al 0,55%, con la excepción del año 2007 en la que se produce un incremento prácticamente inapreciable.
1.AA.4.A-Commercial/institutional, liquid fuels, CO ₂	FR	- 3 135	- 21.8	Les consommations en produits pétroliers des catégories CRF 1A4a et 1A4b ont été revues à la hausse en 1990, alors que la consommation de biomasse a été revues à la baisse impliquant une réévaluation des émissions de CH ₄ . Environ 0,8Mtep ont été transférés des secteurs 1A4a et 1A4b vers le secteur 1A4c
1.AA.4.B-Residential, biomass, CO ₂	FR	- 3, 642	- 13.4	Les consommations en produits pétroliers des catégories CRF 1A4a et 1A4b ont été revues à la hausse en 1990, alors que la consommation de biomasse a été revues à la baisse impliquant une réévaluation des émissions de CH ₄ . Environ 0,8Mtep ont été transférés des secteurs 1A4a et 1A4b vers le secteur 1A4c
2.B.2-Nitric acid production, N ₂ O	Germany	- 6 376	- 66.7	In the submission 2010 germany is reporting for the first time the plant specific data from the producers. The reason for the changed emissions are the new activity data and the changed emission factor.
4.B-Manure management, swine, CH ₄	Spain	- 3 297	- 38.7	New Tier 3 methodology used, including new information regarding manure management systems. Slight change in number of animals due to a change in the estimation method
EU-15 Total recalculations	EU-15	- 5 775	- 0.1	
EU-27 Total recalculations	EU-27	- 6 528	- 0.1	

Note: Explanations for recalculations as provided by the Parties in their national greenhouse gas inventory reports

ES.8 Information on indirect greenhouse gas emissions for the EU-15

Emissions of CO, NO_x, NMVOC and SO₂ have to be reported to the UNFCCC Secretariat because they influence climate change indirectly: the former three substances are precursor substances for ground-level ozone which itself is a greenhouse gas. Sulphur emissions can contribute to formation of microscopic particles (aerosols) that can reflect sunlight back out into space and also affect cloud formation.

Table ES.11 shows the total indirect GHG and SO₂ emissions in the EU-15 between 1990–2008. All emissions were reduced significantly from 1990 levels: the largest reduction was achieved in SO₂ (– 81 %), followed by CO (– 60 %), NMVOC (– 51 %) and NO_x (– 39 %).

In the EU-27, SO₂ emissions decreased by 76 %, followed by CO (– 59 %), NMVOC (– 49 %) and NO_x (– 39 %) (Table ES.12).

EU Member States also report annually emissions of these same substances to the United Nations Economic Commission for Europe (UNECE) Convention on Long-Range Transboundary Air Pollution (LRTAP), and of NO_x, NMVOCs and SO₂ under the EU's National Emissions Ceilings Directive (NECD).

ES.9 Information on using EU ETS for national GHG inventories in EU Member States

This report also includes an analysis of the use of data and emissions reported under the ETS for preparing national GHG inventories in the EU-15. The analysis shows that most Member States used the ETS data to improve and refine the estimation and reporting of CO₂ emissions from energy and industrial processes. Twenty-four of 27 countries used ETS data at least for quality assurance/quality control purposes and checked data consistency between both sources. This is a higher number of Member States than in 2008.

Fourteen Member States have used verified emissions reported by installations under the EU ETS in their national greenhouse gas inventories. Fifteen Member States used ETS data to improve country-specific emission factors. Ten Member States reported that they used activity data (e.g. fuel use) provided under the ETS in their national inventory. The use of ETS data improved the quality of greenhouse gas inventory data with respect to completeness (additional emission sources can be estimated for which no data were available before the EU ETS), accuracy (e.g. due to improved country-specific emission factors) and improved allocation of emissions to correct CRF source categories.

Table ES.11 Overview of EU-15 indirect GHG and SO₂ emissions for 1990–2008 (Gg)

Greenhouse gas emissions	1990	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
	(Gg)														
NO _x	13 614	12 015	11 728	11 287	11 088	10 805	10 515	10 287	10 041	9 952	9 785	9 583	9 305	8 992	8 308
CO	52 561	42 301	40 786	38 780	37 184	34 957	32 143	30 340	28 734	27 748	26 550	24 679	23 342	22 152	21 182
NMVOC	15 757	12 869	12 336	12 121	11 722	11 234	10 498	10 012	9 544	9 573	8 948	8 705	8 508	7 996	7 687
SO ₂	16 497	9 958	8 934	8 173	7 641	6 822	6 090	5 820	5 565	5 116	4 895	4 543	4 348	4 161	3 112

Table ES.12 Overview of EU-27 indirect GHG and SO₂ emissions for 1990–2008 (Gg)

Greenhouse gas emissions	1990	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
	(Gg)														
NO _x	16 915	14 628	14 398	13 881	13 553	13 067	12 694	12 410	12 134	12 260	11 931	11 751	11 572	11 186	10 322
CO	70 377	51 656	50 761	48 282	61 707	49 146	44 686	42 731	38 546	65 344	36 526	35 578	51 500	30 805	29 094
NMVOC	18 287	14 687	14 251	13 989	14 748	13 409	12 410	11 962	11 332	13 527	10 806	10 687	11 772	9 760	9 320
SO ₂	24 928	16 590	15 432	14 378	12 729	11 324	10 286	10 032	9 509	9 020	8 448	7 827	7 602	7 313	5 961

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